

Transnational R&D in China

Analyzing the potential and the hurdles

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The expansion of international investment has led to an increase of transnational company research and development (R&D) activities in developing countries. China seems to become a serious competitor for India as an off-shore R&D location. But success of foreign R&D activities in China greatly depends on a realistic estimation of the country's advantages and a proper identification and handling of barriers.

Introduction

For more than a decade, China has been the most important investment destination for transnational companies (TNCs). As a major production site and marketplace for TNCs, China overtook the USA as the biggest recipient of foreign direct investment (FDI), rising to an estimated US\$ 53 billion in 2002.¹ To some degree, this has been due to international investor confidence in, and support for, China's entry into the World Trade Organization (WTO) in November 2001. The strong growth of FDI also increases the TNC tendency to localize R&D activities in China. Most TNCs gradually realize that international expansion takes place through a series of small steps, adapting gradually to the host country's unique environment. This is why TNCs prefer to invest cautiously and to benefit from the experiences and knowledge they gain from prior investments by

building upon the existing network of foreign value-added activities.

Investment in R&D in China

According to an analysis of the official statistics of the Ministry of Science and Technology in 2003, the trend of establishing R&D organizations (equity-based) in China has grown. Between 1988 and 1992, an average of only 0.8 new R&D units per year were established in China, while between 1998 and 2002 this number had grown to 8.4. Even this statistic does not reveal the exact dimension of foreign R&D activities in China - Motorola, for instance, with 18 R&D centres in place and 7 more under construction, is only counted once in the statistic - but one can undoubtedly recognize the trend of longitudinal growth.

The majority of TNC R&D centres are based in the two most economically important cities of China - Beijing and

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Shanghai. The most attractive features of these two cities are highly qualified human resources, well-developed infrastructures, numerous industrial sectors and high-tech parks, and mature local scientific communities, including top-class universities and research institutes.

Two thirds of the R&D centres are embedded in TNC joint ventures in China. This tendency for wholly-owned R&D centres is positively related to the technological sensitivity of a TNC's business field, since wholly-owned R&D centres protect knowledge and prevent unwanted technology transfer.

Computer and telecommunications industries are driving R&D investment in China. Other important industrial branches with R&D investment in China include chemical, petrochemical, biotech, pharmaceutical, automotive, transportation and power generation equipment. These TNCs typically come from the triad regions. Most of them are from North America, especially from the USA, followed by the European Union and Japan. A further significant group of R&D investors comes from Greater China, specifically Hong Kong and Taiwan.^{4,5}

Due to the sheer size and specific requirements of the Chinese market, the majority of TNC R&D activities in China are market-driven and development-oriented. For example, software and mobile phone companies such as Microsoft or Nokia set up development centres to develop localized user interfaces with the Chinese language.

Nevertheless, several TNC laboratories have added sufficient resources to transform the lab into a competence centre for an entire global enterprise and to devote to fundamental research. For instance, Microsoft set up its research centre in Beijing in 1998, conducting research on topics such as next generation multimedia and Chinese PC technology.⁸ Siemens and IBM have already had long established corporate research labs in Beijing.

Go for the best people

The massive numbers of qualified personnel is one of the most important input-oriented incentives for establishing R&D in China. In 2002, 2.5 million stu-

dents graduated from the country's 3,000 universities and colleges, and these included 14,000 Ph.D.s, which helped rank China third behind the USA (ca. 40,000) and Germany (ca. 30,000). China also produced more than 66,000 postgraduate students in 2002. Many top-flight universities such as Tsinghua, Beijing, Zhejiang and Fudan produce highly qualified graduates in disciplines such as mathematics and natural sciences.

Aside from domestic graduates, between 1978 and 2002, more than 580,000 students went to over 100 countries and regions worldwide to study, with 150,000 of them returning to China. The majority of students chose to emigrate to other countries after graduating. Hence, China has suffered from an outflow of talents (brain drain) to a great extent.

In recent years, Chinese governments, at both national and local levels, have introduced policies to induce highly skilled overseas Chinese to return to China. Increasing numbers of scientists and graduates have returned from abroad, thanks to the enduring economic growth and better opportunities in China. In 2002, more than 18,000 of the so-called 'returnees' came back to China, an increase of 47 per cent compared to 2001.¹¹ These key people represent an additional pool of unique qualified human resources, as they bring experience and knowledge from around the globe.

Tap into informal networks and information sources

In China, business success is heavily dependent on good informal networks and relationships (*GuanXi*). The establishment of a local R&D centre enables a company to build and maintain informal networks with universities and local scientific communities, which can help TNCs establish strategic partnerships and establish human resources in the long run.

In addition, China's industrial development is at an emerging stage and the economy is undergoing a transition from a planned to a market-based system. Hence changes in industrial regulations, legislations and policies are all the more dynamic. Their on-spot

R&D activities and proximity to the government help TNCs to keep pace with changes in the dynamic Chinese environment and allow them to achieve critical competitive advantages.

Adapt to the local scientific community

Since Chinese policy makers seek to raise the level of China's industrial production and increase the country's competitiveness to an international level, special economic and other investment zones have been established and have become the main engine for growth in the Chinese economy (e.g. "High Technology Development Zones"). For example, Beijing's high-tech Zhongguancun area, located northwest of the city, is home to a large number of universities and scientific institutions, including Tsinghua University, Beijing University and the Chinese Academy of Science. As a result, there are a number of start-up firms, foreign-capital firms and large-scale local firms that are seeking access to high potentials through building strong relationships with universities. Again, these pockets of innovation attract investors with space, advanced infrastructure, and the high-tech facilities they require, along with financial incentives. For example, the Chinese State Council and Beijing municipality both offer start-up firms located in Zhongguancun area tax-free operations for three years following their establishment, followed by a 50 per cent discount for the next three years, and a 15 per cent discount from the seventh year onwards, along with other tax incentives. Due to the substantial governmental support and geographical uniqueness, it is expected that a few of these industrial and science parks will become centres of excellence in the future.

Since more and more Chinese cities and regions are trying to capture the attention of TNCs by various incentives, more TNCs have invested outside of Beijing and Shanghai, the two established hubs of foreign R&D activities in China.

Develop for local markets

Aside from the stagnated world economy, the dynamic growth of the Chi-

nese national economy and its overwhelming market size has made China one of the strategically most important markets for TNCs. Especially in IT and telecommunications, multinational giants such as Microsoft, Nokia, Motorola, and Siemens have invested hundred of millions of dollars into their R&D activities in China, which is in essence an investment in China's future market. For example, China has become the world's largest mobile phone market with more than 200 million users by the end of 2002.¹⁸ The critical mass of the Chinese and the Asian markets is increasingly influencing mobile phone size, style and applications globally. As a response to the strong demand for affordable, entry-level mobile phones in the Chinese and Asian markets, Siemens Mobile division has established the global headquarters for voice-centric mobile phones in Beijing in October 2002.

One main reason why so many companies are establishing development bases in China is therefore to locally develop products specifically for the Chinese market. Selling products without paying attention to the needs of the local markets is bound to fail. Locating R&D activities in China allows TNCs to adapt and tailor their products and services to the local culture and market needs. A typical example is adapting IT user interfaces, telecommunication or car infotainment products to be used with the Chinese language. Moreover, specific local conditions in which products are operating require appropriate modification and redevelopment. For example, in China, some automotive components such as air conditioning and combustion engines need to be redeveloped according to local climatic conditions and local gas quality. In the next 2-3 years, over 75 per cent of growth in electronic manufacturing capacity will take place in China. Risks of such a production shift purely for cost reasons are high; local development and product adaptation in these fast growing markets can support manufacturing operations and increase competitiveness.

There is an additional benefit in operating in different cultures and countries such as China. A company can develop new products and forge

advanced thinking on many product issues. Products which satisfy the requirements of the most difficult consumer and market environments are likely to succeed anywhere in the world. Microsoft Research Centre in China is pursuing problems of computing in Chinese due to the difficulty in inserting Chinese characters on a Western keyboard. Besides, the improvement in software's suggestion and error-checking system, researchers also focus on data entry methods such as speech and handwriting recognition. The result will make computers more user-friendly in Chinese, but will in the end benefit all computer users.⁸

The elevator and escalator company Schindler established an R&D centre in Shanghai in the late '90s because Shanghai was, and is, one of the most booming and sophisticated markets in the construction business. Chinese customers are less risk-averse than Western customers, which is typical for booming economies. In 2003, Schindler conducted a field study for a new web-based personalized infotainment system in the elevator cabin - an advanced experiment that would have been less likely to be accepted in Europe or the USA. Based on that study, Schindler has planned to multiply the system requirements for the product launch worldwide.

Exploit cost advantages

Due to the general low cost level in China, running similar R&D facilities in China costs about only one-tenth of what it would in the U.S.A.⁴ The lower wage structure in China attracts TNC R&D activities as well. Although the wage of highly qualified Chinese R&D staff is high by Chinese domestic levels, it is still a fourth or a fifth of the R&D staff salary in the triad regions. Companies in the software industry that typically went to India are now starting to evaluate China. Their reasons are increased labour costs in India. Moreover, as mentioned in the above section, China has enacted a series of preferential policies to encourage the establishment of foreign R&D activities which imply further cost advantage potentials for doing R&D in China, such as foreign R&D centres in China that can import certain equipment duty-free.

Localized R&D allows for a shorter R&D cycle time, especially for products which require customer- and market-specific accommodations. Furthermore, local R&D activities can assist manufacture operations to improve quality, learn to produce new offerings, reduce costs, or increase capabilities.¹³ The Swiss packaging specialist, SIG, is going to open an R&D unit in Suzhou in 2003 to support their manufacturing units.

Use political support for R&D

For over a decade, one can observe China's increasing sensitivity towards technology's contribution to economic growth. "Revitalising the Nation through Science and Education", a strategy which was officially adopted in 1995 by the Chinese government to speed up Scientific and Technological Progress,¹³ has led to rapid growth of China's national science and technology activities. In 2000, China spent \$ 11 billion on R&D, amounting to 1 per cent of their GDP. It represents an increase of 150 per cent over 1995 levels of \$ 4.2 billion.¹⁴ Furthermore, although OECD countries provide over 90 per cent of FDI globally, their share of FDI in China is much smaller. As a result, China has continued to liberalize the approval process for FDI, and a number of preferential policies have been put in place in order to encourage foreign businesses, especially TNCs, to set up local R&D investments. Thus China has the ability to attract long-term, relatively capital-intensive and high-tech projects from multinational enterprises in OECD countries.¹⁵

Chinese policy makers believe that an effective way to bridge the gap to international technology levels is to deepen linkages to the international R&D community. One important means is the establishment of high-tech parks, combined with incentives such as free rent, low tenancy costs, favourable lease terms, and tax relief. A major reason for the Chinese government to establish such favourable policies is that local R&D activities are considered to be important evidence that the company is interested in developing long-term commitments in China. It helps to build trust and good working relations with

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the government and to receive official support. But due to the enticement of financial incentives and other business advantages, some foreign firms are even tempted to register their China activities as "R&D," whether their research does or does not entail genuine research and development activities.¹⁶

Given the pure power of the Chinese government, it is in a position to play one foreign investor against another in order to accelerate TNC investment levels and R&D commitments. Prior to China's accession to the WTO, foreign investors were regularly pressured to transfer technology in return for market access. For example, there was intense competition between several global automobile companies concerning the establishment of an automobile joint venture in Shanghai in the late 1990s, which was speculated to be the last such approval for many years. General Motors finally won the licence to establish a joint R&D centre in Shanghai.^{16,17}

Culture, language and people

Given the general lack of experienced indigenous R&D managers in China, the majority of upper R&D management is staffed by foreign expatriates. Unfortunately, most of them have either inadequate management experience in the Chinese environment or none at all. The Chinese language is an initial barrier in management. Although some of the top Chinese research staff have a good command of English, most of the local engineers only have limited English capabilities. An even larger obstacle for Western managers is to overcome the cultural gap during the daily interactions concerning issues like communication style and "face saving". A Western manager may have done everything correctly according to their understanding of good management style. However, the lack of experience and sensitivity to Chinese mentality and culture will usually incur managerial inefficiency, wrong decisions and inadequate leadership.

For example, Western managers coming mostly from low context cultures (e.g. Germany, the USA), are used to capturing the meaning of a message with words alone. They believe spell-

ing it out clearly is the only way to avoid ambiguity. On the contrary, in the high-context Chinese culture, a message is delivered with non-verbal signals (e.g. tone of voice, use of silence, facial cues, and body language), unspoken assumptions, and the context or environment surrounding the conversation. People from high-context cultures assume that the receiver of the message is sensitive enough to understand its true connotation. Lack of awareness and proper handling of interference between high- and low-context communication styles can eventually lead to misunderstanding, confusion and ineffectiveness.

The R&D teams of TNCs in China are diversified and typically composed of three groups of people. Local graduates make up the majority of the R&D staff. Western expatriates and global Chinese comprise the other two groups of the team. Although diversity in R&D teams can increase creativity and innovation, it also provides sources of potential conflict. In addition to general difficulties of managing intercultural teams, one particular challenge lies in the potential conflicts between local Chinese staff and global Chinese.

The term 'global Chinese' refers to three subgroups of Chinese people working for foreign R&D: mainland Chinese returnees with foreign education and working experience; Chinese from "Greater China" (i.e. Taiwan, Macao and Hong Kong); and overseas-born ethnic Chinese. On the one hand they share the same Chinese origin and culture and have few language difficulties with each other. On the other hand, being aware of the multi-layered differences between these sub-groups, due to such elements as different educational background, different working style and perception, and in particular the huge wage gap between the groups,²⁰ one should be wary to generalize these three sub-groups of Chinese people. Western expatriates are often not aware of, or underestimate, these differences.

Like many other foreign enterprises in China, many R&D departments are plagued by high staff turnover rates, particularly those located in large cities such as Beijing and Shanghai, where sufficient new opportunities are available. In general, there are three main

causes of staff turnover. Some of them leave because they have simply found a better paid job elsewhere, while some go abroad to obtain graduate degrees. Only a few, but worth mentioning, leave to work for, or to establish, high-tech start-up enterprises.¹⁶ Foreign companies are often used as career springboards. Working for a foreign company not only provides Chinese graduates higher salaries and practical experience; but also makes them familiar with Western management practices and provides them with possibilities of advanced on-the-job training. These kinds of references enable them to get a job with better payment and perspectives. In the worst case scenario, they would be hired by competitors.

Compensation strongly influences the affiliation and loyalty of Chinese R&D staff. Beside money issues, one should not ignore the level of attachment to Western employers. It could be argued that, given the fact that China has made a strong effort in building national consciousness, many Chinese employees strongly associate themselves to their own country rather than to their Western employer. As a result, some R&D managers have limited trust in local people, since they are afraid of lack of loyalty and losing knowledge to competitors. This is especially relevant within Sino-foreign joint ventures, where the parent company of the Chinese partner, or simply the partner itself, participates in, or owns, other domestic enterprises operating in similar business fields. For example, ABB has lost plenty of technological knowledge through their Swiss-Chinese joint ventures. The lack of trust in local people is one reason why Schindler's competitive intelligence unit in Switzerland consists of just two Chinese staff members.

Building long-term staff loyalty is a challenge for human resource managers in China. It is particularly relevant for R&D labs, given that know-how travels with people.

The importance of GuanXi

As mentioned in the above section, the Chinese government provides incentives for foreign R&D activities in China. But receiving promised preferential conditions, such as tax relief and other incen-

tives, can be a stressful and prolonged procedure, due to multiple bureaucratic hurdles and rigid rules. For example, importing test materials can be difficult; and transferring people from Beijing to Shanghai requires an official permit, which requires long-term preparation.

Therefore, a good relationship (*GuanXi*) network with the government is crucial to business efficiency and success. This kind of relationship network needs time and occasional financial support. Relationship investments take the form of sponsoring IT equipment for local universities or making other contributions to non-profit official organizations such as a municipal kindergarten. However, one should not mistake this kind of financial aid for a bribe.

Again, due to a lack of transparency in Chinese policy-making, China's industrial, political, legal, technological policies and strategies are difficult to discern. This provides more uncertainty for foreign R&D activities in China. Furthermore, even if intervention in foreign enterprise activities by the Communist Party of China (CPC) has decreased in recent years, and the party branch (i.e. the party secretary) within some wholly owned foreign company is not involved in the business at all, there are still numerous possibilities for the Chinese government to retain its influence.

Conclusions

The emergence of foreign R&D activity in China is a recent phenomenon and has rapidly increased since the mid-90s. This trend will carry on in the future, based on the assumption that China will continue its economic and societal transformation, and that enduring trends continue in R&D internationalization in the triad regions. This article seeks to add to the understanding of the drivers of, and barriers to, foreign R&D activities in China. Input- and output-oriented, as well as business-ecological motivations, drive TNC R&D endeavours in China. The more advantages created by local R&D activities in China, the greater the challenges of managing on-site R&D for TNCs. Major barriers, such as complexity in human resource management, bureaucracy, uncertainty in legal changes and low confidence in the protection of intellectual property rights, will also last for at least the medium term. TNCs in-

tending to establish R&D sites in China should cautiously set local R&D activities in accordance with their internal strategy of R&D internationalization and, more importantly, with their long term purpose in the country. The success of foreign R&D endeavours in China depends strongly on a realistic estimation of its advantages on the one hand, and on an awareness and proper handling of identified barriers on the other.

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