Development and Innovation of Mobile Internet

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Abstract:
This paper proposes that the business model of mobile Internet services is shifting from a walled garden to an open one. The service development model relies more on open Application Programme Interface (API); and the online application software store is becoming an important platform for service delivery. The terminal platform has been the commanding point of the layout and competition of the mobile Inernet in the world. Based on the smart terminal, the competition for platform system from the hardware platform to the operation system, the middleware and the applications platform have been in shape globally. The competition in the terminal platform of mobile Internet is moving from close to open, from uni-controlled by one company to open and cooperated by the whole industry. China should forge a terminal platform system and the ecosystem for the mobile Internet industry, and seek to achieve an overall breakthrough in the whole value chain of the industry based on the huge mobile user market and the productivity of the terminal. The breakthrough should start from the application software, stepping from the top to the bottom platform, to extend the industry chain.

1 Current Development of Mobile Internet

The mobile Internet has become the most rapid growing field in information communication industry in the past two years. The iPhone launched by Apple Inc. in 2007 signified the advent of a brand new stage of global mobile Internet with rapidly growing users and dazzling service innovations.

1.1 Service System and Features of Mobile Internet

The current mobile Internet service system breaks into three categories as shown in Figure 1:

(1) Duplication of fixed Internet services to mobile terminals

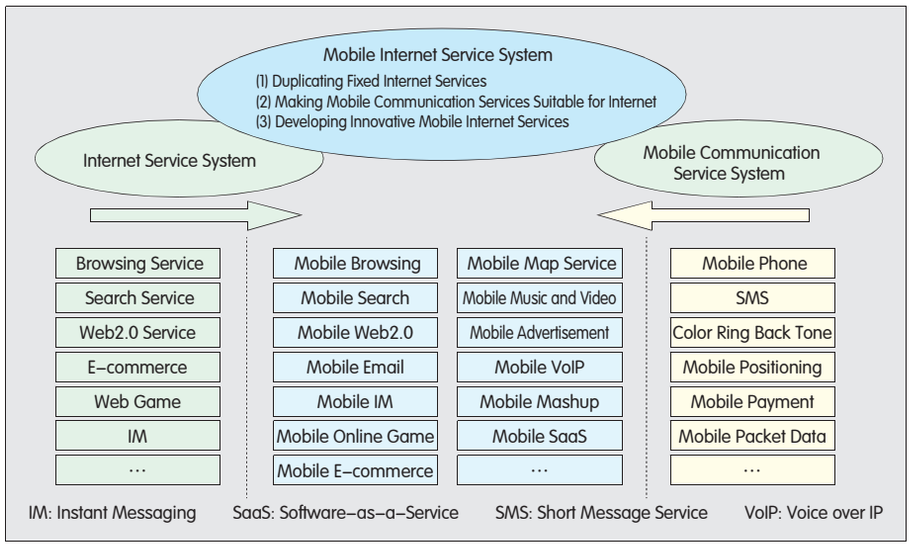
We enjoy mobile Internet services that are similar to those on fixed Internet as a result of service duplication. This is also the foundation for developing services on mobile Internet. Since the services on fixed Internet are relatively maturated, the main task for mobile Internet service development is currently to copy the services on fixed Internet.

(2) To put mobile communication services on Internet

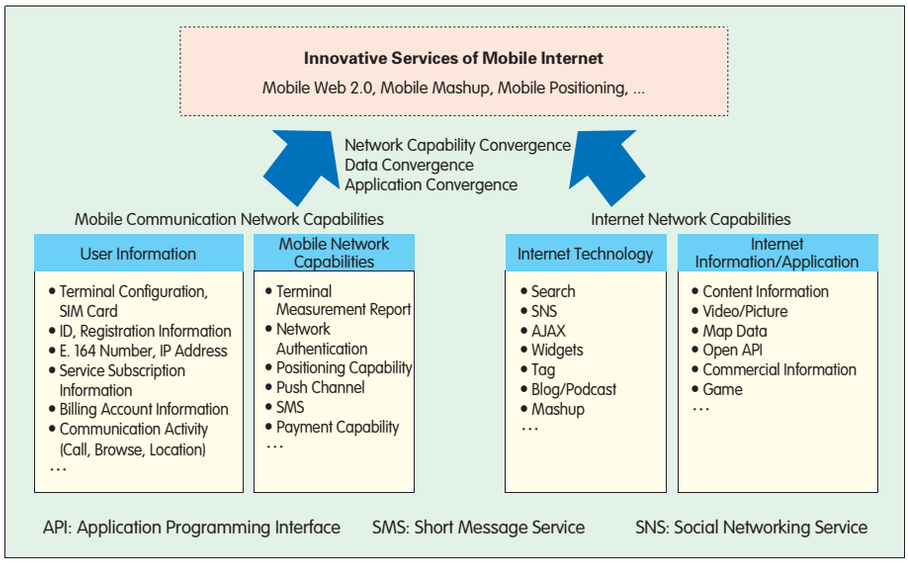
This is to put the original mobile communication services, which are not many, onto the Internet. The mobile VoIP service launched by 3 Italia together with Skype is an example.

(3) Service innovations based on mobile and Internet convergence

An important direction of mobile Internet service development is to merge the network capabilities of mobile communication with the network and applications of the Internet, so as to produce innovative Internet services for mobile terminals. Such services include mobile Web2.0 service and mobile



▲Figure 1. Mobile Internet service system.



▲Figure 2. Service innovations after the convergence of mobile communication and Internet capabilities.

location Internet service. This direction is also what differentiates mobile Internet from fixed Interent in terms of development trend.

Figure 2 depicts the innovative services produced as a result of the merging between mobile communication and Internet capabilities. The mobile communication network features special information and powerful services, and its unique capabilities are related with the mobility and users. Meanwhile, the application technologies and open interfaces of the Internet are hotbeds for service innovations, especially the architecture and technology of Web2.0 have cleared the way to large–scale and personalized service innovations.

1.2 Service Reuse and Service Experience of Mobile Internet

The current services of the mobile Internet are applied in the following two modes. One is the Wireless Application Protocol (WAP) mode, which is the Internet website pattern exclusively designed for mobile phones. The other is the Web mode (same as that for fixed Internet), and in this case, users are able to surf the Internet just as any fixed Internet users.

The disparities between WAP and Web modes embody a major problem in the service development of mobile Internet, that is, the content reuse between fixed Internet and mobile Internet. Disputes concerning contents and applications have arisen as whether we should deploy one or two Internet networks. There are two major modes for the moment:

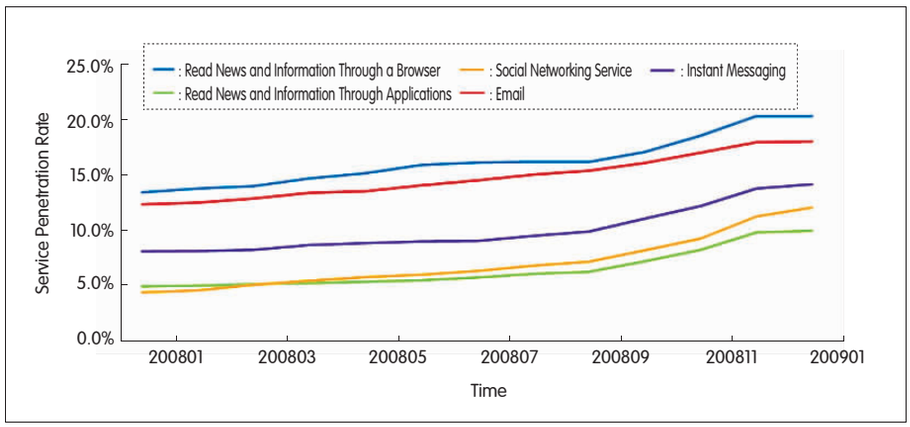
The first mode is the "Internet to adopt mobile phone". It is to re–design the Web contents of fixed Internet based on features of mobile terminals and network speed of mobile communication, with some functions compromised, so that the contents are suitable for display on mobile terminal screens. This mode requires secondary development and user's service experience will be much different than what the fixed Internet can bring about. The WAP–based Internet is an example of this mode.

The second mode is the "Handset to adopt Internet". It is to get the mobile terminal connected with the fixed Internet contents through adaptation. No secondary development of website contents is required for this mode and the adaptation of mobile terminal to website contents is done through a mobile browser. This mode covers two browse methods, one is that the user sends a service request and the server captures contents, compresses traffic, performs adaptation and finally sends the contents to the user. The other is that a browser is installed in the mobile phone for direct adaptation and thus no brower is needed for relay.

The development trend implies that there will most probably be only one Internet. To put it more specific, contents will be stored on one Internet and displayed on two, with the software–based adaptation being automatically performed. This way, the mobile Internet will bring about as similar as possible service experience as the fixed Interent does. On the other hand, however, the inherent differences will give rise to many service and application innovations matching with mobile phone features, for example, the mobile short video, location–related service application and mobile games, which are another indication that the mobile phone is adapted to the Internet.

1.3 Current Status of Mobile Internet

Business of global mobile Internet has grown fast. Accoring to comScore, in the US, 20% of the mobile users browsed websites through the mobile Internet and 12% used the service of mobile social network by January 2009, as shown in Figure 3.



▲Figure 3. Mobile Internet Penetration Rate in US.

China	US	UK
• 1.kong.net—Mobile Internet Portal • 2.baidu.com—Search Engine • 3.google.cn—Search Engine • 4.sina.com.cn—General Portal • 5.qq.com—Instant Messaging • 6.hao123.com—Website Search • 7.sohu.com—General Portal • 8.xiaonei.com—Social Network • 9.3g.cn—Mobile Internet Portal • 10.taobao.com—E-commerce	• 1.google.com—Search Engine • 2.myspace.com—Social Network • 3.facebook.com—Social Network • 4.wikipedia.org—Encyclopedia • 5.yahoo.com—Portal and Search • 6.nytimes.com—News • 7.gamejump.com—Mobile Game • 8.accuweather.com—Weather Service • 9.youtube.com—Video Sharing • 10.my.opera.com—Blog/picture sharing	• 1.google.com—Search Engine • 2.yahoo.com—Portal and Search • 3.facebook.com—Social Network • 4.bbc.co.uk—News • 5.live.com—Search Engine • 6.wikipedia.org—Encyclopedia • 7.bebo.com—Social Network • 8.youtube.com—Video Sharing • 9.myspace.com—Social Network • 10.msn.com—Instant Messaging

▲Figure 4. The most popular websites in China, US and UK.

▼Table 1. Use proportion of mobile Internet services

Services	Mobile Video	SNS	Facebook	YouTube	Google Map
iPhone	30.9%	49.7%	20.0%	30.4%	36.0%
Other Terminals	4.6%	4.0%	1.5%	1.0%	2.6%

SNS: Social Networking Service

▼Table 2. Use time proportion of mobile Internet services

Services	Internet	Music	Email
iPhone	12.1%	11.9%	10.4%
All Terminals	2.4%	2.5%	2.8%

As the traffic indicates, the global leading manufacturer Opera of mobile browser finds out that, through a compact mobile Internet browser Opera Mini, its users browsed 8.6 billion webpages in March 2009. If calculated without compression, the monthly total traffic reached up to 1.4 PB (with a compression rate of 90%), a year-on-year rise of 319%.

The global mobile Internet has started to turn from the WAP mode to the full experience of WWW mode. According to observation of the Opera company, the data Web traffic in the first quarter of 2008 exceeded that of WAP and accounted for 77% of the total traffic volume.

In terms of service characteristics, service and application preferences of current mobile Internet users are similar to those of the fixed Internet users. The Web2.0 service has become hot in Internet communities with 40% of global traffic coming from social networks (in the US, it's 63%). In the US, UK and China, the websites visited by mobile Internet users are similar to those visited by fixed Internet users, with most of the services being the search and Social Networking Service (SNS). Figure 4 lists the most popular websites with the mobile users in the three countries[1].

The advent of iPhone in 2007 has significantly changed and enhanced people's recognition of the mobile Internet, by making it possible for mobile terminals to experience fully the services and applications of the Internet. As a result, the user activities on mobile Internet changed much, which in turn fuelled the growth of mobile Internet.

Table 1 (source: MMetrics) and Table 2 (source: iSuppli) show that the use rate and time duration of Internet services by way of iPhone are both much higher than those by other mobile terminals.

The mobile Internet and 3G have been helping each other forward, and as a result, the revenue from mobile data service has also grown fast. Figure 5 (source: Chetan Sharma) shows that, in the US where the mobile data service has comparatively lagged behind, the Average Revenue Per User (ARPU) of mobile data users has arisen steadily over recent years.

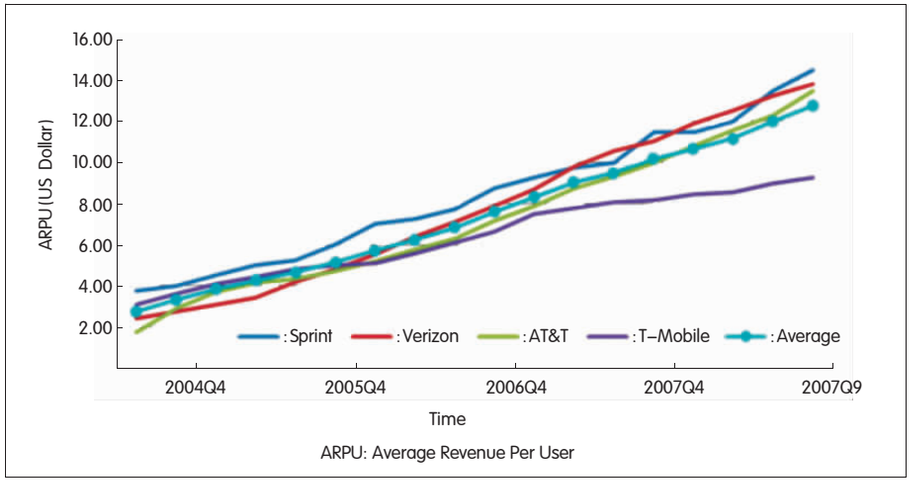
Although the 3G network of China is yet to be completed, China's mobile Internet has grown frantically because of the mass quantity of mobile users and also business experiences gained from fixed Internet. Different from the developed countries, however, the WAP mode prevails in China, and websites capitalizing on mobile Internet service are emerging.

By the end of 2008, there had been 117.6 million users browsing websites with their mobile phones, a 133% rise from 2007[2]. In 2008, the WAP traffic volume of China Mobile alone reached 13.3 billion Megabit, a 151.1% increase from 2007. Revenues from WAP service reached RMB 12.99 billion yuan, up 42.9% from 2007[3].

2 Innovations of Mobile Internet

2.1 Development Mode–Walled Garden and Open Garden

Different from the fixed Internet, a major



▲Figure 5. ARPU of mobile data service users in US.

feature of the mobile Internet is its closeness, which is to much extent originated from the closeness of mobile communication and traditional telecom. Current fixed Internet has started to open up in terms of both technical/service architecture and business mode; while mobile Internet is more like a closed and walled garden.

In 2007, Google and some organizations applied for the frequency of 700 MHz and at the same time raised the request of network openness, including open application, open device, open service and open network.

In 2008, Federal Communications Commssion (FCC) of the US approved open application and open device to be the principles for the bidding of 700 MHz, but said no to open service and open network.

The two openness approved by FCC covers a bunch of principles, for example, functional open, consistent and transparent standard, non-discrimination policy, and open procedure. By open functions it means to open some functions that may possibly conflict with the operators' interests, such as terminal's freedom to change network (terminals non-locked), independent portal on mobile Internet, Wi-Fi and MP3 ring tones.

Meanwhile, with considerations to the mobile Internet features and outstanding problems of fixed Internet, FCC also imposed some restrictions, such as to prevent misapply of openness and to keep from malicious terminal and software; operators may go on using their own standard and procedure to authenticate applications and terminals; operators have the right to guarantee the network security and completeness while it is open; and operators can keep its network control functions (management of terminals on the network, and to control network performance) for the sake of dynamic management of network operation.

2.2 Service Development Mode—Development and Release of Application Software

Mobile Internet services are turning to the Web for development, just like those of the fixed Internet. As a result of the progresses of Web2.0 technology, it has become all the easier to develop Internet applications. Regular small and medium enterprises and even individuals are now able to develop applications with the open API. This trend coupled with more personalized applications has put Internet applications more to the long-tail distribution, thus enormously changing the development and innovation models of the traditional telecom network environment.

To adapt to and tap more from this trend, big companies participating in the mobile Internet competition have released API and Software Developer's Kit (SDK), and successfully created the model of online shop for application software.

So far, Apple Inc. has established online Apple Store, Google set up Android Market, and Nokia opened Ovi Store. Other companies, such as Vodafone, China Mobile, France Telecom, Microsoft and Palm, are planning on similar online shops of application software. The basic model of online application software shops is that the main service providers release API and SDK, which attract developers everywhere to use the platform to develop application software and then release the software in the online shops. The main service provider and software developer share, by some proportion, the revenue that comes from software downloads.

The availability of online application software shops has considerably changed the way in which traditional mobile communication services were developed, put service applications more in the long-tail distribution, lowered the cost for applications and also put service developers more in the long-tail distribution.

Apple store is as of today the most successful online application software shop: more than one billion downloads of mobile Internet applications in nine months after its launch. It's estimated that currently Apple Store is selling software for one million dollars per day.

The success of Apple Store is partly attributed to the success of iTunes, the online shop for music download. In 2006, music download through iTunes accounted for 82% of all legal downloads in North America (mainly by iPod users). In January 2008, iTunes had a stock of six million songs and had sold 4 billion songs.

The success of online software shop on mobile Internet showcases the enoumous productivity of the integration of mobile communication and Internet, especially when powered by the Web2.0 technology. It is a very helpful experiment for the development of future telecom service.

2.3 Terminal Platform Architecture—Bottleneck of Mobile Internet Innovations

The terminal platform of mobile Internet, due to the traditional closeness of mobile communication, has actually become the bottleneck in network development and service innovations of mobile Internet.

Except for different access technologies involved, the overall architecture of mobile Internet is basically the same as that of the fixed Internet. Nevertheless, the differences in features and stages of development have led to disparities in terminal platforms of mobile Internet and fixed Internet.

If compared with the fixed Internet, the architecture of mobile Internet is very much non-standardized and closed. To put it more specific, its terminal platform is a highly closed one that is standardized at a very low level and with too many systems. There lacks a common standard and also a factual standard that can adapt to and guide further development. At the present stage, the mobile terminal platform plays a key role in the development of mobile Internet. The service provisioning and innovations of mobile Internet require the adaptation and openness of the terminal platform. But because of the closeness and lack of common standards, service and application development for mobile Internet needs not only network adaptation (that is, openness of network interface and adaptation of network parameters), but also terminal adaptation.

The service and application of mobile Internet need to adapt to different terminals and even different releases of every terminal. The large number of terminal types and releases (with more than thirty operating systems) make the adaptation very complicated, which in

turn translate to high cost of service development and long period of development. This means that it is hard to carry out interoperability and consistent experience among different mobile terminal applications. Survey shows that it takes one year and a half for a mobile Internet service to get prepared and then be launched formally, yet still, the user experience of it on different terminals can hardly be the same.

The mobile terminal platform comprises hardware and software platforms, while a really effective platform should be able to vertically integrate the hardware platform, low–level software platform and service applications. Many platform systems of mobile Internet have so far been set up on the basis of varying hardware and software platforms.

There are two major hardware platform architectures with the chip processor structure at the core: Advanced Reduced instruction set compute Machines (ARM) and Intel. ARM is currently and indisputably the unique leading chip structure as moble communication is concerned, that is quite adaptive to the size and power consumptions of mobile terminals. The x86 chip of Intel is much inferior to the ARM one in terms of integration and power consumption. However, most current fixed Internet applications are based on the x86 architecture and it is rather easy to convert to mobile Internet. It is expected that the x86 architecture of Intel will not be able to beat the dominance of ARM in the near future.

The software platform of mobile terminals, as compared to hardware platform, is even more complicated.

Mobile communication used to function on a closed software platform, with the Symbian of Nokia dominating the market, while Microsoft and RIM software also having a slim share. The iPhone system of Apple Inc. then, to the surprise of the world, followed the established closeness and suddenly appeared on the horizon of software platform market with its unique design and market orientation. On the other hand, the developing mobile Internet is requiring more on the open software platform. The Linux–based open–source open systems are booming and becoming important options for later developers. However, there are at least ten types of Linux–based software platform, including the rather competitive Android that is advocated by Google, Linux Mobile (LiMo) founded by many terminal vendors and operators, and mobile Linux (Moblin) originally launched by Intel.

The closeness and non–standardized status of mobile Internet terminal platform have stood in the way to service growth. The service development and innovation for mobile Internet requires an overall end–end–end solution involving every layer and process of both the terminal and network. Thanks to the improving Internet application technologies (Web2.0, for instance) and mobile network system, the service development and innovations at the network layer are getting more convenient and the network openness and standardization status are getting all the better. In contrast, the openness and standardization status of terminal platform is very much lagged behind and is more and more a bottleneck in service growth of mobile Internet. It is therefore very important to tackle this terminal platform issue so as to clear the way for service development and provisioning for mobile Internet.

2.4 Global Competition of Terminal Platform

The terminal platform has been the commanding point of the layout and competition of the mobile Inernet in the world. The competition features the following:

(1) Competition of platform system

The key to the development and competition of mobile Internet is to establish a smart terminal–centered platform system comprising hardware platform, Operating System (OS), middleware and application software, so as to carry out end–to–end service development and innovations.

(2) Industry chain convergence

Centered on terminals, the mobile Internet platform puts together powers on the industry chain including hardware chip developer, OS developer, middleware and application software developer, telecom operator, mobile Internet application provider and terminal manufacturer to shape up a new ecosystem for service development. If compared with the fixed Internet, the mobile Internet platform features higher internal connectivity and mutual dependency.

(3) Leadership of platform

The competition of mobile Internet terminal platform is in fact the competition of industry chain. Actual industry standard will come into being for the platform, which then turns into the industry leadership through market competitions. That is to say, the one who successfully leads the mobile Internet platforms will become the industry leader.

On the other hand, openness and open source are directing the ongoing development of terminal's software system platform, although the exclusive and closed terminal platforms are still in domination for now. The Linux–based terminal platform with the open source system is becoming an important factor that pushes the development of mobile Internet, and Android and LiMo are good examples in this aspect. Influenced by Android and other open–source open terminal platforms, Symbian, the leading OS in the "smart mobile device" market, is also moving to open source. In June 2008, Nokia acquired Symbian and set up the Symbian Foundation. Symbian OS and its associated user interfaces S60 (Nokia), UIQ (Sony–Ericsson and Motorola) and MOAP (NTT DoCoMo) were contributed by their owners to the foundation with the objective of creating the Symbian platform as royalty–free, open source software.

The competition on mobile Internet terminal platform is turning from closeness and dominated by one to open, innovative platform backed by coordinations along the industry chain. The platform leader will become the industry chain leader and the competition among different platforms will evolve into one among different ecosystems of the industry.

The iPhone system of Apple, although with closed source, is still popular currently due to the exquisite design and performance.

3 Conclusions

The mobile Internet has for the past two years been stunning the information communication industry as it grew and

innovated so fast. The service innovations, model innovations and global competitions in the field of mobile Internet has rolled out especially after Apple launched iPhone and Google established Open Handset Alliance (OHA) to work on the terminal platform on Android. The mobile Internet has seen competitions among top Internet companies, mobile operators, telecom manufacturers, consumer electronic vendors, chip manufacturers and software developers.

The following are supposed true of the development and innovations of China's mobile Internet:

(1) The key to sharpening the competitiveness of China's mobile Internet is to keep on openness and at the same time, to build a terminal platform system with some decision–making right and leadership, to the end to form and lead the ecosystem of the mobile Internet industry.

(2) The breakthrough should start from the application software, stepping from the top to the bottom platform, to develop middleware and OS step by step and extend the industry chain. Focus should be put on the mobile Web environment that is able to function among different OS, and also to develop the secure middleware related with the service security, user activity collection, Digital Rights Management (DRM). As for the hardware platform, breakthroughs should be made in application processor with China's Co–Processor (CP) strengths to form the open and software/hardware integrated development mode on an open software platform.

(3) Development of China's mobile Internet depends heavily on whether the industrial powers, including mobile operators, Internet service providers, terminal manufacturers, software developers and chip manufacturers, can be integrated effectively, and therefore, it is necessary to construct a tight industrial association with a clearly defined objective, to push cooperation among enterprises and the standardization of the mobile Internet platform system.

In a word, China should, based on the mobile user market and terminal productivity, proactively develop and popularize mobile Internet applications and push forward the process of national informationization. Meanwhile, China should make breakthroughs in application software and extend the industry chain from top down, so as to shape up the mobile Internet terminal platform system and industrial ecosystem, for the sake of overall progress in the field of mobile Internet.

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Biography

Yu Xiaohui

Yu Xiaohui is a senior engineer and the deputy chief engineer of China Academy of Telecommunication Research of MIIT, and the director of the Economy and Policy Research Institute. He has long been engaged in national communication industry planning and research, network communication technology research, informationization development research, and telecommunication operation enterprise planning and research.

Roundup

ZTE Launches Global University Recruitment Campaign

ZTE Corporation (ZTE), a leading global provider of telecommunications equipment and network solutions, held a grand ceremony to launch its Campus Recruitment Campaign at Xi'an Jiaotong University, China in October, 2009. After recruitment from over 40 campuses across China, the Company plans to further expand its campus recruitment program by late 2009 to include universities in the United States, France, Mexico, Colombia and Ethiopia. This will help inject fresh thinking and talent into ZTE from major regions in the world, accelerating its internationalization process to meet growing market demand.

As the leader in international expansion amongst Chinese enterprises, ZTE is also the first Chinese endeavor to recruit university students worldwide. In 2008, local employees accounted for 65% of ZTE's overseas workforce.

ZTE's overseas recruitment plan will be mainly based on the company's strategic business roadmap and in relation to its actual needs to expand business in specific markets. The localization of its overseas operation talent will lay a solid foundation for the future development of the company. To date, ZTE runs businesses in over 140 countries and has 107 branches worldwide.

In early 2009, ZTE carried out pilot overseas recruitment campaigns and successfully hired university graduates in India, Indonesia and other countries. The program has strengthened ZTE's determination to conduct further overseas recruitment. After taking up their posts, university graduates receive a half–year training course to ensure a successfully transition into ZTE and the corporate world. This is a significant strategic measure for ZTE to enhance the level of internationalization in its headquarters and branches.

In 2007, overseas operating revenues accounted for 53% of ZTE's overall operating revenues, overtaking its domestic operating revenues for the first time. In 2008, the overseas business continued to expand to 60%. In the first half of 2009, as most of its international peers experienced business drops or even losses due to the global financial crisis, ZTE continued to maintain growth in the international market. Its operating revenues amounted to US$4.06 billion, with Europe and the United States contributing 16% of it. (ZTE Corporation)