Diffusion and Impacts of the Internet and E-Commerce in China

February 2004

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This research is part of the Globalization and E-Commerce project of the Center for Research on Information Technology and Organizations (CRITO) at the University of California, Irvine. This material is based upon work funded by the U.S. National Science Foundation under Grant No. 0085852. Any opinions, findings, and conclusions reflected in the material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

ABSTRACT

E-commerce diffusion has apparently taken different paths in different nations. This is partially because of the significant implications of national technology and the political and economic environments for e-commerce adoption. In this paper, both the diffusion and the impacts of e-commerce in China are examined based on the results of a large-scale survey conducted in 10 countries, including China. The survey focused on three sectors – manufacturing, wholesale/retail, and banking/insurance. The paper also compares the Chinese case with the global trend drawn from the 10-country survey. Findings lead to the conclusion that Chinese firms have started to build up e-commerce technology infrastructure and to create a web presence. However, they fall behind in conducting actual e-commerce transactions mostly because of barriers in business, legal, and cultural perspectives that fail to accommodate the technology progress. In addition, the three surveyed sectors, manufacturing, wholesale/retail, and banking/insurance, appear to follow quite different paths in adopting e-commerce. There are also differences between large firms and SMEs regarding e-commerce diffusion strategies and impacts.

INTRODUCTION

This is the third-phase study of the Globalization and E-Commerce project funded by the National Science Foundation (NSF) and organized by the Center for Research on Information Technology and Organizations (CRITO) at the University of California at Irvine. In expanding the first-phase study on baselines for e-commerce and the second-phase study on environment and policy for e-commerce, this study focuses on the diffusion and the impacts of e-commerce at the firm and industry level in China. It addresses the following questions.

- What are the significant conditions for e-commerce diffusion? What are the key drivers and barriers?
- What has been the actual e-commerce diffusion in China? Is e-commerce diffusion similar or different across different sectors and among firms of different sizes?
- What are the impacts of e-commerce diffusion on firms' internal business operations and outside relationships with other firms? Are these impacts similar or different across industry sectors and among firms with different sizes?

This study is primarily based on the survey data from the CRITO/IDC Global E-Commerce Survey conducted in 10 countries - Brazil, China, Denmark, France, Germany, Japan, Mexico, Singapore, Taiwan, and the United States. This survey sampled 2,139 establishments evenly split among three industry sectors – manufacturing, wholesale/retail distribution, and banking/insurance. Secondary data from government statistics, survey results by other organizations and research institutions, and data on some websites have also been collected to support this study. A selective sampling approach is used in data collection for all countries. In China, samples were selected from four economically advanced major cities: Beijing, Shanghai, Guangzhou, and Chengdu. Therefore, survey results from China have some limitations and do not necessarily represent all Chinese firms.

The findings of this study suggest that Chinese firms have followed a leapfrog approach to significantly upgrade their technology infrastructure for e-commerce diffusion and to establish their web presence while bypassing traditional technologies such as EDI. However, the lack of a solid historic foundation of deploying and utilizing internal information systems, the poor integration of business processes with information systems, the existence of environmental barriers including security concerns, insufficient legal protection and laws, the low credibility of both vendors and consumers, and backward delivery and other supporting systems have, to a large extent, failed to promote a rapid e-commerce diffusion in China. This is evident in China's actual online sales and purchases, which are much lower than those in the other sample countries.

Across the three surveyed industry sectors, e-commerce diffusion is taking different paths. The banking/insurance sector stands out as a traditionally information intensive sector with a long history of building up its information infrastructure and integrating its business operations with information system applications. These factors have contributed to the successful e-commerce diffusion, particularly B2C, in the banking/insurance sector. The wholesale/retail sector suffers the most from its inferior IT infrastructure, poor credibility monitoring capacity, and backward

delivery and other supporting systems in general. B2C transactions, which are strong in other countries' wholesale/retail sectors, are significantly lower in China's wholesale/retail sector. The manufacturing sector is characterized by disparities in firm size and ownership as well as in their IT infrastructures. E-commerce platforms, transactions, and diffusion also witness a wide range of levels in the manufacturing sector.

These findings lead to the conclusion that China has been aggressively upgrading its *technology* infrastructure for e-commerce diffusion in recent years. However, *barriers in business, legal, and cultural perspectives* fail to accommodate the technology progress. The combined factors lead to a very limited amount of actual B2B and B2C transactions in China, compared with other sample countries. This is why most Chinese websites do not offer or support online business, although there is a large percentage of web presence among Chinese firms. In some special cases, such as wireless SMS services, where business, legal, and cultural barriers are resolved, technology upgrades allow China to experience e-commerce diffusion on par with or even beyond other countries. In general, China falls behind the average of sample countries in its e-commerce diffusion. On the other hand, the impressive annual growth rates of B2B and B2C transactions in recent years, as well as the positive forecasts, are pointing to the fact that China is progressing on gradually working on its business, legal, and cultural barriers while upgrading its technology infrastructure. It remains to be seen how quickly these barriers can be reduced or even eliminated.

BACKGROUND AND A PRIORI EXPECTATIONS

China is a large economy with a sizeable absolute gross domestic product (GDP). However, its huge population brings its GDP and wealth level per capita way below developed countries and in-line with many developing countries. Geographically speaking, some wealthy regions, including mostly coastal provinces, have a GDP per capita close to that in newly industrialized countries. Inland provinces have a much lower GDP. This is also true for China's IT infrastructure as well as e-commerce diffusion. For example, between 1990 and 2001, China's telecommunications, information technology (IT), and Internet infrastructures experienced an average of 50 to 200 percent growth. Its large population brings the penetration rates of these infrastructures way below developed countries and only a little higher than many developing countries. However, wealthy regions, which are mostly the coastal provinces, have an infrastructure penetration rate close to, or even higher than, that in newly industrialized countries. It is again inland provinces that have maintained a relatively backward infrastructure.

In general, China's infrastructure for e-commerce diffusion is characterized by "disparities" among geographic areas, demographics, industrial fields, and firm size. Large cities and economically advanced coastal provinces enjoy much better infrastructure and many more Internet users than remote and economically poor provinces. Internet users are dominated by an educated younger generation. Certain industries, including banking and insurance, are information intensive and better positioned to adopt any information related activities. Large enterprises have bigger IT budgets and better-trained staffs than small- and medium-sized enterprises. The infrastructure disparity leads to an e-commerce diffusion disparity in China. Current e-commerce activities in China are concentrated in large cities, coastal provinces, certain

industries, large enterprises, and among well-educated young people. Large cities and coastal provinces also tend to have a better legal environment for e-commerce activities. In general, Chinese firms either have poor internal management information systems or have been building or upgrading their management information systems in the past few years. The integration of information systems with business processes in Chinese firms is far behind that of their counterparts in developed countries.

Along with the poor technical infrastructure, there are many other barriers to e-commerce diffusion in China. The most significant barriers include lack of security, lack of a system to monitor and guarantee buyer and seller credibility, and an inefficient delivery system. The lack of a credibility-monitoring system extends to both vendors and individual consumers. In addition, there is not a sophisticated legal framework to facilitate e-commerce activities and to protect the interests of both vendors and consumers.

These factors, to a large extent, characterize China's Internet applications in general and e-commerce activities in particular. Many firms have recognized the potential of the Internet and e-commerce. They have taken the first step by connecting to the Internet and setting up websites to introduce and advertise their products and services. However, only a very small number of firms have actually moved to the next step to conduct e-commerce activities via their websites. The Network Economy Research Center at Beijing University (2001), supported by the State Economic and Trade Commission, surveyed 638 large and medium-sized enterprises in 2001. 87% of them reported that they had connected to the Internet and 69% of them had created websites. However, only 4% of the firms reportedly had conducted online purchases and less than 4% of them had offered online sales for their products.

TABLE 1 E-Commerce Activities Among 638 Large and Medium-Sized Firms in 2001

	Yes	No
Has the firm connected to the Internet?	87%	13%
Has the firm created its own website?	69%	31%
Has the firm conducted online purchases?	4.1%	95.9%
Has the firm offered online sales of its products?	3.4%	96.6%

Source: Survey results by Network Economy Research Center at Beijing University (2001).

It is obvious that the security, credibility, delivery, and legal barriers are having a negative effect on the improving but still not advanced technology infrastructure that is aimed at actual e-commerce transactions. Significant online transactions can occur only after a solid and comprehensive infrastructure is developed, including the technical, legal, and business infrastructures. This is expected to be a time consuming process.

This paper focuses on e-commerce readiness, diffusion, and impacts in three sectors – manufacturing, wholesale/retail, and banking/insurance. Each sector has its own historical path in the development and deployment of information systems and applications. Expectations from each sector are also apparently different.

Manufacturing

China's manufacturing sector has a large variance in terms of firm size and ownership. There are many large state owned enterprises, a lot of small and medium-sized state owned, joint-stock, and privately owned establishments, some joint ventures, and some solely foreign owned firms. Disparities occur among the IT infrastructures within the manufacturing sector. Some enterprises have bigger IT budgets and better-trained staffs. E-commerce platforms have been set up for them to actively conduct online transactions. Some firms have very limited IT budgets and qualified staffs. Their e-commerce activities are often limited to a web page to show the world their existence, sometimes together with a brief introduction of their products and services. Some fields, such as the automobile and petroleum industries, have a close supply and demand relationship. Substantial B2B e-commerce activities are expected to occur in these industries. The B2C e-commerce and B2B e-commerce transactions with loose supply and demand relationships are expected to be handicapped by poor legal protection, low credibility of suppliers and consumers, an insufficient IT infrastructure, and lagging delivery systems.

Wholesale/Retail

Within China's wholesale/retail sector, there are various kinds of firms, which maintain very different internal IT infrastructures. Joint ventures with foreign partners and solely foreign owned chain stores tend to have sophisticated IT facilities for internal management and coordination with their parent companies abroad. However, the percentage of the joint ventures and foreign owned stores is relatively low since China's wholesale/retail sector has only recently been opened at a very selective level to multinational corporations.

Most of China's wholesale/retail establishments are state-owned SMEs and large enterprises. These firms have been busy adding stand-alone computers to their stores and offices in the 1990s. The build-up of hardware and software for ERP and other decision supporting functions only began two to three years ago. A very small percentage of firms has started to build up their e-commerce platforms (Wang, 2002). Therefore, significant e-commerce activity is not expected in the near future, given the poor IT infrastructure. In addition, the lack of a supporting legal environment and the low credibility of both suppliers and consumers are expected to further slow down the diffusion of both B2B and B2C e-commerce within the wholesale/retail sector.

Banking/Insurance

China's banking/insurance sector has one of the most advanced IT infrastructures among its various industry sectors. This is measured in terms of hardware and software ownership, IT applications to support business functions, and IT budgets, as well as employees with IT expertise. This strong IT presence is aiding the diffusion of e-commerce within China's banking/insurance sector.

The banking sector is still dominated by large state-owned banks, while there are only a very limited number of privately owned banks and some branches of foreign banks. State banks started to build up their foundations for IT infrastructure in the 1980s. Large-scale projects and applications were mostly deployed in the 1990s. By the end of 2000, these large state banks had

installed 266 large mainframe computers, 1,500 medium-sized mainframe computers, 6,000 mini computers, 138,000 servers, 440,000 PCs, 373,000 bank teller machines, and 33,000 ATM machines across the country (Nie, 2002). In addition, a significant portion of the budget has been allocated to the enforcement of network security systems, ERP systems, and customer relationship management (CRM) systems. All of the large state banks have set up their own websites that are able to support online transactions and payments.

There were only 52 firms in China's insurance industry at the end of 2001. These 52 firms consisted of 5 state-owned corporations, 15 joint-stock companies, 19 Sino-foreign joint ventures, and 13 foreign-owned firms. All of these insurance firms have deployed sophisticated IT infrastructures to automate their core business processing systems, accounting systems, telephone dispatching systems, CRM systems, office systems, intelligence and decision making supporting systems, and management information systems (Insurance Monitoring Commission, 2002). Some of these firms have configured their e-commerce platforms to support online searching, online claim processing, and online commenting, as well as online sales for some products. All of the other firms have set up their websites to introduce their insurance products and services.

Given the well-established IT infrastructure in China's banking/insurance sector, significant e-commerce activities are expected to take place. The banking/insurance sector is traditionally regarded as a highly secured business with reliable credibility. This should further alleviate customers' concerns about conducting B2C transactions with banks and insurance companies.

METHODS

This paper is primarily based on the results from the CRITO/IDC Global E-Commerce Survey conducted in 10 countries including China. Secondary data from government statistics, survey results by other organizations and research institutions, and information from several websites have also been cited in the paper. In addition, intensive interviews were conducted for the case study on the stock-trading sector in China.

The CRITO/IDC Global E-Commerce Survey sampled 2,139 establishments in the following 10 countries – Brazil, China, Denmark, France, Germany, Japan, Mexico, Singapore, Taiwan, and the United States. All establishments already use the Internet for business, so they represent advanced users of e-commerce. This is a well-balanced mixture of developed, newly industrialized, and developing countries. Firms are evenly split among three industry sectors – manufacturing, wholesale/retail distribution, and banking/insurance. Half of the sample firms are small to medium-sized establishments (SMEs) with 25 to 250 employees, and the other half are large firms with more than 250 employees.

The sample in China consists of 204 establishments with 69 in manufacturing, 68 in wholesale/retail distribution, and 67 in banking/insurance. Among the 204 establishments, 102 are SMEs and the other 102 are large ones. However, these establishments are drawn only from four major cities: Beijing, Shanghai, Guangzhou, and Chengdu. These four cities are among the most economically advanced regions in the country. Thus, the survey results are not a typical representation of China's firms as a whole, which could create some limitations on any

conclusions drawn from the survey data. After obtaining the raw data, weights are applied based on the actual distribution of establishments in each sample sector. Both the global results and the China results in this paper are based on the weighted calculation.

E-COMMERCE READINESS

Infrastructure Readiness

Telecommunications Infrastructure

China has been rapidly building up its telecommunications infrastructure since the late 1980s (Mueller & Tan, 1997). On average, more than 10 million telephone lines were added to China's telecom network each year in the last decade. Total telephone lines in China reached 180 million in 2001. While China's telephone penetration rate was only 0.3 per 100 capita in 1980, it rose to 25.9 in the year 2001, as shown in Table 2. Many big cities and economically developed areas such as Beijing, Shanghai, and Guangdong have seen telephone penetration rates of 40-50%. The remote rural areas often lag behind with single-digit penetration rates.

TABLE 2 Telecom Infrastructure

	1990	1995	1996	1997	1998	1999	2000	2001
Total telephone users (million)	16.3	40.7	55.0	70.3	87.4	109	145	180
Tele-density (per 100 capita)	1.11	4.00	6.33	8.11	10.5	13.0	20.1	25.9
Total mobile phone users (million)	n/a	3.63	6.85	13.2	24.9	43.8	85.2	145.2
Annual growth of mobile phone users (%)	n/a	131	88.8	93.1	88.8	75.3	94.6	72.2
Total CATV users (families in million)	13	42	61	65	70	77	80	90
Total television sets (million)	160	300	321	340	360	n/a	n/a	n/a

Source: MII's statistics 2001; China Information Almanac 2002; ITU statistics 2000.

China’s wireless phone network has experienced an even higher growth rate than its fixed phone network since the first TACS cellular phone system was installed in 1987. In July of 2001, China’s 120.6 million mobile phone users made it the largest mobile communications market in the world, surpassing the 120.1 million users in the United States. Wireless phone users in China reached 145.2 million by the end of 2001.

Television sets have been one of the most popular consumer products in China. In 1998, there were 360 million television sets used by Chinese consumers, equivalent to about 28 TVs per 100 capita. This high television penetration rate makes e-commerce via television a distinct possibility, since the PC penetration rate is relatively low in China and the PCs are difficult to operate, especially for the old and less educated members of the population. In addition, cable TV has enjoyed impressive growth in China since the early 1990s. Starting from only 13 million families in 1990, China's CATV industry penetrated into 90 million families in 2001.

Information Technology Infrastructure

China has identified its IT industry sector as the most significant driving force for economic growth since the 1980s, as well as for sustainable economic growth in the future. This is a consensus among government policy makers, industry executives, and academic researchers in China. The data in Table 3 clearly demonstrates the significant growth of the IT sector in China. China has been nurturing its domestic IT industry through many policy initiatives, including its plans to revitalize the electronics industry and to promote informatization.

TABLE 3 Information Technology Infrastructure

	1990	1995	1996	1997	1998	1999	2000	2001
Total PCs (million)	.500	2.80	4.50	7.50	11.20	17.78	28.96	n/a
PCs per 100 capita	0.04	0.24	0.36	0.60	0.90	1.42	2.32	n/a
Hardware Revenue (US$B)	1.2	5.8	7.6	10.9	14.1	17.7	22.7	n/a
Software Revenue (US$B)		0.82	1.11	1.35	1.66	2.19	2.87	2.85
IT Service Revenue (US$B)		0.93	1.36	1.78	2.25	2.87	3.88	4.01

Source: China Software Industry Association; ITU Statistics 2000; Read Electronics Research, Statistics 2001

Internet Infrastructure

As in the United States and many other nations, China's Internet began in the academic community (Tan & Foster, 1999). However, the commercialization and rapid expansion of Internet access and diffusion in China did not occur until 1995-1996, when multiple IT infrastructure programs and applications across diverse sectors were introduced through the Golden Projects promoted by the Chinese government (Clark, 1996). Table 4 shows the number of Internet users, computers with an Internet connection, international gateway bandwidth, and domain name registrations under .cn since 1997. The results clearly show a rapid growth since 1997. The number of Internet users grew from only 620,000 in 1997 to 59 million in 2002. Computers with an Internet connection increased from 340,000 in 1997 to 20.8 million in 2002. Total bandwidth to the global Internet increased to 9,380 Mbps in 2002 from 30 Mbps in 1997. Domain names under .cn also climbed from 5,000 in 1997 to 179,500 in 2002.

TABLE 4 Internet Infrastructure in China

	1997	1998	1999	2000	2001	2002
Internet Users (million)	0.620	2.10	8.90	22.50	33.70	59.10
Computers with Internet connection (million)	0.34	0.75	3.50	8.92	12.54	20.83
International gateway bandwidth (Mbps)	30	143	351	2,799	7,597	9,380
Domain names (cn) (thousand)	5	18.4	48.7	122.1	127.3	179.5

Source: CNNIC (China Internet Network Information Center at http://www.cnnic.or.cn)

In summary, China's infrastructure was extremely poor before the 1980s, compared to other nations. Significant expansion has occurred mostly in the past two decades, which makes China one of the largest infrastructures in the world. However, China's huge population drags the per

capita share of every perspective of its infrastructure to a very low level, close to that in most developing countries. There is still great potential for its infrastructure to further expand.

Technology Readiness

Use of E-Commerce Related Technologies

China is typically below the average global level in use of e-commerce technologies. Yet the gap is not significant, especially for newly deployed e-commerce technologies. This is consistent with the fact that e-commerce technologies are mostly a recent deployment both in China and in the world, which has offered China an opportunity to grow together with other nations. This lack of difference is also evident in our sample that consists of only advanced users in each country.

For the newly deployed technologies including e-mail, web-sites, intranets, and extranets, China is only 4-5% behind the global average; 95.9% of surveyed Chinese firms use e-mail, compared with the global average of 98.5%; 69.5% of Chinese firms have some type of web-site presence while the global average is 74.1%; 60.8% of Chinese firms use intranet while the global average is 63.6%. Extranet usage is an exception, with Chinese firms reporting 36.2% use, surpassing the 32.7% global average.

However, China falls far behind in using 'traditional' e-commerce technologies such as EDI, EFT, and call centers. Only 25% of the surveyed Chinese firms use EDI, compared to the global average of 44.3%. EFT is used by 25.7% of Chinese firms, while 43.4% of global firms have adopted it. Call centers have only been deployed in 20.8% of Chinese firms, while the global average is 32.3%. All of this data points to a significant gap between Chinese firms and their counterparts abroad. This result has further confirmed our expectation that IT infrastructure has only recently been deployed in Chinese firms, thus bypassing the 'traditional' technologies. There is a debate over whether this bypass or 'leap-frog' strategy would work in China's e-commerce diffusion. From the technology perspective, the constant upgrading of information and communication technology creates many advantages to later adopters in terms of lower investment and better technology. With e-commerce, later adopters could gain comparative advantages by jumping into the Internet based technology directly and ignoring the EDI type of technology. However, the lack of experience in using traditional EDI and EFT type of technology means no experience in internal system integration, business coordination in marketing and customer services, and familiarity with legal and policy issues. Later adopters need extra time to acquire this knowledge and these skills, which may slow down their progress.

More large Chinese enterprises use newly developed e-commerce than small and medium-sized (SME) ones. However, more small and medium-sized firms have adopted EDI and EFT. This occurred even before the Internet became a viable e-commerce tool. It could be explained by the more intensive involvement of SMEs in international trade than large firms.

China's banking and insurance sector is clearly leading the use of both the 'traditional' and newly developed e-commerce technologies, with only its web-site presence slightly falling behind the manufacturing sector. This is strongly reflected in the high IT budgets and expertise

of the banking/insurance sector and its strong desire to serve customers with e-commerce technologies. It also matches our expectations.

TABLE 5 Use of E-Commerce Technologies

	Establishment Size		Sector			Total	
Percent using …	SME	Large	Manufac-turing	Wholesale/ Retail	Banking/ Insurance	China	Global
E-mail	95.3	99.1	91.7	99.7	99.3	95.9	98.5
Website	67.9	77.4	77.9	61.3	72.0	69.5	74.1
Intranet	57.6	76.6	67.2	53.6	72.0	60.8	63.6
Extranet	35.5	40.1	27.5	43.4	49.5	36.3	32.7
Extranet accessible by suppliers/ business partners	28.2	31.5	16.5	40.0	32.5	28.7	20.9
Extranet accessible by customers	21.1	25.6	15.5	26.4	40.2	21.9	17.8
EDI	26.1	19.6	22.6	26.0	38.9	25.0	44.3
over private networks only	9.5	10.7	10.4	8.0	27.7	9.7	19.4
Internet-based only	4.2	2.5	3.3	4.3	6.3	3.9	8.4
Both	11.2	6.3	6.8	13.8	4.5	10.4	15.9
EFT	26.1	23.9	27.4	22.7	45.9	25.7	43.4
Call center	20.5	22.3	28.9	12.3	29.2	20.8	32.3

Source: CRITO Global E-Commerce Survey, 2002

Enterprise Integration Strategy

While the enterprise's upstream and downstream integration to their internal database and information systems is low across countries, China falls behind the average of the sample countries. Among surveyed firms, 16.5% of Chinese firms have significant integration with internal databases and information systems, which is below the global average of 23.9%. Only 7.9% of Chinese firms have serious electronic integration with suppliers and customers, although the global average is just slightly higher at 9.6%. This is reflected in a generally low level of internal information systems in Chinese firms, except for some sectors such as banking and insurance.

Across sectors, the banking and insurance industry shows both strong downstream and upstream integration -- 41.4% of banking and insurance firms report high linkages to their internal database and information systems, while the percentage of banking/insurance firms with high linkage to suppliers and business customers is 26.2%. The manufacturing industry has an extremely low integration (5.7% with high internal linkage and 6.4% with high outside linkage to suppliers and customers). The wholesale and retail sector also shows a low integration, with 25.7% having significant internal linkage and 8.1% having significant outside linkage.

TABLE 6 Enterprise Integration Strategy

Extent to which Internet applications are electronically integrated with …	Establishment Size		Sector			Total	
	SME	Large	Manufac-turing	Wholesale/ Retail	Banking/ Insurance	China	Global
Internal databases and information systems							
% little to none	47.0	47.7	61.1	34.5	26.7	47.2	52.5
% some	37.4	31.6	33.2	39.8	31.9	36.3	23.6
% a great deal	15.6	20.8	5.7	25.7	41.4	16.5	23.9
Those of suppliers and business customers							
% little to none	64.6	55.4	68.6	58.2	44.7	62.9	72.1
% some	26.8	39.7	24.9	33.7	29.0	29.2	18.3
% a great deal	8.6	4.9	6.4	8.1	26.2	7.9	9.6

Source: CRITO Global E-Commerce Survey, 2002

Mobiles and the Internet

Mobile subscribers have nearly doubled each year in China in recent years, as discussed in the infrastructure section. This trend toward a significant mobile user increase has caught industries' attention. 35.6% of China's banking and insurance firms have already had mobile content or services available, which is much higher than the average of 21.2% among global banking and insurance firms. China's manufacturing sector also reports a high mobile content availability of 21.9%. However, mobile content or service availability among China's wholesale and retail firms is relatively lower (7.1%) than the global average (12.5%). This again confirms our argument that China is not behind other countries in many newly deployed technologies.

TABLE 7 Content/Services to Mobile Customers

	Manufacturing		Retail/wholesale		Banking		Total	
	China	Global	China	Global	China	Global	China	Global
Already available	21.9	14.2	7.1	12.5	35.6	21.2	15.1	13.7
Plan to add within the next year	17.9	17.7	14.5	18.4	14.7	18.9	16.1	18.2

Source: CRITO Global E-Commerce Survey, 2002

Mobile e-commerce clearly has great potential in China. It is still too early to obtain concrete data to evaluate its diffusion across the three sectors – manufacturing, wholesale/retail, and banking/insurance. However, it is obvious that consumers have readily adopted it, given the recent growth of SMS (Short Message Service).

SMS is a messaging service that allows 140 bytes to be sent to a cellular phone via the non-traffic (control) channel shared by phones on the system. Every message can accommodate up to 160 English or 70 Chinese characters. For any user, SMS is an always-on service once the phone is turned on, because the control channel that facilitates SMS service is connected to all the users all the time.

In 1992, Vodafone first used SMS over its GSM cellular network by sending a message from a PC to a GSM phone. It was not until 1999 that the number of SMS messages started to grow

dramatically. In China, the two licensed Chinese wireless carriers, China Mobile and China Unicom, launched SMS services in late 2000. There were 18.9 billion messages sent in 2001, which generated revenue of over US$ 220 million. In 2002, total SMS messages increased to 90-100 billion, which brought the market size to over US$ 1.1-1.2 billion. SMS services have grown into a significant e-commerce business in less than three years. Its success is often attributed to the following reasons:

SMS is a well-coordinated value-chain and an affordable service. There are some direct communications between two cellular users. However, a significant number of SMS messages are sent via an Internet Service/Content Provider (ISP/ICP). Only 1.2 cents is charged per message by cellular carriers, which makes the service very affordable, while a 2-12 cents surcharge could be applied when messages are sent via a website. Cellular carriers retain 15% of the total revenue, and the remaining 85% is given to the Internet service and content providers. Cellular carriers certify ISP/ICPs to make sure that their content and operation are legal and do not violate the rights of consumers. Certified ISP/ICPs are free to develop their own content and operation. This well-defined value chain allows carriers to increase network traffic, motivates ISP/ICPs to create new services and content, and encourages consumers to use this affordable service. The impressive total number of messages put the 1.2 cents per message into a US$ billion business. SMS services have also helped portal sites become profitable, contributing 24% - 40% of their total revenues to the top three portals in China -- sina.com, sohu.com, and neteasy.com -- in the first half of 2003.

SMS services have also been well integrated into local demand and local culture. There are currently six popular SMS services in the Chinese market (Wu, 2002). Handset individualization allows users to pick up, design, and download their own rings and pictures into their cellular phones from an ISP/ICP. News services update cellular phone users with up-to-the-minute political, economic, and sports news from around the world. Real-time chatting services accommodate communication between different devices including cellular phones, PDAs, laptops, and desktops. Gaming and entertainment services also provide value for cellular phone users, especially when they are on the move and want to kill time while taking a bus or train. Advertisement services, which are still regulated in China, could expand into a significant business. Transaction services with small monetary amounts such as purchasing via vending machines and ordering phone cards, songs, or flower delivery via websites are becoming feasible and popular. All of these services reflect the value of SMS services, user demand, mobility, and Chinese environment and culture.

In addition, there are only minor business barriers in terms of payment, delivery, and the credibility monitoring of buyers and sellers for SMS services. Every payment for SMS is included in the user's phone bill, which ensures that the charges are paid. Products and services are delivered to cellular phones, which guarantee on-time delivery and the quality of contents. The sellers are the two licensed carriers, together with ISP/ICPs certified and regulated by the two carriers. The buyers are registered phone users. Both of them have full access to each other's vital information and credit histories. This setting eases the general concern of credibility of both sellers and buyers in China.

SMS has demonstrated that e-commerce could be diffused and that a leap-frog strategy could work in China when significant business, legal, and culture barriers are resolved.

KEY BARRIERS AND INCENTIVES

As in other countries, there are some factors that promote the adoption of Internet use and e-commerce activities in China. There are other factors that stand as barriers to the diffusion of Internet use in China.

Drivers for Internet Use

Drivers for Internet use in China are clearly similar to those for global surveyed firms. The top four drivers are "market expansion for existing products," "customer demand," "new markets," and "cost reduction." Chinese firms ranked all drivers higher than the global average. The only exception is "to improve coordination with customers and suppliers," where China's response rate is lower than the global rate (38.3% versus 43.7%)

Manufacturing establishments clearly recognize the significance of "expanding markets for existing products or services" (59.3%) and "coordination with customers and suppliers" (45.9%). Wholesale and retail firms consider "customer demand" as the number one driver. Small firms report a stronger pressure from customer demand than large firms (47% versus 36.1%). Large establishments indicate a stronger government incentive than small firms (16.6% versus 11.5%).

TABLE 8 Drivers for Internet Use

	Establishment Size		Sector			Total	
Percent indicating a significant driver	SME	Large	Manufac-turing	Wholesale/ Retail	Banking/ Insurance	China	Global
Customer demand	47.0	36.1	34.2	56.1	39.9	45.1	36.9
Major competitors were online	33.0	31.0	37.4	27.7	36.2	32.7	31.3
Suppliers required it	27.5	30.7	31.5	25.6	12.8	28.0	22.3
To reduce costs	38.4	45.1	41.8	37.7	31.9	39.5	35.7
To expand market for existing products or services	56.2	51.0	59.3	52.0	47.7	55.3	47.9
To enter new businesses/markets	42.4	45.8	44.2	41.5	45.6	42.9	42.0
To improve coordination with customers and suppliers	36.2	49.0	45.9	31.2	35.0	38.3	43.7
Required for government procurement	22.3	22.7	24.6	19.9	26.0	22.3	15.2
Government provided incentives	11.5	16.6	14.1	10.3	6.0	12.3	8.3

Source: CRITO Global E-Commerce Survey, 2002

Barriers to Internet Use and E-Commerce Diffusion

Chinese firms share the same opinion with the surveyed global companies in the "concern about privacy of data and security issues" and "inadequate legal protection for Internet purchases" as the top two obstacles to e-commerce diffusion. However, there are some concerns specific to China. "Business laws do not support e-commerce" was reported as a serious obstacle in China, while the global firms considered it a moderate obstacle (40.8% versus 24.2%). In addition, the "prevalence of credit card use" is perceived by Chinese firms as a more serious concern than in

other countries (30.2% versus 20.3%). This data matches our expectation that China is insufficiently established in a general legal framework, security protection, and credit card use for e-commerce diffusion. It is worth noting that the top barriers all have to do with the lack of policy and legal protection.

All of the three industry sectors perceive the same top three obstacles -- "concern about privacy of data and security issues," "inadequate legal protection for Internet purchases," and "business laws that do not support e-commerce." Small and large firms share similar perceptions on these obstacles except for staff recruitment and credit card use. Large firms report that it is fairly easy to recruit staff with e-commerce expertise, while small firms have some difficulty (9.2% versus 21.9%). Large firms also consider the prevalence of credit card use less of a concern than small firms (20.5% versus 32.1%). The banking/insurance sector has the highest concern about privacy of data or security issues among the three sectors (72.6% as opposed to 51.5% and 36.9%). This is primarily because it deals with information directly related to financial data.

TABLE 9 Barriers/Difficulties to E-Commerce Diffusion

	Establishment Size		Sector			Total	
Percent indicating a significant obstacle	SME	Large	Manufac-turing	Wholesale/ Retail	Banking/ Insurance	China	Global
Need for face-to-face customer interaction	31.0	28.3	27.2	34.0	28.7	30.6	33.8
Concern about privacy of data or security issues	45.4	44.7	51.5	36.9	72.6	45.3	44.2
Customers do not use the technology	33.6	27.8	35.2	29.8	34.2	32.6	31.4
Finding staff with e-commerce expertise	21.9	9.2	21.6	18.2	14.4	19.7	26.5
Prevalence of credit card use in the country	32.1	20.5	29.1	31.5	27.2	30.2	20.3
Costs of implementing an e-commerce site	27.3	35.4	34.3	23.1	28.2	28.6	33.6
Making needed organizational changes	22.2	23.1	21.2	22.7	33.6	22.4	23.9
Level of ability to use the Internet as part of business strategy	31.8	27.9	35.4	27.7	21.0	31.1	24.8
Cost of Internet access	22.6	18.7	17.4	26.8	15.5	21.9	15.1
Business laws do not support e-commerce	40.8	40.4	36.6	43.5	57.0	40.8	24.2
Taxation of Internet sales	19.9	15.6	18.9	19.2	21.8	19.1	16.5
Inadequate legal protection for Internet purchases	55.7	49.1	52.4	56.7	54.5	54.5	34.1

Source: CRITO Global E-Commerce Survey, 2002

USES OF THE INTERNET

Chinese firms and their global counterparts use the Internet mostly for the same kinds of business purposes, such as advertising and marketing (52.1% versus 57.6%), after-sale customer service and support (55.4% versus 43.7%), and data exchange with business customers and suppliers (52.1% versus 50.7%). However, Chinese corporations make less use of the Internet for selling and purchasing. Only 23% of Chinese firms offer online sales, compared to 29.9% of surveyed global firms. 31.3% of Chinese firms make online purchases, compared to 46.8% of surveyed global firms. This is consistent with the findings in the previous section and leads to the conclusion that some obstacles, including "concern about privacy of data and security issues," "inadequate legal protection for Internet purchases," and "business laws that do not support e-commerce" are delaying the use of the Internet for online selling and purchasing in China.

The manufacturing, wholesale/retail, and banking/insurance sectors use the Internet for different business purposes while sharing some common ground. The manufacturing sector uses the Internet for after-sale customer service and support (57.6%), advertising and marketing (53%), data exchange with suppliers (47%), and data exchange with customers (43.3%). This sector also conducts some online sales (27.8%) and online purchases (30.7%), and reports poor integration of the same business processes with suppliers or other business partners via the Internet (20.6%).

The wholesale/retail sector uses the Internet for data exchange with business customers (61.4%), after-sale customer service and support (54.5%), advertising and marketing (51.7%), and data exchange with suppliers (47.6%). Making online purchases (32.7%) is more significant than online sales (17.8%) for wholesale/retail firms. They report a strong integration of the same business processes with suppliers or other business partners via the Internet (39.2%).

The banking/insurance sector uses the Internet for advertising and marketing (45.7%), data exchange with business customers (42.2%), after-sale customer service and support (38.9%), and data exchange with suppliers (37.8%). In contrast to the wholesale/retail sector, making online sales (30.1%) is more significant than online purchases (19.6%) for banking/insurance firms. They report a moderate integration of the same business processes with suppliers or other business partners (32.8%).

SMEs and large firms use the Internet for similar business purposes except for one major difference. More SMEs (34.7%) make online purchases than large firms (14.5%). This is consistent with our expectation that SMEs tend to do real business when they decide to get online. International trade business requires SMEs to rely more on e-commerce. Large firms are relatively slow to conduct real business after getting online.

TABLE 10 Uses of the Internet

	Establishment Size		Sector			Total	
Percent using the Internet for …	SME	Large	Manufac-turing	Wholesale/ Retail	Banking/ Insurance	China	Global
Advertising and marketing purposes	50.9	58.2	53.0	51.7	45.7	52.1	57.6
Making sales online	22.9	23.6	27.8	17.8	30.1	23.0	29.9
After-sale customer service and support	56.5	50.0	57.6	54.5	38.9	55.4	43.7
Making purchases online	34.7	14.5	30.7	32.7	19.6	31.3	46.8
Exchanging operational data with suppliers	46.0	51.9	47.0	47.6	37.8	47.0	48.1
Exchanging operational data with business customers	51.8	53.7	43.3	61.4	42.2	52.1	50.7
Formally integrating the same business processes with suppliers or other business partners	28.7	37.4	20.6	39.2	32.8	30.1	33.9

Source: CRITO Global E-Commerce Survey, 2002

How Establishments Use the Internet to Sell Products and Services

Chinese firms differ from global firms in the way the Internet is used to sell products and services. Global firms use the Internet more frequently to "address traditional distribution channels only" than Chinese firms (44.1% versus 9.9%). Chinese firms tend to use the Internet more for "competing directly with traditional distribution channels" than global firms (49.1% versus 27.4%).

Within China's three industry sectors, "competing directly with traditional distribution channels" is ranked as the most popular use of the Internet. In addition, the manufacturing and banking/insurance sectors report the highest use of the Internet to "address new markets only" (36.2% and 34.1%). The wholesale/retail sector is more likely to use the Internet to "replace traditional distribution channels" (26.9%) than the manufacturing (13.0%) and banking/insurance (4.9%) sectors. Large firms are more likely to use the Internet to address traditional distribution channels than SMEs (28.1% vs. 6.1%). This is mostly because SMEs are more innovative and they tend to use the Internet to create new and non-traditional distribution channels to survive market competition. However, both SMEs and large firms have to compete directly with traditional distribution channels (52.1% and 34.7%).

TABLE 11 How Establishments Use the Internet to Sell Products and Services

	Establishment Size		Sector			Total	
Percent indicating Internet used to	SME	Large	Manufac-turing	Wholesale/ Retail	Banking/ Insurance	China	Global
Address new markets only	23.9	22.1	36.2	0.0	34.1	23.6	15.3
Address traditional distribution channels only	6.1	28.1	13.9	4.0	0.0	9.9	44.1
Compete directly with traditional distribution channels	52.1	34.7	36.9	69.2	61.0	49.1	27.4
Replace traditional distribution channels	17.9	15.1	13.0	26.9	4.9	17.4	13.2

Source: CRITO Global E-Commerce Survey, 2002

DIFFUSION OF E-COMMERCE

E-Commerce Industry

China continues to experience an expansion of its e-commerce industry. This is true both for B2C and for B2B sectors. B2C websites are created by various players, including entrepreneurs with domestic and foreign venture capital, small firms, and large enterprises that want to rush into the "gold mine." After a few years, many of the B2C start-ups have gradually left the market while some of them eventually started to make a profit.

There were about 2,056 B2C websites in 2001, based on CCID's statistics (CCID, 2002). However, only 659 websites out of the 2,056 (roughly 25%) actually conducted and maintained B2C operations. 270 out of the 2,056 B2C websites offered e-commerce services for multiple products. The remaining 1,786 websites focused on one or a few special products.

The B2C sector has seen a low transaction volume in spite of its large number of websites. But its annual growth rate is impressive. According to survey results by CCID Consulting (CCID, 2002), China's total B2C transactions reached about US$150 million in 2001. This is a 237% annual growth rate over the previous year. The B2C sector is expected to experience a steady, triple-digit annual growth rate in the next five years, although the growth rate will slow down (CCID, 2002).

TABLE 12 B2C Sector in China in 2001

Total Transactions	US$ 150 million; triple-digit annual growth rate is forecasted for the next 5 years, although the rate will slow down.
B2C Multiple-product Websites	270; only 63 out of the 270 websites actually conducted and maintained B2C operations.
B2C Special-product Websites	1,786; only 596 out of the 1,786 websites actually conducted and maintained B2Coperations.
Total B2C Websites	2,056; only 659 out of the 2,056 websites actually conducted and maintained B2C operations.

Source: CCID's 2001-2002 Annual Report of E-Commerce in China.

Entrepreneurs -- with the support of domestic and foreign venture capital -- create most of China's B2B websites. The burst of the global Internet bubble and the uncertainty of the return-on-investment have gradually drained much of the domestic and foreign venture capital. Many start-ups have disappeared from the playing field. Meanwhile, large enterprises and government-affiliated organizations have started to dominate the B2B sector by buying out existing websites or creating their own. This is mostly because large enterprises and government-affiliated organizations have deep pockets, a large pool of IT experts, and close ties to the industry sectors where B2B e-commerce flourishes (CCID, 2002).

The B2B sector has seen a higher transaction volume and more stable growth than the B2C sector. There is a wide range of the total market size estimated by different sources. According to the survey results by CCID Consulting (CCID, 2002), China's total B2B transactions reached about US$13 billion in 2001, which is much more than the US$150 million for B2C. The B2B sector is forecasted by CCID Consulting (CCID, 2002) to expect a steady 40-60% annual growth rate in the next five years.

CCID (CCID, 2002) reported about 1,345 B2B websites in 2001. However, only 667 websites out of the 1,345 actually conducted and maintained B2B operations, and only 149 out of the 1,345 B2B websites offered cross-sector e-commerce services. The remaining 1,196 websites were sector-specific B2B service providers. This suggests that B2B e-commerce tends to be sector focused.

TABLE 13 B2B Sector in China in 2001

Total Transactions	US$ 13 billion; 40-60% annual growth rate is forecasted for the next 5 years.
B2B Cross-sector Websites	149; only 72 out of the 149 websites actually conducted and maintained B2B operations.
B2B Sector Specific Websites	1,196; only 595 out of the 1,196 websites actually conducted and maintained B2B operations.
Total B2B Websites	1,345; only 667 out of the 1,345 websites actually conducted and maintained B2B operations.

Source: CCID's 2001-2002 Annual Report of E-Commerce in China.

Online Sales

Chinese firms are far behind their global counterparts in terms of real online sales. The gap for the percentage of participating firms is moderate -- 23.1% of surveyed Chinese firms are engaged in B2B online sales, compared to 27.9% of global firms. B2C online sales attract 16.9% of surveyed Chinese firms, compared to 22.1% of the global average. What is significantly different is the large gap in the actual volume of online sales. When sales for consumers and businesses are combined, only 3.4% of Chinese firms' total sales are conducted on-line, compared to 7.8% for the global firms. In addition, only 8.8% of Chinese firms' websites support online payment, while 33.6% of global firms' websites have the online payment function. This is mostly because of the poor electronic payment infrastructure in China. All of this data points to a large gap in online sales between Chinese firms and their global counterparts. It further matches our expectations that Chinese firms have taken the first step toward participating in e-commerce; but they are not yet capable of conducting substantial amounts of actual e-commerce transactions.

The banking/insurance sector is involved in both B2C (23.1%) and B2B (23.6%) online sales. Their online sales to consumers (2.6%) are close to the online sales to businesses (2.3%). This strongly suggests that B2B and B2C are equally significant for the banking/insurance firms. The manufacturing and wholesale/retail sectors share some commonalities that are different from the banking/insurance sector. There are more firms engaging in B2B than in B2C both for the manufacturing sector (26.4% versus 20.2%) and for the wholesale/retail sector (19.7% versus 13.0%). There is a very large gap for wholesale/retail firms' online sales to consumers (0.7%) and to businesses (2.6%), while there is no gap for the manufacturing sector between their consumer online sales and business online sales (1.8% and 1.6%). In addition, only 1.7% of wholesale/retail firms and 13.1% of manufacturing firms have an online payment function through their websites, compared to 30.8% of banking/insurance establishments. This leads to the conclusion that the wholesale/retail sector is experiencing major concerns/problems with B2C e-commerce, which is quite different from the trends in other countries, where B2C is often one of the most significant e-commerce activities for wholesale/retail firms.

SMEs definitely do less online selling than large firms in China. Only 2.8% of SME's total sales are conducted online while the large firms enjoy 6.6%. In general, SME's online sales fall behind large firms' online sales both for B2B (1.8% versus 3.9%) and for B2C (1% versus 2.7%). This supports our earlier argument that large firms are promoting e-commerce more than SMEs in China. SMEs are doing more B2B than B2C (1.8% vs. 1%) because a large segment of their online business is international trade to foreign buyers.

TABLE 14 Online Sales

	Establishment Size		Sector			Total	
	SME	Large	Manufac-turing	Wholesale/ Retail	Banking/ Insurance	China	Global
Type of Online Sales							
Percent B2B	24.5	15.8	26.4	19.7	23.6	23.1	27.9
Percent B2C	16.4	19.0	20.2	13.0	23.1	16.9	22.1
Mean percent of total consumer sales conducted online (all establishments)	1.0	2.7	1.8	0.7	2.6	1.3	3.8
Mean percent of total business sales conducted online (all establishments)	1.8	3.9	1.6	2.6	2.3	2.1	4.0
Mean percent of total consumer sales conducted online (only those doing B2C sales online)	7.3	16.9	9.1	8.1	14.2	9.1	18.6
Mean percent of total business sales conducted online (only those doing B2B sales online)	8.1	34.1	6.3	16.9	14.3	10.4	15.1
Percent of websites that support online payment (only those doing online sales)	8.4	11.5	13.1	1.7	30.8	8.8	33.6

Source: CRITO Global E-Commerce Survey, 2002

Online Services

Online services through websites are popular both in China and in other sampled countries. 62.1% of Chinese firms and 56.4% of global firms provide online B2B services, compared to 37.8% of Chinese firms and 46.2% of global firms for B2C online services.

Among the three sectors, the banking/insurance sector demonstrates clear leadership in providing online B2C services while the manufacturing sector leads in online B2B services. The wholesale/retail sector is less likely to provide B2C online services. Manufacturing firms are most likely to provide product specification services over the Internet. The most frequently provided online services by wholesale/retail firms are product catalogues and product reviews. SMEs are less likely to offer online B2C services (35%), compared to large firms (51.5%). This is because most B2C barriers in China, including credibility, delivery, and payment settlement, are more serious for SMEs than for large firms.

TABLE 15 Online Services

	Establishment Size		Sector			Total	
	SME	Large	Manufac-turing	Wholesale/ Retail	Banking/ Insurance	China	Global
Type of Online Services							
Percent B2B	62.6	61.6	71.8	53.4	47.4	62.1	56.4
Percent B2C	35.0	51.5	41.9	32.5	53.6	37.8	46.2
Mean percent of total consumer services conducted online	6.5	12.0	6.7	7.4	12.0	7.2	7.6
Mean percent of total business services conducted online	4.1	17.0	2.3	9.8	26.7	5.7	11.0
Percent of manufacturing websites which support							
Product configuration	69.7	66.7	69.3			69.3	54.7
Order tracking	39.3	66.7	42.2			42.2	21.5
Service and technical support	69.7	100.0	72.9			72.9	54.4
Product specification	100	100.0	100			100	79.9
Account information	69.7	66.7	30.7			30.7	17.0
Percent of wholesale/retail distribution websites which support							
Gift certificates and/or registry	3.8	41.4		7.1		7.1	20.6
Product catalogues	96.2	100.0		96.5		96.5	69.8
Product reviews	96.2	100.0		96.5		96.5	48.6
Ind. customization	0.0	62.0		5.3		5.3	21.3
Account information	24.0	41.4		25.5		25.5	21.7
Percent of banking and insurance websites supporting							
Online services such as filing applications, claims, paying bills, transferring funds	83.6	62.0			78.4	78.4	53.9
Access to account information	85.6	55.8			79.8	79.8	57.3

Source: CRITO Global E-Commerce Survey, 2002

Online Procurement

In general, Chinese firms conduct less online procurement than their global counterparts; 40.2% of Chinese firms have used online procurement, compared to 50.8% of global firms. More significantly, Chinese firms spent less money for online procurement. The mean dollar amount spent via the Internet on direct goods for production is 3.9% for Chinese firms versus 8.3% for global sample firms. The mean amount of money spent via the Internet on goods for resale is 4.8% in China versus 6.8% in global firms. The mean percent of the dollar amount spent via the Internet on supplies and equipment is 3.2% in China versus 8.3% for global firms.

China's wholesale/retail sector is the most active online purchasing participant and spends a higher mean percentage of money on online procurement. The banking/insurance sector is a less active participant and spends a lower mean percentage of money for online procurement. SMEs have a higher participating percentage and spend more money for online purchasing, compared to large firms. This is again because SMEs are more serious about conducting online business when they decide to get online than large firms, who might only create an online presence rather than conducting actual online business.

TABLE 16 Online Procurement

	Establishment Size		Sector			Total	
	SME	Large	Manufac-turing	Wholesale/ Retail	Banking/ Insurance	China	Global
Percent of establishments doing online purchasing	44.1	21.0	36.2	45.2	27.2	40.2	50.8
Mean percent of money spent for direct goods for production ordered online (all establishments)	5.1	0.1	3.9			3.9	8.3
Mean percent of money spent on goods for resale ordered online (all establishments)	4.8	4.7		4.8		4.8	6.8
Mean percent of money spent on supplies and equipment ordered online (all establishments)	3.9	0.2	1.4	5.4	0.8	3.2	8.3

Source: CRITO Global E-Commerce Survey, 2002

IMPACTS

Impacts of Doing Business Online

The most significant impacts of online sales reported by Chinese firms are widened sales area (48.5%), improved competitive position (41.2%), and improved customer service (36.9%), while the impacts of internal process efficiency (31%) and decreased procurement costs (29.7%) fall behind. The global sample firms report improved customer service (34.8%) and improved efficiency of internal processes (33.9%) as the most significant impacts. This suggests that impacts of online business have been significantly recognized by Chinese firms, although online sales are still low in China.

TABLE 17 Impacts of Doing Business Online on Sales and Efficiency

	Establishment Size		Sector			Total	
Percent indicating impact is a great deal	SME	Large	Manufac-turing	Wholesale/ Retail	Banking/ Insurance	China	Global
Internal processes more efficient	28.0	46.1	38.3	23.5	43.7	31.0	33.9
Staff productivity increased	22.7	29.9	24.5	23.0	29.6	23.9	27.2
Sales increased	24.2	32.4	23.1	27.5	30.9	25.6	20.5
Sales area widened	47.8	52.3	50.5	47.2	39.8	48.5	31.4
Customer service improved	35.8	42.1	41.7	31.7	44.7	36.9	34.8
International sales increased	31.1	41.4	31.9	34.4	23.6	32.8	19.5
Procurement costs decreased	29.5	30.8	28.9	31.4	16.0	29.7	17.7
Inventory costs decreased	20.1	26.3	17.8	24.4	19.1	21.1	14.0
Coordination with suppliers improved	27.2	40.8	27.3	32.2	17.9	29.4	29.8
Competitive position improved	40.0	47.1	43.7	38.2	48.9	41.2	29.8

Source: CRITO Global E-Commerce Survey, 2002

The manufacturing sector reports a similar trend with the national sample -- significant impacts on sales and customer service. The most significant impacts of doing business online for manufacturing firms are widened sales area (50.5%), improved competitive position (43.7%), and improved customer service (41.7%). The wholesale/retail sector reports a similar result: widened sales area (47.2%) and improved competitive position (38.2%). The banking/insurance

sector does report a high impact on internal process efficiency (43.7%), together with improved competitive position (48.9%) and improved customer service (44.7%). It appears that online business does have impacts on different areas for different industry sectors. It is worth noting that large firms clearly get greater impacts from e-commerce than SMEs across all the perspectives.

Impacts of Doing Business Online on Distributional Channels, Suppliers, and Competitors

Chinese firms report a higher degree of increase in the number of distribution channels, suppliers and competitors than that reported by surveyed global firms as a result of doing business online; 34.3% of Chinese firms indicate an increased number of suppliers, compared to 29.9% of the sampled global firms. There is a large difference between Chinese firms and global firms regarding the indication of the increased number of competitors (43.2% versus 27.9%) and the increased intensity of competition (48.7% versus 41.5%).

The manufacturing sector indicates an overall increase across the distribution channels, suppliers, and competitors (between 37% and 48%). The wholesale/retail sector does report an increased intensity of competition (49.8%), an increased number of competitors (46.1%), and an increased number of distribution channels. However, the increased number of suppliers is moderate (28.4%). The banking/insurance sector does feel the increased intensity of competition and the increased number of competitors. However, banking/insurance firms report neither a strong increase in the number of distribution channels (22.4%), nor a significant increased number of suppliers (22.2%). This leads to the conclusion that the industry structures for the manufacturing, wholesale/retail, and banking/insurance sectors have been affected differently by doing business online.

TABLE 18 Impacts of Doing Business Online on Distribution Channels and Players

	Establishment Size		Sector			Total	
Percent indicating…	SME	Large	Manufac-turing	Wholesale/ Retail	Banking/ Insurance	China	Global
Number of distribution channels increased	39.4	49.9	37.1	46.0	22.4	41.1	40.2
Number of suppliers increased	31.6	48.8	41.7	28.4	22.2	34.3	29.9
Number of competitors increased	44.1	38.4	41.1	46.1	32.0	43.2	27.9
Intensity of competition increased	49.8	42.7	48.1	49.8	41.0	48.7	41.5

Source: CRITO Global E-Commerce Survey, 2002.

CONCLUSION

Our survey data supports the argument that China has been aggressively upgrading its technology infrastructure for e-commerce diffusion. China's efforts in technology infrastructure are reflected by Chinese firms' rush to establish their web presence and deploy the latest technologies, although this large-scale upgrading only occurred in recent years. On the other hand, China falls far behind in using 'traditional' e-commerce technologies such as EDI, EFT, and call centers. Chinese firms are also behind in facilitating the upstream and downstream integration to the internal database and information systems in enterprises. All of these factors could be viewed as the outcomes of an aggressive leap-frog strategy in upgrading technology

infrastructure. Significant progress should be made over a reasonably short time to achieve technology readiness for e-commerce diffusion.

However, the lack of a solid historic foundation of internal information systems; the poor integration of business processes with information systems; and the existence of environmental barriers, including security concerns, poor legal protection and laws, low credibility of vendors and consumers, and backward delivery and supporting systems have, to a large extent, discounted China's technology readiness for e-commerce diffusion. This is further evident in China's low online sales and purchases. This scenario could be best termed as a mismatch between China's aggressive technology upgrading and its existing barriers in business, legal, and culture perspectives. This suggests that a healthy e-commerce infrastructure should be supported both by advanced technologies and by a friendly business, legal, and culture environment. The success of SMS services in China supports this conclusion.

Based on our survey data, drivers for e-commerce adoption in China are clearly similar to those for global surveyed firms, with the top four drivers being "market expansion for existing products," "customer demand," "entering new markets," and "cost reduction." Clearly, firms are driven by business competition and opportunities to adopt e-commerce. However, barriers are different in different countries. "Business laws that do not support e-commerce," "inadequate legal protection for Internet purchases," and the lack of "prevalence of credit card use" are reported as more serious obstacles in China than in other sample nations. Other researchers have suggested that China has relatively poor delivery supporting and credibility-monitoring systems. All of these point to a set of serious legal, business, and culture barriers to e-commerce diffusion in China.

Survey data suggests that Chinese firms and their global counterparts use the Internet mostly for similar business purposes, including advertising and marketing, after-sale customer service and support, and data exchange with business customers and suppliers. However, there is a striking difference between Chinese corporations and global firms when it comes to the use of the Internet for selling and purchasing products and services. The combined online sales for consumers and businesses by Chinese firms only account for 3.4% of total sales, which is less than half of the global average. Only 8.8% of Chinese firms' websites support online payment functions, which is about one-fourth of the global average. This scenario of high web presence and low online transactions in China is supported by other research as discussed in the background section.

Chinese firms report sales-related issues as the most significant impacts of e-commerce diffusion, including widened sales area, improved competitive position, and improved customer service. The global sample firms consider efficiency-related issues as the most significant impacts, including improved efficiency of internal processes. This again confirms the disconnection between e-commerce and the internal business processes in Chinese firms.

Across the three industry sectors we investigated – manufacturing, wholesale/retail, and banking/insurance - e-commerce diffusion is taking different paths. China's manufacturing sector has a large disparity in terms of IT infrastructure readiness and e-commerce diffusion. Enterprises with bigger IT budgets and better-trained staffs have rushed into the e-commerce era

by creating websites and conducting on-line sales and purchases. Many other enterprises with limited IT budgets and less qualified staffs are slow to adopt e-commerce. In general, substantial B2B e-commerce activities are occurring in several well-organized industry fields, including the automobile and petroleum industries. Very little B2C activities have taken place in the manufacturing sector.

China's wholesale/retail sector is traditionally backward in IT infrastructure build-up and upgrading. In addition, some crucial factors for e-commerce diffusion in the wholesale/retail sector have emerged as barriers in China. These barriers include the poor credibility-monitoring systems both for vendors and consumers, backward delivery systems, and payment solutions and other supporting systems. While the e-commerce diffusion level tends to be high in other countries' wholesale/retail sectors, this sector in China has the lowest e-commerce diffusion level among the three surveyed sectors.

The banking/insurance sector in China has a long history of building up its information infrastructure and integrating its business operations with information system applications as a traditional information intensive sector. Its infrastructure readiness level is higher than the other two sectors. Adopting e-commerce seems to be a natural continuation of the long-term strategy. The fact that the banking/insurance sector has a tradition of paying close attention to security, privacy, and credibility has alleviated many of the customers' concerns. These factors have contributed to the successful e-commerce diffusion in the banking/insurance sector, particularly for B2C businesses. So far, this sector has achieved the highest level of e-commerce diffusion in terms of the on-line functions offered, total on-line sales, and the integration of internal business processes with the on-line activities. However, financial information is among the most critical for individuals and organizations in China and the concern on data privacy and security will never go away if new applications are adopted. That is why 73% of firms in the banking/insurance sector have ranked privacy/security as one of the top three concerns for e-commerce diffusion.

Finally, this study concludes that China has been aggressively upgrading its *technology* infrastructure for e-commerce diffusion in recent years. However, *barriers in business, legal, and culture perspectives* fail to accommodate the technology progress. These factors in combination lead to a very limited amount of actual B2B and B2C online transactions, i.e. limited e-commerce diffusion compared with other sample countries. This is why most Chinese websites do not offer or support online business, although there is a large percentage of web presence among Chinese firms. In some special cases, such as SMS services, where business, legal, and culture barriers are resolved, technology upgrades allow China to experience e-commerce diffusion on par with or even beyond other countries. This has further confirmed that a healthy e-commerce infrastructure should be supported both by advanced technologies and by a friendly business, legal, and culture environment. On the other hand, the impressive annual growth rates of B2B and B2C transactions in recent years, as well as the positive forecasts, are pointing to the fact that China is making progress and gradually working on these barriers while continuing to upgrade the technology infrastructure. It remains to be seen how fast these barriers can be alleviated or even removed. In addition, the three surveyed sectors, manufacturing, wholesale/retail, and banking/insurance, appear to have followed quite different paths in

adopting e-commerce. There are also some differences between large firms and SMEs regarding e-commerce diffusion strategies and impacts.

Conclusions of this paper suggest that government policies regarding e-commerce diffusion should be geared toward passing various laws and regulations to create a legal and safe environment for businesses and consumers. The government could also help, possibly through state-owned enterprises, to build up financial, certificating, security, and even delivery systems to serve e-commerce transactions.

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Appendix: E-Commerce Diffusion in China's Stock Trading Sector

Background

China's stock trading sector consists of trading products, trading participants, and trading markets. Trading products include stocks, bonds, and mutual funds. Trading participants include publicly traded companies, security trading companies, enterprises, institutional investors, and individual investors. Trading markets consist of Shanghai Stock Trading Market and ShenZhen Stock Trading Market, as well as their trading systems. Because of government regulations, commercial banks are prohibited from stock trading. In reality, some banks ignore the government regulations and participate in stock trading, often indirectly.

By the end of August 2002, there were a total of 1,197 A or B type publicly traded companies in China, 124 security trading companies, 203 trust investment corporations doing security trading, 2,412 security trading offices, and 95 security trading consulting corporations. There are 6.8 million officially registered investors. The total market value is about US$500 billion, which is about 52% of China's GDP. There are about 53 mutual funds with total assets of about US$ 10 billion.

China's stock trading market is a total electronic market that consists of four major systems – a trading clearance system, a trading telecommunication system, a counter service system, and a remote trading order system. After about 10 years of build-up and utilization, both the Shanghai Stock Trading Market and the Shenzhen Stock Trading Market have established their own trade matching and clearance systems tailored toward the environment and customer needs in China. On top of the functions of trading, recording, clearing, and real-time monitoring, their processing speed, processing capacity, and intelligence are all on par with the world's best standards. By the end of 2000, systems in both of the markets had been upgraded four times. Their daily processing capacity has reached 20 million transactions.

Telecommunication systems serving the two stock trading markets are based mostly on satellites, assisted by wireline-based systems. This satellite-based system has 2,000 two-way earth stations and 3,800 one-way earth stations. Counter service systems are directly connected to the two stock trading markets via satellite links. Except for the trading order function, the counter service systems also support clearance, information distribution, internal monitoring, account management, and information consulting and services. Remote trading order systems consist of telephone order systems, Internet order systems, cellular phone order systems, and leased-line order systems. Their major function is to send investors' orders to the security trading brokers.

China's stock trading is dominated by individual investors. Institutional investors are the minority. ShenZhen Stock Trading Market published its statistics in 2001 (http://www.sse.org.cn/sse/index.asp?cid=about_intro). Among its 32.21 million investors, there are 32.04 million individual investors, which make up 99.5% of the total investors. There are only 160,000 institutional investors (0.5%). These investors are spread across China. Economically more advanced coastal provinces do see more investors.

Stocks are arguably the most significant trading products in terms of the total trading volume and the total trading market value. According to statistics from the Shanghai Stock Trading Market, there were 690 trading stocks, 31 bonds, and 23 mutual funds in 2001. Stocks account for 93% of the total trading products. The annual total trading value for stocks was about US$ 280 Billion in 2001, which is about 52% of the total trading value. Bond trading reached US$ 210 Billion (45%) and the remaining 3% of the trading value was for mutual funds (about US$16 Billion). Individual investors are mostly holding and trading stocks. Bond trading is dominated by institutional investors.

E-Commerce in China's Stock Trading Sector

China's stock trading sector is a total e-commerce process under the definition that any transaction using electronic means is called an e-commerce transaction. This is because all transactions in China are paperless. However, our case study does not follow this general definition for e-commerce. Our definition of e-commerce is any transaction using the Internet.

In addition, this case study only focuses on stock trading, while ignoring bond and mutual fund trading. Stock trading consists of two major steps – market information acquiring and analysis, and order putting and clearing. Investors can start trading once they have opened accounts with a security-trading broker and deposited the required funds. The trading process includes the following steps:

1. Investors make the buying or selling decision after receiving and analyzing available information.
2. Investors put their orders in to the trading offices of security brokers.
3. Trading offices pass the buying/selling orders to the trading match systems of the stock trading markets.
4. Stock trading markets make the match. The clearance systems send the transaction results to the security brokers. Accordingly, the stocks are added to or deleted from investors' accounts while the same amount of funds are deducted from or returned to the investors' accounts.
5. Transaction results are sent back to the trading offices.
6. Trading results are then passed on to investors.

Steps 3, 4, and 5 have been totally automated and executed through the computer system. Step 2 can be implemented differently, including over-the-counter, over-the-terminal, via telephone, and via the Internet. Step 6 can also be carried out via different means. This case study focuses on steps 2 and 6, which are interactions between investors and trading offices.

Interactions between investors and trading offices are currently conducted through the following methods:

1. Self-order system – Investors are provided with a real-time market analyzing system with trading functions that allow them to both input orders and search the results. The self-order system is often limited to large and medium-sized institutional investors.

2. Over-the-counter order system – Investors fill in the order forms and hand them to a staff of security brokers. Orders are typed in by the staff and sent to the trading systems of the two markets. It is slow and has a high error rate.
3. Self-order system via an ID card – Investors apply for ID cards from trading offices. ID cards allow investors to access the ordering terminals within trading offices. Investors input orders directly.
4. Video phone order system – Investors are connected to trading offices via a modem. The video and audio services allow investors to communicate with the trading systems within trading offices.
5. Telephone order system – Investors can access the trading systems within trading offices via a dial tone telephone. Pushing different keys on the telephone completes the process.
6. Internet order system – The entire order inputting and result-searching process is completed via the Internet. This system is the focus of this case study.
7. Cellular phone order system – Investors can complete the stock trading via the SMS (Short Message System) function or the WAP (Wireless Access Protocol) function.

Table A-1 lists the percentage for each trading order method in 2001. It is obvious that the over-the-counter order system and the telephone order system are the two most popular methods, while the Internet order system and the cellular phone order system are the least popular methods.

TABLE 1 Percent for Each Trading Method

Trading Method	Accounts/Total Accounts (%)	Transaction value/ Total Transaction Value (%)
Internet Order	8.87	5.08
Telephone Order	66.59	22.05
Video Phone Order	9.18	2.68
Other Remote Order Systems	14.77	7.22
Cellular Phone Order System (SMS)	2.93	0.05
Cellular Phone Order System (WAP)	0.08	0.02
Over-the-Counter Order System	69.09	62.9

Source: China E-Commerce Year Book (2002), page 309.

Stock Trading Via the Internet

Stock trading over the Internet was first deployed in China in 1997. In 2000, there were 71 brokerage firms conducting various stock-trading via the Internet. These firms have about 200 trading offices across China to serve about 250,000 investors. There are over 400,000 investors who constantly obtain market information through the Internet. Internet stock trading reached 1% of the total stock trading value in 2000. Two years later, in 2002, stock-trading via the Internet reached about US$ 5 billion, which is about 11.08% of the total trading value in the two stock markets. 4.8 million investors opened their accounts for trading via the Internet. Based on the statistics from the China Security Regulation Commission (CSRC, 2002 at http://www.csrc.gov.cn), Table A-2 documents the details of trading via the Internet. The growth pattern is obvious.

TABLE 2 Percent for Each Trading Method

Year - 2001	Jan.	Feb.	Mar	Apr	May	June	July	Aug	Sept	Oct.	Nov	Dec
Trading via Internet (RMB B)	23.9	23.9	23.9	41.9	31.8	45.6	26.6	29.5	20.9	24.6	27.8	28.8
Total trading (RMB B)	702	702	702	227	890	983	668	533	397	429	450	437
Percent for trading via Internet over total trading (%)	3.41	3.41	3.41	3.59	3.57	4.65	3.98	5.53	5.26	5.74	6.17	6.59
Total accounts for Internet trading (Million)			2.33	2.40	2.56	2.71	2.89	3.01	3.01	3.19	3.29	3.32
Total accounts (Million)			30.7	31.1	31.5	32.0	32.4	32.7	32.8	32.9	33.1	33.3
Percent of Internet trading accounts over the total (%)			7.60	7.70	8.10	8.50	8.90	9.22	9.46	9.70	9.94	9.98

Year - 2002	Jan.	Feb.	Mar	Apr	May	June	July	Aug	Sept	Oct.	Nov	Dec
Trading via Internet (RMB B)	21.3	21.3	67.2	46.2	36.7	75.0	70.2	43.1				
Total trading (RMB B)	340	341	983	708	385	860	64.5	39.0				
Percent for trading via Internet over total trading (%)	6.24	6.24		6.53	9.56	8.73	10.88	11.08				
Total accounts for Internet trading (Million)		3.76	4.09	4.15	4.48	4.51	4.71	4.77				
Total accounts (Million)		33.5	33.7	33.8	33.9	34.0	34.1	34.2				
Percent of Internet trading accounts over the total (%)		11.3	12.1	12.2	13.1	13.2	13.8	13.9				

Source: CSRC's statistics (August 2002) at http://ww.csrc.gov.cn

There were four major phases in China's move to stock trading via the Internet. The first phase is from 1996-1997, when the Internet first appeared in China. Facilities were both expensive and incomplete. Only a limited number of trading offices hosted the systems for their VIP investors. The second phase, March 1998 to May 1999, witnessed major environmental changes. The Internet started to take off. ISPs lowered their prices and provided supporting services in order to lure stock investors to use their Internet services. Meanwhile, trading offices upgraded their software to better accommodate trading via the Internet. In addition, stock prices rose sharply, which led to a sharp increase in trading volume. Providing trading via the Internet offered security brokers comparative advantages. This boosted the popularity of trading via the Internet among security brokers.

The third phase, June 1999 to May 2000, saw the Internet getting even more popular among consumers. The global Internet fever and the emergence of new technologies for stock trading, such as WEB, boosted Internet trading even further. Many new brokerage firms were established and they were specialized in stock trading via the Internet. The fourth phase, June 2000 to June 2001, experienced both support from the government and the improvement of supporting technologies. The chairman of CSRC officially announced his endorsement of stock trading via the Internet. Backbone speed improvement and the deployment of high-speed access technologies, including ADSL and Fiber-to-Home, made Internet trading more feasible and reliable. One of the major developments was that specialized brokerage firms emerged to serve a countrywide market.

Key Factors and Environment Policies

There are both drivers and barriers to the diffusion of e-commerce within China's stock trading market. Key drivers include the following:

1. The sustained economic development in the past two decades. Since 1978, China has been opened to the world and has experienced high annual growth rates. Between 1990 and 2001, China's GDP achieved a 9.3% average annual growth rate.
2. Income per capita has increased rapidly. The increased income led to more savings. This huge amount of savings turned many people into stock investors.
3. Rapid expansion of China's stock market. There were only eight publicly traded companies when the China stock trading market was established in 1990. The total trading products reached 734 in 2001. Market value rose from 3 billion RMB in 1990 to 2,746 billion RMB in 2001. The number of investors jumped from 110,000 in 1990 to 33.8 million in 2001.
4. Impressive diffusion of the Internet. As we discussed in the infrastructure section of this paper, the Internet experienced triple digit annual growth since 1997.
5. Bypassing license requirements and cutting costs. Internet trading provides a great opportunity for brokerage firms to cut costs and obtain comparative advantages. Setting up an online trading platform costs about 6 million RMB, which is a big savings over establishing a physical trading office that costs about 10-20 million RMB on average, or more, in downtown areas. In addition, the number of physical trading offices by each brokerage firm in every city is regulated by the government, which limits the geographic coverage of brokerage firms. The Internet online trading platform could easily offer citywide or province-wide coverage because it could be virtually accessed from anywhere via an Internet connection.
6. Flexible policies and on-time adjustments. Because Internet trading is relatively new to Chinese investors and brokerage firms, the government has been publishing flexible new policies and regulations. More significantly, the government has adjusted its policies when pitfalls are discovered. This creates a nurturing environment for Internet trading to grow.

Given the fact that Internet stock trading accounts for between 10-11% of the total trading, there must be serious barriers to its expansion. These include:

1. Behavior changing. Most stock investors in China are individuals and some of them do not have other jobs except stock trading. Part of their life is to go to the stock trading offices to chat with others and stay around while buying or selling stocks during this period. This is similar to shoppers who enjoy spending time in stores on top of buying things. Many of them would not switch to Internet stock trading, at least in the near future.
2. Security and reliability concerns. Many Chinese investors still do not trust the Internet. They are concerned about whether their trading orders could be executed on time. They also worry about whether their order commands would be intercepted by others. In addition, technical barriers could guarantee the real time execution of trading orders all

the time. As the technologies get better and more reliable, these concerns may soon be alleviated.

3. The availability of the Internet. While the Internet has grown rapidly in China, facilities are much better in large to medium cities and coastal areas. Small cities and remote areas have not been upgraded as well. It will take some time for Internet stock trading to be popular in these locations.
4. Educational background of investors. Many investors have a limited educational background, which means a limited knowledge of computers and the Internet. They might not switch to Internet stock trading in a short time period.
5. Too many substitutions. Internet stock trading does provide some conveniences and advantages. However, other methods, including telephone ordering systems and remote video trading systems, could also provide similar advantages.

In summary, recent statistics point to positive growth for Internet stock trading. This further confirms the conclusion of the paper – information intensive sectors tend to see more rapid e-commerce diffusion in China.