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THE INTERNET

The Internet is a global network medium providing commercial organisations, educational institutions, government agencies, and individuals with a single virtual destination point where they can communicate, access and exchange information, and conduct business activities electronically. It is a medium which provides a wide range of services such as e-mail, business applications, online education, online computing and an enormous amount of other valuable applications and resources.

Internet usage in Hong Kong and the PRC

The number of Internet users in the Greater China region has surpassed 24 million people in the fourth quarter of 2000 according to the recent research conducted by iamasia (Interactive Audience Measurement Asia). There are about 15.2 million Internet users aged five or above in the PRC, 2.2 million in Hong Kong and 6.4 million in Taiwan. It is expected that the number of Internet users in the Greater China region will continue to grow in the near future.

The following table sets out a comparison of Internet usage between Hong Kong and the PRC.

	PRC	Hong Kong
Total number of Internet users	15.2 million	2.2 million
Six-month growth in number of Internet users (from the second quarter to the fourth quarter of 2000)	15.4%	9.7%
Internet penetration (Internet users as a percentage of total population aged five years or above)	7%*	34%
Percentage of Internet users that log on:		
at home	56%	84%
at work	39%	26%
at school	8%	21%
at an Internet cafe	35%	2%
Percentage of Internet users that are male	60%	57%
Percentage of Internet users between the ages of 15 and 29	57%	43%
Average household income of Internet users	US$5,780	US$51,650
Percentage of Internet users that have tried e-commerce	10%	13%

*   *urban population*

Source: iamasia

Many US Internet technology companies and solution providers have entered the PRC market in 1999. With the highest population in the world, the huge e-commerce market in the PRC offers ample opportunities for both domestic and foreign companies.

e-BUSINESS SOLUTIONS

The rapid growth in the number of Internet users has also been combined with a surge in e-Business activities. The table below outlines sales forecasts for B2B sales up to 2004.

B2B eCommerce by Region, 2000-2004 (in $ billions)

	2000	2001	2002	2003	2004	As a % of worldwide B2B e-Business 2004
	US$	US$	US$	US$	US$	
North America	159.2	316.8	563.9	964.3	1,600.8	57.7%
Asia/Pacific Rim	36.2	68.6	121.2	199.3	300.6	10.8%
Europe	26.2	52.4	132.7	334.1	797.3	28.7%
Latin America	2.9	7.9	17.4	33.6	58.4	2.1%
Africa/Middle East	1.7	3.2	5.9	10.6	17.7	0.6%
Total	226.2	448.9	841.1	1,541.9	2,774.8	100.0%

Source: eMarketer, 2001

The rise in e-Business activities has generated demand for e-Business applications which facilitate communication, collaboration and coordination between consumers, business and trading partners. IDC has estimated the world market for e-Business applications grew by approximately 175% in 2000 to reach nearly US$5 billion. While this rapid rate of growth is expected to slow down in 2001 as a result of the weakening economy, the trend towards outsourcing specialist skills is expected to bring about long term growth for e-Business applications.

According to a research on 134 companies from around the world conducted by Cutter Consortium, an information technology consultant firm, approximately 42% of companies who have participated in the research are engaged in e-Business activities. In order to stay competitive, it is believed that e-Business initiatives are critical for a company's long term success.

MULTIPLE ACCESS PLATFORMS

The growth in Internet subscribers and mobile phone penetration is expected to create increasing demand for multiple access platforms. These are sophisticated Internet platforms, capable of receiving and sending information in a variety or a combination of text, voice and other formats.

The sections below illustrate the growing importance of mobile and other emerging wireless communications services in enabling businesses to conduct Internet-based activities.

Alternative Internet Access

The growth in client/server computing, multimedia and online services, and the proliferation of networking technologies have led to the extensive use of services such as e-mail, electronic file transfers, and e-commerce. Meanwhile, the arrival of WAP and broadband services has introduced a whole new dimension to new service possibilities, and has blurred the lines between computing services, multimedia, and telephony. Broadband provides the much-needed bandwidth for the convergence of technologies for computing, entertainment, and communications to digital infrastructures. This enables the creation of a whole host of new product offerings catering for different audiences, and this 'customisation' in turn makes the widespread adoption of the Internet a reality.

As mobile and other emerging wireless communications services become more widely available and affordable, business entities are placing increasing emphasis on the use of wireless communications in sharing information and conducting business electronically. Wireless web-enabled devices are expected to increase usage of the Internet, providing remote access to e-mail and all kinds of information.

According to The Wireless Handbook for China released in December 2000 by Intrinsic Technology, the number of mobile users in the PRC will exceed 250 million by the end of 2005.

|	2000	2001	2002	2003	2004	2005
Number of subscribers (million)	65.2	111.2	158.3	209.8	228.2	254.1
Cellular revenues (US$ million/year)	22,689	32,472	56,728	73,446	79,495	87,969
Average revenue per user (US$/month)	30.10	29.85	29.75	29.24	29.03	28.85
Wireless data users (million)	0.3	3.7	22.4	55.6	65.9	79.3
Wireless data penetration	0.5%	3.5%	14.4%	26.5%	28.9%	31.2%
Data-related revenue (US$ million/year)	2.6	193.3	1,181	2,625	3,759	5,844

Source: Intrinsic Technology

Voice and wireless Internet brings business entities access to relevant information speedily. Through voice and wireless Internet, companies are able to extend their operations, communications and customer service to the mobile medium in order to achieve immediate B2C and B2B communications, enabling them to reduce the time and costs required to transact business.

The following chart shows the increase in the number of users for wireless services in Hong Kong from December 1995 to January 2001:

Number of wireless users in Hong Kong
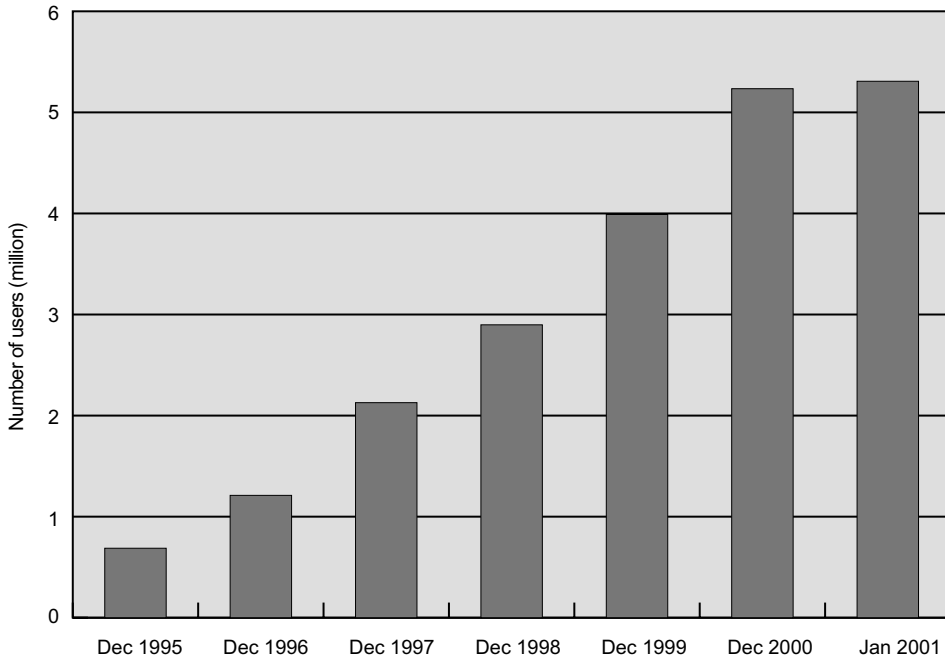
Source: Office of Telecommunication Authority

One of the major potential barriers to growth of e-commerce in the PRC is the lack of PCs in the country. According to the China Internet Network Information Center, among approximately 8,920,000 computer hosts in the PRC at the end of 2000, 1,410,000 and 7,510,000 were connected through leased lines and dial-up connections respectively. At the same time, there were 22,500,000 Internet users in the PRC with 3,640,000 and 15,430,000 users using leased line connections and dial-up connections respectively. Furthermore, apart from computer, other devices such as mobile terminals and information electrical appliances are used by approximately 920,000 users in the PRC to access Internet.

With the disproportionately high penetration of mobile phones compared to PCs in the PRC, Internet access via mobile phones is expected to create a vast potential market.

Mobile Internet

With the emergence of alternative devices for Internet access, mobile Internet is a market with considerable potential growth. Companies are competing for customer mindshare and also a share of future mobile commerce revenues. As the new market is still relatively unexplored, market estimates are as yet rather vague – the current mobile Internet services are characterised by slow speeds, incompatible standards, limited functionality and the absence of compelling content.

However, there are encouraging signs from the industry with dramatic subscriber growth as reported by a major fixed and mobile telecom operator in Japan with the launch of a new service, which provides access to a variety of Internet services such as e-mail and online banking.

Several factors serve to drive near-term growth of the mobile Internet market:

1. Telecom operators and Internet content/portal companies are seeking to establish themselves in these early stages of development, hence driving investment.

2. WAP may create a common standard for handheld devices. It provides an open standard for companies, from mobile operators to content providers and portals, to build a common platform for connection.

3. The expected growth in wireless communications subscribers should further drive rapid adoption of mobile Internet.

4. With the increasing awareness of and familiarity with the Internet, there is growing demand for Internet access unrestricted by a fixed line location – i.e. mobile devices that enable access to information anywhere at anytime.

According to IGI Consulting, an independent consulting firm specialising in telecom market assessment, the number of worldwide mobile Internet-enabled mobile devices is expected to experience significant growth in the next few years.

	2001	**2002**	**2003**	**2004**	**2005**
Number of mobile internet-enabled devices produced (million)	383	490	600	725	830
% growth	155%	28%	22%	21%	14%

Source: IGI Consulting

e-EDUCATION

The Internet's ability to store and deliver comprehensive educational content is the primary driving force behind the adoption of e-Education in the education market. e-Education is an effective and valuable turnkey solution for education systems and corporations that utilises advanced technology to offer online courses and services to individuals wherever they happen to be.

Universities and colleges are bringing everything from course materials to administrative functions online, transforming the way they use to conduct education and enabling them to reduce the time and cost required to conduct education and ultimately improving the quality of teaching. School websites provide students, staff members and administrators with a virtual network where they can communicate. The learning process can also be improved with the effective use of the Internet which provides students with more comprehensive resources. With the use of the Internet, online learning can help develop skills such as problem solving, collaboration, statistical analysis and simulation, creativity and critical thinking, thus facilitating general learning for students.

e-Education eliminates the barriers of time and distance for students, especially for those students who do not have access to universities in their home countries. Through partnerships with universities and reputable institutions in establishing online academic institutions, business opportunity for distance learning can be created.

The Internet can also make higher and continuing education available to a much wider range of people, especially for those mature students who wish to further continue their studies at their own pace. Most universities charge the same amount of tuition fees to online education students as in-campus students without providing any in-campus facilities. Leveraging on these competitive advantages, universities can strategically increase the diversity of degree choices to attract and recruit online students.

Furthermore, there is great potential for the development of online education for undeveloped countries striving to reach developed countries status. Online education provides people in those countries a good learning opportunity with high-quality and comprehensive materials through the Internet. Given the convenience of communication created by the Internet and the substantial opportunity embedded in global education, e-Education enjoys competitive advantage over traditional education, delivering more value at less cost.

e-Education has a number of competitive advantages compared to traditional education:

- *Convenience.* The Internet overcomes the two largest barriers that inhibit traditional education – time and distance. This is particularly true for countries with pockets of scarcely populated areas, or in areas where geological conditions make travelling difficult. In addition, e-Education also prevails over limited accessibility of classrooms, teachers, and libraries.

- *More focused content.* Compared to traditional education, e-Education is less restricted by influences from the local lifestyle and community, and can be more focused, or customized, to meet the particular needs of the target audience.

- *Provides online experiences.* With the Internet penetrating almost all aspects of life, e-Education provides the young generation with vital online exposure.

e-Education also benefits the teaching community:

- *Alliances provide instant solutions.* Companies that offer e-Education content and infrastructure will save schools the resources to develop their own solutions.

- *Helps fulfil the objective of effective education.* The vast information available to students online provides more content and new ways of learning, hence enabling schools to achieve their objective of education more effectively.

- *Helps attract and retain students.* To remain competitive, schools that provide Internet facilities will become more attractive to students.

While schools choose to outsource the development and/or management of their online solutions, numerous companies are taking advantage of this opportunity to provide the schools with tools, strategies and solutions to help them bring content and courses online. Some companies focus solely on the technology platform, while others offer the entire solution including the content, technology, implementation and deployment. The establishment of a computer network system for an university is costly, but the competitive advantage of online education, coupled with high operating leverage for online universities, should translate into high margins and returns on capital in the e-Education industry in the long term.
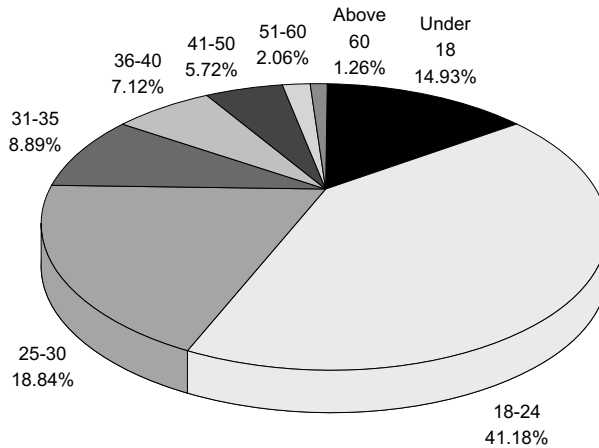
Companies providing e-Education infrastructures will need to foster strong relationships with schools, so that its position is firmly entrenched via a tightly integrated infrastructure across the school, and so that new product and service offerings can be developed through a close working relationship. The infrastructure solution itself should be scalable, and easy to install and to use. Infrastructure providers can also act as a useful link between content providers and schools.

The e-Education Market in the PRC

According to the 電教技術開發應用研究所(e-Education Technology Development and Application Research Centre) of the Ministry of Education of the PRC, the development of the Intranet/Extranet for schools in the PRC is expected to bring about business opportunity of about RMB100 billion for the education market in the PRC. In the next five to ten years, approximately 90% of primary and secondary schools in the PRC will implement Intranet or Internet and the "校校通"工程(Schools Network Program). Out of a total of approximately 700,000 primary and secondary schools in the PRC, about 5,700 have established their own Intranet systems. However, these Intranet systems are currently not linked to each other. Through the "校校通"工程(Schools Network Program), the Ministry of Education of the PRC plans to link up the Intranet systems of the schools thereby forming an extensive educational network in the PRC.

According to the China Internet Network Information Center, approximately 20.92% of students in the PRC access the Internet. Given the needs of students, there will be substantial e-commerce opportunities in the education market. In view of the growing popularity of the school website, online retailers, such as online textbook retailers, are proliferating rapidly, capitalising on the power of the Internet, providing students with a virtual location where they can go for their courseware needs. The following graph illustrates the breakdown of Internet access in the PRC by age at the end of 2000.

Source: China Internet Network Information Center