Asia • China

Tsinghua Tongfang and the Changfeng Computer: Innovative Technology and Enlightened Application

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Sector • Information & Communication Technologies
Enterprise Class • Large National
Summary

China has the largest agricultural population in the world, totaling about 900 million. However, compared to urban counterparts, the rural population of China has significantly less computer accessibility and technological knowledge. This “digital gap” inhibits human development in rural areas, impeding the economic development of the country. Tsinghua Tongfang (THTF) is a high technology computer company based in Beijing, China. In 2005, THTF, with the support of Beijing municipal government agencies, developed the Changfeng computer (CF) specifically for Chinese rural users. Through adopting a low cost operating system and self-developed software, CF computers are more affordable than other personal computers available on the Chinese market. At the same time, the design of CF computers provides a systematic solution to help rural inhabitants better their businesses and personal lives. This case examines how the private sector and the public sector partnered for mutually beneficial outcomes: THTF entered the untapped rural computer market, and the Chinese government worked towards rural digital development.

Digital Challenges

THE DIGITAL GAP BETWEEN RURAL AND URBAN CHINA

The Information and Communication Technology (ICT) sector in China has grown rapidly over the past ten years, while computers and the internet have become a necessity for many people. However, rural Chinese residents have never had access to computers and do not know how to use them. The digital gap between urban and rural areas is increasing, hindering the economic development of rural areas and affecting the life quality of many members of the rural population.

According to the report Digitalization of Chinese Families, 43 percent of urban residents in China had access to the internet, and 45 percent of these people surfed the internet at least once a day in 2005. A much different situation exists in rural China, where only 4 percent of people used internet in 2005, and of those users, 46 percent accessed the internet at least once a week. Another report, from the China Internet Network Information Center (CNNIC), found that internet coverage in rural China was five times less than urban areas in 2005, and this gap continues to increase (see Chart 1.1).

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2 The China Internet Network Center, 18th National Survey.
The digital gap also exists in education. According to the 2006 annual survey of CNNIC, middle school students in rural areas had very little accesses to the internet (50 percent less than students in urban areas) and primary school students in rural areas had almost no opportunity to use the internet at all (See Chart 1.2). This lack of access not only affects children, but also their parents. In China, most people older than 45 did not learn computers in school; therefore their children or grandchildren become their computer tutors at home.

Personal computer ownership is another indicator of ICT development. In 2005, 39 percent of urban families had personal computers, compared to two percent in rural areas. This gap
The digitalization of Chinese families far exceeds that of ownership of other digital devices in China such as land-phones (100:63), mobile phones (100:52) and cable televisions (100:41), and this trend also continues to increase.

RESULTS OF THE DIGITAL GAP

From individual farm families to small-scale farmer enterprises, the lack of accessibility and education related to computers has become a serious barrier to the growth of businesses and has affected various aspects of the rural population’s lives. These impacts are further described below.

Impact on individual farmers

Searching for information on the internet is one of the most efficient ways to gain knowledge and data. However, Chinese farmers - especially individual farmers - lack computer skills and access; hence they still rely on more traditional sources of information, including personally consulting with experts for advice on business decisions. Most of the time, personal consulting is an inefficient process and farmers are not always able to get correct and appropriate guidance. Table 1 outlines the ranking of farmers’ preferred sources of information.

Table 1: Ranking of the Decision Making Factors of Individual Farmers

<table>
<thead>
<tr>
<th>Rank</th>
<th>Information Channel</th>
<th>Rank</th>
<th>Information Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Directly from specialized experts</td>
<td>7</td>
<td>Government agencies</td>
</tr>
<tr>
<td>2</td>
<td>Agricultural agencies</td>
<td>8</td>
<td>Past contracts and orders</td>
</tr>
<tr>
<td>3</td>
<td>Internet searches</td>
<td>9</td>
<td>Personal experience</td>
</tr>
<tr>
<td>4</td>
<td>Newspaper and magazines</td>
<td>10</td>
<td>Experience of neighbors</td>
</tr>
<tr>
<td>5</td>
<td>Television</td>
<td>11</td>
<td>Other</td>
</tr>
<tr>
<td>6</td>
<td>Radio broadcasts</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: THTF Computer Marketing Research Report

Small and medium sized agricultural enterprises

Small and medium sized agriculture companies usually benefit from more advanced tools to manage their daily business needs, because traditional ways of information management are not enough to deal with the currently increasing volume of transactions and complicated business environments. However, the owners of these agriculture companies, typically the persons taking care of all planting and husbandry businesses by themselves, do not have much computer knowledge. Therefore, they have to either use traditional management methods or rely on external assistance. Both options are inefficient and impede the growth of small and medium sized companies.

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Quality of life

Since the middle of the 1990s, many workers in rural areas have taken part-time jobs in cities in order to earn extra income for themselves and their families. Income from part-time jobs has become an important financial resource for a large number of rural families. Sometimes the entire family, including women, children and the elderly, rely on the money sent back from the young people working in cities. This supplemental income can significantly improve the entire family’s quality of life. Today, young people from rural areas are finding it increasingly difficult to obtain appropriate part-time jobs in cities, because many jobs require basic computer skills, and some employment information is only available on websites. Accordingly, the challenges resulting from the digital gap affect the quality of life for the entire rural household.

CAUSES OF THE DIGITAL GAP

By the end of 2005, TV coverage in China reached 94.5 percent, and radio broadcasting coverage reached 95.8 percent. Because of the influence of TV and broadcasting, people in rural areas and those living on the outskirts of cities already have some knowledge of computers. However, the introduction from TV and broadcasting is far from adequate to inspire their interest to learn more about what computers can do. A lot of farmers think that computers are “fancy and expensive stuff for office ladies and men” and computers have nothing to do with their daily life in the country. In general, there are three main reasons explaining the digital gap between the rural and urban populations of China:

Inability to purchase a computer and internet access

Annual personal income in China grew between five percent and 14 percent since the late 1990s. However, buying a computer and obtaining internet access is still a considerable expenditure for typical rural families, and most families cannot afford the expenses. The average monthly income of farmers in 2005 was 966 RMB (US$121), and an ordinary personal computer costs around 2,500-3,000 RMB - almost three months’ income of a typical farmer. Residential internet service costs about 102 RMB (US$12.75) per month in cities, which is about ten percent of an average farmer’s monthly income. In addition, most rural areas in China are in the center and west of the country, with large tracts of land and low population density (see map in Chart 1.4). Because of the high capital investment required to build an internet service provider (ISP) and low potential subscribers and investment return, internet companies have not been quick to spread their services in rural areas. Therefore, rural internet service is more expensive and less available than comparable urban centers. Without internet facilities, rural populations lose an important incentive to purchase computers. Chart 1.3 compares the internet coverage in the major regions of China.

7 The China Internet Network Center, the 18th http://www.cnnic.net.cn/en/index/index.htm
Lack of useful agricultural information

Since local agencies typically do not have the capacity to collect information or build up websites, most agricultural information on the internet is very general, such as provincial and national data, which is not specifically related to farmers’ daily lives and businesses. Furthermore, even the limited number of agriculture computer programmes developed by research institutions is not usually designed for individual use and not readily accessible on the market. This lack of relevant information and programmes partly explains why the small percentage of people in rural areas who actually use the internet spend 31 percent of their time online playing computer games and downloading music; 25 percent of their time...
emailing people and on-line chatting. A very small percentage of the remaining 44 percent of their time is used for searching agriculture information and building relevant skills.  

**Lack of knowledge and skills**

A 2006 study found that 31 percent of rural residents do not use computers because they lack basic operational skills. Instead of investing in a computer, farmers prefer to spend a similar amount of money on something they know how to use, such as a TV, refrigerator or motorcycle. According to a national survey of China Mainland Marketing Research Co., the rural coverage of TV channels increased by 16.9 percent in 2006; about one-third of rural families plan to buy refrigerator in next five years; one quarter of rural families plan to buy a mobile phone, air conditioner and so on. In contrast, there is no sign of increasing demand for personal computers from rural families, even in relatively well-off communities near big cities. Considering that the prices of these durable household items are close to prices of computers, market experts suggest that lack of computer skills is one of the main reasons leading to the lack of demand.

**Tsinghua Tongfang and the Changfeng Computer**

Tsinghua Tongfang Co., Ltd (THTF) is a hi-tech company, founded in 1997, and has four business divisions: Information Technology, Energy and Environment, Applied Nuclear Technology, and Biological Medicine. THTF is a publicly traded company, listed on the Shanghai Stock Exchange, and has recorded profits totaling 232 million RMB (around US$30 million) in 2006.

THTF Computer is the flagship brand of the Information Technology division, including eleven types of personal computers, two types of business computers and eight types of notebooks. From 1997 through 2001, THTF Computer experienced four consecutive years of 100 percent growth in sales volume; in the year 2000, THTF Computer grew into one of the top three domestic personal computer (PC) brands in mainland China (the other top brands are Lenovo and Hasee). In terms of sales volume, in both 2001 and 2003, THTF’s PC sales volume exceeded the record of 1 million units, making it one of the six major computer vendors in the Asia Pacific region.

**MARKET STUDY & FEASIBILITY ANALYSIS**

Beyond the factors contributing to the digital gap in China, there is a complementary business opportunity and human development goal to bring the large rural population online with personal computers and access to the internet. As many computer companies have realized,
the rural computer market is huge and full of potential, but it can also be difficult to tap. Recognizing the business opportunities and development potential, THTF decided to become a pioneer in the rural computer market in China.

THTF, as one of the leading computer companies in China, has broad sales channels nationwide and its sales net in rural areas is of special advantage. Because of this advantage and its development capacity, THTF was selected by Beijing Municipal Government Commission for Science & Technology (BMGCST) for its rural information development projects. After accepting this mission, THTF organized three rounds of in-depth market research in a suburb of Beijing (one of the largest concentrations of the rural population in Northern China) between 2003 and 2004, to look at the viability of developing agricultural computers. The feasibility study reported the following main items:

**Rural market**
- Rural people did not have an overall understanding about how computers could help their businesses and daily lives, and as a result, the substitute demand for other household durable items was strong;
- Rural people had a general understanding about computers but did not link computers with their work and lives;
- Rural people lacked basic computer knowledge and skills;
- Personal computers were prohibitively expensive for rural people;
- Some rural areas lacked basic information infrastructures;
- Rural people were very willing to pay for their children’s education;
- Existing personal computers did not adequately meet the demands of rural users.

**Technology**
- Basic technologies to develop Linux-based software programmes were available but needed further development and improvement;
- Technology of internet based long-distance education programmes were available in technology supporting companies, universities and schools in relatively developed parts of China;
- More than 1,000 agricultural computer programmes covering twenty-two agriculture sectors (such as vegetable planting, animal husbandry, and flower planting) existed, mainly developed for research purposes and not yet commercialized;
- THTF could mobilize and allocate more than 200 technicians and experts to work on long-distance training, software development and integration of Linux software with hardware.

**Government support**
- Rural development was a top priority of the central and local Chinese governments;
- The government was committed to helping rural populations improve their computer skills and accelerating the process to build information infrastructure.
Domestic Competition

- Two domestic computer companies introduced agricultural computers before THTF;
- Previous agricultural computers focused mostly on cost/price control;
- Previous agricultural computers had very few specially designed functions for rural users.

International competition

- Microsoft started working with the Ministry of Information Industry in 2003 and committed an investment of 2.5 billion RMB (about US$320 million) on “digital solutions” for farmers;
- Agricultural computers introduced by Microsoft were mainly for institutional users, such as hospitals, governments and schools, rather than individual usage.

The market study and feasibility analysis conducted by THTF and BMGCST drew the conclusion that the rural computer market in China had significant business potential in the next ten years. The first companies in this market would take on higher risks with market exploration and consumer education but would also benefit from having the first mover advantage. Furthermore, the government’s determination to eliminate the digital gap between urban and rural populations would help the company to reduce the upfront risks at the beginning.

PRODUCT FEATURES OF CHANGFENG AGRICULTURAL COMPUTERS

THTF wanted to go beyond simply producing affordable computers to farmers; the company wanted to provide a “systematic solution” that would help improve the rural population’s businesses and lives. After conducting three rounds of door-to-door surveys in Beijing suburbs, THTF found that the following features and functions would be demanded and appreciated by potential rural clients:

- Multifunction (TV, radio broadcast and so on);
- Low electricity consumption;
- Ability to work in rural environments, including fluctuating voltage, humid air, rats, etc.
- Ease in repairing;
- Educational programmes for children;
- Professional agricultural programmes;
- Capacity building programmes;

Working closely with BMGCST and the Beijing Software Industry Productivity Center (BSIPC), THTF developed the Changfeng agricultural computer (or, CF computer). Building on the capability and knowledge of both organizations in the PC market, CF computer catered to the rural market with three main strategies to meet the special needs described above: a Linux operating system, inexpensive but robust hardware, and customized software applications.

Case Study • Tsinghua Tongfang and the Changfeng Computer
**Linux Operation System**

CF computers use the Linux operating system instead of a more common operating system, such as Microsoft Windows. As a free and open source system, Linux has many advantages over Windows (especially Linux’s price). THTF estimates that the operating system they developed based on the most basic Linux system for CF computers is 20 times cheaper than Windows.\(^\text{12}\) The Linux operating system also requires less memory for almost the same performance in a Windows environment, which in turn helps to control hardware costs (CF computer uses 128M memory). Despite the advantages of Linux, it is not common and many popular programmes can only run on Windows, making it difficult for Linux end-users to download or install programmes. Because of this incompatibility, end-users have to rely on pre-installed programmes.

Through BSIPC’s network of more than 200 software companies, THTF selected four small and medium sized companies to develop computer programmes with similar functions as the most popular programmes, (including Microsoft Office, MSN, and Outlook).\(^\text{13}\) All programmes run in the Linux environment of CF computer. Because these programmes are self-developed, they are much cheaper than common ones found on the market. For example, the CF computer programme with similar functions to Microsoft Office is very user friendly and almost 20 times cheaper. Furthermore, the difficulty of downloading and installing programmes is not a significant issue among rural users at present, because the demand for exploring other more specific software is not strong at the moment and the programmes that CF computers have can meet most of the rural population’s needs.

In terms of a longer-term strategy, THTF is building an online platform for Linux programmes from which users can download the programmes they need. Right now, the number of Linux programmes is increasing, but it is hard to predict whether rural clients’ demand for new programmes will increase faster than the number of Linux programmes made available. At any rate, THTF and its programme partners are following demand very closely and providing the latest upgrades and new programmes on the internet for their rural clients.

**Hardware**

To keep the cost low, all CF computer hardware is made domestically with good quality parts and competitive prices. Because rural customers are more widely dispersed and remote compared to their urban counterparts, after-sales service is not readily available. In order to make fixing and replacing computers easier, all hardware components of CF computers are sourced from three suppliers. CF computers also have the function of “going back by pressing one button”. This function ensures that as long as there is no critical damage to the computer hardware, if something goes wrong with the system, users can make the computer go back to the original status by simply pressing a button on the bottom of the machine. Meanwhile, CF

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\(^{12}\) Linux provides a free open operation system for further development, according to the need of users.

\(^{13}\) Partner companies developing Linux programs for CF computer can choose either getting lump sum payment for their R&D, or charge through the number of computer that THTF finally sell.
computers monitor their power supply to ensure that the computers work well with unstable voltage. The electricity cables of CF computers are embedded with materials that have a special smell, which deters rats from gnawing on them. Another additional function that THTF added to its second generation of CF computers is the TV function. Without needing to turn on the computer, users only need to press a button on the monitor and the computer will turn into a normal TV. All these improvements on hardware are developed according to the needs of rural populations, and it is the first time that THTF has included these functions in its computers.

**Special programmes for rural users**

CF computers have a number of professional agriculture programmes pre-installed, requiring 30GB (or about 20 percent of its total hard drive capacity). Partnering with four software companies, THTF revised these programmes and integrated them into all CF computers. From a professional agriculture perspective, these agricultural programmes make the CF computer a “rural computer” in a very real sense. Having the programmes and databases integrated into the computers, farmers are able to consult with “digital agriculture experts” without being connected on to the internet. The special rural programmes can be categorized into three groups:

1. **Planting and Animal Husbandry Guidance Software**

The planting and animal husbandry guidance programmes were jointly developed by THTF and its four software partners under the guidance of the Beijing Agriculture Information Center. These programmes include information about thirty planting and animal husbandry programmes (basic introduction, planting/breeding technology, immunity and so on). These programmes bring valuable “digital agriculture expert” guidance from the very beginning of planting. The programmes give instructions on necessary procedures often neglected by farmers such as immunity. When something goes wrong with the plants or animals, the database will provide possible explanations and suggestions. Since these databases are integrated with hardware, farmers without internet access available can still acquire all the information. And since the knowledge in these databases is not time sensitive, users can use them as an agricultural reference, and the databases do not need to be updated very often. However, when CF computers are sold to other places out of rural Beijing (where originally developed), THTF revises the database according to local planting and husbandry features. A few example screenshots are illustrated below.

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14 Beijing Agriculture Information Center is a government agency under Beijing municipal government.
15 After the online software platform is built, users will be able to get more recent information and program updating from internet.
2. Long Distance Education

The long distance education software application was developed by one of THTF’s four software partners. It is composed of two parts: primary and middle school education, and minority language education. Although they are both for educational purposes, the operation systems are very different from each other. Similar to the agriculture programmes described above, the primary and middle school education software is integrated within the computer hardware and can run without internet access. Focusing on the subjects of Chinese, English and Math, it provides games to help children develop their minds. The software application for middle school students is more focused towards textbooks, and provides supplementary materials to help students with studying and writing exams. The purpose of the primary and middle school education programme is to improve rural students’ learning, especially for students who have limited access to quality education.

The working principle of minority language classes is different from the education programme previously described. Instead of providing text materials, the minority language education programme is online-based, live classes. First, THTF sets up a camera in a class of a high quality minority middle school and records the whole set of courses from the start until the end of the class. For consistency, each course is taught by one teacher. These courses are transferred and stored in a high capacity server and then uploaded into online courses. Once these digital courses are put on the internet, they can be shared by minority students in remote villages. Minority students then have easy access to quality courses taught in their own language. The minority language programme was developed by a single software partner and not part of the consortium of four partners that developed the Linux programmes.

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16 Computers for recording classes, transferring records are special ones of special functions. Signal receiving computers in remote schools are common CF computers.
3. **Skill Development Software**

In addition to the educational and agricultural professional programmes, CF computers also include specialized software, such as a digital library and skill training programmes to help rural clients develop other skills and become more competitive within their workplaces. The digital library in CF computers includes more than one hundred books covering law, economics, child education as well as novels. Skill training programmes include courses to become an electrical technician, barber, and housekeeper, to help rural users obtain supplemental income through part-time jobs in the cities. Some of the job training programmes, focused on housekeepers and electrical technicians, are provided jointly with local government authorized training programmes, so that trainees can receive certificates after passing exams.

**MULTI-STRATEGY SALES MODELS**

The rural computer market has always been considered by THTF to be very difficult to enter, even with very aggressive promotions and attractive prices. THTF started to introduce and promote its CF computers to rural clients through traditional means right after the first generation of CF computers was developed. The company organized three rounds of on-site promotions in three villages at the end of 2005 and demonstrated the special functions and features of CF computers to the rural population. Unfortunately, this traditional marketing method turned out to be very expensive and ineffective. First, there was no way for farmers to fully understand what computers can do for them. After the live demonstration, most of the participants still thought that computers were “fancy and expensive stuffs for office ladies and men”. Second, a two-hour live demonstration was not enough to encourage farmers to commit to the big purchase of buying a computer. Third, the lack of computer knowledge was not resolved by the live demonstration.

As a result, THTF adjusted its marketing strategy and took the opportunity to harness various government-sponsored development projects to reach rural clients. Since CF computer was jointly developed by THTF and BMGCST, it was relatively easy for THTF to approach these development projects. In addition to development projects, THTF also cooperates with other companies to reach rural clients indirectly. These strategies are described below.
Beijing – Rural Information Centers

The rural area of Beijing is the most important regional market sector for THTF. This is because of the market size, purchasing ability and most importantly, because the first generation of CF computers was designed based on the market research in Beijing suburbs. By 2005, BMGST built 37 information centres in villages around Beijing, in order to provide facilities for farmers to develop basic computer skills; BMGST plans to build 300 such information centres in total by 2010 to cover all villages around Beijing. The average cost of building an information centre is about 100,000 RMB (about US$12,500), including the cost of purchasing equipment.

A typical information centre has twenty CF computers and two computer technicians who are employed by BMGST to provide training to farmers and take care of the facility. After (free) registration, farmers are able to take no-cost computer training, including help from technicians if they have any questions or need further assistance. The technicians are also responsible for collecting local agricultural information and putting it on the Beijing Rural Information Center website\(^\text{17}\). For example, they find out what vegetables each family plans to plant at the beginning of spring and post the information, so that other farmers can avoid overproducing the same types of vegetables and reduce potential losses. Before the establishment of these information centres, there was no collection of information on a local level. All the technicians working in information centres are recruited from villages nearby; their close connection with local families makes the information collection task easier. Information centres also provide other services to farmers such as selling telephone cards, computer textbooks and collecting various household utility bills (water, electricity and telephone). The revenue generated from these additional services is used to fund part of the technicians’ salaries.

The purpose of BMGST’s investment in information centres is to help rural populations have the most direct understanding about computers and provide them with facilities to practice the skills they learn. In this case, BMGST, THTF’s development partner of CF computer, is also the client of CF computers. THTF sells CF computers to BMGST at market price and at the same time is responsible for computer installation and after-sales services\(^\text{18}\).

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\(^{17}\) The website of Beijing Rural Information Center: [http://www.96296.com.cn/](http://www.96296.com.cn/)

\(^{18}\) Installing computers in information centers is free of charge. After-sales services is paid service.
Hebei Province – China Mobile agricultural information text messaging

Chengde is a middle sized city in the Hebei province, with a considerably large rural population in the areas outside of the urban center of the city (about 6 million people). Similar to other big cities in China, Chengdu has a large number of rural people taking part-time jobs in urban centers. THTF is working in Hebei with the largest telecommunication company, China Mobile, to reach rural residents.

China Mobile wanted to explore the rural market, and they devised a new service of sending cell phone text messages to its farmer clients through special CF computers purchased from THTF. The CF computers store a great deal of agricultural information. The text messages sent by China Mobile to rural subscribers contain planting tips, market information, as well as information on relevant technologies and agricultural policies. Cell phone users can read the messages and also forward them to other people. China Mobile is testing this service in its eleven regional servers; the text message is currently free of charge. If market feedback is positive, China Mobile will provide this service in its more than two hundred local servers across Chengde, requiring the purchase of about 200 additional CF computers (each CF computer covers one region).

Xinjiang Province — Minority language programme & Long-distance training

There are 55 minorities in China, in addition to the majority of Han. Xinjiang province includes twelve out of fifty-five minorities in China. In most cases, the quality of minority language teachers is below that of teachers speaking Mandarin. Therefore, many parents in Xinjiang prefer to send their children to schools teaching in Mandarin, even though their children do not speak or understand any Mandarin. Realizing this problem, THTF introduced the long-distance minority language education programme to minority schools in Xinjiang. The programme is being tested in the middle sized city of Bole. Following the procedure explained earlier, THTF records courses taught in minority languages in the school in Bole first, transfers and stores the recording in a local server and then uploads these courses onto the internet. Students in other minority schools are able to follow highly qualified courses taught in minority languages. The teachers in the remote villages choose the on-line courses and help their studies after class. In addition, technicians from THTF also train school teachers on how to operate and maintain the facilities.

According to the agreement with the school, THTF and the Bole middle school have joint ownership of these online courses. In the first stage, THTF targeted minority schools located in cities or towns with internet access. THTF sells CF computers to the minority schools,

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19 The exact number of rural people working in Chengdu is not available.
20 THTF revised certain functions of CF computer so that the computers it sold to China Mobile have bigger capacity to store and upgrade agriculture information for the purpose of sending text message.
21 China Mobile sends agricultural text messages only to its farmer users. It also sends text messages about other industries to users from government, schools, companies and etc.
together with a PIN code for online courses\textsuperscript{22}. By Feb 2007, three minority schools started using the online long-distance education programmes in two minority languages: Kazak and Mongolian. If it works well, this model will be adopted by approximately three hundreds minority schools in Bole.

In addition to minority language classes, THTF also plans to use the long-distance education programme to address another challenge in Xinjiang: the lack of uptake on favorable government policies to help farmers purchase agricultural machines. However, many farmers do not know how to operate these machines, which is a waste of the preferable policies. Effective training on agriculture machines would help resolve this problem. However it is extremely difficult to organize training in Xinjiang, because of the very broad territory and low population density.\textsuperscript{23} It takes two days to travel from the north of Xinjiang to the south by train. THTF is trying to use its long-distance education programme of CF computers to build capacity for farmers in Xinjiang province to operate agricultural machinery. The programme is expected to start in the middle of 2007.

**Experiences and Lessons from THTF**

The CF computer was introduced to the market in June 2005. Through the three sales channels (government information centres, private sector, and schools), THTF sold about 1,011 CF computers by October 2006, at an average price of 3,101 RMB (about US$388). Although it is too early to tell how successful CF computers will be, the experience of THTF is able to provide some valuable guidance to other companies trying to explore rural markets, as well as governments determined to develop rural information and rural technology.

\textsuperscript{22} THTF did not apply patents for their on-line courses. They use PIN code to protect its intellectual property rights.

\textsuperscript{23} The population density in the Xinjiang province is about 9 people per square kilometer.
Table 2: Market Performance of CF Computer from June 2005 to Oct 2006

<table>
<thead>
<tr>
<th>Client</th>
<th>Number of Computers</th>
<th>Amount of Sale (RMB)</th>
<th>Average Price</th>
<th>Profit Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schools</td>
<td>330</td>
<td>957,000</td>
<td>2,900</td>
<td>6</td>
</tr>
<tr>
<td>Governments</td>
<td>670</td>
<td>2,144,000</td>
<td>3,200</td>
<td>7</td>
</tr>
<tr>
<td>Companies</td>
<td>11^24</td>
<td>36,300</td>
<td>3,300</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>1,011</td>
<td>3,101,000</td>
<td>3,101</td>
<td>6.7</td>
</tr>
</tbody>
</table>

Source: Author compiled from interviews

BUSINESSES

Understanding the hidden needs of clients

CF computer was designed according to the needs of rural clients. Since the Chinese rural computer market was untapped, companies lacked understanding about rural clients’ needs. The three rounds of market research helped THTF gain a broad and clear understanding about rural clients, which in turn helped in the design of all the special functions and programmes of CF computers. “Chinese farmers cannot afford fancy things…they only pay for what they want,” Said Mr. Jun Li, the Vice-General Manager of computer department of THTF. Li continued: “CF computer comes from the minds of the people in suburbs, or more precisely, people in agriculture industry…Putting our feet in the shoes of farmers is our basic principle… What we did is to turn their ideas into tangible computer products.” THTF believed that previous agricultural computers were not accepted by farmers because previous computers did not really capture what farmers needed. Li further added, “From our market research, we believe that what farmers really need is not simply a cheap computer, but a set of solutions to problems that farmers face in their daily work and life…We really need to think how our computers can make their life easier, rather than simply trying to make them buy our computers.”

Client education

Client education is the toughest challenge in the rural market. “How can we expect a person to buy a product that he knows nothing about?” Li said. “Experience told us that the traditional ways of promotion, such as advertisement and on-site promotions do not work in the rural computer market at all, no matter how aggressive they are…The first thing we have to do is to let farmers know that computers are useful and the second thing is to teach them how to use a computer…. But as you know, client education takes considerable time and resources and it is extremely difficult in the rural markets.” THTF stopped using a direct marketing strategy two months after CF computer was introduced. Instead of taking the risk of conducting client education by itself, THTF worked with the government to nurture the client group first. In this model, rural information development projects that THTF is involved in (such as the rural information centres) comprise the first step of client education.

^24 THTF received orders of 200 CF computers from companies for the first half of 2007.
The final target group is composed of individual farmer clients; cooperating with government sponsored projects is the currently adopted strategy to reduce the risk of initial market exploration and client education.

**Partnering with the Government**

“...The rural computer market in China is just too difficult for any computer company to jump in alone right now...Without the support of BMGCST and BSIPC, THTF would not be able to ‘touch’ it”, Li said. Following the mandate outlined in “The Eleventh Five-year National Development Plan” (2005-2010), the Beijing municipal government is determined to eliminate the digital gap through the efforts of BMGCST. THTF managed to get the initial development funding from BMGCST (6 million RMB, approximately US$770,000) to develop CF computer, which makes the government its partner. Simultaneously, BSIPC, another government agency with the broadest network of software companies, helped THTF to select five appropriate partners (four software partners for the Linux programmes and one partner for the minority language programme) from 150 software companies to work together to develop Linux software, agriculture programmes and the long-distance education programme. BSIPC also tested the quality of all CF computers before they were introduced to the market. This added a great deal of credibility to CF computers on the market.

In return for the support from BMGCST and BSIPC, THTF will be evaluated on its market performance. According to the agreement between THTF and BMGCST, by the end of Sept 2007, THTF needs to sell at least 30,000 CF computers to rural customers through direct and indirect channels in total. If THTF fails to reach this goal, BMGCST will take back part of its initial investment. The way that THTF partners with BSIPC and BMGCST is not the traditional public-private partnership. In this partnership, THTF, as a business, helps the government to carry out the mission of rural information development with innovative technology, while the government, as the guider of market, provided initial funding for THTF to develop a truly rural computer and used various rural development projects to help THTF initially reach rural clients. The following chart illustrates the relationship of THTF with its government sponsors and major partners.
The partnership with the government also plays an extremely important role in sales and promotion. As illustrated above, schools and governments are currently the major purchasers of CF computers. Without being able to tap these rural information development programmes, it would be very difficult for THTF to open up the rural market alone in the initial stage.

**Multiple revenue sources**

To keep the price of the CF computer low, THTF has to keep the profit margin of CF computer between six percent and seven percent. It is expected to take years in order to fully nurture and support the rural market. Until rural individuals see the value of computers and have the ability to purchase and operate personal computers, THTF will continue with indirect marketing strategies. However, if THTF fully relies on government clients and educational institutions - even if the big group of direct users grows in the near future - CF computer will be challenged to meet the 30,000 sold computers target. Therefore, while nurturing individual rural clients with government and schools, THTF is exploring other revenue resources to support its growth.

Most software programmes in the CF computer need to be upgraded periodically, to keep the information current and useful for farmers. Technically, it is impossible to put all the agricultural information of China into one computer. Farmers from different areas have their own focus and preferences. THTF and its software partners are developing a website, which contains much more information than the amount that one computer can afford. The website will also become an online platform whereby people can download updates of the programmes they have in Linux system. This website will not only generate sustainable revenue through charging fees for downloading programmes, but also become a large online centre of agricultural knowledge, information and Linux programmes. In conclusion, the
long-term and short-term revenue sources of CF computers can be illustrated by the following picture.

**GOVERNMENT**

**Public-Private Partnership**

The public sector sets policies to promote rural information development and eliminate the “digital gap” between urban and rural areas. Instead of working with educational departments or directly investing in information facilities, BMGCST and BSIPC chose to invest in and partner with a private sector company to leverage its resources and distribution network in order to first build up the “hardware” of rural information development. This model of public-private partnership made rural information development possible and easier to carry out.

**Capacity building**

Compared to the financial investment required to build facilities, it is much more challenging to build farmers’ knowledge and understanding about computers and the internet. A survey was carried out in three rural information centres around Beijing to find out what farmers think about the information centres. 56 people took this survey in total. Generally speaking, people who came to the information centre were content with CF computers, and they thought that it was very well designed and user friendly. In terms of convenience, people usually waited less than twenty minutes for their turn, and the time they spent using a computer was more than thirty minutes. However, there were still many people in the villages that did not know about the information centres and were not interested in learning about computers. Even for people who used information centres, 68 percent of them suggested that “more training programmes” should be organized. This item was considered far more important and urgent than other items, such as upgrading computers, extending opening time, and so forth.
This feedback indicates that there is still a lot of work that the government needs to do to educate farmers on how to use computers and to demonstrate how computers can help them.

**Conclusion**

The Chinese rural market was considered too risky to enter for any single computer company, because of all the difficulties and challenges involved. However, THTF, with its government partners, are nurturing the rural computer market by helping rural residents gain more understanding about information technology and strengthen their basic computer skills. The support and investment of the Beijing municipal government was important for THTF to start exploring the rural computer market. THTF used various rural information development programmes supported by government and relevant education projects to reach rural customers. These development projects are the main revenue source of CF computer in the initial phase. At the same time, the government leveraged the capability of an ICT company, including its sales channels and technological know-how, to revolutionize the computer for rural areas. Although CF computer was introduced to the market in the middle of 2005, it will take more time to evaluate the strategies that THTF applies to reach commercial viability. The essence of this case is to illustrate the public-private-partnership innovation, which opened the door of the computer industry for the rural poor, and continues to nurture the market for future growth.
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Mr. Lin Ma, Beijing Municipal Government Commission for Science & Technology, Director General.

Mr. Guangzhi Jiang, Beijing Municipal Government Commission for Science & Technology, Director of Information Division.

Mr. Qinghua Hu, Beijing Software Industry Productivity Center, Director.

Mr. Jianhang Li, Tsinghua Tongfang Group, Vice-President.

Mr. Jun Li, Tsinghua Tongfang (Computer Division), Vice-General Manager.

Mr. Gong Cheng, Tsinghua Tongfang (Computer Division), Project Manager of ChangFeng Computer.

Ms. Jianglan Wu, Tsinghua Tongfang (Computer Division), Manager of Public Relationship.

Mr. Hui Gao, Tsinghua Tongfang (Computer Division), Project Manager, R&D.
## Appendix A: Basic Setting of CF Computer

<table>
<thead>
<tr>
<th>Elements</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mini-ITX (7.5 inch to 7.0 inch)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Processor</strong></td>
<td>0.13 Intel Celeron 1.0GHz processor based on 400MHz System Bus</td>
</tr>
<tr>
<td><strong>RAM Chip</strong></td>
<td>A 184-pin DDR SDRAM Slot</td>
</tr>
<tr>
<td></td>
<td>Up to 512 MB</td>
</tr>
<tr>
<td></td>
<td>Intel 845GV Chipset, Component</td>
</tr>
<tr>
<td><strong>Video</strong></td>
<td>Intel 82845 GV Graphics and Memory Controller Hub (GMCH)</td>
</tr>
<tr>
<td><strong>Audio</strong></td>
<td>Intel 82801DBL Controller Hub (ICH4L)</td>
</tr>
<tr>
<td></td>
<td>Intel Extreme Graphics</td>
</tr>
<tr>
<td></td>
<td>Audio Sub-System with AC’97 Processor using RealTekALC202A Multi-Media</td>
</tr>
<tr>
<td><strong>USB</strong></td>
<td>Support USB1.1</td>
</tr>
<tr>
<td><strong>External Interface</strong></td>
<td>Two USB Ports</td>
</tr>
<tr>
<td></td>
<td>Supports PS/2 Keyboard and Mouse</td>
</tr>
<tr>
<td></td>
<td>An Ear jack + A Microphone Jack</td>
</tr>
<tr>
<td><strong>Expansion</strong></td>
<td>An Intel 10/100MBit LAN port (RJ45)</td>
</tr>
<tr>
<td></td>
<td>A VGA Out port (D-sub)</td>
</tr>
<tr>
<td></td>
<td>An Expansion PCI Slot</td>
</tr>
<tr>
<td></td>
<td>An UDMA 33, ATA-66/100 IDE</td>
</tr>
<tr>
<td></td>
<td>Support a 1.44MB Floppy Drive</td>
</tr>
<tr>
<td></td>
<td>Support Front_Panel_Audio</td>
</tr>
<tr>
<td><strong>BIOS</strong></td>
<td>4 Mbit BIOS ROM size</td>
</tr>
<tr>
<td><strong>Plug-in &amp; Play</strong></td>
<td>Support improved construction and power interface. ACPI Plug-in and Play and</td>
</tr>
<tr>
<td></td>
<td>SMBIOS, PXE</td>
</tr>
<tr>
<td></td>
<td>Support PCI Limited Bus Standard referenced 2.2</td>
</tr>
<tr>
<td><strong>Elements</strong></td>
<td>Support Wake on PCI PS/2 and USB port</td>
</tr>
<tr>
<td><strong>Processor</strong></td>
<td>Mini-ITX 7.5 inch to 7.0 inch</td>
</tr>
<tr>
<td></td>
<td>0.13 Intel Celeron 1.0GHz processor based on 400MHz System Bus</td>
</tr>
</tbody>
</table>
September 2007

The information presented in this case study has been reviewed and signed-off by the company to ensure its accuracy. The views expressed in the case study are the ones of the author and do not necessarily reflect those of the UN, UNDP or their Member States.

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