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IBM China Development Lab Shanghai: Capability by Design

A few years ago, IBM organized its global business around different territories. . . . Asia-Pacific, North America, Europe . . . that was the map. But today, it's different. A Growth Markets Unit was established, including China, India, Russia, Brazil, and other fast-growing countries, to drive global hypergrowth businesses. The headquarters of the Growth Markets Unit is in China, here in Shanghai. You can tell the importance of China now in IBM's global strategy.

— Christine Cui, Executive, IBM China Development Lab

As the program director of B2B & Smarter Commerce, IBM Greater China Group, Christine Cui had the responsibility for a team of more than 200 people. Her people included product managers, solution managers, business development managers, solution architects, and software development engineers. The team had the worldwide development responsibility for what IBM called Smarter Commerce Solutions for the company's entire global client base. Cui was also the executive who oversaw IBM China Development Laboratories (Shanghai) with a team of more than 600 people spread across locations in cities centered around Shanghai, including Ningbo, Hangzhou, Wuxi, and Nanjing, focusing on industry solutions development across finance, logistics, manufacturing, and so on.

Cui's office was in the Zhangjiang Hi-Tech Park, the largest industrial park in Shanghai, located in the Pudong district, which had seen remarkable growth in the last 10 years. A decade before, the park was mostly farmland. In 2011, companies like General Electric, Hewlett-Packard, Lenovo, SAP, ZTE, and countless development labs for multinational corporations were down the street. The IBM China Development Lab (CDL) had grown at a frenetic pace as well. Ten years before, it was a handful of people. In 2011, at a headcount of more than 5,000, it was one of the largest development labs in IBM's global network.

Was the term *growth markets* simply a euphemism for *emerging markets*, or was there a more deliberate strategy behind the naming of IBM's Growth Markets Unit? Beyond the symbolic significance of making China the headquarters for growth markets, was China now ready to be the platform for IBM's product development, targeting places like Brazil or Russia or India? Did CDL people have the skills, and did they command the respect of the other IBM labs in places like Silicon

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Valley or Toronto or Hursley, in the U.K.? Was CDL a peer in the network of development labs yet, or did it still need to build its skills?

As Cui headed off for yet another customer meeting, she didn't have much time to take these questions one by one. There were far too many opportunities in front of her in the booming China market alone.

IBM R&D in China

IBM had operated in modern China since 1979, when it shipped an IBM System/370 Model 138 mainframe to the Shenyang Air Blower factory.¹ During the 1970s and early 1980s, the Chinese government tried to develop an indigenous information technology (IT) industry, and IBM participated by setting up joint venture factories. But the government changed course in the mid-1980s, adopting a more pragmatic strategy of importing advanced technologies and emphasizing use of IT throughout the economy.² While the government encouraged joint ventures with foreign companies that would supply technology and manufacturing expertise, it experienced little success in high-end markets, so by 1991 it abandoned the goal of self-reliance and decided to import mainframes and minicomputers while focusing the domestic industry on microcomputers, peripherals, and software. IBM saw some success in its selling efforts, operating out of Hong Kong and gradually establishing sales operations on the mainland.

The government accorded the electronics industry priority status in 1993. Between 1989 and 1995, there was a dramatic increase in the use of IT, with investments in hardware, software, and services expanding by 20% annually. While the percentage of scientists, engineers, and programmers in the Chinese population was not as high as in some other developing economies, China's population was so large that the absolute number of professionals was also quite large (see **Exhibit 1**). At the time, many Westerners held the view that Chinese workers were not as productive as workers in the West, but how much of that perceived difference in productivity was from a lack of accumulated experience and access to tools? After all, wage rates in China were a fraction of those in developed countries, tools could be bought, and experience would come over time.

IBM set up its China Research Laboratory (CRL) in August 1995, a difficult time in IBM's history.³ James McGroddy, the director of IBM's Research Division at the time, recognized the advantage of being a first mover. He saw the market potential but also China's rapid growth in the education infrastructure and its ability to train engineers and scientists. By setting up a research lab in China, McGroddy thought, the company would become a magnet for the best talent, as well as derive great advantage in establishing relationships with universities and the government. "Everybody wanted to partner," McGroddy recalled, "but we decided we would dance with everyone but marry no one." He felt it was important to control the R&D output, and the way to do that was to be solely responsible for it. Partnering with a state-owned enterprise (SOE) would add complexity. IBM became the first multinational corporation to locate a research lab in China.⁴

To set up CRL, McGroddy recruited George W. Wang, a physicist who worked for him at IBM's T. J. Watson Research Lab in Yorktown Heights, New York. Wang was born in Tianjin and had emigrated first to Taiwan and then to the United States, where he received a PhD in physics at Columbia University. "George was the perfect person," recalled McGroddy. "Smart, he spoke Mandarin, and he knew his way around China. Plus, I trusted him."

Wang and McGroddy held discussions with numerous government officials and leading Chinese universities before settling on a site in the Haidian district on the northwest side of Beijing near

National Tsinghua University. Initially the lab planned to hire 15 to 17 researchers with a budget of \$3 million. As the first employee of the lab, Dr. Katherine Shen recalled that at the time there were only two personal computers with an Internet connection, and people had to wait in line to check their e-mail.⁵ There were numerous challenges: how to attract the best people, how to find interesting work for them, and how to establish the lab's capabilities and reputation.

The stated strategy was to harness local technical talent and to have that talent on the ground in a rapidly emerging market. Wang observed, "If it was just about low labor rates, we'd probably have R&D centers in places like Romania and the Philippines."⁶ The lab was given significant missions at the outset: innovating world-class information technology, attending to Chinese development trends and needs, developing local talent with management abilities, and promoting collaboration with Chinese academies and top universities.

McGroddy and Wang chose Chinese speech recognition for the lab's first project. "IBM had a speech recognition engine, but we did not have a Chinese-language front end. That was a natural to try to achieve early success," McGroddy recalled. The newly recruited Chinese team members worked so quickly that they developed a prototype in time for the dedication of the lab a number of months later.

Over its first 10 years, CRL's work appeared in products like IBM's ViaVoice speech recognition technology for Mandarin, a translation engine for WebSphere,⁷ and numerous industrial solutions. CRL established collaborations with many Chinese universities, linked to a part of China's 11th five-year plan that emphasized "promoting modern service industry." With Tsinghua University it designed a services science curriculum and taught a graduate course, Introduction to Service Science.⁸ It also researched solutions engineering methods and tools with Peking University. CRL staffers became increasingly engaged with Chinese clients through IBM business units. By its 10th anniversary in 2005, CRL had attracted more than 150 staff members and was growing by 20 percent per annum. It had become an important node in a widely respect global network of eight IBM research facilities.

IBM CRL was followed into China by the research labs of dozens of other multinationals, including Intel and Microsoft in 1998, and Lucent in 2000.

IBM China Development Lab

IBM China Development Lab (CDL) was founded in 1999 as an affiliate of the IBM Software Group. It positioned itself as dedicated both to providing Chinese customers with software products, technologies, and solutions tailored to local requirements and to serving as a communications bridge connecting the Chinese software industry with the world, bringing advanced software technologies to China.⁹ Like CRL, CDL was a little ahead of other companies that would ultimately establish development facilities. By 2000, the rapid shift in manufacturing to China had observers proclaiming it to be the workshop of the world. But CDL's establishment heralded a parallel trend in product development.

Once again, harnessing local talent was a principal driver. "Manufacturing is shifting to China but the big win for multinationals is the ability to capture the knowledge assets on offer," said Denis Simon, president of the Monitor Group.¹⁰ Matt Wang, the lab director of CDL and an IBM vice president, explained:

When you look at R&D, how you deploy your R&D globally, the number one thing is talent. People. So where do you put your people? When you look at that question, you want to

know the education [infrastructure], the University system and how easily you can access that talent. Furthermore you also want to know the market size in that area. China is at the cross-section of all of these sweet spots. So it was very crucial that IBM invests in this market because of the talent, the sheer volume of the talent in this market. The secondary consideration was cost, but cost was not the main consideration. Service delivery, on the other hand, needs to consider costs, delivery costs. That's why India is one of the primary choices. You don't need a huge domestic market to sustain that. They can do the global delivery anywhere in the world because of the [communications] technology today.

For product development, really you want to get the best talent even at premium cost. That's why Silicon Valley is still a premier lab in the U.S. Because the innovation, the access to the information, and access to all the other peer labs is over there. Now when we look at China, obviously Beijing and Shanghai are the two primary locations with top universities here. The communication is easy, it's English-speaking, and also transportation is easy with lots of direct flights . . . so those factor in. Also the government support, the government makes it easy, policywise, for multinational companies to set up their research R&D.

In 2011, CDL was part of the North Asia-Pacific (AP) Cluster, which included labs in Japan, Korea, Singapore, Malaysia, and Vietnam. Within greater China, the lab included facilities in Taiwan, Beijing, Hong Kong, Ningbo, Shanghai, and Xi'an.

A Platform for Growth Markets

The shift from multinational corporation to globally integrated enterprise has assumed two distinct forms. The first has involved changes in where companies produce things; the second, changes in who produces them. Until recently, companies generally chose to produce goods close to where they sold them. As a consequence, most foreign investments targeted specific foreign markets. Today, overseas investments continue to be made with a view to gaining access to important sources of foreign demand, but companies are investing more to change the way they supply the entire global market. The global integration of production cuts costs and taps new sources of skills and knowledge.

— Samuel J. Palmisano, IBM Chairman and Chief Executive Officer¹¹

Historically, IBM was a typical multinational with sales subsidiaries located in countries around the world and with tasks like R&D and product development performed on a global basis. IBM country subsidiaries were set up as smaller versions of itself. Localization was useful to overcoming trade barriers, and as those barriers came down and communications became much easier (facilitated by the Internet), the whole nature of how a global corporation might organize started to shift. This was at a time when the company foresaw major changes that would reshape the IT industry:¹²

- The lowering of trade barriers, the rise of the developing world, and the emergence of the World Wide Web.
- Changes in technology — A shift from a PC-based client/server approach to a world where computational capability was widely distributed among a range of devices beyond traditional computers — phones, cameras, roadways, power lines, and so on — all connected through the Internet. The company described this as the “industrialization of IT.”
- Changes in client demands — Customers’ need to innovate beyond just products and services into their business processes, management systems, policies, and core business models.

Samuel J. Palmisano, IBM's chairman and CEO, started talking about the globally integrated enterprise model as one in which IBM would fashion its strategy, its management, and its operations for integrated value delivery worldwide. "State borders define less and less the boundaries of corporate thinking or practice," he wrote.¹³ In 2008, the company reorganized along a very different axis. It established its Growth Markets Unit to serve what it saw as its highest growth opportunities: emerging market economies. It defined these markets as countries with the potential to grow at above-average rates over the coming decade, including China, India, Brazil, and Russia (see **Exhibit 2**).¹⁴ Between 2005 and 2008, the markets in this group increased their revenue contribution to the company by one percentage point per year, and grew at least eight points faster than the established markets. IBM placed its Growth Markets Unit headquarters in Shanghai. Established markets like North America and Europe went into the Major Markets Group, headquartered in New York.

For CDL, this reorganization meant more than just a change in reporting lines; it marked the opening of significant new opportunities. Matt Wang elaborated:

A lot of people thought Singapore or Hong Kong should be the headquarters, but look at the fast-pace of growth of China. I think we made the right bet. . . . They actually made a drastic move. I originally covered six regions—Japan, Greater China, Korea, India, ASEAN, ANZ [Australia and New Zealand]. They carved out Japan, out of Asia-Pacific, separated it out! People were thinking why, it's in Asia-Pacific, right? But because the business model [for Japan] is completely different, very different, by design it was separated out. And then, by design, the new organization grouped Eastern Europe, Russia, Latin America, Africa, and the Middle East, together with the Asia Pacific, and created GMU, the Growth Markets Unit. The Growth Markets group is headquartered in JinMao [Tower] in Shanghai. Within IBM for a very long time, the growth was in one area, the money was spent in another area. That's a form of the innovator's dilemma, on the market side. Not only in research and development was there a dilemma, but also in the market investment there was a dilemma. The sales and growth were in one area; all the profits were soaked up, and put back into the area with little growth. So by design, we separated them out, and it was now separately budgeted, to protect the investment for the growth markets.

Could CDL become a development platform that would serve the other geographies in the Growth Markets Unit? How about the Major Markets geographies? Matt Wang reflected:

Some small projects that we have here will not give you huge revenue, but they have hypergrowth. Some of the areas . . . will be so different from the product delivery model of major markets. Software as a service happens to be here. We have more major projects here. So it is not really here versus there, it is really the business models versus each other. Even as software as service is developed in Silicon Valley, for example at Salesforce.com, it also much different from the traditional CRM model.

Project Selection for CDL and the Global Division of Labor

How we started was quite simple. We started by taking pieces of jobs, all kinds of jobs. We did advertisements for ourselves . . . "no experience, but we can learn." Our people are smart, they can learn very fast. We started with testing jobs for products, and we did those jobs very well. And groups that gave us that work thought, "Well, these guys can do more than testing, they can do the development work." So we started into the development . . . not just coding, we can design. Then they let us do component design, and more. The most important thing for you to keep things going is . . . every step you need to guarantee that successful step,

no matter how small a piece of work. . . . You need to make all of the pieces you work on successful. Success means doing even better than when it was done in the past somewhere else. You need to prove that.

— Christine Cui

Unlike pure research, which could often be segmented across labs with focus and specialization, the globalization of product development placed additional demands on dispersed labs for coordination and working together. Economies of scale and the costs of coordination made it easy to concentrate development in one location. The need to adapt products to the needs and tastes of a local market; the desire to gain or improve market access; or the desire to harness lower factor costs such as abundant talent and lower-cost labor, government incentives, or local market knowledge could offset coordination costs.

When CDL was founded, most of the work that flowed to it from other IBM software development labs looked like traditional outsourcing work. National language support (the translation of user interfaces and commands into multiple languages for the international distribution of software) was an obvious task: it was very well defined, no architectural skills were required, and it was very labor intensive. Such work would often be described by outsiders as pure labor arbitrage, substituting low-cost employees in one country for high-cost ones elsewhere, the essence of outsourcing. As Christine Cui recalled, CDL took almost any jobs that were offered from other parts of IBM and endeavored to deliver its work products on time, on budget, and at expected quality levels or better. It was a good way to get started. Even though many of the developers that CDL hired had advanced degrees, CDL was willing to take work that labs in the U.S. or elsewhere found tedious and expensive. As the lab developed a track record for delivering work on time and on budget, other sites started sending more sophisticated projects.

The lab had significant resources assigned in several product areas, which are described below. The division of labor depended on the capabilities of the respective teams as well as on local market knowledge and needs.

WebSphere Front Office for Financial Markets

WebSphere Front Office was an IBM product that targeted the market data delivery needs of financial services firms such as asset managers, broker-dealers, investment banks, and hedge fund managers. It provided a customer infrastructure to support trading decisions and large analytical capabilities. IBM put together the product by combining three pieces: (1) the acquisition of InfoDyne, a privately held software company in Chicago, Illinois, that it saw as a leader in high-speed platforms and data feed connectors; (2) ultra-low latency messaging technology from IBM's Haifa, Israel, labs; and (3) IBM's WebSphere development environment. (**Exhibit 3** shows the overall architecture of the product.)

Billy Huang was the senior development manager in CDL with the responsibility for WebSphere product development at the Shanghai site. He described the product as follows: "The functionality of the product is very simple, which is to acquire financial market data from all the exchanges, so that IBM WebSphere Front Office can compose these market data and transform these for the financial end-user to interpret the market data for their trading and data analytics purposes."

After IBM's purchase of InfoDyne in 2008,¹⁵ development ownership for the product was transferred to an IBM group in Austin, Texas. While some of the developers remained in Illinois, part of the development responsibility was moved to CDL. Huang explained the division of labor:

This product has two major components—one we call the platform, we call it WFO, which is an abbreviation for WebSphere Front Office; and the second part is called the feed handler. The purpose of the feed handler is to construct the data acquisition policies and mechanisms based on the different protocols that are provided by all kinds of exchanges. For example, data communications from the NYSE is quite different from NASDAQ, and they each have their own communication protocols. In order to capture these market data, like stock prices and quotations, we need to get the protocol information from the exchanges, and implement a special adapter for each exchange, so that we can get the data according to the communication protocol, to get the data into our own software. We build the adapters, exchange by exchange; we call these kinds of components feed handlers, which are basically data feeds. The China team is responsible for developing the feed handlers here. We have the roles and responsibilities divided between the U.S. team and the China team; we receive instructions from the U.S. owners. So we have the release manager here. *Release manager* is a special term in China; in IBM it means the person who is responsible for deciding what kind of features will be implemented in a particular product release. That's a big responsibility from the product perspective.

Routine work, like cranking out a multitude of different feed handlers, was well suited to a low-labor-cost site like CDL. Was it a reflection on the relative skill level found in Huang's lab? Huang explained:

From a platform perspective, the U.S. team certainly has a higher skill level compared to the China team. The platform requires advanced programming skills and advanced architectural skills. So the U.S. team is certainly more mature compared to the China team, and so they own the platform. Meanwhile, the feed handler requires a lot of development effort, so if you don't have enough developers you cannot build enough feed handlers, because we have to build the feed handlers exchange by exchange. Sometimes [in the case of a] research exchange we have to develop multiple feed handlers for them. So in such situations, we call the development labor-intensive work. They moved this kind of work to China, because we have smart developers here. Although the skill level required is not as high as the U.S. team, . . . we learn quickly. Another consideration is certainly the cost. You know, by spending less money we can produce more, so that's a decision. So typically it's driven by two important factors: one is skill, another is cost. And a third important factor, but it doesn't apply to all software products, is the local market. If customers require and need a strong technical presence in China, they will also consider moving the product to China.

In the matrix-managed IBM organization, there was also a demarcation of reporting responsibilities. While work content was specified by the U.S. product team, people management responsibilities fell to local managers. This served to overcome time-zone, distance, and language barriers and the management of individual performance. Huang explained:

We call it the people reporting line, and the functional reporting line. From a functional perspective, we report to [the] U.S. because this product is owned by the development owner, and the business owners are all in the U.S. They provide the development and business instructions to the team in the China development lab, which is the WebSphere Front Office China development team. And from the people management perspective, it is CDL's responsibility to take care of this team's career development, and provide performance feedback and management for the teams so that they can work happily here. And also feel that they have a bright future in this lab. They can get the opportunities to grow and learn new skills. So that's how things operate. From the business direction and the development direction

perspective, we receive instructions from the U.S. Different CDL teams may have different levels of maturity.

Would Huang's team always be given the labor-intensive, commoditized work like writing feed handlers, or were there prospects for moving up to more complex work? To Huang, this was more a question of developmental maturity. Huang's team currently had full responsibility for the feed handlers, as he explained:

The maturity level is different, and we have the product with full ownership in this lab, which means we have a product line manager—you could also call it a product manager—responsible for making decisions for the roadmap of this product, and to analyze market trends, and analyzes user requirements so they can decide what kind of features and what kind of requirements should be incorporated into the next release of the product. We hope that with the implementation of new features, we can help the sales guys to sell more products to the market so IBM can get more revenue.

e-Commerce as a Service

Electronic commerce (e-commerce) was the buying and selling of products or services over electronic systems such as the Internet. E-commerce was becoming increasingly complex through continuous innovations and developments that fulfilled the evolving needs of businesses. Software solutions were developed for all parts of the value chain, ranging from sales, marketing, and customer management at the front end, to inventory management and order fulfillment at the back end. IBM's flagship product was called WebSphere Commerce. Started as Net.Commerce in 1996, WebSphere Commerce had evolved into the company's main customer interaction platform for online and cross-channel commercial transactions.

The product's traditional strength was on the front-end process of interacting with customers and on customer management. In August 2010, IBM acquired Sterling Commerce from AT&T, because it saw Sterling as having strong back-end offerings in order management and fulfillment solutions. (**Exhibit 4** shows the architecture of WebSphere Commerce.)

Although WebSphere Commerce was well suited to developed markets, the local sales team found it hard to break into the domestic Chinese market with the base product offering. For example, WebSphere Commerce delivered a streamlined customer shopping experience through a Web2.0 Starter Store. The store front pages were all created with standard base templates to deliver a simple, clean web-page look and feel. However, in China, this did not meet local market requirements. Because customers often did not know where to look for merchandise and deals, the local team felt that a web page should allow shoppers to find their products and deals with a small number of mouse clicks. Chinese online shopping sites all had front pages loaded with marketing information and flashing discounts to increase sales, so prospective customers often dismissed IBM's products based on front-page design alone, never even considering the back-end capabilities.

The checkout process was also quite different for U.S. and Chinese online stores. In the U.S., the checkout flow was typically linked to the store's existing back-end process. The store collected the payment information by providing text fields where customers filled out billing address, credit card number, expiration date, and card verification value (CVV) code. Yi Luo, a software architect on the WebSphere Commerce Development team at CDL who started with IBM in 2005, commented on the differences in China:

In China, this is impossible because we are still in the early phase of e-commerce development; there is no trust between shoppers and the merchant. So we need to rely on a third-party payment service provider—for example, Alipay provided by Taobao, or Tenpay provided by Tencent. So this is a different shopping flow. Originally our product could not support this kind of flow, which was a concern. However, if we failed to provide some very common requirements, usually requested by each Chinese customer, the implementation cost for the customer would be very high.

In addition to the up-front cost of the software, the cost of implementation of WebSphere Commerce for many Chinese customers was prohibitively high. Most Chinese clients did not have a sophisticated enterprise resource planning (ERP) or inventory management systems to link to. Many of them had manual back ends. To address e-commerce opportunities in China, CDL decided to use cloud computing and a commerce-as-a-service (CaaS) strategy because the initial costs for small and medium business (SMB) customers were low. Charly Mao, product manager for WebSphere Commerce at CDL, described the approach:

Commerce as a service is an example of the combination of American technology and Chinese local requirements. From an e-commerce perspective, in the U.S., it's the big brands that do e-commerce. In the commercial world in the U.S., like the garment industry for example, there are 20 or 30 top brands already. So in the U.S., IBM's marketing strategy is to attack these accounts and to get revenue from that sector. But for China, garment firms are traditionally SMBs. For these companies, it is not affordable to purchase IBM. [What the cloud does] is to aggregate the demand from the people with smaller requirements and pool them together. That's the basic idea. Once we have the cloud, how do we deliver the services to each enterprise? The good thing is we have a way called our CaaS service. Even in the U.S. it is a new thing. But here with the CaaS model, it is really a fit with small companies, and the cloud gives us a way to put it together.

In 2009, IBM partnered with Wuxi's iPark, a municipal research campus, to host a data center for local software firms. IBM worked with a business partner who would then operate the Wuxi cloud data center, and signed an original equipment manufacturer (OEM) contract with that business partner to have WebSphere Commerce hosted. The business partner provided a complete offering to clients who wanted to use the service. Clients, who were typically SMBs, paid for the service on a revenue sharing basis. This significantly reduced the up-front costs and requirement for proprietary back-office IT systems. The only costs were a small setup fee and an onboarding fee. The business partner typically charged between 5% and 10% on a pay-as-you-go basis, and IBM received a share of this revenue stream. Industries with high gross margins were attracted to this model, and as a result small and medium enterprises (SMEs) in the garment industry in China became early adopters of IBM's CaaS.

At CDL, software engineers had much more responsibility for CaaS product development, since most of the market needs were locally driven. CaaS was an alternative product that IBM could offer to the Chinese market in addition to WebSphere Commerce. The CDL WebSphere Commerce team now had to manage both products carefully, allocating resources between the products based in the Toronto lab, as well as products based at CDL.

Mao had an interesting history with the project. He was one of the original engineers sent to the Toronto Development Lab to transfer WebSphere Commerce know-how to China. Mao then left IBM in 2004 because he felt stuck just doing coding, testing, and work that was far removed from customers and actual product design. He went to work at a foreign company that was starting a lab

in Beijing. But in 2009, he returned to CDL, attracted by a product line manager position that would give him a global product management role on the e-commerce team.

WebSphere Multichannel Bank Transformation Toolkit

The multichannel bank transformation toolkit (BTT) was an IBM technology architecture solution intended for banks carrying out branch banking transformation. It provided a multichannel runtime platform, optimized for the high-volume requirements of channel applications, and the development of transaction-oriented banking functions. For the end customer these applications might include tellers, automated teller machines (ATMs), Internet and e-banking, mobile banking, home banking, contact centers, and other customer touch points. For banks, the applications extended to a set of service systems including a wealth management system, a customer relationship management system, a product management system, a fund financial management system, and an insurance system. The system further required support of legacy applications and existing documents built up over time, such as Word documents, PDF documents, calendars, and appointment management.¹⁶ (Exhibit 5 shows the overall architecture of the product.)

BTT was a complex, all-encompassing solution that was developed and managed from IBM China. Matt Wang explained, "It's Internet banking, or e-banking, or mobile, or branch office banking, et cetera, retail banking. The product is actually managed here—worldwide, here. And the worldwide director for product development is here." The rationale behind this location choice was that the technological requirements of Chinese banks were actually much higher than those of their Western counterparts, driven largely by the size of their massive retail branch operations.

The importance of branch banking in China had increased dramatically in recent years. In the financial services industry, the retail banking business contributed more than 60% of the total revenue for many large banking groups. Yet compared with other international markets, Chinese retail banking had seen little development.¹⁷ With the entry of foreign banks, the banking environment had become much more competitive and customer expectations had risen. In addition, branch banking had become much more prominent, with small and medium-sized banks the growing number of branches at 14% annually between 2006 and 2011.¹⁸

Foreign banks had focused on high-end customers in economically developed regions largely at the expense of local banks. According to one survey of 11 foreign banks, the number of retail customers increased tenfold from 2005 to 2008.¹⁹ The growth of foreign banks had pushed up customer requirements, yet local banks had invested little in developing the technological back end to support the growth in transaction volumes and higher customer expectations. As a result, domestic branch banks were spending less time on valuable marketing activities because transaction processing and back-office efficiency was very low, while operating personnel spent most of their time on customer service, transactions, back-office processes, and office administration, which were all low-value areas.²⁰ The resulting gap in profit margins was further impacting public valuations (most Chinese banks were publicly traded).

Chinese banks had recognized this technological disadvantage, and IBM in turn had recognized a market need, prompting the company to move the development of BTT from Toronto to China. Wang explained the deeper rationale behind the transition:

Now the majority of the development team is here. The banks in China are very interested in innovating new banking ways and this is like a perfect market for the BTT product managers and directors to get market access and understand this. But nevertheless, [the product manager for BTT] also has the capability to access other places. She has many

customers today, and incumbent customers in Europe. She goes frequently to visit them, collect information, and she has product managers over there too. So they get feedback, and she also has a user group. People get together to talk about what is the future for banking industry. . . . So the competency, the market access, and the talent are all right here for that product.

Employee Development

In software, and a lot of other creative industries, the best people are exponentially better than the average. It is a mistake to go to a local market and hire cheap to produce cheap. You need to pay up and hire the best talent.

– James McGroddy

Employee development had long been part of IBM's focus. By 2002, IBM was already spending more than \$1 billion annually on training.²¹ In addition to traditional mentoring and shadowing programs, structured learning activities ranged from classroom-based workshops and blended platforms of learning activities to flexible e-coaches and personal management development plans, in which employees could design their own development plans. The training programs largely distinguished between technical and management paths, and while in principle similar, the programs were focused on honing specific capabilities.

According to Dr. Zhang Ling, technical leader and global architect for Lotus Connections at CDL, "Usually we do not have managers mentoring technical people, because we only have senior technical leaders mentoring technical people. And we also have mentoring programs that we can design. . . . Senior technical leaders from the U.S., from other countries, come to mentor the local team. I have . . . three IBM distinguished engineers as my mentors; I actually learn a lot from those senior people." Since he had been at the company, Ling had acquired mentors locally and internationally, across different software groups such as middleware and collaboration. Ling commented, "I usually have regular meetings, conference calls with my mentors. Talk about my work, my life, a lot of things like that. . . . I think it is a good channel."

As development employees progressed in their careers, IBM exposed them to more specialized, higher-level training programs. Billy Huang reflected on his experiences:

IBM has a very good and well-developed education suite for its leaders. I think that has also helped me a lot. Especially, how to build the leadership competencies, and how to manage the leadership framework that is proposed by IBM so that we can understand how to build the mission, build the strategy, and create the breakdown structure for the strategy. And it goes to the execution level. So this kind of thing is what I learned from IBM, and I think it's very valuable.

As project manager, Charly Mao's experience had been similar:

Globally they're training you how to do interview . . . how to find a qualified engineer, how to do the coaching, how to transfer skills to your subordinate. So gradually for me I learned how to train the team, form a team, and maintain a team's morale, this kind of thing.

A lot of these changes Mao experienced after returning to IBM in 2009. Before 2004, Mao observed, "your improvement depended on your personal effort, but now, here, there is a kind of culture, there is a group of people to work with you, to move together." During that time, IBM had developed a variety of communities ranging from project management to quality assurance. Whereas in the past employees had to learn through working with other development labs and personal initiative, when

Mao returned to IBM in 2009, there were organized communities from different working groups and products in which, for example, the test leader for one product could actively exchange ideas with the test leader for another.

A separate path of capability development was through assignees from developed markets, mainly senior-level distinguished engineers (DEs) who rotated through CDL on one- or two-year assignments. Charly Mao described these people as “really, really top talents, very good engineers,” and added: “I see that they deal with some people here and they will grow local people, through learning and practice.” Such exchanges had gone in the other direction as well. Local CDL talent rotated on short assignments to labs in developed markets. For example, Ling had done a six-month rotation through the lab in Yorktown Heights, New York, working with the corporate university, and Charly Mao as a junior engineer was frequently assigned to short exchanges at the Toronto lab.

On a personal level, shadowing and mentoring played a crucial role in talent development and integration of the organization. A specific training program focusing on growth markets and China called Tomorrow’s Leader had become integral to talent design and growth. Matt Wang explained:

We send people to the other labs and other divisions, around the world, the major market, just doing three months, short periods, maybe six months, longer ones sometimes up to a year, for intensive shadowing. The shadowing program is very interesting. We consider, “Who will we want this person to be in the future?” Then we pick a fellow, a DE, a VP, or a general manager, that person we see as a best fit. . . . That person will shadow day-in and day-out, attending meetings, conference calls, and visit customers, travel, even visiting their family. That person has exposure to what’s going on. Two things we want to grow in that leader: one is a business view. That person may have a technical view, et cetera, [but we want] a business view. Any technology has to be combined with a business strategy. Second is a global view. You cannot say that China is a big market, and then you lose sight of the global view. The product has to serve in the global market. We have such programs, and every year, we send so many talents out and they come back refreshed, a new person. And then we assign them new projects, critical projects, for them to be able to use their skills and talent, [and employ] technology knowledge they have learned from abroad . . . very important. And we also give them the authority, the funding, the resources, to accomplish that. The network that comes from shadowing the senior leaders also is tremendous. Now they know who to call, what the other organizations can offer, [and] they learn they can interlock with other organizations very easily; the other people also know this person. By design, we create the leader of the future.

Managing Growth

IBM was an early mover in establishing R&D and product development centers in China; therefore, many companies that were seeking to establish their own operations came to IBM for experience sharing. CDL Shanghai had grown rapidly, from 10 to hundreds of employees in the space of a decade. Christine Cui shared her perspective in brief:

It is easier to start with simple work, establish your management system and grow in size. The real challenge is to grow in leadership and mission. That takes time. Progress like rotational assignment, mentoring, and professional training could help. More importantly, the fast-growing market in China provides the best innovation environment to any R&D organization and company.

Exhibit 1 Human Resources Comparison, 1993

Country	Population (Millions)	Scientists and Engineers per 1,000 Workers	Software Professionals per 1,000 Workers	Number of Software Professionals (1,000s)
China	1,178	5.6	1.0	1,172
Australia	18	45.8	6.9	124
India	903	3.3	1.0	917
Indonesia	197	0.1	1.0	203
Japan	125	74.2	7.8	977
South Korea	45	37.2	7.5	340
New Zealand	3	27.0	8.0	24
Philippines	68	n.a.	2.5	171
Singapore	3	30.5	2.2	140
Taiwan	21	38.1	2.2	140
Thailand	59	n.a.	2.1	125
United States	258	75.6	7.8	2,006

Source: Adapted from Kenneth L. Kraemer and Jason Dedrick, "From Nationalism to Pragmatism: IT Policy in China," *IEEE Computer* (August 1995): 64-73.

Exhibit 2 IBM Globally Integrated Enterprise Model

3 ... and became a globally integrated enterprise, leveraging our scale to capture new growth.

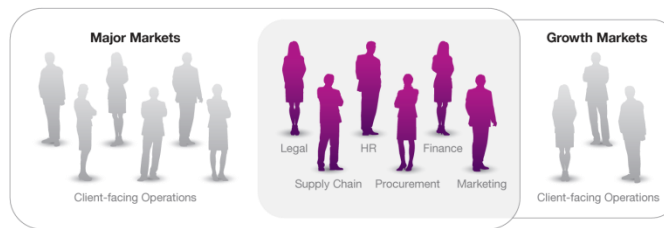
International
(mid-19th to early 20th century)
Most operations are centered in the home country, with overseas sales and distribution.



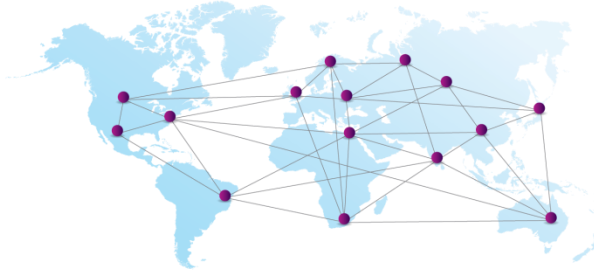
Since 2005, global integration has enabled IBM to cut expenses by \$5 billion and improve service quality, speed and risk management in very dynamic environments. We have shifted resources toward building client relationships and employee skills, while positioning IBM for new market opportunities, such as business analytics, smarter cities and the large-scale infrastructure build-outs underway in emerging markets.

During this period, IBM has pioneered a new operating model, changing from a classic "multinational," with smaller versions of the parent company replicated in countries around the world, to a global model with one set of processes, shared services and broadly distributed decision making, carried out by a highly skilled global workforce managed by a common set of values.

Multinational
(mid-20th century)
Creates smaller versions of itself in countries around the world and makes heavy local investments.



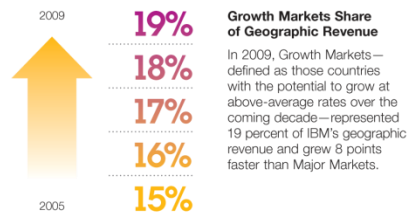
Globally Integrated Enterprise
(21st century)
Locates operations and functions anywhere in the world based on the right cost, skills and business environment.



Globally Integrated Operations

IBM's shift to a globally integrated model allowed the company to refocus our country organizations on generating growth and serving clients. Currently, nine out of every ten employees in our country organizations are focused on providing our clients with high-value, high-margin solutions.

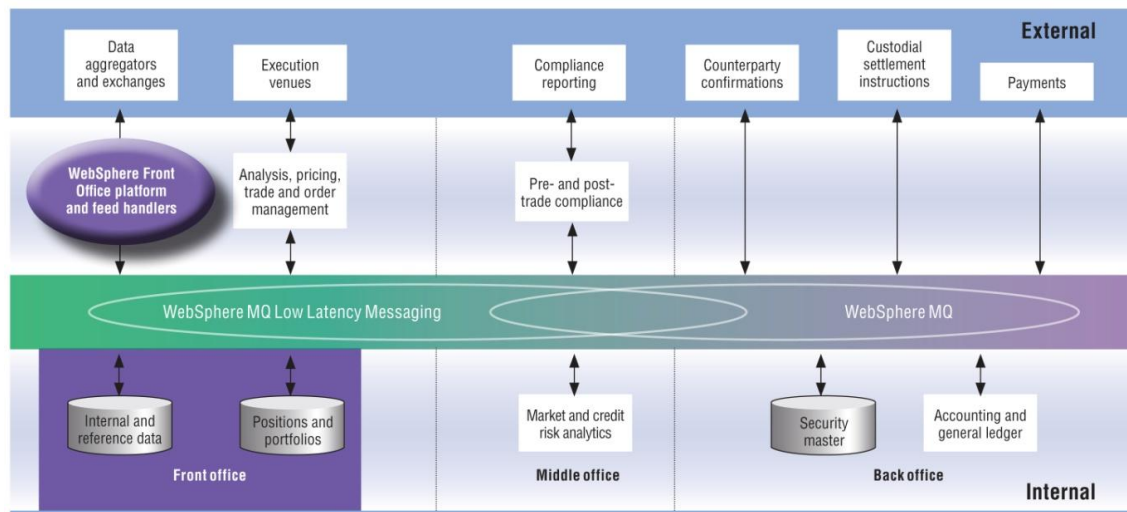
In the globally integrated model, even the smallest of our emerging country teams can leverage IBM's global scale and expertise to deliver value of a depth and breadth unattainable in a multinational construct.



Growth Markets Share of Geographic Revenue

In 2009, Growth Markets—defined as those countries with the potential to grow at above-average rates over the coming decade—represented 19 percent of IBM's geographic revenue and grew 8 points faster than Major Markets.

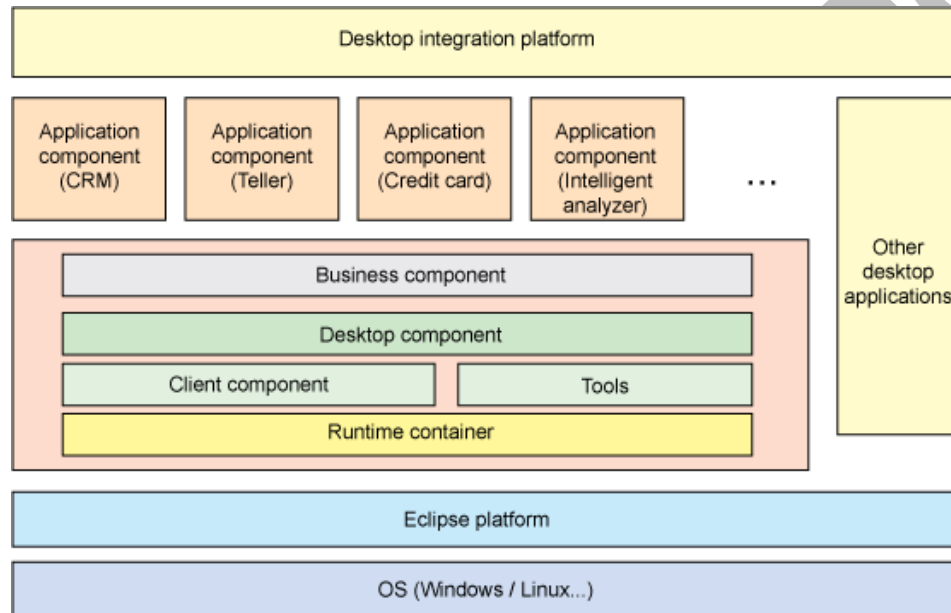
Source: IBM, 2009 Annual Report, http://www.ibm.com/annualreport/2009/2009_ibm_annual.pdf, accessed March 12, 2011.

Exhibit 3 IBM WebSphere Front Office Architecture

Source: Company product literature.

Exhibit 4 IBM WebSphere Commerce Product Architecture

Source: Company product literature.

Exhibit 5 IBM WebSphere Multichannel Bank Transformation Toolkit

Source: Company product literature.

Exhibit 6 Career Development/Developmental Assignments**Billy Huang**

Billy Huang is a senior development manager of the IBM WebSphere Front Office development team, responsible for building out the development team. He joined a state-owned enterprise after graduation. He joined IBM CDL as a software developer in IBM Globalization and Translation Tools. He was then promoted to technical leader, project manager, and later department manager.

Yi Luo

Yi Luo is the technical lead for post-M&A integration of Sterling Commerce OMS into WebSphere Commerce. He manages the global team on this project. He joined the IBM CDL WebSphere Commerce development team after graduation from Wuhan University with a master's degree in computer science. As a starter, he worked in product development on new releases and new functions under the direction of U.S. labs, supported postsales work and customer-reported problems, and came up with root causes to resolve issues. He followed a technical career ladder, not a management ladder. Then he moved to the CaaS team, focusing on addressing local Chinese market requirements and engagements.

Charly Mao

Charly Mao is leading development for e-commerce as a service product offering. He joined IBM and worked as a developer in various projects with different teams. He left IBM to lead the buildup of an R&D facility in China for other foreign companies and rejoined IBM as a product line manager for WebSphere Commerce.

Christine Cui

Christine Cui is the program director of B2B & Smarter Commerce, IBM Greater China Group, leading a high-tech team. She is also the executive of greater Shanghai lab clusters that are based in cities centered around Shanghai, such as Ningbo, Hangzhou, Wuxi, and Nanjing. Christine's contributions are not limited to IBM. She is also the dean of the Department of Service Science and Engineering, Software College, Zhejiang University. This department was created with IBM, aiming to train master students to become world-class engineering professionals in the IT industry. Christine has taken many leadership roles in IBM, including executive assistant to the president of IBM Greater China Group, and has more than 10 years of experience in the industry.

Matt Wang

Dr. Wang is vice president of China Development Laboratories (CDL). In addition to the responsibility as the head of Asia Pacific North Lab Cluster—which includes China, Japan, Korea, Singapore, Malaysia, and Vietnam—he leads more than 5,000 software engineers and architects in Beijing, Shanghai, Xi'an, Ningbo, Hong Kong, and Taipei, building IBM middleware products (WebSphere, Lotus, Information Management, Tivoli, and Rational) and solutions (Lotus, ECM,

Business Analytics, and other industry assets development), providing software services and support to clients and providing leading edge industry solutions to enable customer success.

In his previous role, Dr. Wang was vice president of Technical Sales and Services, IBM Software Group Asia Pacific, leading a team more than 2,000 IT specialists and architects to provide technical solutions based on IBM middleware products. Before he came to Asia Pacific, Dr. Wang was a director of Silicon Valley Lab, where he led High Performance On-Demand Solutions (HiPODS).

Dr. Wang has a broad experience inside IBM. Before he joined the Software Group, he was in IBM Research as executive assistant to the senior vice president of Research Worldwide. He was responsible for Technical Team studies on several strategic corporate directions and led an Innovation Frontiers task force for the National Innovation Initiative sponsored by the U.S. president. His other contributions are in the areas of On-Demand Innovation Services, Global Technology Outlook, and Emerging Business Opportunities for IBM and Global IT industry. Before that, Dr. Wang was a certified senior project executive in IBM Global Services, managing multibillion-dollar accounts in the process petroleum, automotive, and electronics industries. Before that, he was chief architect in charge of the global supply chain for IBM Personal System Group.

Dr. Wang holds a PhD in computer science from Vanderbilt University and an MBA from George Washington University.

Source: Compiled from interviews.

Endnotes

- ¹ IBM, "IBM Opens 30th Branch Office in China," press release, March 7, 2011, <http://www03.ibm.com/press/us/en/pressrelease/33975.wss>, accessed March 7, 2011.
- ² Kenneth L. Kraemer and Jason Dedrick, "From Nationalism to Pragmatism: IT Policy in China," *IEEE Computer* (August 1995): 64-73.
- ³ "International Business Machines: China-Based Research Lab Is to Be Set Up Next Year," *Wall Street Journal*, December 8, 1994, p. B14.
- ⁴ Chen Zhao, "IBM Research in China," *Interactions* (March-April 2006): 20-21.
- ⁵ Ibid.
- ⁶ Richard Wallace, "R&D Follows Talent Worldwide," *Electronic Engineering Times*, March 26, 2004, <http://www.eetimes.com/electronics-news/4047574/R-D-follows-talent-worldwide>, accessed February 12, 2011.
- ⁷ Richard Wallace, "IBM China Lab Sees Gains in Speech Recognition," *Electronic Engineering Times*, October 19, 1998, pp. 26-27, accessed via ABI/ProQuest.
- ⁸ Stuart I. Feldman, Krishna S. Nathan, Thomas Li, Kazuyoshi Hidaka, and Corrina Schulze, "The Clarion Call for Modern Services: China, Japan, Europe, and the U.S.," *Communications of the ACM* 49, no. 7 (July 2006): 86-87.
- ⁹ This was part of CDL's recruiting pitch to Chinese university students. See <http://campus.chinahr.com/2009/pages/bluepathway2009/intro03-3.asp>.
- ¹⁰ James Kynge, "Rich Vein of Raw Talent Makes China Potential R&D Hothouse: Multinationals Can Cash In on Intellectual Benefits," *Financial Times*, April 19, 2002, p. 14.
- ¹¹ Samuel J. Palmisano, "The Globally Integrated Enterprise," *Foreign Affairs* 85, no. 3 (May-June, 2006): 127-136.
- ¹² IBM, 2009 Annual Report, http://www.ibm.com/annualreport/2009/2009_ibm_annual.pdf.
- ¹³ Ibid.
- ¹⁴ Ibid.
- ¹⁵ Company press release, April 29, 2008, <http://www03.ibm.com/press/us/en/pressrelease/23996.wss>.
- ¹⁶ "Transform a Branch Bank into an Efficient and Effective Banking Service Provider," IBMdeveloper Works, December 7, 2010, <http://www.ibm.com/developerworks/industry/library/indwmbtt/?cmp=dw&cpb=dwin d&ct=dwnew&cr=dwnen&ccy=zz&csr=121610>, accessed February 15, 2011.
- ¹⁷ Ibid.
- ¹⁸ Ibid.
- ¹⁹ Ibid.
- ²⁰ Ibid.
- ²¹ "Training Top 100: IBM," *Training* (March 2002): 39, 3.