Opportunities and Challenges to Cooperate with Chinese Enterprise:
Based on strategic technology alliances between the Western and Chinese

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Summary

In this master thesis, how the Chinese side recharges their competitive advantage via international technology alliances is the main research question. In order to study from the Chinese perspective, qualitative approach was used and around 12 telephone interviews to Chinese enterprises were conducted. In the study framework, three sub-research questions were proposed which are connected together to build up the process model of Chinese side to powering up. The Chinese domestic technology capability is the first sub-research question which is regarded as the most important drive of Chinese side to actively establish international strategic alliances with Western partners. Technology transfer is another crucial topic based on which the impact of strategic alliances and output of technology alliances were interpreted. Catching-up path/model of Chinese side was come up as the third one based on the first two subtopics and three typical Chinese cases. It is found that during the cooperation with Western partners, technology alliances are considered as the main mechanism to transfer technology and therefore improve the Chinese side’s technology capability; moreover, since the Chinese side plays as the late-comer in the international catching-up match, various advantages are embraced by them so as to stimulate them to catch up in a typical frog-leap way and create the strategies to keep up with the technology development. In-depth motivations and barriers in the Sino-Foreign technology alliances were also studied in this thesis based on the perception of Chinese side. It is found that the motivation of Chinese side to conduct alliances with foreigners does evolve overtime and with regard to the cooperative barriers, culture difference is considered as the root cause. We additionally discussed the Chinese IP system and its deepening problems, which is expected to provide foreign businessmen in China with managerial implication. All in all, three academic and practical contributions are made by this study. Firstly, it establishes the bridge for the academic research of Sino-Foreign technology alliances because this study is the first one to illustrate from the perspective of Chinese side as well as explain in details that how Chinese side grows up at a fast speed via foreign investment. Secondly, technology capability, technology transfer and national catch-up are firstly integrated into strategic alliances to study the Sino-Foreign cooperation and firstly the relationship between them is illustrated within a model. Third, from Chinese perspective this study provides many managerial implications for foreign multinationals to deal with the relationship with Chinese side reciprocally, culturally and locally.
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1. Introduction

1.1 China growth and research initiative

Over the past decades, many forms of international cooperation have been constantly applied and researched with the environment rapidly changing. Of there, three mechanisms play the important role which includes merger, acquisition and strategic alliances. However, in spite of many researches being conducted to demonstrate the different function each form has respectively, it is hard to say that which one must be more prior than others. But no matter what differences existed, in the current environment where product and technology life cycle is shortening; product and complexity of product is becoming complex; demand of customer is going up; and learning curve is showing steeper and steeper, in order to survive in this network economies, all the forms have to acquire external or quasi-external acquisition of know-how. This is applicable for those firms that have been at the developed level and aim to be more developed. Of course, it also matches to the catching-up firms in the developing country, like China. In order to fulfill the technological gap with developed countries, China opened its door and exerted a series of economies-reform policy since late 1970s, of which the priority was to acquire foreign advanced technology, capital, skills and management strategy. China’s unprecedented success in attracting foreign investment has drawn much attention of both academic scholars and policy makers. In order to fulfill the technological gap with developed countries, China opened its door and exerted a series of economies-reform policy since late 1970s, of which the priority was to acquire foreign advanced technology, capital, skills and management strategy. China’s unprecedented success in attracting foreign investment has drawn much attention of both academic scholars and policy makers. In order to fulfill the technological gap with developed countries, China opened its door and exerted a series of economies-reform policy since late 1970s, of which the priority was to acquire foreign advanced technology, capital, skills and management strategy. China’s unprecedented success in attracting foreign investment has drawn much attention of both academic scholars and policy makers. In order to fulfill the technological gap with developed countries, China opened its door and exerted a series of economies-reform policy since late 1970s, of which the priority was to acquire foreign advanced technology, capital, skills and management strategy. China’s unprecedented success in attracting foreign investment has drawn much attention of both academic scholars and policy makers. In order to fulfill the technological gap with developed countries, China opened its door and exerted a series of economies-reform policy since late 1970s, of which the priority was to acquire foreign advanced technology, capital, skills and management strategy. China’s unprecedented success in attracting foreign investment has drawn much attention of both academic scholars and policy makers. In order to fulfill the technological gap with developed countries, China opened its door and exerted a series of economies-reform policy since late 1970s, of which the priority was to acquire foreign advanced technology, capital, skills and management strategy. China’s unprecedented success in attracting foreign investment has drawn much attention of both academic scholars and policy makers.

In the area of national catching-up, followers embrace many advantages. China, as a powerful emerging economy, has many advantages comparing with the developed countries. With large amount of FDI flowing into China, Chinese companies and Western companies established the cooperative relationship based on strategic alliances. However, according to the study of De Man and Duysters (2003), in the research of strategic alliances, the larger part of studies are focused on North America (37%), 17% are focused related to Japan and 10% is for Europe. Fewer studies are conducted for alliance with Chinese side and pay more attention to draw a whole picture of strategic cooperation between them. It is also found that fewer of them are studied from Chinese side perspective. The gap comes up in terms of lack of research on the collaboration between China and Western Countries from Chinese perspective and no one has attempted to incorporate all factors (motivation, policy, technology capability, catching-up and barriers etc.) into a completed model to objectively overview China issues based on the modern cooperative pattern—alliances.

As we can see a plethora of literature has emerged, Branstetter and Feenstra (2002) show that FDI inflows reflect political openness in China, while Cheng and Kwan (2000) find that large regional market and good infrastructure are important determinants of FDI in China. Lardy (1995), Henley, Kirkpatrick, and Wilde (1999), and Zhang (2001) identify potential market size, low labor cost, preferential policies (e.g., tax credits), openness, geographic proximity, and political stability as primary factors attracting FDI. Moreover, Chen (1996) analyzes the regional distribution of FDI and emphasizes the role of special economic zones in attracting FDI. According to the National Bureau of Statistics report in 2007, by the year of 2006, there has been 9056 high-tech companies in 53 national high-tech industry zones producing 172237 billion (RMB) Total Industry Output Value (China annual report on national high-tech industry zone,2006). The China’s fast growing up and the Scholars’ intensive interests in researching China reveals that China has become a valuable topic for both academic and pragmatic fields. Of course, this is one of reasons where our research initiates.
Therefore, under this topic, we try to exploit deeper issues of international technology cooperation between Chinese side and Western countries. Attempts will be made to uncover the significant factors that influence the collaboration behavior not only from national perspective but also from the firm level. Due to the characteristic of China’s position as a catch-upper and their increased technology capability, the cooperation pattern of alliances will be as the theoretical basis in this research.

Moreover, the research will be done not only from insight from the foreign side but more importantly from the Chinese side perspective. The aim is to dig out the implicit attitudes toward international technological cooperation from both perspectives. In order to make this research more focused and make research based on different national culture, only Western countries will be considered as the foreign side; Asian countries and regions such as Japan, Korea, Singapore and Taiwan etc. will be excluded.

Chinese firms and foreign enterprises are normally the two basic players in the Sino-Foreign alliances. However, as matter of fact, in the network of Sino-Foreign cooperation, the research institutes from both sides and their relationships are becoming more significant. From the figure 1.1 it can be seen that five key actors (Chinese enterprises, Chinese research institute and universities, foreign enterprises, foreign institutes & universities and intermediary/promotion agent) make up the Sino-Foreign alliances network. The intermediary/promotion agency is identified. In China context it is a public administration sector either in the mode of government or Bureau of Technology & Science Management. It is rather important in the Chinese situation since China is a policy-driven country and its participating in the network offers Chinese side additional politic support. Within this network, every participant can have collaboration each other, directly or indirectly.

![Figure 1.1 the network of interacted international cooperation in China](image)

This network is considered as the beacon of this research, based on which we will interpret in detail why, what, and how the network players are interacted and potentially come up the collaboration. Of there, the relationship between foreign enterprise and Chinese research institutes as well as the tie between foreign universities and Chinese enterprises are not vague nowadays, therefore we labeled them in dashed line. Additionally, the dashed cycle in center represents that the role of this player is sometimes invisible and
uncontrolled by other actors. In the table 1 six pairs of alliances are listed (in Table 1), and five of them are identified as international cooperation. Since in this research we will pay more attention on the Chinese domestic technology capability based on which Chinese firms are the key actor, the alliances relationship of type 2\textsuperscript{nd} and 6\textsuperscript{th} are concerned.

Table 1.1 the main 6 collaborating combinations of technology cooperation/alliances\textsuperscript{2}

<table>
<thead>
<tr>
<th></th>
<th>Chinese I &amp; U ( \leftrightarrow ) Chinese Enterprises</th>
<th>Out of this research scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Foreign Enterprises ( \leftrightarrow ) Chinese Enterprises</td>
<td>Major part of technology collaboration</td>
</tr>
<tr>
<td>2</td>
<td>Foreign I&amp; U ( \leftrightarrow ) Chinese I &amp; U</td>
<td>Research-Oriented Collaboration. Mainly in the academic area</td>
</tr>
<tr>
<td>3</td>
<td>(Foreign Enterprises + Foreign Universities) ( \leftrightarrow ) Chinese I&amp;U</td>
<td>New mode of Collaboration: aim to incorporate more talented Chinese researchers. i.e. Philips Brain-Bridge Plan (TU/e+ Philips + Zhejiang University, China)</td>
</tr>
<tr>
<td>4</td>
<td>(Foreign I &amp; U ( \rightarrow ) Chinese I&amp;U)</td>
<td>Continued relationship following type 3</td>
</tr>
<tr>
<td>5</td>
<td>Chinese Enterprises</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Foreign Enterprise ( \rightarrow ) Chinese Enterprises (technically supported by Chinese I&amp;U)</td>
<td>Applicable to the condition where high-technologies transfer to Chinese firms but which do not have sufficient knowledge basis/capability and need help from domestic I&amp;U</td>
</tr>
</tbody>
</table>

1.2 Problem definition

As mentioned before, scholars pay less attention on the issue of establishing alliances between China and Western countries from Chinese perspective; this has made the research in this area be rather laggard behind the practice. Since the motivation and attitude that Chinese side holds to conduct strategic alliances with foreign side has been evolved dramatically, as for the foreign companies which do business in China, getting well known about the changes of Chinese side with regard to why and how of Chinese

\textsuperscript{2} No. 1 is not related to international topic and out of this research scope.
side to change the learning strategy via international alliances is very important. The central research question of this study is therefore:

In which way does Chinese side recharge their competitive advantage via international alliances?

This central research question is related to the question of "what factors can influence the Chinese catching-up portfolio?" As assumed, international strategic alliances are the main mechanism of cooperative pattern. The process model of Chinese side’s powering up can be identified in figure 1.2. In spite that all the elements noticed in this model are related to Chinese side, the international strategic alliances shown in the black box determine that foreign side’s behavior and its strategy should be considered.

![Figure 1.2 the process model of Chinese side’s powering up](image)

To answer the central research questions, the three sub-issues have to be analyzed based on above process model.

The Chinese Domestic Capability

In the figure 1.2, technology capability is the input of the black box. In other words, it also can be regarded as the initiative reason that Chinese side starts to carry out strategic technology alliances proactively. It is not only very crucial for us to understand the motivation of Chinese side in the collaboration but also is the basis in this study to explain why does Chinese side appear incapable to attract advanced technology and effectively absorb it. Hence, the first sub-question should be:

1) At which level does Chinese domestic technology capability stay?
To answer this question, we firstly make an analysis on the evolution and major challenges of technology alliances in China in chapter 3 to indicate that how does Chinese entities improve their technology capability based on domestic and international cooperation. The Chinese firms’ technology capability is measured and analyzed in terms of technological matrix in chapter 5 and Chinese domestic technology capability is evaluated from NSI perspective in the section 6.1. Based on that, the reason why Chinese side feels difficult to absorb advanced technology from foreign side and why Chinese managers complain lacking of technological talents are interpreted.

**Technology Transfer from Western countries to Chinese side**

This is the second crucial issue which we have to make in-depth analysis. As seen in the figure 1.2, this factor plays as the out-put of international strategic alliances and meanwhile it is the precondition to make the next round of technology capability development. Many elements influence the effectiveness of international technology transfer. Of there, it is not only related to the mechanisms and characteristic of technology transfer in Sino-Foreign alliances category, but also the learning strategy of Chinese side and the effect of government policy & the FDI growing role could be associated. Motivation and attitude of Chinese side towards international technology alliances are also be concerned since they largely decide whether the Sino-Foreign cooperation can be continued. Thus, the second sub-research-question should be:

2) **What influence the international Sino-Western strategic alliances execute on the technology transfer to China?**

To answer this question, we design the Chapter 4 and Chapter 7 and 8 to make a completed analysis. In Chapter 4, we introduce the evolving theoretical views on the rationale for technology transfer and give the comments on the Chinese policy in the technology transfer via FDI. We make a brief analysis on the growing role of FDI in this chapter and discuss the mechanism and learning strategy that Chinese side applies to implement the inter-firm learning. We also analyze the general effect of technology alliances on the innovation in the first set of Chapter 5 and in chapter 7 and 8 the motivations, attitudes, problems and barriers happened in the Sino-Foreign alliances are identified from Chinese side point of view based on our empirical investigation.

**The Catching-up model of Chinese side**

To be as the third concerned research issue, Chinese catching-up can be considered as the main index to judge whether the technology transferred has provided positive influence on the development of technology capability. Moreover, it is rather concerned by foreign partners in latest years because Chinese side has started to transfer their role from the previously pure cooperator and technology recipient to the nowadays powerful international competitor. Thus, we design the third sub-research question:

3) **What is the Chinese firms’ catching-up path to develop their core competences?**
This question will be answered in Chapter 6. We firstly introduce the Chinese National System of Innovation (NSI) as the framework to recognize that which factors might be incorporated in the Chinese catching-up model. Secondly, we introduced the three different types of catching-up model according to the three types of taking-off Chinese companies. The modest learning attitude of Chinese firms is identified and based on that we found that China is going the creative leap-skipping catching-up way which is different from any other emerging countries.

1.3 Study design

Qualitative approach is applied as the main research method in this study. The main reason to select this paradigm is the fact that this study is an exploratory research in which the variables are unknown and never existed in the previous literature; plus, this study is context-based and people’s perception appears more important (Creswell, 1994).

In the qualitative research, firstly, the literature review and theory analysis are thoroughly conducted which can be seen in chapter 2. A framework of alliances and related theories central to this study as well as their contributions to the alliances are discussed.

Secondly, as another aspect of qualitative study, a questionnaire designed for Chinese side is applied to be as the base of the in-depth informal and formal interview (this questionnaire and its corresponding Chinese version can be referred in appendix 1. In order to make the Chinese version of questionnaire readable and easily-comprehensible by Chinese interviewees, 3 Chinese native persons were invited to revise. The final version was e-mailed to our interviewees in advance for a pre-consideration). In order to make our investigation reliable, the interviewed companies were selected from different districts and different industries in China, which is aimed to offset an effect of Chinese imbalanced region economic development and unfair industry development. Within the 12 interviewed companies, 6 are from less developed region--- Shaanxi province and 6 are from developed districts---Beijing, Shanghai and Jiangsu province. It involves life science, pharmaceutical and biotechnology agriculture, electronic, semiconductor producing, food and beverage processing, household appliance manufacturing, national defense, research institutes and garment manufacturing etc. Some of companies we interviewed are intermediated by the local government and we were thereafter granted to directly interview the CEOs of several companies. The interviews were conducted by phone from Eindhoven. Firstly, we pre-contacted the interviewees by expressing our intention and aim, e-mailing them the questions which we were going to interview and asking them to respond the suitable interview time and people. This section lasts for average one week and at the second stage the phone interviews were conducted if the interviewed companies were agreed. Some people were secondly interviewed afterwards if we have additional questions and some of them are the people whom we have interviewed during August 2007 in which this project was at the literature review stage.

The third perspective of qualitative approach is the study of table cases. This is pivotally used in the Chapter 6 in which we make analysis on Chinese side’s catching-up path and China-based models.
Even though the quantitative approach is not concerned the main method in this study, it was also used in the analysis in certain chapters. The data from the UNU-MERIT Database and China Statistic Bureau are applied, therefore the research on the evolution of technical alliances in China in section 3.1 and China’s National System of Innovation in section 6.1 are quantitative-related.

Figure 1.3 shows the structure of this study. The arrows indicate the sequence of the sub-topics and serve to iterate the flow of the study. After introduction, chapter two provides an extensive literature review on the strategic alliances and theories. This provides us the theoretical basis to understand the Sino-Foreign technology alliances.

Chapter three generally introduces the strategic alliances in China. It gives the detail description of strategic alliances which evolved in China from 1950s until now. Attractiveness of China for multinationals and the main challenges for both sides to cooperate are discussed. This chapter emphasizes the phenomenon of strategic alliances in Chinese context and provides a front-script for Chapter 4. In chapter 4, the term “technology transfer” is introduced. Strategic alliances in China are therefore regarded
as the instrument of Chinese side to absorb external knowledge and technologies. The influenced factors based on technology transfer are discussed in this chapter and thereby the Chinese policy about FDI, the growing role of FDI and characteristic/trend of technology transfer to China are involved. As the arrows indicate, chapter 3 and 4 become the antecedents of chapter 5 in which we discuss the effect of technology alliances on Chinese firms' competence. In Chapter 5, the Chinese domestic technology capability is defined and based on that we analyze the factors that have effect on the performance of knowledge transferring. Chapter 6 entails all possible catching-up models of Chinese companies analyzed based on having government support or not. We argue that strategic alliances can be used for Chinese side as the shortcut to catch-up developed countries. Chapter 7 is important since from which the Chinese attitude towards international alliances and current motivation to ally with foreign entities are figured out. The barriers in the Sino-Foreign cooperation that are resulted from different culture background, different understanding on trust and Chinese IPR system are discussed in chapter 8. Eventually, we make the conclusion in Chapter 9 and give our suggestions to those participating in the Sino-Foreign alliances.
2. Literature review on strategic alliances and theoretical basis

2.1 Strategic alliances

2.1.1 Collaboration and advantages of collaborating

Collaboration can be defined as a structured, recursive process where two or more people/organization work together toward a common goal. It includes patterning with suppliers, customers, competitors, complementors, organizations that offer similar products in different markets, organizations that offer different products in similar markets, non-profit organizations, governments, universities and others (Schilling, 2008). The form of collaboration varies from informal alliances to highly structured joint ventures or technology exchange agreements/licensing to outsourcing and collective research organizations. Any firms especially the technology/knowledge-based ones will definitely face a series of difficult decisions, such as whether to develop certain product at a solo venture or collaborate with partners. Collaboration enables firms to achieve the goal at faster rate and at less cost or risk than they can achieve alone. The organization history proves that firms preferring solo development have to pay for much more cost and higher risk than that in the collaborating manner. Five advantages of organizational collaboration are listed as follow.

Firstly, opportunities can be offered by organizational collaboration to obtain the complementary competence, skills or technology in the fastest way because fewer companies are able to develop all the necessary skills in house and expend cycle time to develop complementary capability internally. Collaboration such as strategic alliances can enable companies to access to important complementary assets with rapid speed (Chan, 1997). Secondly, collaboration offers companies dramatic flexibility and helps them reduce the commitment in their assets. This is rather important in today’s technology-oriented market since companies that are committed to the fixed asset will be washed out and shortened product life cycles decide that innovation is the primary detriment of success. Thirdly, collaboration is accompanied by knowledge exchanges between collaborative partners and it offers companies an important chance to execute organization learning. Close contact with other firms can facilitate the transfer of knowledge between firms and the creation of new knowledge that individual firms could not have created alone (Mowery et.al., 1992). Fourth, since technology development is characteristic of expensiveness and uncertainty, R&D cost and risk sharing becomes the objective that companies have to achieve. Finally, in the technology collaboration, the establishment of industry technology standard promotes the collaboration to expand at the commercialization stage such that the compatible and complementary products follow the unified standards. In certain industry network-formed collaboration is established to prevent the emergence of multiple competing standards in the same area.

Therefore, it can be concluded that as the development mode collaboration enables organization to (1) obtain complementary competence; (2) reduce commitment in fixed asset to improve the flexibility; (3) execute organizational learning externally; (4) share risk and cost; and (5) establish the industry technology standard.
2.1.2 Definition and nature of strategic alliances

Definition of strategic alliances evolved for a long time since it was emerged in the 1960s. A large number of literatures give examples of strategic alliances in forms of internal ventures, joint ventures, minority investments, co-operative agreements and R&D partnerships as well as franchising. Technically, these forms are classified into three categories full-equity ownership, partial ownership and no ownership controls. Yoshino and Rangan (1995) provide three necessary & sufficient conditions of strategic alliances to be as the academic basis of strategic alliances’ definition. (1) Two or more firms or organizations try to realize a set of common goals they agreed on; (2) Partners have control over the alliances and share in the generated advantages; (3) Partners continuously contribute to one or more strategic areas of the alliance.

The scholars follows these three conditions and label that strategic alliance has been used to denote a variety of inter-firm relationships (Osborn and Hagedoorn, 1997); or intensive cooperative arrangements between two legally independent entities, aimed at realizing competitive advantage for both partners (De Man et.al, 2001); or temporary cooperative agreements in which two or more firms share reciprocal inputs to realize improved competitive positions for the partners involved while maintaining their own corporate identities (Heimeriks, 2004). Thereby, it can be defined as

Agreements between two or more partners as a cooperative form towards a common goal by sharing necessary resources as well as coordinating activities.

Differing from the advantages of collaboration which has been interpreted in 2.1.1, strategic alliances additionally provide participants the opportunity to (a) access market; (b) accelerate the return on investment; (c) share the cost of investment such as R&D; (d) spread risk; (e) access resources such as complementary technology; (f) create efficiencies through economies of scale and scope or through rationalization; (g) open up otherwise unattainable investment options; (h) co-opt competition.

Specifically, companies which use strategic alliances might

- Fully exploit their own capability by leveraging them in another firm’s development effort;
- Develop the product or penetrate a new market faster with less cost and lower risk.
- Take a limited stake in the smaller firms’ development efforts if they are the larger companies or tap the larger firms’ greater capital resources, distributions and marketing capabilities or credibility if they are the smaller firms.
- Gain an early window on emerging opportunities that they may want to commit to more fully in the future (Schilling and Steensma, 2001).
- Obtain overall level of flexibility by establishing a limited stake in a venture while maintaining the flexibility to either increase their commitment later or shift these resources to another opportunity (Schilling and Steensma, 2001)

The significance of alliances reflects that “alliances for companies’ growth” can involve new capabilities, new channels and new geographies. Alliances can give companies a way to leverage their existing skills while they quickly and flexibly access the capabilities of others. As for companies seeking to expand sales through new distribution channels, customer acquisition cost can be much lower for alliances than for go-it-alone strategies.
2.1.3 Classification of strategic alliances

In order to classify the strategic alliances, available alliances forms and dimension term need to be exploited. Based on the literature review a number of strategic alliances forms are identified. Of there, the most basic alliances forms are **contractual agreement** which can be exampled by Supply-buyer relationships (Contractor & Lorange, 1988; Elmuti & Kathawala, 2001), **Service agreements** (Contractor & Lorange, 1988; Yoshino & Rangan, 1995), **Co-production** (Nooteboom, 1999; Contractor & Lorange; 1988) or co-marketing (Elmuti & Kathawala, 2001; Contractor & Lorange, 1988), **Joint-distribution** (Elmuti & Kathawala, 2001; Yoshina & Rangan, 1995) and **Joint R&D or licensing** (Elmuti & Kathawala, 2001; Contractor & Lorange, 1998; Yoshina & Rangan, 1995) and **equity alliances** in the forms of equity investment (Toshina & Rangan, 1995; Gulati & Singh, 1998; Nooteboom, 1999; Todeva & Knoke, 2005), joint venture (Lei & Slocum, Gulati & Singh, 1988; Knoke, 2001). The complexity of alliances increases as the number of participative partners enlarges. Multi-partner alliances have advantages in terms of setting industry standards and leveraging intangible capital by positioning at the centre of the network such as Symbian. Similar to dyadic alliances, network alliances are either equity alliances or contractual alliances, for instance, the contractual multi-partner alliances include **cooperatives**, **standardization consortia** (Nooteboom, 1999; Yoshina & Rangan, 1995; Knoke, 2001), **virtual cooperation** (Nooteboom, 1999; Contractor & Lorange, 2002) and franchising (Todena & Knoke, 2005; Contractor & Lorange, 1988; Yoshina & Rangan, 1995). The new form of strategic alliances which is characteristic of equity multi-partner alliances firstly emerged in Japan and Korea and called **Japanese Keiretsu** and **Korean Chaebol** (Nooteboom, 1999; Lei & Slocum, 1991). Nowadays, a large part of strategic alliances in domestic China are the evolved form of Korean Chaebol and Japanese Keiretsu. One examination (the Mckinsey Quarterly, 2000, 4) conducted by Mckinsey on topic of alliances effect showed that “alliances are better received than M&A in fast-moving, highly uncertainty industries such as electronics, mass media, and software; also, contractual alliances, simple and flexible, are better received

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3 A company grants another company the right to use its patented technology or production process for a specified time in the royalty payments by return.

4 A firm buys a direct financial interest in another firm through a direct stock purchase, either a majority stake (more than 50 percent of shares), a minority stake (less than 50 percent), or equity swaps.

5 Either in the form of 50-50 equity ownership or unequal shareholding between partners, joint venture refers to two or more legally distinct partners create a jointly owned legal organization by bringing assets and paid from the profits earned by the entity.

6 A coalition of small enterprises that combine, coordinate and manage their collective resources to gain market or bargaining power.

7 It is the inter-firm contractual agreements typically between groups of 10-15 firms, which are used to standardize norms or perform R&D.

8 It refers that a firm that perform only one piece of the value chain achieves the other functions like procurement, marketing, and service through strategic alliances.

9 It refers that a franchisor sells the right of market goods and services to franchisees under his brand name and its business practice. The franchisor retains central control over pricing, marketing and standardized quality norms. The return is paid by fee and percentage of gross monthly sales from franchisees.

10 It equals to $\Phi/\xi$ lie in Chinese and system or series in English. In practice, it means that a set of companies with interlocking business relationships and shareholdings form a type of horizontally-integrated business group around a certain bank which can lend money to the Keiretsu members by taking member companies’ equity as well as charging monitor responsibility to minimize the presence of hostile takeovers.

11 It means big Business in English and refers to powerful independent entity acting in the economy and politics but sometime cooperating with government in planning and innovation. Government plays an important role in encouraging competition among the Chaebol in certain area to avoid monopolies.
by the market than more complicated equity alliances; and multi-partner and consortia tend to be quite well received”

With respect to classifying the strategic alliances, many dimensions are used respectively to distinguish each sub-group. Based on the literature review, it can be summarized that there are mainly 4 categories of dimensions having ever been used to classify strategic alliance presenting as below:

1. Horizontal V.S. vertical relationship between parties at the same level in different supply chains or between suppliers and buyers within the same supply chain (Ghemawat et.al., 1986; Bronder & Pritzl, 1992);
2. Equity V.S. contractual relationships (Casciaro, 2003);
3. Degree of integration (Pekar & Margulis, 2003; Contractor & Lorange, 1998 and Todeva & Knoke, 2005): the extent to which partners integrate in formal or informal structures, procedures and mechanisms in the aim of coordinating partners’ resource contributions, administrative responsibilities and division of reward.
4. Number of participants (Faulkner, 1995)

Amongst these 4 classification dimensions, the last three are of the most prevalence. The discussion in taxonomy of equity usage reveals that alliances involving equity are considered to be much more complex than contractual alliances and requires more intensive cooperation between partners (Pekar & Margulis, 2003). As seen in figure 2.1, contractual arrangements are put at one extreme and joint ventures at the other (Lei & Slocum, 1991), enclosed by arm-length contract and merger & acquisition.

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Figure 2.1 Classifying strategic alliances by equity usage
If considering degree of integration as the single dimension to classify strategic alliances, as Knoke (2001) discussed, the extent of integration can be enhanced along the line of service agreement, licensing, franchising, co-production, joint R&D, joint ventures. However, the problem can be occurred in the place of licensing and franchising. It is logic to say that patent-licensing which is of less inter-organizational dependence is less of integration than franchising while know-how licensing agreement might be more organizational integrated than that of franchising.

<table>
<thead>
<tr>
<th>Service agreement</th>
<th>Licensing</th>
<th>Franchising</th>
<th>Co-production</th>
<th>Joint R&amp;D</th>
<th>Joint Ventures</th>
</tr>
</thead>
</table>

Degree of integration

Figure 2.2 Categorizing strategic alliances by degree of integration

In order to incorporate more alliances forms into categorization and avoid ambiguity of adscription, we integrate above two dimensions and re-name them as “integration of business process” and “Participants’ financial linkage”. In figure 2.3, eleven forms of alliances are involved and sequence is designed.
2.2 Economic theories related to strategic alliance

The research about alliances starts from transaction cost economics. Under this theory, organization units were considered to be much more individual and self-fulfilling (Williamson, 1975) and alliances were viewed as separate business cases and single transaction that used to overcome market failure and industrial constraints. Studies based on transaction cost theory focus on critical success or failure factors that related to competitive issues between partners (Das and Teng, 2000b): Choice of governance structure (Williamson, 1985), partner fit or symmetry (Harrigan, 1988b) and trust and complementarity (Luo, 2002a). Other factors such as relational advantage (Dyer and Singh, 1998) or collaborative advantage (Kanter, 1994) were also addressed to be the critical issues leading to collaboration-specific rent (Madhok and Tallman, 1998) or common benefits (Khanna et al. 1998). Overall, in spite of this
stream of early studies contribute to uncover critical success factors for managing individual alliances at inter-firm or dyadic level, it falls short to stipulate how process and what mechanisms should be taken underlying success alliances management, in other words, investigation on firm-specific or intra-firm factors to explain fixed-firm performance is needed. Alliance capability was therefore introduced and refers to the dedicated assets and mechanisms available to help firm gain the competitive advantage (De Man, 2001). This stream of research allows alliances study to incorporate a set of new intra-firm attributes such as organizational structure, managerial processes and routines. Recent empirical studies validate that the development of alliance capabilities can significantly accelerate a firm’s ability to derive value from alliances (Simonin, 1997; Kale et al, 2002; Draulans et al., 2003; Heimeriks, 2005).

In line with the development of strategic alliances, academic theory basis is enlarged to resource-based view, knowledge-based view, dynamic capability view and competence-based view. For this study, the literature review in this part is based on the resource-based, competence-based and knowledge-based view since taking use of critical resources as the basis for competitive advantage are lacked by Chinese side and using organizational learning to catch up with the developed level should be emphasized. These three theories not only address that firms are largely heterogeneous entities, whose evolution depends on unique resource bases and the tacit knowledge they accumulate (Nelson and Winter, 1982; Aldrich, 1999), but also imply that by active learning from distilled and disseminated lessons are firms able to be competitive and of uniqueness.

The resource-based view emphasizes firm’s unique set of resources because it allows firm to differentiate from competitors and therefore grasp the competitive position (Teece, 1997). Studies show that firms that hold superior resources can overcome the micro-economic equilibrium so that heterogeneity can be realized through effective resource-picking mechanisms (Barney, 1986). Because certain resources might not be completely tradable due to the structural inertia (Thomke and Kuehmerle, 2002), alliances are regarded as the best vehicle to access to the desirable assets. Resource-based theory notices that firms that call for the isolated mechanisms to prevent resource diffusing could barrier competitors (Rumelt, 1984). Since specific resource features such as ambiguity and “stickiness” might cause firm’s inability to change strategic direction (King and Zeithaml, 2001), alliances can be selected to overcome it and firm’s picking or investing in the right resources to obtain economics rent become possible.

Competence-based view was introduced in the early of 1990s and it can be seen as an extension based on the resource-based and dynamic capability view (Hamel, 1994; Sanchez, 1997). Whereas the competences themselves are often seen as resources (Prahalad and Hamel, 1990, 1993), recent research addresses that it represents the specific constellation of resources, organizational processes and capability unique to the firm (Heimericks, 2005). Competences are differed from resources and capabilities as they entail a capability to change capabilities (Henderson and Cockburn, 1994). Characteristics of core competence prove that competence is not only an integrated bundle of unique skills (Hamel, 1994), but more importantly it can be developed and raised through organizational learning. Organizational learning theories at this place can be linked with competence-based view and therefore learning by coordination

12 It stresses the importance of firm-specific capabilities as a source of imitable and thus sustainable competitive advantage.
and integration of skills and technological capabilities (Appleyard et al., 2000) imply that adaptation of complex interaction between skills, organizational process and routines are desired to improve the core competence (Karnoe, 1995). As for the application of competence-based view to alliances researches, the consistent studies show that the competence-based view embraces ability to integrate various theoretical backgrounds and provide a more comprehensive representation of the importance for firms to be able to develop a firm’s capabilities over time in order to remain competitive in the long run (Heimeriks, 2005).

Knowledge-based view is very essential for this study because it is of great help for understanding the role of knowledge in production and exchange process (Demetz, 1991). Knowledge is considered to be a key competitive resource. In the study of Nonada and Takeuchi (1999), the authors proposed four modes of knowledge conversion. (1) **Socialization**: convert tacit into tacit knowledge through direct interaction between individuals and shared experience; (2) **Combination** concerns that transformation of explicit knowledge into new knowledge through combination of different bodies of explicit knowledge via social processes such as meetings; (3) **Internalization** refers to the conversion of explicit knowledge into tacit knowledge; (4) **Externalization or articulation** is conversion of tacit into explicit knowledge (Hedlund, 1992). To create new knowledge, disseminate it throughout the organization and embody it in products, service, and systems (Nonaka and Takeuchi, 1995:3), these four modes implies that firm’s learning by sharing and institutionalizing knowledge must be very important. Knowledge-based view underlines that transferring and integrating knowledge are critical to optimize value creation in alliances (Inkpen, 1996). Loss of knowledge and asymmetrical learning are the impediments of successful alliances and the long-term survival of the firm (Inkpen and Beamish, 1997). Leveraging knowledge via alliances appears much more important since organization learning can be realized through knowledge sharing and most of researchers suggest that with respect to this issue alliances should be considered as a portfolio rather than a separate activity (Lorenzoni and Baden Fuller, 1995; Duysters et al, 1999b:184). Since the ability to leverage knowledge from technology transfer and alliances is an important driver for Chinese firm to execute international alliances, it is regarded as another basic theory basis of this study.

Actually, the above mentioned theories should not be identified independently, instead, in the alliances research they are cross-fertilized one another. Since complementary natures and overlapping characteristics of different theories, they allow scholars to research alliances from different point of view. In line with our study, the combination of various basic theories enables us to have a better understanding about impediments and drivers of Sino-Foreign Chinese alliances. This kind of “general theories illuminate specific cases” assists us to forecast and give appropriate suggestions for tomorrow’s Chinese-involved alliances.
3. Strategic alliances: evolution and major challenges in China

3.1 The evolution of technology alliances in China

By comparing the study of technology alliances between China academic area and that of advanced countries (especially West Europe and U.S.), we found that the biggest difficulties in researching this topic in China is the limited number of empirical and academic resources. Fewer researchers are dedicated to alliances research, not to mention the technology alliances which has already become the hot spot in the international academic field. During the investigation of technology alliances evolutionary in China, we found that even “China Technology Statistic Annals” (the most authoritative statistical annual about technology investment, technology development in China) has never noticed statistics related to technology alliances, not to mention the international technology alliances. This gives us a message that the imbalance between research in Chinese technology alliances and the fact of increasing amount of technology alliances in China is indeed existed. We hope that our primary research in this area can fill up gap for Chinese research.

In order to make this research more empirical and show the general trend of technology alliances of China which includes inward, outward, domestic alliances together. We refer to two sets of data sources by accompanying with the result of our in-depth interviews. One is from the second-hand data from HuaZhong Technology University, which is used to present the alliances issue before Chinese Economic Reform (in 1978) and domestic alliances in China; the other is from the databank of Security Database (see Appendix 2) which is mainly used to show the general trend of China focused inward technology alliances from the 1980s till 2005 and the international alliances. These two data sources complemented each other since empirical record of technology alliances in China before 1978 was never incorporated into any international databank. We hope that our introduction about history of technology alliances in China etc. can establish a bridge of academic research between period before Chinese economic reform and period of China’s taking off (approximately since 1985).

The History of Technology alliances in China

Since the foundation of P.R. China in 1949, domestic technology alliances have started. But this cooperation is not among the firms but between the China Science Institutes and their facilitated subordinates. The manufacturing firms were not distributed resources in basic or applied researches whereas Universities and various National Research Institutes were granted to make technology alliances between each other. During the planned economy (1957-1979), Technology alliances in China are characterized of "no firm involving and researches separating with manufactures'.

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13 This data was from the national questionnaire survey in 2000, mainly conducted by Huazhong Technology University, on the topic of technology cooperation in China. This set of data does not distinguish domestic and international categories. The data used in this section can be sourced from Research Group of Technological cooperation in China, HZTU (internal document)
After open-door reform in 1978, more Chinese firms were encouraged by Chinese government to cooperate with large foreign companies in order to release fund stress and import technology and managerial skills. However, technology alliances were not developed as fast as expected at that time because (1) Companies addressed low interests in forming technology alliances with foreign companies due to lack of competition stimulates; (2) Most of Chinese firms had the same competence that induce no necessity to cooperate and complement each other; (3) Most of large domestic firms prefer to cooperate with Chinese research institutes or universities in order to improve their technology capabilities but based on the Chinese firms’ philosophy “monopolizing the whole domestic market”, they have no intention to establish technologically alliances with other Chinese firms because of the domestic market competition.

However, since 1990 because Chinese products presented low competitive power in the international market, Chinese firm and government realized that the real corporations’ development has to depend on the technological innovation and market exploitation (Sun, 2002) and only relying cooperating with Chinese research institutes is not sufficient to solve problems such as fund shortage and marketing satisfaction. This motivation drives domestic firms to wake up and decide to form technology alliances between firms. By analyzing the second-hand data from Huazhong Technology University, we found that 48% of Chinese firms have experience in technology alliances with domestic firms and 65.1% of them were established from 1991 (Zhong, 2000) (see figure 3.1.1).

![Figure 3.1.1 Starting Time of strategic technology alliances](image)

Besides the alliances with local firms, Chinese firms started to cooperate with multinationals in various areas since 1985. According to our empirical investigation based on our analyzed data from the databank of Data Security, China has undertaken an average of 337 alliances per year (from 1985-2005). Of there, about 16% of alliances are labelled domestic (Chinese firms allying in China), 63% of them are labelled inward alliances (foreign firms allying with Chinese firms in China) and 21% are labelled as outward alliances (Chinese firms allying with foreign firms outside of China).

Based on the data from Thomson Financial, We integrated the China focused alliances including inward, outward and intra. Since this research is also involved high-tech alliances, data about high-tech inward, high-tech outward, high-tech intra are also incorporated.
From figure 3.1.2, we can see that China inward alliances always account for the main part with regard to the alliances issue. This can be interpreted by Chinese firms’ financial stress, desire to learn from outside due to low level of technology or knowledge capabilities and favourable Chinese policies on the foreign investment. This type of activity increasing dramatically from 1992 with peak in its popularity in 1994 is caused by the strong support of Chinese government and Chinese FDI policies. As Pieter (2002) reported, inward strategic alliances in China remains the dominate mode and accounts for 74.54% of the total value of actual FDI in 1994. During 1997, multinationals held down the investment in Asian area which is also include China because of the 1997 Asian Economic Crisis. Although it is said that activities of alliances were not so much influenced than that of M&A (Duysters, et.al, 2007), the number of inward alliances are shown decreasing. During 2002 the international alliances increased again which was basically stimulated by the idea that China entering into WTO in 2001. Another dropping down happening in 2003 was caused by SARS occurred during that time in China. From 2004, inward alliances in China kept rising.

In spite of fewer deals of outward alliances of Chinese firms, we can also recognize that the increase in inward FDI led to an increase in outward FDI. This is caused by the increased competition in the home market and in its turn Chinese firms are encouraged to go abroad and exploit new market (Yiu, Lau and Bruton, 2007). The remarkable increase in outward alliances during the year 1999, 2000 and 2001 in China can be explained by the government-led “go global” initiative that started in 1999 (Buckley, Glegg, Cross, Liu, Voss and Zheng, 2007; Luo and Tung, 2007). The deals of high-tech alliances either of outward or inward present rather lower, which is dramatically due to China’s incomplete intelligent property protection in legal way and somewhat resulted from Chinese firm’s immature capability to absorbing and digesting infused knowledge (which we will show in the next few chapters). Due to China’s imbalanced regional development, of which eastern part of China is developed than Western part, high-tech inward alliances only concentrate in certain developed cities such as Beijing and Shanghai where there provides sufficient qualified talents and facilitates.

![Figure 3.1.2 China focus inward/outward/high-tech inward/high-tech outward/intra/high-tech intra alliances](image)

*Figure 3.1.2 China focus inward/outward/high-tech inward/high-tech outward/intra/high-tech intra alliances*

**The Scale of Technology alliances**
The Scale of cooperation in technology development will be investigated in terms of invested R&D expense, number of R&D personnel and lasting period per R&D project. Based on the database sourced from Huazhong Technology University, we found that

(1) More than 48% ((calculated by 37/(37+20.8+19.2)) of surveyed firms which have involved technology alliances distribute averagely less than 1,000,000 RMB in per project (approximately equal to 100,000 Euros); whereas 20.8% of firms investing more than 5,000,000RMB (500,000 Euros) per R&D project. See figure3.1.3

Figure 3.1.3 Invested fund in per R&D cooperation

(2) Chinese firms don’t want to invest R&D cooperation project that might lasts more than 4 years. 74.1 % of firms prefer technology alliances within 1-4 years (see figure3.1.4), aiming to solve technical problems proposed by consumers or develop new product.

Figure 3.1.4 Average period of per R&D alliance

(3) Chinese firms mainly focus on mid-sized R&D cooperation, which is also reflected from the number of personnel invested. Normally, the R&D project which is dedicated by more than 30 talents is considered as large project in China (Chen, 2003). The survey data shows that less than 17% of Chinese companies have ever invested more than 30 people in single R&D project.
Either from the lasting time perspective or the invested R&D personnel and the fund invested point of view, Chinese firms are characteristic by cooperating in the mid-sized technology alliances. This is consistent with the result of our interview and it can be traced by smaller percentage of alliances that concentrate in R&D cooperation.

**Number of Cooperative Partners**

If just considering the technological cooperation between Chinese firms, multi-partners is the main trait in intra alliances. Survey shows that 53.9% of responded firms have more than 3 partners in each alliance. This is not because of demand of network cooperation but due to the low level of technology development capabilities of Chinese firms. Without cooperating with foreign large companies, Chinese firms have to offset the shortage in technology capability by lobbying more domestic firms to participate. Additionally, because large Chinese firms have no intention to collaborate with others domestic firms due to their philosophy of taking monopoly in the market, mid-sized Chinese companies which account for 40% of the total enterprises choose to cooperate with the same size of counterparts (Li, 2001).

According to our interviews, there are generally two reasons for Chinese firms to form technology alliances domestically. First is to make new product development, which can be shown in the survey that 30.8% of intra technology alliances are engaged with this aim. Secondly, technology alliances are established for solving technological problems that might happen in manufacture process. More than 40% of Chinese firms cannot solve process-oriented problems independently, which leads to the trend to rely on the external power (Zhong, 2000).

**Achievement of Technology alliances**

Based on our interview, we found that the majority of technological cooperation between Chinese firms did not achieve the international advanced level, which is also consistent with the study of Song (2001), Zhong(2000) and Chen et.al (2003). The weak technology capability of individual Chinese company is the major reason. However, from the alliance partner selection perspective, another crucial reason is the so-called "Chinese alliances dilemma" which means that Chinese firms are likely to select companies who have higher level of technology capabilities than theirs as the technological cooperative partner to
lead to the situation that “companies that are willing to participate in technology alliances domestically are the one who have lower technological capabilities whereas those embracing higher technological competence cannot participate due to fewer opportunity available for learning and obtaining benefits”. Therefore, it gradually builds up a “Chinese-Characteristic-Situation” that China’s national technology capability is improved slowly because mid-sized companies that have not sufficient technological competence have no chance to learn from large firms which however are intended to go for technology alliances with foreign large enterprises.

All in summary, the above points lead to the following consequences (see figure 3.1.6)

1. The history of technology alliances in China started very early (more or less after foundation of P.R.China in 1949) but progressed in the single mode till the end of 1970s; Calling out technology alliances from 1950s to 1970s (except the Culture Revolutionary from 1966 to 1976) by Chinese government was aimed to solve basic-science problem in the academic area. The cooperative relationship was only existed between universities and research institutes and the cooperative agreement was mostly related to basic research in the industry of national defence. Firms were not largely allowed to incorporate in this type of academic-oriented technology alliances, which was based on the ideas that the responsibility of all the firms (at that time all the firms were state-owned) was to achieve manufacturing yield planned by Chinese government (due to the Chinese planned economic system at that time) and all the country was still surviving in the situation of lack of commodities supply (in other words, there was no market competition).

2. Strategic alliances were noticed by China since open-door policy in 1978. But the real grow up of technology alliances were started from 1985 and most of them were located in low- or medium tech industries. From 1985 till 1995, there are two memorable traits about that moment’s strategic alliances. The most important one was the government-led which means that all the cooperative partners as well as the industries proposed to be invested were dramatically decided by Central and local government; firms themselves had no right to participate in the decision process. Secondly, from the mid of 1980s till the mid of 1990s, only the largest key national-owned firms had opportunities to establish alliances with foreign companies, but just a small part of agreements were associated with technology development. Thirdly, Chinese Alliance Dilemma leads to the consequence of less improvement of mid-size Chinese companies’ technology capability, which to large degree slackened the national technological level (because 80% of companies in China are mid-sized).

3. Since mid of 1995, due to the Asian Economic crisis in 1998 and forthcoming HongKong hand-over (in 1997), most of foreign investment in Asia transferred their business mode from M&A to strategic alliances. Due to China having safe investment environment in the period of Asian Crisis, the first peak in establishing strategic alliances came in, followed by steady growing up in absolute and relative amount (only slightly sliding down in year 2000 and 2003 due to SARA crisis and decline in stock market at that time). From 1995 to 2005, the most excited thing for the Chinese side is the Chinese firms started to actively ally with other firms either overseas or domestically. This was labelled by alliances built by Haier, Dongfeng Auto Group, Legend, TCL et.al with foreign MNCs. Since most of Chinese firms had insufficient technological capabilities
and less alliance experience, there were only small part of domestic firms were able to exploit the international market in the late of 1990s, most of strategic alliances was still located in China. The other argument for this consequence might be that the domestic market in China had become rather internationally as a result of intensive competition from MNCs and domestic Chinese companies. This is consistent to the empirical investigation held by Duysters et.al’s (2007), from their investigation, the average number of strategic alliances from 1995 to 2005 in China is 337 deals per year with 16% of them domestically, 63% focus inward (foreign firms allying with Chinese firms in China) and 21% labelling outward (Chinese firms allying with foreign firms outside of China). Secondly, increasing number of strategic alliances tend to be of technological cooperation. Manufacturing in low-tech industries began to be taken over by Chinese township enterprise (Todeva, 2007) and 70% of cooperation has more or less involved medium- or high-technologies (Li, 2002).

(4) Following the alliances development during period of 1995~2005, it can be forecasted that there will be more number of Chinese firms actively participating in the technology alliances either with foreign or with domestic counterparts. Mid-sized Chinese firms will break the Chinese Alliance Dilemma by empowering their competence through getting support from intermediate technology agency or pre-empted allying with large companies. Alliances will still keep on medium or high technology industries but Chinese side will grasp more control than before. Chinese characterised business network will be eventually formed.

Figure 3.1.6 The evolution of technology alliances in China
3.2 Attractiveness of China and major challenges of alliance in China

Attractiveness

China is now the second largest FDI recipient in the world which follows U.S. can prove that China is increasingly attractive. According to the announcement of the State Administration for Industry and Commerce (SAFIC) in March 2008, foreign-funded enterprises have invested a total of 2.11 trillion U.S. dollars in China only in year of 2007, up 23.5 percent increased year by year (with 286,200 foreign-funded companies being approved to invest in China until end of 2007, by 4.14 percent increase). Among them, the biggest investment source is from Asia with 2,067,000 firms investing in mainland China; followed by North America, European Union and Latin America. In spite of tax changes for foreign companies in 2008 (the new corporate income tax law that took effect on Jan. 2008 unified the income tax rate for domestic and foreign companies at 25 percent (Previously, the effective rate was 25 percent for Chinese companies and 15 percent for foreign enterprises)) which allows foreign-funded companies to feel that the Chinese investment environment more competitive, China will still be the top 3 choice for foreign investment which is according to the Xin Hua Press Report (2008). In fact, in the World Investment Report (2005) it has been shown that besides the FDI attractiveness, China is also the primary reference for multinationals to take R&D cooperation (figure 3.2.1) (more information goes for appendix 4)

![Most attractive prospective R&D locations](image)

Figure 3.2.1 Most attractive prospective R&D locations

Foreign investors are free to opt for either WOS (The wholly-owned subsidiary (WOS) can often be considered a close substitute of the ISA) (Beamish and Banks, 1987) or international strategic alliances (ISA) as an entry mode to make direct investment. ISA remains the dominate mode and accounts for
74.54% of the total value of actual FDI in 1994. According to the Chinese government’s classifications and announcement in Sino-Foreign ISAs based on 2002 statistics, it includes:

- **Equity joint venture** (EJVs) which accounts for 69.79% of the total amount of ISAs’ actual investments involves the creation of limited liability companies with equity and management shared in negotiable proportions by the foreign and Chinese partners.

- **Contractual (or cooperative) joint ventures** (CJVs) which accounts for about 26.45% of all ISAs in terms of actual investment refers to variety of arrangements and is a looser association of partners (although it may still involve establishment of a limited liability company) which agrees to pursue a joint undertaking. The Chinese and foreign partner cooperate in joint projects or other business activities according to the terms and conditions stipulated in the venture agreement. Technology transfer and long-term licensing agreement are also included in this classification.

- **Joint exploration projects** (offshore oil exploration consortia), which represents 2.45% of total investment of ISAs, ranks the third. Under these arrangements the initial exploration cost is paid by the foreign partner, with following development costs shared with cooperated Chinese firms. This type of ISA does not result in the establishment of new limited liability enterprises even though it allows foreign firms to manage projects.

- Processing and assembling agreements, in which Chinese firms act as the manufacturer to process or assemble raw materials or semi-products of the final goods and then distribute them to international markets, constitutes 0.79% of ISA total investment.

Many arguments on the motivation of foreign side to ally with Chinese side entities relies on the traditional point of view that China is the most formidable competitor in the world as well as its cost-advantages in labour and resources. However, it has to be acknowledged that as for the multinationals, active participation in the Chinese market is the first step for being a viable global competitors or meeting the global challenge. Generally, the lure of China can be categorized into three subparts. **Financial benefits** (be able to provide incremental income on fixed investments in R&D and manufacturing); **Strategic learning** (learning new skills, capabilities, technology or information in one market and then transferring them within a corporation worldwide to strengthen its global competitive position); **Strategic position** (China alliance is able to weaken Chinese competitors’ global attack by understanding “soft” elements of Chinese competitive style and values—a complex bureaucracy, guanxi network and many vague or unwritten rules and regulations). As the young-age conception of inter-firm relationship, firms have recently become aware of the potential of strategic alliances as a means of quasi-external acquisition of technology. Today, firms in high technology sectors have a much higher propensity to undertake alliances as a compared to their counterparts in low-and medium tech sectors (Duysters, 2001). As China became the biggest consuming market in the world, more and more MNCs enter into Chinese market and take strategic alliances as the mean to add complementary competence, especially in the marketing area. Meanwhile, Chinese partners take advantage of this opportunity to enhance their technology capability by absorbing external knowledge. They collaborate together to achieve respective objectives. However, the failure rate is much higher than expected, approximately approaching to 80%.

**Challenge**
In the collaboration between Chinese and foreign parts, challenges are present in terms of their imbalanced collaborative positions (strong-weak cooperation which we will illustrate in the next few chapters). To be honest, most of Chinese companies have no sufficient knowledge basis to learn, absorb, and take-over the diffused knowledge. This leads to the consequence that those large international companies which play as the knowledge diffuser cannot find the equilibrium point (point E in the figure below) to deploy knowledge without proper overlap of technology base with Chinese partners. Therefore, for Chinese side the indigestibility becomes the first major challenge at the early stage of alliances; the second big challenge for them concerns the adverse selection because information about relevant technological assets is often tacit and not readily available (Duysters, 2001).

Similar scale of challenges is also accounted by MNCs because the information asymmetry between two sides is the main reason of moral hazard in terms of principal-agent style. As can be seen, usually MNCs have less information about tactics in relationship with Chinese government and Chinese entity, they therefore may consider their partners having an incentive to act inappropriately if the interests of both parties are not aligned. Sometimes, the information asymmetry in alliances might make alliances turn to termination due to the trust draining.

Challenges confronted by both sides also involve unintended knowledge diffusion which causes foreign side to terminate the alliance. The risk increases if the diffused knowledge enables to empower Chinese partners to likely become the key competitors in the near future. For example, in the early of 1990s when Huawei was founded, it was just a tiny R&D collaborator of Cisco; however right now, in the telecommunication industry it has become one of five key competitive rivals of Cisco. Besides it has to be acknowledged that each year Huawei invests about 10% of its revenues in R&D to improve its technology base, the early international R&D coloration with large MNCs such as Cisco provides it with more unintended diffused knowledge to make initial growth than the others.

Since the amount of diffused knowledge which MNC’s devote in the knowledge exchange is not offset by what they would ask from their partners, non-equilibrium of diffusion and protection becomes another main origin causing challenges in Sino-Foreign alliances. As can be seen in figure 3.2.2, at the left side of point E, alliance partners are ready to collaborate together by exchanging contracted knowledge to each other. Cooperation always goes well during this period on the condition of information symmetry. However, if information cannot be guaranteed to be of symmetry, alliances might be failed at the beginning due to indigestibility and adverse selection & moral hazard problems. As shown in the figure, two blue dashed lines that start from point A and B respectively implicate that diffusion will go up while

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14 It refers to the market process in which “bad” results occur due to information asymmetries between buyers and sellers: the “bad” products or customers are more likely to be selected.

15 Information asymmetry is the presence when one party to a transaction has more or better information than the other party. This creates an imbalance of power in transactions which can sometimes cause the transaction to go awry.

16 Moral hazard is the prospect that a party insulated from risk may behave differently from the way it would behave if it were fully exposed to the risk.

17 Principal-agent problem is a special case of moral hazard where one party called agent acts on behalf of another party called the principal. The agent usually has more information about his actions or intentions than the principal does because the principal usually cannot perfectly monitor the agent.
protection will go down and gap between them is getting larger. Similarly, on the other side of equilibrium point E, alliances might go to termination because of amount of knowledge diffusion exceeds that of knowledge protection.

Figure 3.2.2 Equilibrium of knowledge diffusion and protection
4. Technology alliances and technology transfer to China

4.1 Strategic technology alliances in China

Strategic alliances can be interpreted as the cooperative agreements in which two or more separate organizations team up in order to share reciprocal inputs while maintaining their own corporate identities (De Man and Duysters, 2003). From the second half of 1980s, large number of established strategic technology alliances has become in vogue, which was coincided with the worldwide structural and technological change. Many advantages of strategic technology alliances especially its flexibility were discovered by companies. Many multinationals even move their R&D center to the emerging market. Voelker and Stead (1999) found that research is normally undertaken at the home country while development laboratories are drawn abroad when overseas markets become sufficiently large. Based on the studied of 42 international R&D unites, Ronstadt (1977) found that the majority of these facilities were initially geared to adapting head-quarters-generated technology to local market conditions; some of them do even later develop into a more autonomous set of technological capabilities and objectives. MNCs have not only treated their international R&D facilities as a series of quasi-independent units but as one integrated whole, serving global as well as regional purposes (Nobel and Birkinshaw, 1998). According to our interview with IBM CDL and Microsoft in China, establishing technical cooperation with local firms or universities are not only aimed to save costs but more importantly to gain access to emerging technologies and making good use of local qualified talents. Even though there are still many difficulties and conflicts needed to be solved within the cross-boarder cooperation and technology alliances were not a panacea to all the corporation problems because of the high rate of alliance failure, strategic technology alliances is the most effective way to deal with increased competitive pressure, ever­rising costs of R&D and shrinking technology/product lifecycle. Therefore, strategic technology alliances become an important vehicle for keeping up with turbulent technology change, even though average alliance success rate remained poor (De Man and Duysters, 2003).

With respect to the classification of technology alliances, Yves Doz and Gary Hamel (1997) categorized it into two dimensions. The first dimension is the degree of alliances practice capability complementation\(^{18}\) v.s. capability transfer\(^{19}\). The second dimension is whether the firm manages each alliance individually or manages a collective network of alliances.

\(^{18}\) It refers to combining/pooling the capabilities and other resources of partner firms, but not necessarily transferring those resources between the partners.

\(^{19}\) It refers to the exchanges of capabilities' across firms in such a manner that partners can internalize the capabilities and use them independently of the particular development projects.
In the figure 4.1 Quadrant A represents that firms forge an individual alliance to combine complementary technologies or skills needed while carefully avoid the exchange of proprietary technology between firms. This does quite happen in recent Sino-Western technology alliances. More than half of international alliances conducted in China are belong to this category and foreign part favor this type because they can use this pattern to prevent the proprietary knowledge being diffused whereas taking advantage of alliances to make up their lacked capability in Chinese context. In quadrant B, firms apply a network of alliances to combine complementary resources without attempting to internalize its partners' technologies but keeping a flexible and egalitarian network of independent businesses. A number of large Western companies that make business in China pick up this type by having relationship with a variety of alliances partners that are either as the supplier or as the retailer in the vertical line. No significant technologies could be released because their knowledge bases are rarely overlapped. In quadrant C, firms transfer capabilities between partners by individual alliances. Each partner can perceive an equitable opportunity for gain from exchanging capabilities. Companies are willing to apply for this when partner's technology capability is generally equal because only in this case both partners are possible to gain as much knowledge by learning through technology alliances as expected. However, in the other cases such as alliances conducted between firms from emerging country such as China and those from developed nations where partners are not at the same level either in technology capability or in alliances experience, technology alliances are difficult to quarantine each participant to gain technology as much as they expected especially for the strong part. Therefore, knowledge transfer via strategic alliances in quadrant C and D is characteristic of one-way in which partners being weak in technology capabilities are more advantaged to absorb and learn than their counterparts whose knowledge is possible to be unintentionally diffused! In quadrant D, firms use a network of alliances to exchange capabilities and jointly develop new capabilities. The collective research organization is the typical example of this situation where member organizations collectively create, share, and utilize knowledge. This can be recognized from our investigated interviews where we know that many Chinese universities or research institutes are now
having specific cooperation via strategic technology alliances with foreign large companies (in times includes foreign top universities). By doing joint research project together, Chinese side such as BeiHang University and Beijing Technology University recommend their excellent research candidates who have ever participated in joint R&D to foreign partners to be trained abroad or continue to make research. The joint Brain Bridge Project conducted by Zhejiang University, Technology University of Eindhoven and Philips Co. which we have mentioned in Chapter 1 is also a good example of quadrant D. According to our interview, with increase of Chinese partners’ technology capability, such kind of cooperation is wished to be the main pattern in the future Sino-Foreign technology alliances.

Although each category has potential to improve the competitive advantage of participative members, opportunism and self-interests exists for all parties of alliances, which is due to limited levels of mutual commitment (Harrigan, 1987). According to Doz and Hamel (1997), collegiality between partners can facilitate trust and communication while too much collegiality may be a warning sign that information gatekeepers within the firms are not being sufficiently vigilant. Therefore, as suggested\(^{20}\), employees at all levels should be regularly informed about what information and resources are off-limits to the partners and the firm should stringently monitor what information the partner requests and receives.

Technology alliances are frequently established in advanced technology industries. With Chinese government exerting reform broadly, policies and incentives toward foreign investment were toward signaling the FDI in the high-tech area. The definition of advanced technology industries are defined as those with R&D spending to sales ratio at least twice the average of all industrial sectors, which was articulated by De Woot (1990) as the measure to distinguish advanced and non-advanced industry. It has to be noticed that the in China context where Chinese side and foreign part have different demand in advanced technology; sometimes the advanced technology transferred by MNCs may not be the real advanced from their perspective but may be rather advanced based on the level of technology capability of Chinese side. Within our more than 10sets of in-depth interviews, almost all the respondents have noticed that they are very aware that the technology they learned through Sino-Foreign cooperation is not the most advanced one in their industry, especially in the international market; but comparing with their domestic competitors, what they learned from foreign partners in the knowledge exchange has already been pretty enough for them to compete others in the coming 5 years in the domestic market. One of the interviewees who is the senior researcher in Beijing Agricultural Machinery Institute additionally said that even in the academic area China is still laggard behind; however they do cherish the opportunity to learn from developed countries even though the transferred technology is not considered the most advanced. She expressed, every development needs a long progress.

In the game of Sino-Western technology alliances, European firms play a significant role. Firstly, Based on Chinese government policy in foreign direct investment, industries that Chinese government pays special attention to enhance via Sino-Foreign cooperation are coincided with the sectors that Europe firms are considered to have particular technology strength. According to the European Commission Document (1998), it includes aerospace and aviation, power generation equipment and energy as well as energy management, specialist electronics, life sciences/biotechnology pharmaceuticals, materials and materials

\(^{20}\) By Hamel, Doz and Prahalad “Collaborate with Your Competitors---and Win”. 

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design, machinery/machine tools/computer integrated / manufacturing, motor vehicles/components and telecommunications equipment. This implies that in the past, current or even the future international cooperation, European firms would be favored more by Chinese side than the other firms outside of EU. Secondly, in the practical technology cooperation between EU and China, players/partners had clear understanding about definition of technology and technology transfer and in most cases they described technology as the know how for making a product or operating a process which may be embodied in equipment, codified in handbooks, blueprints, patents and other records and knowledge and skills which are held by persons or groups of people and which may or may not be easily transferable to others21 (Liu, 2001). Until now, the technology transfer to China is normally conducted in forms of sale of machines and designs, sale of designs by themselves, technical consultancy services and training. They are transferred either in product technology, process technology or product & process technology. Specific report about technology transferred from EU has ever been reported by National Annual Statistics at CCTV.com. In 2007, it shows that by the year of 2006, 50% of technology transferred from EU into China involves product technology; 9% involves process and 41% are both product and process. These figures are consistent with our qualitative investigations. In our small sample of interviews, besides only 1 out of 10 firms which is the off-spin venture of Beijing Agricultural Machinery Institute involves process technology, all the other are excluded out of this respect. The low percentage on process technology transfer implies that different levels of technology capabilities are required as for the technology acquirers and higher level of capabilities improvement asks for longer term collaboration between the technology owners and the acquirers. In terms of characteristics of the technology recipients, it is also reported from CCTV.com that 74% of the technologies were transferred to producers in the same sector in modes of licensing, co-production and joint ventures and Western companies made comments that averagely, 25% of technologies transferred can be absorbed and used within one year, but in general most would take much longer for the Chinese to master, especially to the point where they could replicate them.

4.2 Evolving theoretical views on the rationale of technology transfer

About technology transfer, the word “transfer” is the centre of debate. There are two main views about the meaning of transfer. One believes that technology is only really transferred when transferees actually utilize the technology. The other believes argue that it is not necessary for the recipient to use the technology. The intellectual property expertise Yang Deli (2000) indicates that transfer is a process and not a result.

Most researchers agree that technology transfer is a process of knowledge transmission (Gee 1981; Erdilek & Rapoport 1985; Reisman 1989). Gee (1981) defined it as application of technology to a new use or a new user for economic gain, which happens via people, products and process. Reisman (1999) said that technology transfer is a conveyance or shift of the tools techniques, procedures and/or the legal titles thereto used to accomplish some desired process by way of transmission, revision and implantation of knowledge.

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21 This is consistent to the empirical research about technology transfer held by Bennett et.al. in 2000.
Technology transfer can be broadly be categorized into horizontal technology transfer and vertical technology transfer (Brook 1984). Vertical technology transfer means the flow from basic research, applied research to development, commercialization and marketing for a particular technology (Rogers & Valente, 1991). Most research describes technology transfer as a horizontal flow. Horizontal technology transfer can be further divided into two groups: intra-national and international technology transfer (Perlmutter & Sagafi-nejad, 1981). The former one takes place between sectors or regions domestically. The latter one occurs across national boundaries.

In the stream of technology alliances, technology transfer is seen by Chinese government as a practical and strategic means to increase collaboration between developed countries and China. Mansfield (1975) emphasized that technology transfer needs to be conceived at different level. The first level is to distinguish vertical technology transfer (a given information flow from the basic to the production level) and horizontal technology transfer (when a technology used in one place, organization, or context is transferred and used in another place, organization and context (p.372)). Another distinction involves several phases of process of technology transfer. The first stage is called “material transfer” which refers to the transfer of a new material or a product to a country. The second phase equals to blueprint/designs transfer which facilitates the manufacturing process of the new product or material. The last phase which is much more difficult to achieve is called “capacity transfer” and involves adapting the items to the specific conditions of the recipient country. In line with these three phases, technology transfer can be categorized into direct form and indirect form. With regard to direct form, acquisition of factories on a turnkey basis is the normal mode. On the contrary, the indirect form of technology transfer involves licensing, co-production, joint ventures with majority/minority equity participation, and wholly or partly owned subsidiaries established through FDI. In China, the third phase of technology transfer “capacity transfer” is paid more attention and it is expected to help create indigenous technology base.

In the history of evolving theoretical views on the technology transfer, there existed 2 opposed schools: the Marxist dependency theorist and the conventional school of FDI. In the first stream, technology is dealt with in the context of capital accumulation and much of the technology transferred to developing economies was inappropriate. It emphasized weak bargaining position of developing nations when confronted with large MNEs and their inevitable political sub-judgition to the bourgeoisie of the capitalist countries (Lall and Streeten, 1997). On the contrary, from the other side, the researchers argued that inflows of investment and technology contributed to economic growth in developing host nations, and that the bargaining position of the recipient country would improve over time. Quinn (1969) presents that technology transfer through the entry of MNEs' fully integrated production facilities contributes to higher growth rates of productivity, to higher competitiveness levels and to higher living standards in the less developed host countries.

Although these two theories argued in contrary viewpoints, this dialectic confrontation was indeed put into end by a number of economists who are proponents of the neo-Schumpeterian tradition on technology transfer to developing countries. They investigate the relationship between technology transfer and technology process and result in the idea of “creative destruction” (Schumpeter, 1942, Part I, Chapter 7) and of the capitalist process as an evolutionary process whereby the emphasis is put on the strategic
role played by the acquisition of technology capability of the later-comer. The central view of this school can be summarized as the notions of technological mastery, technology capability (Bell & Pavitt, 1997) and “the domestic capacity to alter, modify and adapt the transplanted technology in a thousand different ways” (Rosenberg, 1982). Since the micro-domestic capacity is associated with macro national innovation system, it can be concluded that “Possibility for host country to absorb, use, adapt and improve the transferred technology depends largely upon a sort of assistant elements which reflect the concept of a national or local innovation system”.\footnote{As for the Chinese innovation system, please refer to Section 6.1.}

Even though technology transfer is defined clearly in the academic area, in practical Chinese context, its real meaning is mixed with technology trade (refers to the flow of technological products from one country to another and which is normally meant by technology export and import) and Chinese government did not give a fixed definition of technology transfer. In China, researchers simply equate technology transfer to imports of technology embodied in production facilities (such as complete plant) (Andreosso-o’callaghan and Qian, 1999) and the ambiguous definition of technology transfer and technology imports leads to the consequence that there is still no authorized statistics document in China to state clearly that what should be included under technology transfer. Although the joint venture is generally accepted as being the most widely used method (de Bruijn and Jia, 1993), no data can indicate that how much of joint venture can be considered as technology transfer per se in value terms.

**4.3 Chinese policy on technology transfer via FDI**

China, due to its development and size, has been considered as the strongest developing country in the world, in which the policy on the technology transfer plays an important role in developing Chinese technological capabilities. Since 1949 when the People’s Republic of China was established Chinese policy on technology transfer has undergone a number of changes (Battat, 1986). During the 1950s and early 1960s, the technology was supplied by USSR (Union of Soviet Socialist Republics) in the form of turnkey project investment. The investment was mainly in the heavy industries such as steel, machinery and vehicle manufacture. After that, as the political relationship with former Soviet Union broke up, Japan and West Europe became the major tech. exporters for China in 1960s but the amount is dramatically limited. Until the late 1970s the bulk of technology imports were still in the form of complete sets of equipment or turnkey plants (Shi, 1998). The investments were mainly in the petrochemical, steel, electricity generation equipment and mining machinery industries.

Since 1978 when Third Plenary Session of the 11\textsuperscript{th} Congress of Communist Party was operated, China firms accepted the transferred technology through FDI. Generally speaking, China’s policies toward FDI roughly underwent four stages: gradual and limited opening, active promoting through preferential treatment, promoting FDI in accordance with domestic industrial objectives and attracting FDI by accessing WTO.

The first stage lasts almost 8 years from 1978 to 1985, where government policies about FDI are characterized by setting new regulations to permit joint ventures by using foreign capital and setting up
Special Economic Zones (SEZs) and “Open Cities”. Four SEZs were built up in Shenzhen, Zhuhai, Shantou, and Xiamen. With a series of revise work about *The Law of the People’s Republic of China on Joint Ventures using Chinese and Foreign Investment* in July 1979, December 1982 by National People’s Congresses, more domestic market was liberalized and business environment was clarified in the further way. Until the year of 1985, SEZs was extended to another fourteen coastal cities and 12 of them were titled Technology Promotion Zones to expedite the technology transfer. Besides that, in 1985 Chinese government opened up six “Development Triangles” (including the Yangtze River Delta, The Pearl River Delta in Guangdong, and the Min Nan Region in Fujian, Liaodong Peninsular, Shandong Peninsular, and the Bohai Sea Coastal Region) to foreign investment for in-depth cooperation. During this stage, the “Four Modernizations” program which emphasizes on the transfer of technology from more developed economies was announced to encourage Sino-Foreign cooperation in encompassing Science, Technology, Agriculture, Defense and Industry.

The second stage starts from the year of 1986. Chinese State Council promulgated the *Provisions of the State Council of the People’s Republic of China for the Encouragement of Foreign Investment* characterized of a series favorable regulations and provisions for attracting FDI inflows. In accordance to it, Chinese government provided with preferential tax treatment, the freedom to import inputs (like materials and equipment), the right to retain and swap foreign exchange with each other, and simpler licensing procedures for those who establish export-oriented joint ventures or transfer advanced technologies. More favorably, privileged access to suppliers of water, electricity and transportation are also provided in terms of paying the same or lower price as/than Chinese state-owned firms and have right to apply for interest-free RMB loans. The significance of this stage of policy is that Chinese government began to provide incentives for FDI instead of merely permitted it. It encourages foreign investment to stick to the area which is export-oriented or advanced-technology oriented. Thanks to Chinese government’s proactive policies on FDI, the inflow of foreign capital was increasing rapidly in the late of 1980s and particularly till the mid of 1990s when Chinese government policies began to focus more on promoting domestic industries by FDI, which was also the sign of the third stage originating (on November 3, 1994 the Chinese State Administration for Industry and Commerce and Ministry for Foreign Trade and Economic Co-operation issued a *Circular on Issues relating to Strengthening the Examination and Approval of Foreign-Funded Enterprises*).

In the third stage, Chinese government policies gave favorable benefits to those who can transfer technology to the industry such as agriculture, energy, transportation, telecommunications, basic raw materials and high-technology industries and projects which can take advantage of the richest natural resources and relatively low labor costs in the central and NorthWestern regions. Additionally, Chinese government firstly clearly stipulated the basis of examination and approval of FDI projects by categorizing them into four classes: encouraged, restricted, prohibited and permitted (see table 4.3)
Table 4.3 the encouraged, restricted, prohibited and permitted FDI projects in China

| Encouraged Projects | • Infrastructure or underdeveloped agriculture;  
|                     | • New/advanced technologies that can upgrade product function, save energy, improve economic efficiency, or prevent/control pollution;  
<table>
<thead>
<tr>
<th></th>
<th>• Export oriented</th>
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| Restrict Projects   | • Technology has been developed or transferred;  
|                     | • Production has exceeded domestic demand;  
|                     | • Under experiment or monopolized by the State;  
|                     | • In the exploration of rare and mineral resources. |
| Prohibited Projects | • Jeopardize national security or public interests;  
|                     | • Damage environment, natural resources or human health;  
|                     | • Use sizeable amounts of arable land;  
|                     | • Technologies unique to China |
| Permitted Projects  | Those which are not in any of the above groups |

With the China's entering into World Trade Organization (WTO) in December 2001, Chinese government policies toward FDI stepped into the fourth stage. In this stage, China accession to WTO on the one hand provides more incentives for more exported-oriented FDI because quota and restrictive measures against China's export are eliminated or reduced and trade dispute can be dissolved under WTO's trade dispute settlement mechanisms; and on the other hand it opens up the industries which have great market potential but were originally dominated by relatively inefficient state-owned enterprises such as telecommunication, banking, and insurance. Different from the cases in which China was not WTO member, since 2002 foreign firms embrace the right to import and export directly without going through a Chinese state-owned trading firm as a middleman. The tariff in different industries was reduced or eliminated by according to the WTO regulation (China reduced its industrial tariffs to an average rate of 9.4% and tariff on products such as computers, semiconductors and all internet-related equipments to zero by the end of 2005). It can be concluded that Chinese accession to the WTO boost investor's confidence in the Chinese economy and the Chinese market and thus will induce more direct investment in China (Fung, Lau and Lee, 2002)

4.4 The growing role of foreign investment

Foreign investment to China is very important to help China open up to the outside world and actually it is one of the great practices of building up socialist economy of Chinese characteristics, according to Chinese communist party's policy. The Law of the People's Republic of China on Chinese-Foreign Equity Joint Ventures was promulgated by the National People's Congress in 1979, then the work of utilizing foreign capital was considered as an important content of opening up to the outside world.
initiated as China’s fundamental principle. After thirty years of great efforts, the scale of absorbing foreign capital increasingly expands as well as the level was increasingly upgraded when China’s law and managerial system on foreign investment is gradually implemented. The achievements won the whole world’s attention, which effectively promoted the continuous, fast and healthy development of national economy. In the progress of foreign investment within these thirty years, the amount of foreign R&D investment increased overtime and as many as 750 foreign invested R&D centers have been operating in China Mainland by 2005 with this number significantly fast growing (China Daily (2005)). The rapid growths of foreign investment and foreign R&D investment in China give the world an implication that the foreign investment plays an important role in China’s growth.

4.4.1 The basic means of China’s absorption of foreign investments

As mentioned before, foreign investment is a significant element to promote China technology improvement and economy growth. In the Chinese context, many basic means of foreign investment constitute the modes of Sino-Foreign cooperation. Technically, the foreign investments are basically divided into direct investment and other means of investment. The direct investment, which is widely adopted in China, includes Sino-Foreign joint ventures, joint exploitation, exclusively foreign-owned enterprises, foreign-funded share-holding companies and joint development. The other means of investment includes compensation trade and processing and assembling. In the following section, we will briefly introduce the sub-actors of foreign direct investment in China to help the readers have a general picture about FDI to China.

(1) Sino-Foreign joint ventures

Sino-Foreign joint ventures are also named as share-holding corporations. They are formed in China with joint capitals by foreign companies, enterprises, other economic organizations and individuals with Chinese companies, enterprises, other economic organizations and individuals. The main feature of this joint venture is that the joint parties invest together, operate together, take risk together according to the ratio of their capitals and take responsibility of losses and profits. The capitals from different parties are translated into the ratios of capitals, and in general as stipulated by law the capital from foreign party should not be lower than 25%\(^2\). Statistically, the Sino-Foreign joint ventures are the first form of Chinese side to absorb foreign direct investment and they account for the biggest part of all the modes.

(2) Cooperative businesses

Cooperative business has another name of contractual cooperation businesses. They are formed in China with joint capitals or terms of cooperation by foreign companies, enterprises, other economic organizations and individuals with Chinese companies, enterprises, other economic organizations and individuals. The rights and obligations of different parties are embedded in the contract. To establish a cooperative business, the foreign party, supplies all or most of the capital while Chinese party supplies

\(^2\) This figure does not apply for financial industry. According the Chinese policy, foreign banks are not permitted to have more than 25% of share of stock in the joint financial project/venture.
land, factory buildings, and useful facilities, and also supply a certain amount of capital, too. This mechanism has been becoming widely used by Chinese research institutes, by which it provides the least risk associated to large flexibility and more opportunities to exchange technologies.

(3) Exclusively foreign-owned enterprises

Exclusively foreign-owned enterprises, which are totally invested in China by foreign companies, enterprises, other economic organizations and individuals in accordance with local laws, is also named foreign wholly-owned entities. According to Lu, (2001) who studies on Chinese Investment Law for Foreign Merchants, the establishment of foreign enterprises should benefit the development of Chinese national economy but in order to invest in this mode in China, it has to firstly agree with at least one of the two following criteria: the enterprises must adopt international advanced technology and facility; all or most of the products must be export-oriented. Normally, due to Chinese unsound law implementation, the foreign funded enterprises often take the form of limited liability on the basis of requirement for export-oriented.

(4) Joint exploitation

Joint exploitation is the abbreviation of maritime and overland oil joint exploitation. It is a widely adopted measure of economic cooperation in the international natural resources field. The striking features are high risk, high investment and high reward. The joint development is often divided into three steps: exploitation, development and production. Compared with the other three means mentioned above, joint exploitation accounts for a small ratio.

(5) Foreign-funded share-holding companies

Foreign companies, enterprises, other economic organizations and individuals can form foreign funded share-holding companies in China with Chinese companies, enterprises, and other economic organizations. The total capital of the share-holding company is formed by equal shares. Share holders will take due responsibilities for the company according to the shares purchased; company will take responsibilities for all its debts through all its assets and the Chinese and foreign shareholders will hold the shares of the company. Among them, the shares purchased and held by foreign investors account for more than 25% of the total registered capital of the company. Limited company can be founded either by means of starting-up, and the limited liability company invested by the foreigners can also apply to share-holding companies. The qualified enterprises can also apply to issue A & B share and list abroad.

(6) New types of foreign investment

While expanding areas and opening-up domestic market, China is also exploring and expanding actively its new types of foreign investment such as Build-Operate-Transfer (BOT), Investment Company etc. 24

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24 Build-Operate-Transfer (BOT) is a form of project financing, where a private entity receives a franchise from the private or public sector to finance, design, construct, and operate a facility for a specified period, after which
Since multinational merger and acquisition has become the major type of international direct investment, Chinese government is now researching and enacting related policies so as to facilitate the foreigners to invest in China by means of merger and acquisition.

4.4.2 The growing role of foreign direct investment

Since foreign direct investment (FDI) accounts for the major means of foreign investment in China, the research on its impact appears more significant either for Chinese side or strategy design of foreign companies' investment in China.

The significance of foreign direct investment for China can be reflected by FDI's "packaged" characteristic. Since such investment supplies the provision of capital with technical know-how, equipment, management, marketing and other skills which are able to be transferred in the form of package, this investment-related transfer of technology has grown dramatically in the complex, high technology industries both in the advanced industrial countries and developing countries (Lall, 1993).

As for China, the resurgence of the importance of FDI may be traced to several factors, which can also reflect the impact of FDI on the Chinese growing economies. Firstly, the share of world innovation, production and trade accounted for by transnational firms has grown steadily, which forced such industrializing countries as China to establish close contacts with them. This could be evident by Chinese "structure adjustment", which emphasizes market forces, fuller integration into the world economy and absorbing the upgrading technologies as well as skills in the manufacturing industry. Secondly, investment flows provided by transnational firms may provide China with the necessary technologies, skills and access to international market in the quickly and effectively manner. With growing constriction in commercial lending and aid flows to developing countries, financial component of investment flows is of considerable importance, by which China could also respond as the second investor to other less developing countries. Third, viewed from Chinese firms, FDI is a powerful and important mode of technology transfer. Chinese firms' technology capability can be technically developed in the environment of policy regime on trade and industry, of investment in skills, information flows, infrastructure and supporting institutions. Even though there are several steps between the import of technology and the development of local capability, the process of FDI is able to provide Chinese firms with a short-cut way to the advanced technology and force them to build new organizational & technical skills, to enhance its ability to generate and tap information, to develop an appropriate specialization vis-à-vis other firms and strike up the favorable relationship with suppliers, buyers and institutions. Finally, due to the widespread externalities in the creation of skills and technologies, as the Chinese firms' technology capability exploding, the social benefits of enterprise efforts to develop capability may far exceed the individual benefit to the firms themselves.
4.5 Technology transfer modes and mode choice

There exist a large number of modes of technology transfer according to the intensity, duration and nature of the relationships between the suppliers and buyers of the technology. Alternative channels include informal learning, licensing, FDI, strategic alliance, co-development and so on. Usually, within so diversified choices of technology transferring mode, the important issue is the relative superiority of licensing vs. FDI. In the early days of industrialization, one-site instruction from the buyers in OEM export contract was the important mode. Other than this, the main form of technology transfer was imports of licensed technology (OECD, 1996, p.91, 149, 184). Up to a certain point in the development of local companies’ technology capability which is due to the mature technology in the form of licenses from leading companies, licensing becomes difficult or expensive and Chinese firms confronted two choices on a new channel of technology absorption. One source is to establish more close and long term collaboration or integration with the foreign firms via FDI or subcontract in stabilizing the source and flow of new technology. The other channel is to gain assistant from some small technology specialists or R&D companies who are able to shoulder the responsibility for transferring knowledge when big foreign companies refuse to do so. As for the local Chinese firms which have collaborated with foreign enterprises and shared its ownership and management, according to our interview, they have clearly perceived that foreign developed firms were reluctant to transfer advanced technologies to them. Chinese case of digital telephone switch development suggests that FDI or JV can rather be a source of new knowledge for the local indigenous firms and local R&D units that try to absorb new knowledge. However, it should be noted that successful indigenous R&D did occur not at the JV itself but other local firms and people who purposely absorbed knowledge from JVs through mobility of engineers and scientists, on-site observation and learning, and even participation at the adaptation process of foreign-made products in China (Mu and Lee, 2005). Thus, before we put effort on explaining Chinese transfer mode categories, it is necessary to notice that (1) FDI in the form of JVs in locality offers Chinese indigenous companies with a window to learn and imitate; and (2) having additional technology transfer modes backup is rather important for Chinese local companies to catch up.

In this part to discuss about modes of technology transfer in China, we exclude such modes (which account for minor part) as migration of skilled personnel, publications, symposia, visits etc. in the purpose to keep this research more focused and corresponded. Only two categories will be emphasized: internalized and externalized forms of technology transfer.

**Internalized forms** refer to the investment associated technology transfer where control resides with the foreign partner (associated with majority or full equity ownership) (Lall, 1993). **Externalized forms** refer to all other forms, primarily licensing, international subcontracting, and joint ventures of foreign firms and local ventures (Lall, 1993), which differ from the forms of FDI mentioned in part 4.4.1, refer to as non-FDI forms of technology transfer. In general, internalized technology flows is a very efficient means of transferring a package of capital, skills, technology, brand names and market access to developing countries. And externalized mode is much more efficient if the technology is more standardized, diffused and buyers are more capable. In China, by 2006, externalized forms have covered 89% of technology transfer where joint venture dominant up to 58% and licensing and subcontracting relationship account
for 31% (China Annual Report on National High-Tech Industry Zone, 2006), which reflects that externalized forms are much widely applied than internalized forms in China.

Tracing the root causes by which Chinese side choose the technology transfer mode, four sets of factors are there for consideration: the nature of the technology, the strategy of the seller, the capability of the buyers and the host government policies.

(1) as for the nature of technology, the choice of mode is related to the inherent complexity of the technology, its speed of change, its novelty, the degree of centralization of R&D and whether the technology is product or process based. Normally, the higher degree of complexity, the greater need for continuous personal interaction between transferor and transferee, the faster speed of change, the newer and more valuable technology transferred, and the more centralized the R&D on which it is based, the more possibility of technology transfer will not go to externalized forms. This might be partly determined by the issue of technology leakage viewed from transferor perspective while on the other hand might be derived from the worries of technology transferor that immature hard- and soft-ware environment in China is possible to negatively impact the development of advanced technology. Generally, there is an implicit disciplinarian in the mode choice: process technology is more readily transferable in externalized forms due to its less developed skills demanding and necessary cooperation with local companies; while product technologies are much more of internalized forms since high-level of technical and management skills from local partner are required to be available.

(2) The second factor refers to the seller’s strategy which is normally determined by five sub-factors: a) size of firm: larger foreign firms would like to prefer internalized modes for their valuable technologies and be capable handling transnational operations. b) Product concentration: More diversified firms are more willing to externalize non-core technologies. c) Dependence on proprietary brand names: firms which embrace higher valued brand names call for more internalization. d) The firms’ experience of technology transfer: the firms which are less exposure to international operations prefer more externalization. e) The transferor’s home country culture: countries that are new entrants to the new investment scene have tended to have externalized mode.

(3) Buyer’s capability plays a mixture effect on the choice of the mode. In China, there is a very interesting occasion that local companies whose technology capability is sufficiently high (i.e. Haier and Huawei) have experienced both being transferred technology from foreign firms and transferring technology in return to other developing countries. This evolution provides an evidence that mode choice is somewhat determined by the capability of buyers. Technology suppliers feel less need to exert internalized transfer but carry out externalized transfer toward local companies whose capability is sufficiently high because of demand in high effectiveness on R&D cooperation, shared cost and possibility to localize the technology. On the other hand, since a more capable buyer poses a greater potential threat to the supplier, especially if it is oriented to world markets, technology transferors prefer internalization or sale at very high prices and with many conditions attached. The outcome is usually settled by a bargaining process and is affected by the skills, knowledge and assets that are mastered by both parties. Moreover, in a
broad way, buyer's capability encapsulates home countries' hardware provision. Viewing the development of 54 Chinese National high-tech zones, it is clear that medium to high technology investment increasingly concentrate in locations that are already industrialized, with good infrastructure and a base of technological capabilities (such as Beijing Zhongguan zone etc.); while lower technology investment goes to less industrialized areas, but even concentrate on locations with relatively high levels of human capital and infrastructure (such as Xi'an high-tech zone etc.).

(4) Host country policy is an additional factor affecting the choice of mode. Since China is out of scope of requirements of free market, government policy functions specially as adjusting FDI activities in the developing country. Honestly, besides what has been mentioned in part 4.3 that Chinese government encourage advanced technology import or transfer, Chinese policy has been to increase externalized technology transfer in order to boost local capability development, meanwhile still confine internalized technology transfer to high tech or export oriented activities, which is because of associated capital flows and the commitment entailed.

4.6 The mechanisms of technology transfer

One important objective for Chinese firm to conduct technological collaboration in the mode of alliances, merger, acquisition or purchasing is derived from the intention to transfer technology. At some places, technology transfer is also named knowledge transfer in which the knowledge supplier can play either active or passive role.

Based on Kim (1997, p.101)
Here, we refer to the mechanism of knowledge transfer proposed by Kim (1997) as the mechanism base to explain technology transfer in the Chinese context, which is not only because all the four quarters in this matrix were still consistent to the reality in China but more importantly it can reflect the position of foreign flagships and responses of Chinese indigenous company.

Different from the situation of other countries, in China, the external knowledge is mainly transferred by the expenses of market trading. Market, in China, acts both the mediated role and the catalyzer to promote the collaboration more closely. Big size of Chinese domestic market and some dose of government policies keep this international collaboration game going in the active or passive way from time to time.

First, formal mechanisms in quadrant 1 of figure 4.6 of transferring knowledge to local recipient does possibly happen when the local recipients are subsidiaries or joint venture partners. It can be referred as mechanism from such flagships as Intel, Motorola, Texas Instruments, and Fairchild which tend to outsource assembly operations of their semiconductor devices and took technical consultancies and turnkey plants to establish their subsidiaries in China. They insisted on majority ownership of the subsidiaries to license and transfer a complete production system in the active manner.

Second, sometimes, flagships may execute the passive behavior when independent local companies have order to buy the machinery. Despite flagships are not necessarily the suppliers of the machinery, they can still play an important and indirect role to improve the indigenous firms' production capabilities by pushing them to purchase more sophisticated equipment, because machinery is a major source of process innovation for their users (Abernathy and Townsend, 1975). For instance, Dalian Engine Co. Ltd. improves its own production capabilities by purchasing diesel engines production lines (although the product is branded in Deutz) from Germany Deutz AG., and produces and sells them in the global market.

Third, flagships actively transfer knowledge in the form of blue prints, technical specifications, and technical assistance, mostly free of charge, to independent local customers to ensure that products and services produced from the local enterprises meet the flagships' technical specifications. This is a more direct way for flagships to transfer knowledge to independent local firms (always in the role of customers) in an informal mechanism in quadrant 3. In order to make customers at best to take advantage of machine to produce chips, for instance, ASML, a Dutch electronic chip-making machinery company selling high-tech equipments to Chinese clients, establishes customer- closed geographically supporting offices (in Beijing, Wuxi, Tianjin and soon in Dalian) to give specific customer service and technical assistance.

Fourth, technology/knowledge can also be transferred in an "unconscious" way. Some channels such as human mobility, academic session, or observation tour can help independent local companies to acquire new knowledge and make innovation through reverse engineering. In China, for instance local governments frequently organize their local companies to have observation tour of foreign firms. Human mobility quite happens between foreign companies and state-owned enterprises. In the quadrant 4 Chinese local companies obtained benefits not only from the repatriation of top-rated engineers trained abroad but also from the actively using experienced foreign engineers who are hired for short periods as so-called "moonlighters".
In Chinese context, MNCs relied heavily on the mechanisms of quadrant 1, setting up their plants either for the penetration of markets or for exploiting differential factor costs. However, knowledge is also transferred through mechanisms of quadrant 2, 3 and 4 in both the active and passive manner. Not surprisingly, these transfers have stealthily granted local companies many channels to improve technological capabilities and help them to get stronger to threaten the position of MNCs in the Chinese market.

4.7 Characteristic/trend of strategic technology transfer in China

As what we have discussed before, technology transfer is embedded in various modes and determined both by recipients and suppliers. As Chinese market becomes more mature and Chinese firms’ technology capability develops by learning, there have been presenting a characteristic of transferring technology within the international cooperation. In the following part, this will be interpreted firstly from foreign side and then discussed from the Chinese side’s point of view as well.

From the multinational’s point of view, strategic partnering with Chinese indigenous firms is characteristic by Matthew Effect. “Good becomes better, and bad becomes worse!” In another word, Chinese companies which have already good reputation and record in the cooperation with multinational companies are able to attract more cooperation agreements with other notable international enterprises; on the contrary, companies which hold low credits in international cooperation deserve fewer opportunities to grow up. With regard to the Matthew Effect, our respondents in the interview also provide their opinions in Chinese context, a good starting performance in cooperating with foreign parts can probably guarantee the 50% of the success and one who is able to take advantage of first chance to carry out international cooperation is actually having possibility to be competitive than other domestic rivals.

Seeing from the Chinese local companies’ perspective, foreign companies’ behaviour to transfer technology in terms of foreign part majority-equity enterprise is the second trend. According to China Bureau of Statistics (2006), by 2005 76.1% of foreign investment in China was organized in the mode of foreign wholly-owned and foreign controlled enterprise. Thereof, the foreign controlled enterprises accounts for 52.6% and foreign wholly-owned enterprises covered 23.5%, where the high-tech companies such as IBM, Microsoft, Nokia, Compaq etc. invested their R&D laboratory in China in the mode of wholly-owned enterprise.

The third characteristic/trend of technology transferring from multinationals to Chinese side is the imbalanced position between transferors and transferees in the process of technology transfer, which is also the basis of Sino-Foreign cooperation shows up the second trait. Technically, it can be argued that this trend is coming from MNCs’ intention to avoid releasing core technology and China’s unsound protection of IP system. It is interpreted that in any progress of technology transferring, the equal position is hardly posted because comparing with Chinese side whose technology capability is much weaker than their foreign partners, transferors possess more advantaged bargaining power to decide what is going to be transferred and in which mode to transfer out. To prevent the current partner from being the future competitor, most of multinationals usually pick up the less advanced technology to be applied in Chinese context. Of course, it has to be acknowledged that some of them source from the fact that technology
transferors are suffering the illegal copyright in China. Indeed, the extent to which the appropriated technology is unintentional diffused or fast copied is largely decided by the extent to which local IP law can protect and the easiness of their technology to be copied. Many multinationals experience the same issue that once their products in which the core technology is embedded are released to Chinese market, they will soon see the similar products come out to the market produced by certain Chinese domestic companies. For instance, DSM which invented a very high-tech material Dineema was very soon rebranded in China by a Wenzhou firm through illegal copy as Chineema as soon as DSM promoted their products into China. It makes many companies fear to introduce their advanced technology in China since Chinese unsound IP law implementation. Therefore, in order to maintain their technology leadership position without suffering illegally economic loss in Chinese context, MNCs learn to minimize the technology unintentional diffusion and generally apply two ways: one is to maintain their basic R&D in home countries while transferring less advanced applied technology into market country (This is consistent with what we got from interviewing IBM CDL where the IT architecture part (the core technology in IT solution) is not involved and indeed belonged to IBM lab in US); the other is to establish wholly-owned or foreign controlled enterprise as the mode in the progress of international technology alliances.

The fourth trend appears in terms of transferring mode. Generally speaking, strategic alliances become the major mode for Sino-Foreign technological cooperation. Actually in China a technology alliances network has been established which involves Chinese local companies and Chinese universities or research institutes. For example, joint R&D occurred in the technology alliances between China Kongka and Lucent Technology for developing cell-phone; Britain Group Lotus allied with China TCL information Group for exploiting China Internet business; as well as TsingHua University China allied with many MNCs to joint establish 3 research institutes, 4 international laboratories and 12 training centers. In agreeing to the technological allying with foreign companies, China Bureau of Technology and Science addressed two requirements for Chinese local entities if they conduct technological cooperation with foreign part: one is to expand scope of technology alliances into various industries; the other is trying to improving technology research level, from local applicable research gradually transferring to global basic research for mother companies (Zhang Jingan (secretary-general of China Bureau of Technology and Science), Second International R&D Forum, Beijing China, 2004).

Finally, the evolutionary trend of technology transfer to Chinese side is characterized by the function transition of MNC’s affiliates, which is embedded in the multinationals’ globalization process. As Malnight (1995) addressed in his globalization research, firms which carry out globalization strategy must involves a complex building process both within and across functions, the process involves moving from primarily leveraging domestic capabilities (appendage stage), to performing an increasing array of tasks within affiliates to expand local activities (participation stage), to upgrading affiliate capabilities to respond to global competitive challenges (contribution stage), to integrating domestic and international operations in a single global network structure (integration stage). In the investigation of foreign R&D laboratories in China, we found that most of MNCs such as Sweden-affiliated companies established in China including Ericsson (China) and ABB (China) experienced such a process from primarily marketing and distribution at the initial stage to assembling products in participation stage to doing local R&D and
eventually to doing business plan or strategy design in the integration stage for local market. R&D centers built at local market are to nurture the future market and improve additional competitive advantage. As for MNC itself, function has to experience the transition from participation stage toward contribution stage if considering the process based on Malnight (1995). As for the MNC affiliate built in China, its function underwent such a process stepping from the stages of solo doing marketing & distribution in China, to establishing manufacture JVs, towards local design and R&D and finally eventually to the functional separated with headquarter and design local strategies (See figure 4.7).

4.8 Organizational learning through technology alliances in China

Obtaining the opportunity to learn from partners is the most significant advantage of alliances for participated partners. In order to get well known about Chinese firms’ learning strategy through strategic technical alliances, in this part the issues such as the main characteristics of Chinese firms which import technology, the strategy by which Chinese firms carry out for learning, and the problems existed in this process are going to be discussed.

*Chinese firms that import technology*

Importing technology from overseas through technology alliances remains the primary mechanism for Chinese side to improve technology capability. As discussed in section 4.1, the technology import has been indeed promoted since China conducted the economic reform in 1978. In the afterwards years, especially after 1985, Chinese industries enlarged the technology import scope with average size of each project decreasing dramatically. It is particularly because of Chinese government encouragement in importing technology from abroad in 1985. Chinese technology importers are divided into two groups in which one group is constituted by small sized companies which emphasize the technology transfer through purchasing equipment, technical support & service and focuses more on market value and immediate market profit than an advanced level of technology; on the contrary the other group is composed by large enterprises that pay more attention on the technical know-how transfer and receive
benefits from technical strength and potential software-based cooperative partners. In spite that transferring technology know-how is more advanced and developed, the technology transfer through hardware purchasing especially by licensing is still accounting for the large part in Chinese context. In many cases, it is considered not having positive influence on the improvement of Chinese industrial technology capability in that less can be learned by Chinese part from the mature technology.

Strategies for learning

Learning through alliances needs suitable strategies, especially for latecomer countries. Looking at successful catching-up of Japan and Korea, it can be seen that Japan underwent a process from technology follower to technology leader currently and Korea is now very successful in its innovative imitation. Therefore, with respect to latecomers which are going to catch up with the developed countries an appropriate learning path must be categorized into a progress from acquisition to self-innovation. Actually in China only a small part of stated-owned firms such as China Aeronautic Group that dedicate to design satellite or Space Station is absolutely posited as the technology leadership worldwide; most of the others in various industries Chinese firms still have to devote more effort in learning via technology alliances.

Generally, in order to keep line with the relatively advanced technologies, Chinese firms are using three types of strategies based on their different knowledge bases. As for the small firms which have weak technology background or the transferred technology does not need complicated skills, they apply the so-called “principle of bring in” (Chinese proverb “拿来的主义 – na lai zhu yi”) which in Chinese means that firm does not need to make any alternative changes for acquired technology but only use it in the original way (because of little technology base available for further development). In another case where Chinese firms is able to absorb transferred technology based on their proper knowledge basis, Chinese firms will attempt to design new product model by replicated imitation and reverse engineering. This is the simple imitative learning but here knowledge base can be enlarged by comparing to the first case. Finally, if Chinese firms’ learning capability is raised to a relatively high level and Chinese firms possess capable R&D teams to conduct innovative design, new products with different function values might be created to compete with those from multinationals. Therefore some large Chinese firms may step into the final stage to charge leading strategy. See figure 4.8
As other international giant companies, focal Chinese firms also need to develop core competence to improve their competitive advantage, which was also proposed by Chinese government and China Bureau of Technology and Science at the beginning of Chinese economy reform. Overtime, the consensus has been done that competence development can be as the progressing result of organizational learning. Based on the knowledge-based view of point, it is known that tacit knowledge which is implicit in everyday’s routine operations is much more important and more difficult to learn or imitate than codified knowledge that may be explicit in the patents or copyrights of a firm.

In the current competitive environment where knowledge is considered as the pivotal resource, strategic technology alliances show specific function to generate a good junction of firms’ internal and external capability, by which existing external knowledge might be acquired whereas new knowledge within the firm can be created as well. However, in order to touch this ground, partnering with external organizations requires four conditions: the availability of desired knowledge in the alliance partners and the possibilities to access to the partner’s knowledge; experience of alliances and proper knowledge base overlapped with partners. Within these four elements, what the Chinese side lacks is the sufficient alliance experience and proper knowledge base which do indeed restrict the Chinese side’s capability to judge desired knowledge and lessen their possibility to access to the partner’s knowledge. These four factors are correlated each other and together determine the eventual success of inter-firm cooperation. As for alliances novice such as most of Chinese companies firms which have seldom cooperated with foreign partners, alliances experience can be accumulated through international cooperation. But whether codified and tacit knowledge can be learned via alliances in the present alliance operations or can be internalized...
to enhance firm’s strategy and business operation is dramatically determined by the extent to which Chinese side’s knowledge base overlaps with that of their partners. In order to value the external knowledge, Chinese firms are specially required to possess adequate degree of absorptive capability. According to our investigation, Chinese part is frequently complained by their foreign partners due to limited absorptive capabilities and it is clear that less prior knowledge to overlap with foreign partners’ is the main reason. Therefore, we suggest that in the Sino-Foreign alliances, necessary self-evaluation and third party evaluation on the firms’ knowledge base is required since it can push Chinese part to fill up the knowledge gap immediately and more importantly help them judge whether they have sufficient capability to shoulder alliances challenge.
5. The effect of technology alliances on the Chinese firms

5.1 The general effect of technology alliances on the Innovation

Over many decades, the governance modes of technology cooperation evolved dramatically. Although alliances have much shorter history than merger and acquisition, it has received much attention from both academic area and pragmatic industry, which is not only because of its effect of easy entering into new market, effectiveness in achieving scale and scope of economies but also because its flexibility is able to increase the positive effect on the innovative performance of companies involved. Since the innovation has been considered as the most powerful forces of twentieth-century growth (Franko, 1989), it is necessary to study the effect of this governance mechanisms on the innovative performance of company (Vanhaverbeke, Duysters and Noorderhaven, 2002), especially for the emerging economies such as China.

During the technology alliances, knowledge transfer is the noticeable progress to produce cooperative output. Companies including Chinese enterprises actively taking part in technology alliances are result from the fact that this governance is able to stimulate innovations. According to Bresman et. al (1999), alliances can be used to solve problems related to *tacit knowledge transmission*. Besides that, larger R&D projects which needs large amount of budget from partners can be tackled than each individual firm that could have done, which is able to lead to *more advanced technologies being developed* with spread innovation risk. By doing alliances, the combined partners’ specific strengths can develop new technologies or products as well as produce a significant reduction in lead time that each partner on its own would not have been able to create (Gerpot, 1995). Furthermore, another alliances’ specific characteristic that promotes its effectiveness in innovation and other governance modes do not possess is its *radar function* which enables firms to scan their environment for promising new technologies at low cost instead of fully committing to all the opportunities. In such a way, only most promising technologies might be brought into application and less promising ones can be abandoned. This characteristic of technology alliances is much similar to the principle of Blue Ocean Strategy where companies are suggested to minimize the products’ or service’s features which are less valued to the current or future market but maximize those that can raise or create value to the market. Therefore, limited resources are allocated in the optimized way and generate the maximum of profit. Next, *cherry picking* or precision targeting (aiming at a very specific piece of knowledge) of alliances is able to make partners avoid indigestibility which M&A might induce.

Of course, negative effect might also be generated by technology alliances because of *differences in corporate culture, processes and knowledge base* (Lane and Lubatkin, 1998) and *competitive positions between partners*. This is also quite happened in the alliances between the Western and Chinese companies where the strong part is fear to help its current partners (that might be its future competitors) to develop the new technology. Duysters (1996) presents the root cause that these firms do not participate in the cooperation for mutual benefits but have the incentive to absorb the other partner’s knowledge, skills and other assets.
The previous studies on the effect of strategic technology alliances basically measure whether companies entering into technology alliances exhibit higher share prices, margins, return on investment, survival rates or growth (De Man and Duysters, 2003). As for the impact of collaboration on the innovation, Anand and Khanna (2000) maintain that firms with more alliance experience or firms that have more alliance management tools in place clearly outperform firms without a well-developed capability to manage alliances. Additionally, Mowery, Oxley and Silverman (1996) present that alliances of which the partners have an overlapping or similar knowledge base outperform alliances in which companies have no similar knowledge background. Some articles which address the effect of alliances conclude that (1) intensive forms of alliances have a positive impact on innovation whereas looser forms of collaboration like licensing have a neutral impact (Anand and Khanna, 2000), which can be explained that the knowledge transfer can be accelerated as a result of close collaboration between organizations; (2) alliances are not effective for developing core competences in the short run (Duysters and Hagedoorn, 2000) and sub-optimal network strategy can diminish firm innovation. It is also found that organizations with a large internal knowledge base and a small alliance network or a small internal knowledge base with a large network have higher rates of innovation than firms pursuing other strategies (De Man and Duysters, 2003).

In summary, the effect of strategic technology alliances on the innovation is concluded in the figure 5.1.1., from which we can see that the positive effect of strategic technology alliances on the innovativeness is based on the conditions where 1) companies must embrace well-developed capability to manage alliance and more alliance experiences as well as ability to integrate network with knowledge basis; 2) partners should have overlapping or similar knowledge background or their knowledge basis has to overlap to an optimal degree; 3) their collaboration is better to be intensive. Only under these prerequisites could there be the possibility for companies to take advantage of cherry picking, radar function, shared common objectives and commitment etc to achieve innovativeness.
5.2 Domestic technology capability

The domestic technology capability can be regarded as the root cause leading to different performance of using the same transferred technology in differing countries. Lall (1996) maintains that although there are several steps between the transfer of a technology (in the sense of providing the equipment, instructions and blueprints) and its effective mastery (absorption, deployment and subsequent upgrading), the same technology is often found to be used at widely differing levels of efficiency in different developing countries. Technology capability involves many elements, of which the initial one is the absorptive skills which is the basis for technology acquirers in the technology alliances to see whether they have the ability to learn, replicate the technology they obtained from the exchange. Practically, the technology capability can be classified into three levels: well developed, developing and under developed. The extent to which it can be achieved largely depends on the companies’ technology vision and leadership, technology management, technology infrastructure, technology support, technology/system training, data
management and use of data (see appendix 3). In order to judge the Chinese firms’ average level of technology capability, we distributed the Chinese version of appendix 3 to our interviewees before the formal interview and let our interviewees self-judge which level their entities’ technology capabilities are. The result shows that 70% of involved companies stay at the “developing” level and specifically 80% of them noticed that technology management is the difficult part to handle since they lack well-trained managerial people in the technology area. They express that if comparing with their foreign partners, they are much more laggard in the technology and knowledge basis.

Level of technology capability is positively associated with the level of self-owned techniques and the knowledge base. It is said that the higher level of technology capability can induce high level of self-owned techniques of a firm. Based on our investigation, Chinese firms embrace low level of self-owned technologies due to their limited technology capability. This directly leads to the fact that most of technology alliances between Chinese side and foreign side are hard to move to Block 1 and Block 4 (see figure 5.2.1). This is corresponded with our investigation result that 60% of involved companies cooperated with their foreign partners in the joint-production. It can be seen that if technology acquirers possess a high level of self-owned technologies which indicates that they have sufficient knowledge base and technology capability to conduct the technology transfer, no matter which level of shared-used technology is, knowledge transferring would be tended to tacit knowledge (Block 1 and Block 4); however, on the contrary, low level of technology capability desires technology acquirers to apply mature or hardware technologies that are more equal to the explicit knowledge.

Additionally, with respect to China’s imbalanced development of regional economy, Chinese firm’s technology capability shows up an unequal development. Based on our investigation the firms in different provinces remain the different demands of technology based on their technology capability. East part of provinces such as Jiangsu province where regional economy is the most developed in China and the cooperation with foreign partners starts earlier have achieved at a higher stage to obtain tacit knowledge (soft knowledge) such as management know-how; whereas the least developed economies such as Xinjiang, Ningxia Province which are located in Northwest part of China are keen to obtain explicit
knowledge (hard technology) such as a specific technology to manufacture a product. The relationship between Chinese imbalanced economy development and need for technology alliances shows in figure 5.2.2

![Figure 5.2.2 Relationship between Technology Transfer and Regional Economy](image)

Different companies which embrace various technological capabilities require different ways for learning. China's reality shows that in the simple industry, such as garment, toy etc, the development capability is best promoted by free trade and some institutional support; whereas in more complex activities, such as auto industry, foreign investment can shorten the local company’s learning period and release the financial stress of local government and enterprise. In the early phase of such an advanced industry as auto industry (when it was an infant industry in China), earning costs that has to be subsidized by import protection from government. However, deleterious effect of protection causes that this industry was nurtured to failure since they cannot shoulder the competitive pressure and domestic technology capability is not improved. Learning from the Asian Tiger countries like Korea and Malaysia, after entering into WTO, China integrated previous import restrictions with certain measures to limit the duration of protection, which aimed to force firms to compete internally and enter world market quickly, such as to help the industry move rapidly from labor intensive manufactures into technology intensive activities.

In order to develop the domestic technology capability, Chinese government advocates national social investment in education, training and the provision of information. Thus, developing domestic technology capability is proposed to be boosted by establishing cooperation between domestic and abroad institutions. As China's entering into WTO in 2001 from which the international trade and internal competition regime in China started to optimize, universities were encouraged to build research
relationship with foreign research institutes to efficiently promote the technological development; this is also positively stimulated by international competition regime in Chinese domestic context (Lall, 1993).

In comparison to the level of Chinese technology capability in the early days, Chinese firms have been recognized to improve a lot to absorb new knowledge; but a trouble is still there that this type of improvement is hard to cause the chances to upgrade and innovation. From the informal interviews, we found that the Western’s perception toward Chinese firm’s technology capability is rather positive by which they even warn other MNCs to watch out the so-called future Chinese cooperated-competitors; while on the contrary, Chinese side addresses much more consideration to improve their design capability because R&D activities done by Chinese research institutions and universities are not of high-level and most of MNCs satellite R&D labs in China focus on the applied research instead of basic one. In spite of large amount of foreign investments infused in China, few technologies are related to process know-how. Long-term cooperation with foreign partners in production know-how has made Chinese firms be insensitive to innovative capability enhancement which primarily consists of tacit knowledge and distinctive competence.

Therefore, it can be concluded that China domestic technology capability consists of six characteristics:

- Chinese firm’s technology capability stays at developing level which if comparing with their foreign partners is much more laggard.
- Low level of technological capabilities determines that the technology alliances between Chinese side and Western side are hard to improve into basic research cooperation.
- Chinese technology capability shows up dualistic geographic characteristic by which the firms which locate in the developed regions are likely to absorb soft technologies whereas on the contrary those in the less developed district tend to cooperate in the mode of joint manufacturing.
- Development is stimulated by internal intensive competition and based on the cooperation between domestic and abroad institution;
- Government policy in limited import restriction provides Chinese firms a while of breath to prepare competing with foreign companies. The benefit is that it prevents significant Chinese industry from abortion at early stage.
- Shortage in design and innovative capability makes Chinese companies still cooperate with foreign partners in production know-how transfer, which has impeded the technology capability improvement in the next step.

5.3 The factors influencing capability enhancement in international cooperation

In the section 4.5 we mentioned that there are four factors executing effect on technology transfer from foreign companies to Chinese side: Nature of the technology, the strategy of the seller, the capability of the buyers and the host government policies. Within the research on the cooperative performance and influenced factors, these four factors are still considered significantly. Since in the previous chapters, we have discussed in detailed about government policy, technology capability of Chinese side, in this section we are going to pay more attention on the nature of the technology and the strategy of the technology
In the following part, the technology will be interpreted in terms of knowledge both in tacit and explicit and strategy of technology sellers is identified as protective-oriented. Based on the previous investigation of this study, we can propose that Chinese side’s experience in international cooperation is far from enough.

Strictly speaking, the information/technology which is exchanged between strategic alliance partners is the knowledge. Knowledge can be in the duration of alliances the single and unique element, which means that the nature of the input of the strategic alliance is same as the nature of the outcome. We say that knowledge transferred does not only embed in the document, agreement, equipment, product, but also it does exist in each communication or negotiation between partners. So, as Grant (1996b) maintains, knowledge is endowed the most strategically-significant resources of the firm exerting influence on the firm and on its competitiveness.

In line with the significance of the knowledge, it has been agreed that knowledge embrace several specifications. Of them the most noticeable characteristic of knowledge is its causal ambiguity. Szulanski (1996:37) addresses it most important because “causally ambiguous” nature of knowledge in the process of knowledge transfer between strategic alliance partners has negative effect on the outcome of knowledge transferred. He integrated the prior researches on the knowledge ambiguity (i.e. Hedlund and Zander, 1993; Reed and Defillippi, 1990; Szulanski, 1996) and gave a summarized definition that knowledge ambiguity encapsulates a similar lack of understanding of the logical linkages between actions and outcomes, inputs and outputs, and causes and effects that are related to technological or process know-how (It can refers to the same underlying notion of transferability of knowledge (Grant, 1996b), difficulty to imitate (Foss et al., 1995), inertness of knowledge (Porter, 1994), internal stickiness (Szulanski, 1996)).

During the investigation of technology alliances between China and Western countries, we surprisingly found that the theory on the ambiguity of knowledge provides a good basis of why and how some Chinese partners are able to overcome the difficulties happened in the duration of technology transfer but why others cannot.

Looking for the source of knowledge ambiguity, multiple factors can be found and they can at the same time determine the ambiguity level. Reed and Defillippi (1990) propose that tacit-ness, specificity, and complexity are able to cause knowledge ambiguity. Zander and Kogut (1995) make effort to demonstrate the practical effects of the comprehensive list of taxonomic dimensions of knowledge which was pointed out by Winter (1987). This list involves such elements of knowledge as tacit vs. explicit; not teachable vs. teachable; not articulated vs. articulated; not observable in use vs. observable in use; complex vs. simple; and element of a system vs. independent. As the research in this area goes forward, some other attributes of knowledge were also incorporated to be as the major source of knowledge ambiguity, such as context (fertile vs. barren organizational context; ease of communication etc.), and recipient of knowledge.

25 The case will be mentioned in the following part.
ambiguity. In order to restrict this topic within the table case and avoid overlapped discussion, only parts of above elements such as tacit-ness, complexity, prior experience, and partner protectiveness are selected as the independent viable to explain how knowledge ambiguity exert effect on the knowledge transfer in the Chinese context (the general picture of effect of knowledge traits on the knowledge transfer can be seen in the following figure).

Figure 5.3 Moderated Effect of Knowledge Ambiguity on Knowledge Transfer

**Tacitness**

Tacitness can be defined as the implicit and un-codified accumulation of skills that results from learning by doing (Reed and DeFillippi, 1990). Nonaka’s study (1994) shows that tacit knowledge is difficult to be obtained by sharing and communicating because it is deeply rooted in action and in an individual’s involvement within a specific context. In the 20 years history of international technological cooperation between China and Western countries, absorption of tacit knowledge is always the major issue which is difficult to deal with. Most of what the Chinese local firms obtained was only within the scope of articulated knowledge being well documented in the systematic language or presentation (Choi and Lee, 1997). The lack of experiential knowledge to be transferred leads most of the technology transfer agreements which were originally purposed of exchanging tacit knowledge and expertise to break down. Tacitness, as a source of instability of cooperation, is still producing many conflicts in the Sino-Foreign alliances, especially if the most of the knowledge relevant to production is difficult to codify.

26 Such as culture distance will be discussed in the Chapter 8. Something needs to be mentioned is that in China “all cultural differences in an international joint venture, regardless of their nature or intensity, will ultimately recede over time (Meschi’s, 1997: 218)” In other words, in the context of international joint ventures the effects of national distance tend to decrease over time considerably more than those of organizational distance; organizational culture seems to be far more durable than national culture.
Through the phone interviews towards eight installment engineers who work in China’s office of ASML, we found that the most serious issue for them is to grasp some ambiguous installing skills which are available in the headquarter. They complained that even though each of them has two to three times per year to be trained, they can deeply feel that many skills which are hard to explain by coaches (“perhaps those are their experience”) cannot be mastered by them immediately, particularly in the case that there is no codified and teachable document to conclude the lessons from experienced engineer masters. Actually, this is not an isolated case in China. For most of activities related to technology transfer, the degree of tacitness of knowledge is equal to the extent of its nontransferable (Mody, 1989). Reed and DeFillippi (1990) identify that tacitness is a source of knowledge ambiguity that raises barriers to imitate and further postulate.

However, there are also several Chinese firms succeeding in actively grasping latent knowledge by minimizing the degree of knowledge ambiguity. Just as the example of China’s telecommunication industry trying to acquire advanced digital switch technology, they applied the typical bidirectional strategy: pushing the knowledge holder to intensify the effort to standardize best practices, tools, lessons in codification while learning from experience and by doing in the presence of knowledgeable partners, in particular, to expatriate experts who are greatly valued at home to do project in the partner’s headquarter so as to gain first-hand experience with the partner’s technology through the partner’s own team of engineers or scientists. Another example is that excellent young researchers in the Chinese Universities (i.e. Zhejiang University) are selected and sponsored by the local companies to do the related research project in Philips Co. or its affiliated research institutes for one to two years. In this way, these “star” expatriates make sense of their direct contact with the foreign counterparts, to observe with a purpose, to help their “stakeholders” ask the right questions, or learn from mistakes.

Complexity

In China, most of companies’ so-called new technology is come out based on the strategy of imitation and replication; only a small number of large-size of firms such as Haier and Huawei embrace sufficient resource and capability to make radical innovation. As Reed and Defilippi (1990) argued, more complex human or technological systems produce higher levels of ambiguity and therefore, restrain the learning; complexity does become the major cause to affect the comprehension of the totality of an asset and to impair the transferability to China.

Complexity refers to the number of interdependent technologies, routines, individuals and resources linked to a particular knowledge or assets (Simonin, 1999). As what has been noted by Mosakowski (1997:422), in China it is also obvious that the complexity of technology which is inherent in a non-decomposable system contribute to causal ambiguity. From the transferor’s point of view, in some rapidly

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27 This was conducted by the author during the April, 2008 on the phone to (China) Wuxi office of ASML. The interviewees include junior and senior installment engineers. Also, some additional informal talk occurred in Eindhoven with some Chinese engineers who were deployed in Netherlands for intra-firm projects.

28 By 2007, Huawei has ranked among the worlds’ top ten telecom-equipment vendors; it won more new contracts for UMTS (Universal Mobile Telecommunications Systems, one of the third-generation mobile-telephone technologies) and ranked fourth in the world in the number of international patent applications.
developing fields where technology might be sophisticated and widely dispersed, foreign ventures would be structured and modularized so as to prevent technology that is not intended to be transferred from leaking easily to others (Roehl and Truitt, 1987). From the perspective of transferees, Chinese government has tried many attempts to guild foreign enterprise to establish relationship with indigenous companies but not to set up wholly-owned subsidiaries so as to improve the possibility of technology diffusion, reduce ambiguity of knowledge and require the integration of knowledge and expertise (Smith and Zeithaml, 1996).

**Prior Knowledge**

Knowledge ambiguousness is also reflected by the degree of prior knowledge which knowledge seekers possess. Simonin (1999) demonstrates that the prior knowledge is negatively related to ambiguity. It means that in the context of knowledge transfer between strategic alliances partners, the greater (lower) the level of prior experience of the knowledge seeker with the underlying knowledge domain induce the less (more) ambiguity of the knowledge which is transferred. Here, the prior knowledge is limited in the scope of technology or professional information, in the research stream of alliance capability, the importance of prior knowledge/experience on the alliance performance is also emphasized and it is pointed out that prior experience is positively related to the alliance success (Draulans et al, 2003; Heimeriks and Duysters, 2004; DeMan, 2005).

In the technology transfer, for the knowledge seeker, Cohen and Levinthal’s (1996: 58-59) argues that a firm’s absorptive capacity is largely a function of the firm’s prior related knowledge. Pisano (1988) maintains that in a cooperative context, related technological experience of the partner on the technology searching counteracts the effect of the intrinsic tacitness of the technology upon its understanding and transferability. In short, using the point proposed by Hamel (1991:97), it stipulates that “if the skills gap between partners is too great, learning becomes almost impossible”.

China is a developing country where particularly the technology development starts from the lower level. Less or no prior technical knowledge on the related area force many Chinese companies suffering from terrible troubles. As the first technological Joint Venture established in China, Shanghai Bell Telephone Equipment Manufacturing Corporation encountered many problems in the technology absorption due to its insufficient knowledge base on the digital telecommunication switches. Learning was even impeded because of the significant differentials in base-knowledge and skills between Shanghai Bell and ITT (the foreign partner). In order to fill up the knowledge gap between two sides, Shanghai Bell invited as many experts, engineers and professionals as they can to participate in its production. Of there, the most memorable lesson is the project to develop the switch model HJD-03 in 1987 led by Professor Wu at the Center for Information Technology (CIT) under Zhengzhou Institute of Information Engineering of the People’s Liberation Army (Shen, 1999: 76-99). The success of the cooperation between local experts and Shanghai Bell rescues Shanghai Bell by making up his missed knowledge at the fastest speed and as what

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29 This example will be elaborated in detail in Chapter 6.
Tule has been proved by most Chinese cases, this is the most effective way to offset the “less prior knowledge” disadvantage of Chinese side (Zhao, 2005)

Partner Protectiveness

In the strategic alliances, especially between the two different national cultures, partner protectiveness may not always be detectable or observable. Via the informal interview to the Chinese managers who have ever involved in the international strategic alliances30, we found that even though the cooperation in alliance can be achieved, technology related to core competencies are always protected by the foreign partners. Interviewees figured out that they can confirmedly “feel” that some technologies are definitely retained by their partners but they had no means to obtain them. When being asked in which way they observe their partners build the protective wall, they replied that when they ask for certain significant techniques which they need to import or acquire for specific joint project, foreign partners would be intent to partition the related tasks or physically not engage related experts for those assignments if this technology is closed to their core technology; the foreign part would throw out words that “our gatekeepers denied to export this technology”. Gradually, protectiveness induces the trust loss in the alliance and possibly leads to irreparable damage of their relationships and in turn probably leads to an alliance termination. Explanations of this behavior can be interpreted by “learning races perspective” (Hamel, 1991). In the strategic technology alliances, technological cooperation is initiated by the incentive to acquire complementary resources from selective partners. There exists a psychological motivation that partners try to outlearn the other partners as fast as they can because outlearn can reduces the dependency on the partners. Therefore, firms start their cooperation from the point in which they can access to the other firm’s know-how so that they can jointly use their knowledge to produce something that can increase their common benefits; but the problems is this initial cooperation might gradually evolve to the stage where the inter competition rises as a result of each firm’s attempting to use its partner’s knowledge for private gains. The effect of protectiveness appears negatively. It has been agreed that completely eliminating the partner’s protective behavior in the cooperation is impossible since today’s cooperator might become the tomorrow’s competitor.

Even so, some Chinese companies have their specific way to increase chances to figure out the partner’s protectiveness action. Enlightened by the “SUNTZU the Art of War” on the “Army on the March (Chapter 6 of the Art of War)”, some interviewees expressed that for them the wisest way is to regularly probe a partner’s disposition by articulating specific requests. Some signals can indicate the emergence of protectiveness such as technological gatekeepers, specialized organizational structures such as transfer groups, or pricing of access to proprietary information (Heppel, 1994). However, the possibility to obtain the protected technologies is largely depended on the bargaining power of both sides (Zhao, 2006).

30 This was conducted in the July, 2007 via telephone to investigate Chinese attitudes towards international cooperation with Western countries’ firms, in the project of China’s alliance capability held by Professor Geert Duysters at UNU-MERIT. The interviewees come from diverse industries, some ever involving technology alliances. Since the interview was undertaken in the informal way and interviewees desired us to be confidential of their name and their correspondent firm names.
Therefore, as shown up in the figure 5.3, the knowledge attributes has influence on the outcome of technology transfer, but which is mediated by the knowledge ambiguity. As for Chinese enterprises that are now doing alliance aiming for technology transfer, in order to reduce knowledge ambiguity and expand the success of knowledge transfer, they need to comprehend the relationship between the knowledge attributes and knowledge ambiguity (where tacitness, partner protectiveness and complexity are positive related to knowledge ambiguity; while prior knowledge of transferees is negative associated to knowledge ambiguity); and attempt new steps to speed up the learning pace.
6. Model of technological learning and catching-up path of Chinese firms

Doing research on China's catching-up model at firm's level is necessary, which is because China succeeds in dozens of year's international alliances to enhance technology capability. Recent years, with more Chinese firms surviving in the international market and getting more competitive, it has been agreed that tomorrow's Chinese indigenous firms are most likely to be the strongest threat for the multinationals. It gives us an implication that China, as an important emerging economy, its catching-up model should be researched. Moreover, in order to help readers understand why different types of Chinese firms choose different catching-up models, Chinese National System of Innovation will also be interpreted.

6.1 The Chinese National System of Innovation (NSI)

Freeman (1987) proposed the concept of NSI in his study based on Japan's technology development. He defines NSI as the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies. According to innovation system theory, innovation and technology development are the result of a complex set of relationships among actors in the system (Lundvall, 1992) and NSI can be seen as a flow of technology and information among people, enterprises and institutions which is the key to the innovative process on the national level (Edquist, 1997).

In this part, we will discuss the topic of Chinese National System of Innovation (NSI). The aim we put focus on it is that China, as a typical developing country, is now on the way to catch-up developed-countries, which requires to have its own specific macro-economic mechanism to promote technology transfer and S&T advances at the micro-level. Different from the normal NSI of other developing countries, Chinese NSI additionally is notable for its complicatedness in the framework and in implementation. This is partially due to the fact that Chinese economy is driven by complex social and political forces that go far beyond simple market imperatives (Chee & West, 2004).

As described by OECD (1999), the large and catching-up economies offer larger markets with poor customers and may benefit from late development. Their R&D intensity is relatively low, and their innovative activity tends to be quite low compared to high-income countries. The economic structure of these countries is often more geared towards low- and medium-technology industries. However, as the transfer and adoption of technology plays a very large role, their system of innovation has a strong focus on the perspective of technology transfer, adoption and diffusion. China's situation is consistent to this and in the following paragraphs the national system of innovation (NSI) of China will be discussed.

Chinese NSI is constituted by three parts: (i) the technology which is externally sourced from rest of the world, either via imports or technology transfer; (ii) the central and local socio-political, financial educational actors and business community which are the major elements in the system; (iii) the interactions between system actors which induce the development of a national technology capability.
In this system, the actors that are involved in include the administrative organizations that formulate and co-ordinate the S&T policy and that control public-financial organizations; the private research sector, the higher education institutions and the bridging institutions that act as intermediaries among the other actors. Each of them is required to have six functions and four interactions. Functions involve technology and innovation policy formulation, research and development, financing R&D, human resource development, technology diffusion, and promotion of technological entrepreneurship. Interactions include joint industry activities, public/private interactions, technology diffusion, and personnel mobility. In the following part, each function playing in the Chinese NSI and its effect on the Chinese technology capabilities will be discussed respectively.

Technology and innovation policy formulation

In China, the government centrally develops a series of S&T plans, and then sues these plans as a basis to allocate resources and assign R&D work to relevant institutes. The national S&T plans are generally proposed by State Science and Technology Commission, State Planning Commission; the State Economic and Trade Commission is the fundamental policy operator for organizing and developing S&T activities in China. Each national S&T plan outlines the main direction of S&T development during a particular period (in China, it is normally 5 years); the performers of S&T fulfill the tasks that are assigned to them and depend upon official allocations of necessary resources. Although these performers of S&T activities do not need to be fully responsible for the economic losses as consequence of failure in innovation activities, the communication between operational level and strategic level of S&T appears seldom. Politically, they have limited right to give comments on S&T plans & assignments and more differently they have no authority to allocate needed resources.

Performing R&D

The performance of one country’s R&D is very significant because it can be used to judge a nation’s industrialization and the level of technology capability. Importantly, the amount of R&D investment, the source of R&D expenses and the allocation of them are considered as the core indexes. As for China, the average percentage of R&D expenditure from 1978 to 2006 based on each year’s GDP is above 1.05%; if setting time span from 2000 till 2006, this percentage is going up to the 1.23%, which can be explained by the China’s participation into WTO in 2001 and since then government’s policy emphasized more on promoting technology capability development. In the following table, we make the comparison of R&D expenditures based on GDP among Netherlands, OESO, EU-27, EU-15 and China. Comparing with R&D investment in Western countries, it can be seen that China’s investment in R&D is very low (lower than 1.5). However, it is clear that since 1997 the investment in R&D increased dramatically. This might be caused by Hong Kong’s return from which R&D conducted there was incorporated. Another, it can be seen that Chinese R&D investment based on GDP breakthroughs 1 in 2000 and keeps increasing toward 1.42 in 2006. This is dramatically caused by China’s entry into WTO in 2001 and Chinese government policy that intends to improve domestic technology capability by intensive R&D investment. This year in China, R&D investment based on GDP is forecasted much higher because of the RMB revaluation.
Table 6.1.1 R&D expenditure based on GDP-comparison among NED, OESO, EU and China

<table>
<thead>
<tr>
<th>Year</th>
<th>NED</th>
<th>OESO</th>
<th>EU-27</th>
<th>EU-15</th>
<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>2.05</td>
<td>2.26</td>
<td>1.9</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>1.95</td>
<td>2.19</td>
<td>1.86</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>1.89</td>
<td>2.16</td>
<td>1.83</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>1.92</td>
<td>2.11</td>
<td>1.83</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>1.95</td>
<td>2.06</td>
<td>1.78</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>1.97</td>
<td>2.07</td>
<td>1.66</td>
<td>1.76</td>
<td>0.6</td>
</tr>
<tr>
<td>1996</td>
<td>1.98</td>
<td>2.1</td>
<td>1.66</td>
<td>1.76</td>
<td>0.6</td>
</tr>
<tr>
<td>1997</td>
<td>1.99</td>
<td>2.12</td>
<td>1.66</td>
<td>1.76</td>
<td>0.6</td>
</tr>
<tr>
<td>1998</td>
<td>1.9</td>
<td>2.15</td>
<td>1.67</td>
<td>1.77</td>
<td>0.7</td>
</tr>
<tr>
<td>1999</td>
<td>1.96</td>
<td>2.19</td>
<td>1.72</td>
<td>1.82</td>
<td>0.8</td>
</tr>
<tr>
<td>2000</td>
<td>1.82</td>
<td>2.23</td>
<td>1.73</td>
<td>1.84</td>
<td>1</td>
</tr>
<tr>
<td>2001</td>
<td>1.8</td>
<td>2.27</td>
<td>1.76</td>
<td>1.87</td>
<td>1.1</td>
</tr>
<tr>
<td>2002</td>
<td>1.72</td>
<td>2.23</td>
<td>1.76</td>
<td>1.88</td>
<td>1.2</td>
</tr>
<tr>
<td>2003</td>
<td>1.76</td>
<td>2.24</td>
<td>1.75</td>
<td>1.88</td>
<td>1.3</td>
</tr>
<tr>
<td>2004</td>
<td>1.78</td>
<td>2.21</td>
<td>1.73</td>
<td>1.85</td>
<td>1.23</td>
</tr>
<tr>
<td>2005</td>
<td>1.74</td>
<td>2.25</td>
<td>1.74</td>
<td>1.87</td>
<td>1.34</td>
</tr>
<tr>
<td>2006</td>
<td>1.67</td>
<td>2.27</td>
<td>1.75</td>
<td>1.89</td>
<td>1.42</td>
</tr>
</tbody>
</table>


Figure 6.1.1 R&D expenditure based on GDP-comparison among NED, OESO, EU and China

In China, the R&D expenditure is mainly sourced from government, enterprises (domestic and foreign) and banks. Only in the year of 2006 the ratios of these three sources are 24.7%, 69.1%, 4.6% respectively, comparable with the figures in 1999 that are 32.4%, 34.9%, and 8.8%. With respect to the allocation of
R&D investment, 71% of R&D expenditure goes to enterprises and only 18.9% belongs to domestic research institutes. Within 53 Chinese high-tech industry zones, until the end of 2006, foreign invested corporations ranked the number one in investing R&D in China (in total of 2954 billion RMB), followed by limited liability companies (2821 billion RMB), limited liability corporations (1680 billion RMB) and the state-owned enterprises (1144 billion RMB) (2006 China annual report on development national high-tech industry zone). It implicates that Chinese firms have been aware of the importance of R&D however they still face the financial stress.

Promotion of human resource development

According to the OECD’s announcement in the end of 2005, the number of researchers in China has increased by 77% between 1995 and 2004. China has ranked second worldwide with 926 000 researchers, just behind the United States (more than 1.3 million), and Russia ranks fourth by 2004. In the year of 2006, the number of researchers in China was increased to 4.132 million but the ratio of researchers based on the whole population of 2006’s China was just 3.14 per 1000 persons (National Bureau of Statistics, 2006). Some certain less-developed regions (i.e. Ning Xia and Xingjiang province)’s ratio was nearly zero.

By comparing this ratio with European developed countries (figure 6.1.2), it can be seen that even though the total number of R&D personnel is second highest in the world, the ratio of that based on the whole population is largely laggard behind developed countries. This indicates that shortage in R&D researchers is still a serious problem for China. With regard to R&D activity type, 71.4% of researchers in China are working for experimental development whereas only 28.6% focus on basic and applied research; of there, 65.8% researchers were employed by enterprise while 15.4% work for research institutes. According to
(Li & Zhong, 2003), the development-oriented activities are exploitation-oriented and involve product/material/process adaptation or improvement, product/system testing and interoperability or compatibility testing for local and global markets; whereas the research-oriented activities allow higher degree of exploration, the search for and development of new technical ideas, products and processes. Since technologies derived from research-oriented activities can imply a broad and unspecified set of applications to provide spillover effects to the economy (Vonortas, 1997a), the fact of low funding and low percentage of researchers that are allocated on the research-oriented (basic and applied) area gives China a negative influence to improve technology capability.

![Figure 6.1.3 R&D personnel by sector of performance and type of activity

Source from National Bureau of Statistics (2007)](image)

**Technology Diffusion**

There are three main methods of technology diffusion existed in China. The first one is the technology transfer contracts, which was identified by Kuo (2001) as the most popular method of technology diffusion in China. The second is technology markets, which contain certain mechanisms to allow the supplier and demanders to reach a technology transfer deal, including consulting, technology transfer, training, technical services etc. The third mechanism is spin-offs. Three obstacles restrict the effectiveness of R&D collaboration. Firstly, sectionalism seriously harms the efficiency of R&D collaboration, and most organizations focus exclusively on the function and mission assigned by the central government. Second, Chinese NSI lacks integrated management system for effectively utilizing the collaboration achievements. Third, communication channels and intermediaries are not enough, which indicates that research institutes and universities are unaware of the technical demands in the industry, while industry is in the blank mind of what research institutes and universities can offer to them.

*Promotion of technological entrepreneurship*
Numerous entrepreneurial opportunities currently exist in China owing to its huge internal demand, cheap supply of productive resources, and increasingly reformist economic policy. However, obtaining venture capital in China is still difficult. In addition, China lacks the mature entrepreneurial infrastructure to incubate start-ups effectively. Entrepreneurships find it hard to attract investment due to the lack of acceptable investment channels. Venture capital is unable to function in the effective way because of the absence of mechanisms for capital withdraw and the lack of restrictive regulatory environment system etc.

6.2 Important factors in catch-up

6.2.1 Overview of Chinese Telecommunication Industry

China’s success is now named another East Asian miracle in the world. Among many aspects of success, the technology capability of Chinese firms should be considered significantly. We select Chinese telecommunication industry as the representative to recognize the Chinese characteristic of catching-up, which is because this industry’s growth is the cooperative outcome of all participative players (which include Chinese I &U, Chinese firms, government and foreign firms) and more importantly it reveals that the development of indigenous firms is largely depended on the technology transfer in mode of Joint Ventures where the advanced knowledge is imported originally from foreign companies. In this story, two important actors will go upon the stage, which are Shanghai Bell (the first joint venture in China) and Huawei Co.Ltd (Indigenous firm in the telecommunication industry). The telecommunication industry in China experienced a rapid growth during the last two decades. Until 2001, China has been the largest country embracing most subscribers of mobile phones, and the second largest nation having fixed-line telephone network (MII, 2001). The growth of the technology capability and competitiveness of Chinese telecommunication industry can be reflected in the case of digital automatic telephone switches in China.

Digital Switch Technology and that evolved in China

In the Chinese digital automatic switch market, the local firms have covered domestic market share from less than 50% in the 1980s to the more than 90% in 1996 (Zhang, 2000,a,b). Indigenous companies such as Great Dragon (Julong), Da Tang, Zhongxing and Huawei (normally these four companies are called Ju Da Zhong Hua in Chinese, meaning of “Great China”) make 98% of newly added digital automatic switches in China and have begun exporting products to foreign countries. From 1998, China-made digital switches have become international competitive. Generally speaking, the growth of indigenous firms was derived from three reasons: 1) knowledge diffusion from the Sino-Foreign joint ventures; 2) powerful bargaining power of Chinese side in the negotiation of technology transfer based on China huge market size; 3) segmented domestic market and the initial growth of indigenous firms was based on rural or peripheral markets where the MNCs involved less. The main idea of Chinese firms’ catching-up process in this industry is consistent to the principle of leapfrogging that late-comers may be able to leapfrog older vintages of technology, bypass heavy investments in previous technology system and catching-up with advanced countries (Hobday, 1995). In order to explain clearly that how Chinese firms took stage-skipping catch-up, in the next part we will necessarily interpret the evolution of telephone switch technology and the development of that in China.
Normally, the evolution of the telephone switch technology can be divided into three stages: the manual switches (1880s-1920s) which is characteristic of step-by-step switches; the electro-mechanical switches (1920s-1960s) in crossbar switches, and the electronic stored program control (SPC) switches (1965-till now) in the way of SPC switches. The detailed evolution can be seen in the table 6.2.1

<table>
<thead>
<tr>
<th>Name of switch</th>
<th>Time of invention</th>
<th>Time of commercialization</th>
<th>Switching pattern</th>
<th>Controlling pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magneto telephone switchboard</td>
<td>1878</td>
<td>1880s</td>
<td>Jacks and plugs</td>
<td>Manual</td>
</tr>
<tr>
<td>Step-by-Step switch</td>
<td>1891</td>
<td>1892</td>
<td>Step-by-step</td>
<td>Electro-mechanical</td>
</tr>
<tr>
<td>Crossbar switches</td>
<td>1917</td>
<td>1926 (in USA)</td>
<td>Cross-bar</td>
<td>Electro-mechanical</td>
</tr>
<tr>
<td>Analogue electronic switch</td>
<td>1960</td>
<td>1960s</td>
<td>Read-relay</td>
<td>SPC</td>
</tr>
<tr>
<td>Digital electronic switch</td>
<td>1970</td>
<td>1970s</td>
<td>Digital</td>
<td>SPC</td>
</tr>
</tbody>
</table>

Table 6.2.1 Evolution of the telephone switch technology


After the establishment of P.R. China in 1949, telecommunication system was firstly built in Beijing and connected the whole country. In 1957, the first step-by-step telephone switch equipment factory, Beijing Wired Factory was set up under the help of Soviet experts, producing JZB (47 type) Step-by-Step telephone switches. In 1958, China started to produce step-by-step switches JZB(47) in aim to replace the imported equipment. Because of the weakness of this type of switches (such as slow speed, big noise, frequent maintenance), the Ministry of Post and Telecommunication (MPT) stopped this production in 1974 (Zhu and Lu, 1997). In 1966, the Tenth Research Institute of the MPT developed the first coded crossbar telephone switching system (the major model include JT-801, HJ09 and HJ10), which were widely employed in telephone networks throughout the country. Although many new models were developed by MPT, China had no chance to absorb advanced technologies from the West and therefore the level of technology capability was very low, which was also due to the closed-door policy (1966-1976 period of the Cultural Revolution in China). In 1984 (6 years since open-door policy) China imported a more advanced crossbar switching system with more than 10,000 ports capacity and installed it in Tianjin (Zhang, 1999), which however in the West had already been widely used.

Therefore in China, the step-by-step switches were only applied during 1960s to 1970s. And the cross-bar was mainly used in the 1980s. Because in the 1980s, step-by-step switches comprised about 29% of the telephone network, and crossbar switches covered 33.7%, while analogue electronic switches which were imported from the West, represented only 6.7% of the network in China, it is addressed that only during
The Establishment of First Joint Venture

In order to convert the lagged situation and take advantage of China’s huge market, Chinese government encouraged the multinational suppliers to transfer technology and started a series of joint venture negotiation. Two large joint ventures were established in the 1980s. The first foreign direct investment was approved to establish a joint venture with the Bell Telephone Manufacturing Company (BTM, a son company of the ITT at that time and later the Alcatel), namely Shanghai Bell Telephone Equipment Manufacturing Corporation (Shanghai Bell) in 1984; the other is Beijing International Switching System Corporation (BISC) to produce the EWSD (electronic worldwide switch digital) in October 1988 (IGI, 1997, p.143-144). In the 1990s, the switch market in China has been “JV dominated” instead of “dominated by direct imported goods” as before. The knowledge transfer via R&D, production, subcontracting, marketing, after-sales services and local human resource training (Tan, 2002; Zhang, 2000 a, b, p.148) provided domestic researchers and engineers, entrepreneurs with a good opportunity to develop competitive indigenous product.

During the negotiation to establish Shanghai Bell Joint Venture, Chinese government offered a great help to convince BTM to transfer the technologies that the Chinese request in its joint venture. Thereafter, the digital automatic switching system called System-12 was transferred to China. Additionally, the Belgian government lent a long-term loan at “country-to-country” level to make sure that this project can be of the financial support. The initiation of this technology involved the Belgian and Chinese government, Ministry of Post and Telecommunication (MPT), Bell Telephone Manufacturing Company (BTM), ITT and Posts and Telecommunications Industrial Corporation (PTIC). The multiple cooperative participants and large amount of investment granted this technology transaction by far the largest one in the history of China and of course it always attracted much more attention from both government and local companies (Zhou and Kerkhofs, 1987). Based on the regulation of the contract, PTIC was primarily responsible for providing land, buildings and necessary facilities for the plant and for selling the domestic market for locally produced system-12 exchanges; BTM provided the technology together with various services and the Belgian government contributed the capital (Alcatel Bell Telephone, 1992). The equity share of each stakeholder in Shanghai Bell at the foundation was like this:
Table 6.2.2 Initial Equity share of Shanghai Bell Joint Venture

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Equity share</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>BTM</td>
<td>32%</td>
<td>Provide technology</td>
</tr>
<tr>
<td>Belgian government</td>
<td>8%</td>
<td>Contribute capital</td>
</tr>
<tr>
<td>PTIC</td>
<td>60%</td>
<td>Provide land, building, and necessary facilities.</td>
</tr>
</tbody>
</table>

In the process of adapting the System-12 into the Chinese environment, Shanghai Bell cooperated with local universities and research institution. This action brought about the diffusion of related knowledge and skills, which we will discuss in the next part.

*Diffusion Technology from JV to indigenous companies*

As said above, Shanghai Bell shouldered important responsibility to diffuse advanced technology across the country. As the source of technology, actually, Shanghai Bell’s strategies for improving its own technology capability did casually play the significant role to promote technology capability for domestic companies in the same industry. In the initial 10 years, in order to diffuse what has been learned maximally, Shanghai Bell conducted five channels for knowledge diffusion as well as enhancing their own technological capabilities.

1) Cooperation with local universities and research institutes. In the process of adapting the System-12 to Chinese environment, local university and research institutes gave great help to Shanghai Bell for filling up the gap of digital switches knowledge.

2) Hire experienced engineers from MPT and trained them in Shanghai Bell. After that, Shanghai Bell distributed them to neighbourhood where they were quite familiar for product installation. Therefore, many external experts were gradually getting known about System-12 and at the same time Shanghai Bell made use of these experts to expand their market. After a period, some engineers were returned back to MPT but most of them continued to use the knowledge they learned from the system-12 to carry out various R&D projects for Shanghai Bell.

3) Establish Maintenance Centres and Customer Association with members across the country. In such a way, the new system was regularly introduced to the colleague-firms and users, and technological problems could be solved during the discussion.

4) Attract qualified engineers from their customers and trained them for 6 months. After that, these high-skilled people were welcomed to work in Shanghai Bell, and if they had no willingness, this “training program” still offered a good chance to diffuse the newest technology.
5) Widely circulate their publication titled Bell Dispatches, from which instruction of system-12 was introduced and latest engineer’s experiences were available for customers to search online.

As a consequence, Shanghai Bell became a “big school” fostering a great number of qualified engineers for China (Shen, 1999, p.83).

The Tripartite R&D consortium and Development of new technology

After Chinese engineers and professionals accumulated the sufficient knowledge base of digital switch technology via helping adapting System-12 for Shanghai Bell to developing indigenous switches, they embraced their own technology capability and successfully developed a localized new technology named HJD-04, the first successful central-office-level digital switches in China in 1990s. Its introduction is dramatically owed to the knowledge diffusion of System-12 of Shanghai Bell through the above 5 ways. Additionally, it is also attributed to the tripartite R&D consortium established by the Centre for Information Technology (CIT) under the Zhengzhou Institute of Information Engineering of the People’s liberation Army, the Posts and Telecommunications Industrial Corporation (PTIC) and the Luoyang Telephone Equipment Factory (LTEF) of MPT, where professionals and engineers make use of their experience, skills and knowledge accumulated, acquired information about System-12 learned from publicly available documents and experience in working for project of System-12 (Zhong, 2000 a,b, p.148). Relying on the new developed technology HJD-04, Chinese domestic companies rapidly covered 16% of domestic market share in 1994 by comparing its zero coverage in 1990.

After the successful invention of HJD-04, the knowledge diffusion of new series of technology was not stopped. It was further amplified through the intercourse of key engineers and professionals and consequently led to successive development of other four types of digital automatic switches (EIM-601, ZXJ-10, SP-30 and C&C08). Since some entrepreneurs can provide high salaries for skilled brainpowers, a panel of new ventures thereafter sprang out, which include “Ju Da Zhong Hua”, the four indigenous companies.

The market segmentation, government support and success of indigenous firms

The notion of market segmentation was firstly introduced by Smith (1956), in which he addressed that market segmentation involves viewing a heterogeneous market as a small homogeneous market. From a market segmentation perspective, China is a typical segmented market, based both on geography and on socio-demographics and lifecycle (Schmitt, 1997). There are at least three type of markets in China, a developed east coast market, a developing mid-China market, and an emerging frontier market in the far west (Kotler, 2001).

As for the telecommunication equipment market in China, it is characteristic of both huge and segmented. Rural-urban dualism market exists in China where urban part is similar to developed countries while the other less developed regions are similar to undeveloped counties. It is obvious that in China many inland
districts and rural areas lag far behind the east coastal urban areas and large cities. Customers at less developed regions cannot afford expensive foreign digital automatic switches so that the rural or low-end market was targeted by Chinese firms whereas foreign companies went for large cities. HJD-04 was thereafter very welcomed in rural areas because of its lower price and simple machine-operator interface in Chinese language.

Taking advantage of the Chinese segmented market and relative cheap cost to manufacture; indigenous firms enhanced their competitive advantage. After they dominated the Chinese market since mid of the 1990s, Chinese indigenous companies started to enter into world market by significantly improving product quality and add value/features. On the other hand, the government strong support cannot be ignored especially when they started to compete directly with joint ventures in both rural and urban areas. Chinese government strong support appears in the two concerns. One is the market protection and the other is policy-driven incentives for the adaptation and use of domestic products. Only in 1997, domestic firms received more than 17 million lines digital automatic exchange equipments and 18 million was sold out (Xin and Wang, 2001), which was due to the fact that in 1996, foreign government loans was cancelled for importing digital automatic switch equipment and Chinese government began to impose tariffs on imported communication equipment to promote the purchase of locally made equipment. From 1995, Huawei grew up to the biggest manufacturer and after 1998 it, with the other three indigenous firms (Datang, Great Dragon, Zhongxing), covered more than 60% Chinese market and surpassed Shanghai Bell to become the largest four digital automatic switch manufacturers in China (Xin and Wang, 2000).

Given the political supports from government and the Chinese segmented market, indigenous firms developed rapidly to start competing directly with Joint Ventures.

**6.2.2 The catching-up model of telecommunication industry in China**

As for late-comers, the development path of technology capability is concerned crucial; Kim (1997a) introduces the stages of development by dividing it into “duplicative imitation, creative imitation, and innovation stages”. Also, another research stream is organized in terms of evolution from OEM, ODM to OBM. This was consistent to the observation of Lee and Lim (2001), in which they found that in the case of the late-comers, they start with the assembly production of final goods by using imported parts; then they develop low- to high-tech parts; and then learn to design the existing products with some modification, and finally reach the stage of the new product concept creation. This series is opposite to the process of product development by the fore-running firms and therefore if it is needed to know which stage the firms have reached, it can be recognized by seeing that whether they are assembling, making parts or able to design the products themselves and so on. The problem for most of late-comers is that it is relative easy to progress up to OEM, but appears difficult to reach beyond. In the same line, Lee and Lim (2001) identify that there are three patterns of catch-up (Table 6.2.3). First pattern is a *path-following* catching-up which refers to instances in which latecomer firms follow a path that is identical to that of the forerunners. However, the latecomer firms go along the path in a shorter period time than the forerunners. The second pattern is a *stage-skipping* catching-up, where the latecomer firms follow the path to an extent but skip some stage and thus save time. The third one is the *path-creating* catching-up, which means that the latecomer firms explore their own path of technological development. Among these three patterns, the
first type is more traditional, whereas the last two contain some aspects of leapfrogging. In China context, these three patterns are not necessarily an *each-for-one* occurrence; mixed patterns happened often.

<table>
<thead>
<tr>
<th>Path of the Forerunner</th>
<th>Stage A→B→C→D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Path-Following Catching-up</td>
<td>Stage A→B→C→D</td>
</tr>
<tr>
<td>Stage-skipping Catching-up</td>
<td>Stage A------→C→D</td>
</tr>
<tr>
<td></td>
<td>or</td>
</tr>
<tr>
<td></td>
<td>Stage A--------→D</td>
</tr>
<tr>
<td>Path-Creating Catching-up</td>
<td>Stage A→B→C'→D'</td>
</tr>
<tr>
<td></td>
<td><em>C and C' D and D' are the competing technologies</em></td>
</tr>
</tbody>
</table>

From the above case (part 6.2.1), it is obvious that the typical catching-up path of large Chinese telecommunication firms which have ever received government strong support is based on the stage-skipping roadmap, where they leapfrogged the analogue electronic technology and skipped from crossbar technology directly toward digital SPC. During this period, Shanghai Bell shouldered this responsibility through learning skills by doing and operating. They learned skills and operational know-how while they produced the final products according to the foreign-supplied manual of production lines. The technology capability in the digital switch field increase dramatically by diffusing knowledge via person mobility, document study and technical help from domestic universities. Owing to the support of government policy and Chinese typical segmented market, Chinese engineers and professionals created a new path to make innovation based on System-12 and finally introduced HJD-04 and other sets of technologies. The summary of stage-skipping catch-up in telephone switches in China can be seen from the following figure:
As the model for technology catch-up of Chinese telecommunication companies, we followed the model introduced by Lee and Lim (2001) as the basis to interpret the Chinese catching-up roadmap.
Firstly, the technological Regime was introduced by Breschi et al. (2000) and defined as the combination of technological opportunities, appropriability of innovations, cumulativeness of technical advances, and the property of the knowledge base. Lee and Lim (2001) added technological trajectory into it and pointed out that (1) a technological trajectory with a greater uncertainty implies a small chance for success because it would be more difficult for latecomers to predict the future of technology development; (2) access to external knowledge base by technology transfer would be relevant to the success of the R&D project. Applying it to the Chinese telecommunication industry, it can be seen that (1) because technical trajectory can be examined by the age and lifecycles of new technologies, the regime of the telephone switches is characteristic of more predication because the telecommunication switch equipment traditionally had lifecycle of 20-40 years (Duysters, 1996). (2) Additionally, as a result of the Chinese firms taking advantages of “market trades for technology” as the mechanism to access to external knowledge base, the speed of technology import and absorption remains rather high.

Secondly, as the source for competitive advantage, Chinese firms in the tele-communication industry embrace competitive advantages in the perspective of lower cost than Foreign Joint Ventures in China. They produce products fitting with Chinese dual-segmented market and make the products differentiate from those of first runners.

Thirdly, with regard to the firms strategy and policy firms, Chinese indigenous firms followed a safest way in which government provided protection and coordination during initiation of development and
production, while indigenous firms such as Huawei carried out a culture of militarized administration to guarantee the high effectiveness of intra-firm R&D and production.

Finally, in order to evaluate the success of catching-up, normally it is measured by market share and capability of doing R&D. Since four major Chinese indigenous firms in Chinese telecommunication industry have capability to make research independently and they respectively patented the different version of technology in the mid of 1990s (i.e. SP-30; ZXJ-10; HJD-04 and C&C08), it can be concluded that their technological capabilities have leapfrogged to the advanced international level, which can also be demonstrated by their dominated domestic and improving international market share.

6.3 Chinese bellwethers: from OEM to OBM, from local to globalization

In the previous section, we made a research on the model of Chinese firm’s catching-up based on the typical case study. It is undoubted that Chinese firms are now on the way of catching-up either in stage-skipping or path-creating route. However, China’s label in World Manufacturer signifies that Chinese firms’ catching-up is much more rooted from strategy of Original Equipment Manufacturer (OEM). China’s advantages in low cost labor and raw material and large pool of qualified talents offer Chinese firms many opportunities to contact world’s biggest brands and technology leaders. This enables Chinese firms to gain profit without making much effort in R&D and marketing. But, as Chinese government announced that this mechanism of growing up is difficult to empowering China, in order to convert indigenous companies to international and achieve China’s next generation of leaping up, some China’s biggest companies which are the bellwethers in various industry were encouraged to switch OEM strategy gradually and boost their brand overseas.

As well-known, China has now several successful enterprises in making brand abroad. Such as:

- Haier, China’s biggest appliance maker having its own manufacturing plant in South California sells household electronic appliances in U.S. successfully.
- Legend (nowadays’ name is Lenovo), the China’s biggest computer maker, has launched Lenovo as a global brand to position itself for overseas expansion.
- Galanz, manufacturer of micro-wave oven, has occupied 30% of global market of micro-wave ovens and 80% of China domestic ovens.
- SAV, the largest manufacturer of new photoelectron display products as well as provider of network and information service, achieve successfully more than 33% of sales internationally.

These biggest companies in different industries are considered by Chinese people and Chinese government as the forth-goers that precast the next generation of catching-up. They have the same goal to transfer companies’ status from OEMs towards OBM by embracing high-priced international brand. Three different models are generated as the basic path for switching.

- Path Creating the Samsung model. Because South Korea and China have the same culture origin and their companies embraced same problems (such as low quality reputation) at the start of
going abroad, some Chinese biggest companies for instance Haier partially looked after the way of Samsung’s catching up by making additionally modification. Specific to Chinese firms, they pursue five steps toward building international brand (figure 6.3.1).

(1) Acquire product-development skills domestically by
- Joint Ventures
- Technology-licensing agreements

(2) Competing in the domestic market with foreign brands to
- Occupying domestic market
- Learning marketing skills from foreign competitors by observation

(3) Increasing R&D budgets

(4) Launch global brand by
- Sponsoring international activities such as Olympic Games
- Form Strategic alliances with international technology firms

(5) Position itself internationally by focusing on
- Mass merchants
- Category killers

No

Yes / No

Yes

(3.1) Increasing R&D budgets

(3.2) Learning the requirements of markets by
- Extensive consumer research
- Building up overseas sales and manufacturing operations abroad (U.S.)

Figure 6.3.1 the flowchart of 5-steps of path-creating of Samsung way
Because creating the sustainable brands in developed market is complex, expensive and of uncertainty, the biggest obstacle for Chinese firms is the shortage in marketing skills. In different advanced market such as American area and European district, there exist various difficulties in marketing. For example, in U.S. home refrigeration and laundry market, the top five brands hold more than 80% of market; while in Europe, at least 80% of the refrigeration products are replacement purchase which means that consumers tend to replace product with the same brands they had before. Therefore, in addition to improving the product’s quality and value, marketing skills seems rather important for Chinese firms surviving abroad.

- Distribution-based alliances model. Many Chinese firms have shown quite convincingly that they can manufacture competitively priced, high-quality products. For instance, Little Swan supplies General Electric with dishwashers; Changhong Electric supplied Wal-Mart Stores with televisions under an unrelated brand, Apex Digital; Galanz makes micro-wave ovens on an OEM basis for almost all of the world’s leading consumer electronics companies. It is proved that the Chinese companies which are most likely to succeed in building brand abroad are those that have a good record in low-cost, high-quality manufacturing and show marketing prowess in local area. Therefore, like the MNCs entering into Chinese market, Chinese firms need stronger distribution partner to help establish brand because working with local distributors provides Chinese company with a chance to learn more about abroad markets and build its overseas capability. In line with this model, SVA case of entering into U.S. market offers positive lessons for other Chinese firms. To enter into U.S. market, SVA chose 3 tracks to achieve brand awareness. Firstly, it relies largely on distributors such as Ingram Micro and D&H Distributing that offer promotion and service assistance to manufacturers. Secondly, it works with distributors on trade-level promotional activities such as industry conference to avoid spending millions of dollars to build brand awareness, such that many other small and mid-sized distributors or retailers could be attracted by SVA’s low-cost and high-quality product. Finally, SVA establishes a local team to run its US business by recruiting US-based executives and ex-Sony production managers to help control its manufacturing quality and improve the design of products.

- Merger & Acquisition. Merger &Acquisition is an alternative way for Chinese firms entering into abroad market. The acquired target is usually the companies that have valuable assets (brand, customer bases, technology or channel) and products which however were overpriced due to management failure in controlling cost or producing offshore at low-cost locations such as China. After selecting acquired companies, Chinese firms could move the package of production into China but retain the brand name, distribution channels, and some of local talents in local country. Overtime, it could co-brand the product with its own name to build consumer awareness of its Chinese brand. As soon as the association and awareness have been established, Chinese firms could phase out the target brand. Lenovo improved its brand’s reputation worldwide by acquiring IBM PC division in 2005 and has bypassed Dell to become the largest PC manufacturer and seller and global technology giant in the world.

Most of Chinese firms were born in the domestically intensive competition climate, but without any experience going abroad. As description of these bellwethers’ experience, in order to achieve the next
generation of catching-up, it requires more than combination of attractively priced products, good service and first-rate technology. Since high-priced brand represents features and values, to achieve this great goal needs a wide range of new skills both in product quality and marketing.

6.4 A new generation of Chinese firms: how to become the emerging star in the global market---Chery Catching-up model

The third stream of catching-up strategy for Chinese local companies is represented by Chery Ltd. Co., which is characteristic by late starting-up, fast growing-up and sharp entering into international market. They are very successful in acquiring advanced technology and establishing entrepreneurial culture. In the following part, Chery’s growing/catching up will be thoroughly discussed and from which another typical catching-up model can be discovered.

In the research of Chinese firms’ catching up, Chery path is indispensable. Within the literature related to catching up, there is no research that has ever mentioned the similar model. This is might because this group of firms is the Chinese young generation, which international academic research has not involved in. But the significance is that it represents a young generation of Chinese entrepreneur’s globalization mindset and from another perspective reflects a creative path from OEM to ODM to OBM.

Chery was originally a car engine designer and producer that was established a decade ago, 1995. Now it has become China’s top car exporter and the biggest Chinese local automaker (Right now, Chery has ranked fourth in the passenger-car market (the other three are brands associated with Sino-Foreign joint ventures; Chery is an independent manufacturer)). Chery has seven assembly plants in Egypt, Indonesia, Iran, Russia, Ukraine, and Uruguay and only in year of 2007 it has sold almost 120,000 cars in nearly 70 foreign countries, which is 130% increase from the 2006 level. Besides being active in the overseas market, Chery’s products such as Tiggo, Eastar, QQ, and A5 are also very popular in domestic market. Chery is the only one automaker which embraces its own technology in producing motor engine, car parts and autos in China. Its success is a miracle and it provides us many valuable experiences.

Chery’s 10 years of growing up is full of frustration, setbacks and failures. In the initial stage of company development, except the local government strong support Chery had almost nothing (no state support, no sufficient funding source, no technology, not many of staff and no even any formal production ability; it was started by a small panel of young and inexperienced people) and was a newcomer in the small area that had little tradition of manufacturing and was far from the country’s traditional centers of auto production (Beijing, Changchun, Shanghai and Wuhan). Chery experienced three major transitions within 10years which eventually led to their success.

The first transition happened in the initial stage where Chery failed to find buyers for its designed motor engine and had no choice but to manufacture a car of its own brand so that the engine could find a home. Chery’s people worked very hard and they hired a few small European and Taiwanese companies to cooperate in car designing. Via these cooperation, Chery’s engineers learned beginners’ skills to design a car or motor-engines.
The second transition was resulted from two failed projects where firstly Chery used 20 million U.S. dollars purchasing a second-hand production line but eventually found it turned out to be obsolete very soon; after that when the overseas technology and engineering company was hired to help with installation and commissioning, foreign partners quit and left the project on the halfway only because Chery refused to pay more money in the halfway project. This made Chery to wake up and decided to depend on their strategy surviving in the market. In order to make the competition irrelevant, by relying on what they mastered in the car design and thorough market research, Chery successfully introduced Chery QQ & Chery Feng Yun models (low emission vehicles with lower price) and quickly dominated the Chinese passenger-car market. From academic perspective, QQ’s success accords perfectly with the principle of Blue Ocean strategy where Chery operates its value innovation by raising and creating value for market while simultaneously reducing or eliminating features or services that are less valued by current or future market.

The third transition is the one which provided a path for Chery to particiapate the international competition. The surprising thing is that the necessity to compete in the international market was triggered by Chery’s insufficient design capability and it is consistent with what Yin Tongyao, the CEO of Chery said “the move into global market was not planned”. In order to keep on increasing Chery’s domestic market share, Chery established technical cooperation with several AVL List (a European design company) and Italian design companies for engine and car designs. By cooperating with other design companies, Chery embraced the latest car model and more importantly its R&D team as well as suppliers improved capability dramatically. Until now, Chery never stops actively working on the cooperation with overseas design company, which has already caused that Chery’s R&D can be based on Europe’s latest emission standard because Chery is attempting to upgrade to the highest European standards and California’s emission standards for entering European market and North American market. To penetrate into bigger and more developed market, Chery kept the conservative progress strategy and was not eager to enter into West European market directly, instead, Chery firstly entered into Mid East and East European Markets for market nurturing (with purpose to incubate Chery’s products’ quality improvement) for reducing the entering risk. If its performance in this market appears positive, the follow-up investment will be made. Chery’s success is also due to its insistence on the ownership of designed intellectual property. This promotes them going to the ODM position. To accelerate awareness of Chery’s brand, Chery builds several joint manufactures with well-known auto-vehicle manufacturers such as Chrysler to improve its awareness in the world market.

To summarize, Chery’s taking off comes from many significant factors: Initial local government support, perseverance/positive willingness even facing failure, strategy to improve capability, and never-changed philosophy to take ownership of technology etc. Chery’s model is composed by four parts. One is to deserve market share by value innovation. Second is improving design capability by technical alliances. Third is exerting conservative globalization strategy and reduce market risk by penetrating developed market via neighboring region. Fourth is establishing equity joint venture with overseas developed companies to improving brand awareness. See figure 6.4.1 The significance of Chery catching-up path is that it provides the evidence that Chinese start-ups can be initiative to improve their technology ability.
and by breaking up the traditional growth pattern that capability improvement must depend on FDI can small- and mid-sized companies realize to take off.

From the above three types of catch-up models, it can be seen that China is not only a merely source of comparative advantage based on low cost labor; but more importantly it has emerged to be a source of competitive advantage based on catching-up path of innovation. It can be seen that not only for those Chinese domestic companies which develop technology capability by support from government, by technology imports and by domestic technology alliances (section 6.2) or those that were originally born to be the largest (section 6.3), but also for those which started late but grew up rapidly (section 6.4), Chinese firms show up a huge ambition and energy to catch-up world lead companies. In order to enter into the market, low price strategy will still be the tactic of Chinese companies when they initially compete with foreign firms. However, strategies might be changed later on (according to our interview, Chinese companies such as Huawei will compete on much more than price in the international market) because of technology capability enhancement and the changes of company’s strategy, which was stated by the senior manager (Mr. Ye Yunhai) of overseas marketing department of Huawei Co.. The interview on the district manager (engaged in Southwest China) Mr. Ji Jun of Midea Group (the China’s second biggest household appliance manufacturing firm) reveals that Chinese local companies are very innovative and well-capable to develop the hard-to-reach, less loyal to foreign brand consumers. They firstly grasp the mass market of the early majority and late majority of customers who are sensitive to cost and price but are not as enthusiastic in advanced technologies as innovator customers. John Seely Brown and John Hagel III describe in “Innovation blowback: disruptive management practice from Asia” that Chinese companies are learning to innovate by serving low-income consumers in the developing world. But until the time when their brand is of well awareness they will also apply new technologies learned from cooperation with foreign companies into the new generation of product development under
their own brand. We therefore argue that Chinese catching-up path is reversed from that of Western developed nations (also the price setting, see figure 6.4.2). By applying the transferred technology from foreign partners and making relatively changes, Chinese firms develop localized products that satisfy the late or early majority customers in the domestic market. Also, in response, the presence of Western intruders and intensive competition in China home market inspired these companies to raise their game position. Chinese firms and entrepreneurs were helped to increase the technology level due to the doing by learning. The radical innovation is produced as well by Chinese companies if the commercial success in the product generation being realized by continuous technology transfer and active learning. Chinese products from certain companies do therefore get rid of “made in China” and be labeled the same reputation as that of their international competitors.

Figure 6.4.2 The Chinese catching-up model

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31 Which indicates low quality at low price in the past
7. Chinese motivation and attitude for strategic alliances

7.1 Different approaches of classifying technology alliances motivation

In line with the demographic attributes of technology alliances, international technology alliances can be classified into two categories: home-base-augmenting (HBA) and home-base-exploiting (HBE) (Kuemmerle, 1999). According to the special function of R&D that can help companies obtain local knowledge as well as better adapt their products to the needs of local market (Howells, 1990b), the motivation of international technology alliances can be recognized in two different approaches.

The first approach is used to broadly distinguish demand-oriented and supply-oriented and environmental approaches (Granstrand, Hakanson and Sjolander, 1993; Dunning and Narula, 1995). Of there the demand-oriented motivation are decided by special needs of the local country/market such as modifications of the firm’s production and modification of firm’s products; or host country restrictions, such as local content requirements, tolls, import quotas, and fulfilment of standards. Supply-oriented drivers involves highly sophisticated scientific infrastructure (new regional technological competence centres such as Sillycon Valley, Prato or Modena), by which host country scientific and knowledge inputs and accesses cutting-edge technology can be taken advantage. A third group of motivations, environmental motivation factors includes national policy incentives, investment environment, market size, economic growth and legal regulation systems.

The second approach is designed within a more refined classification scheme where five categories of drivers are recognized which includes input-oriented, business-ecological oriented and performance-oriented. Of there, the input-oriented motivation should incorporate availability of qualified personnel, tapping informal networks and information sources and local pocket-of-innovation (e.g. High Technology Development Zones or Science Parks). Business-ecological motivations involve consideration of governmental policy (incentives such as free rent, low tenancy costs, favourable lease terms and tax relief), continuing economic growth and unique market size, peer pressure coming from those who do not have foreign R&D centres and come under increasing pressure to invest in R&D. Performance-oriented motivations is to service local customers by making market-specific development due to the short R&D cycle time and demand of adaptation to local production process.

7.2 The motivation of MNC to ally with Chinese firms in technology development

In the research of globalization, the topic of where to globalize and how to operate are considered rather strategically. Any firm’s the global process is driven by the interaction of two factors over time: mounting competitive challenges and opportunities and gradual adjustments of the firm’s motivation or objectives for operating internationally (Malnight, 1995). As for most of multinationals, allying with Chinese firms is driven by six motivations.

Firstly, in order to enter into Chinese market and make success in the technological area, embracing a good relationship with government is very primarily crucial. In China, government has absolutely
dominated authority to determine the technology standard in domestic market. Firms that have better relationship with various governmental institutions are regarded having greater problem-solving capability (Luo, 1999). Allying with local partners who have strong government relationships is an efficient means for MNCs to overcome many political barriers in the local market.

Secondly, China has a large pool of well-trained scientists, engineers and technicians capable of performing quality basic and applied research at a relatively low cost. This is a crucial motivation that attracts MNCs to undertake R&D activities in China (Li & Zhong, 2003). Public sources show that more and more multinational corporations are increasing their R&D expenditures in China and hiring more local talent while cutting R&D jobs in North America and Europe. Many multinational corporations like Lucent, Bell labs, IBM, Microsoft and Nokia have all established their extensive R&D alliances with Chinese universities or technical firms to take advantage of the local human resources.

Thirdly, allying with Chinese local companies is driven by the goal of creating vertical linkage. Since each partner contributes one or more different element in a value chain (Contractor & Lorange, 1998), R&D alliances with local firms is not only able to provide MNCs with the opportunity to establish stable relationship with their Chinese customers but also enable them to timely adapt their technology to meet the local market demand.

Fourth, as discussed in the chapter 3, any firms are not possible to possess all the skills they need. Alliances with Chinese side can help foreign companies facilitate access to external complementary skills and resources to better exploit existing resources and develop sustained competitive advantage. In certain R&D alliances driven by economies of scale, in spite that both partners may have similar level of technological capabilities, allying together can make more efficient use of their combined resources: capital, facilities, and human resources such that to lower the costs by using the comparative advantage of each other (Hladik, 1998). Partners can also join forces to meet the “demand for speed” and share the expense of developing costly products that have short life spans (Powell, 1990).

Last but most important motivation is to gain the local market access and market share. In certain industries in China, state-owned enterprises dominate the market and government often place strict control over market operations, for those who want to have market share in related industries, alliances with local partners were therefore the only method (Calantone & Zhao, 2001)

7.3 The motivations to make technology alliances with MNCs from Chinese firm’s perspectives

In the section 4.7 we inspect the history of Chinese firms allying with foreign partners. It presents that international alliances focusing on the production and marketing is established during 1980s and first part of 1990s; technological and know-how cooperation were started from end of 1990s, especially after China’s entry into WTO. Based on our vigorous study on literature and in-depth interviews, we found that current studies on Chinese domestic firms remain in the infant phase, rather laggaring behind practice and sociology and economics disciplines.
Firstly, in our investigations in a small sample of 30 companies, firstly we found that there are 5 conditions which Chinese side does concern to choose cooperative partners. The technology which can provide access to new product design was concerned primarily. Following ranked includes profit return from the selective technology, domestic market value of the technology; market value of cited from other exporters and method of payment for purchasing the technology. Secondly, it is found that the technologies exports are dominated by large international companies for transferring technical know-how, patent, and equipment in the mode of cooperative production while medium and small sized technology suppliers provide a comparatively larger proportion of technical service. The Chinese interviewees noticed that they are more willing to cooperate with medium and small sized suppliers because the technologies they provided are more suited to international markets. But they do less well in transferring technology on schedule and in quality of the product.

Secondly, among our investigations in 30 companies which include state-owned large companies, the high-technology-oriented companies and small enterprises, we found that in contrast with previous condition, Chinese firms launch the pre-empt position. They actively search for foreign partners based on what they need and begin to enhance their bargaining power based on the Chinese huge market.

Thirdly, we found that the motivations that Chinese firms hold to ally with foreign firms show up heterogeneity. Different size of companies in different districts and different industries influence the actions that Chinese firm exert to cooperate with foreign part. It is found that due to a mix of constraints such as Chinese dualistic ownership structure, the absence of a powerful market mechanism, the soft budgeting system and the discriminatory governmental policies toward different firms, what Chinese firms lacked are the technological and organizational skills to cope with an increasingly competitive environment both domestically and internationally. These are confirmed as real reasons of Chinese part actively initiating international technology alliances. As re-asked in the interviews, it is agreed that in the progress of Chinese firms extending the local market to the international domain and creating foreign exchange earnings that are frequently encouraged by government and institutional strategy, what Chinese firms need from foreign partners are not only the physical technologies, but more importantly the foreign partner’s market power, marketing expertise, business experience, and corporate images and pertinent international operations in recent several years. This is strategically noticed by Chinese side to redress their organizational deficiencies and stimulate the goal achievement. After entry into WTO in 2001, Chinese firms accelerate their pace to enter into the international market. High pressure caused by their lower competitive capability/advantage is the main reason. By allying with multinational corporations and other excellent overseas firms Chinese firms can raise their quality in management and technology.

Fourth, we found that taking advantage of foreign companies’ image and government support to attract more talents is another reason on which Chinese side actively ally with foreign part. In addition to the demand to absorb knowledge and skills directly from technology or knowledge exchange, 60% of interviewees expressed that the reason is they want to attract more excellent specialists, researchers and engineers via the Sino-Foreign cooperation. Since currently Chinese government issues a series of regulation and laws to protect foreign companies’ investment right and MNCs establishes their own R&D centres in China, working with foreign partners is furthermore able to reduce the Chinese side’s
investment risk to enter into international market (such as trade barriers) and simultaneously deserve the government trust.

From knowledge-based theory perspective which we discussed in section 2.2, exploiting international market, obtaining foreign resources and searching for advanced technology are the main motivations for Chinese firm to carry out “Going Out” strategy proposed by CCP in 2002 since by which China government wants to change the Chinese Economy Growth mode from extensive of high-investment & high-energy consuming, heavy pollution and low effectiveness to the technology-intensive-driven growth.

Therefore, we conclude that in recent years, motivations of Chinese side to cooperate with foreign partners involves (ranked as importance) entering into international market and enlarging the scale of economies (example such as Asia Steel industry); solving the shortage of technology related; improving the capability both in technological aspect and organisational area; reducing the investment risk when entering into international market and overcoming the trade barriers from legislation point of view (Since China has no completed overseas investment law system available).

7.3 The Chinese attitudes towards Sino-Western cooperation and problems existed between them from the Chinese perspective

With China’s rapid economic growing and Chinese firm’s increased technology capability judged by foreign partners, Chinese populace’s attitude towards alllying with foreign side in the technological area has been greatly changed with the characteristic of attitude being divided. According to our interviews, many advocate the promise that foreign investment affords while others feel overly exploited by foreign interests. Due to the imbalanced regional economie development in China and heterogeneous technological capabilities in different firms and industries, the Chinese firms’ perception on the Sino-Foreign cooperation is not agreeable: some still hold the opinion of depending on foreign side to grow up and this group of firms are characteristic by its start-up stage, low-technology level and being located in less developed regions whereas some has been achieved the stage in which they consider their cooperation with foreign partners as the desirable strategy for catch-up; this kind of firms are normally those which have relatively scale of knowledge/technological base/capability, have several years of successful experience in working with foreign partners, and locate in the developed regions or technology development zones. By thorough study in Chinese literature and Chinese policy, we found that PRC officials and analysts appear to disagree on whether MNC investment can or will contribute value to China’s own science and technology capabilities. They, however, do agree that PRC continues to need foreign technology and R&D investment but must make better use of these inputs or risks.

In our investigation where many top managers are interviewed, several main problems occurred in the Sino-Foreign cooperation were found out. In order to not overlap with the next chapter in which barriers will be illustrated, we will only simply figure out what we have found out during our investigation; the specific reason and argument will be taken over by the next chapter.

China is not a country which lacks technological engineers. However, our investigation shows that the biggest obstacle the most of interviewed companies faced is the lack of managerial talent. This includes
the talents who are not only familiar with international trade and cooperation but also has sufficient capability to manage international cooperation. Most of our interviewees addressed that their long-term aspiration is to grow strongly in revenues from outside the country and to be global competitors in their industries. However the biggest obstacle they face is a lack of managerial talent. Sometimes, as they expressed, only because they have no suitable professional talents in management responsible for the international cooperation, they are forced to be passive in international cooperation deals. This conclusion is consistent with Mckinsey’s survey on executives around world in 2008 in which it shows that lacking professional managers is ranked the first obstacle by Chinese executives.

Additionally, the term of “alliances” is not quite acquainted by Chinese side and we conclude it based on our interviews where interviewees have little knowledge about alliances and many of them falsely consider Merger & Acquisition as it. The weak understand on the international alliances can be reflected in the China automobile industry in which Chinese firms’ participation into international alliances was virtually passive (Huang, 2005). It can be seen that the international alliances between the four largest automobile enterprises and foreign partners in China are still at a lower mode (manufacture alliance) and the cooperation at R&D level did rarely happen. Chinese scholars attribute it to Chinese weak comprehension about international alliances (Huang, 2005, Yang, 2006) which did not trigger Chinese side to enhance technology capability. Since alliance is rarely known by Chinese firms and they always regard merger and acquisition as the only solution to deal with inner knowledge shortage, education about alliances in China becomes urgent.

Secondly, intervention of Chinese government is mentioned as another problem. According to our interviews, the firms which figured out this problem are mostly those either of state-owned large companies or banks or sometimes universities or research institutes (private firms do seldom mention this). This is because in Chinese context of state-owned firms (including banks) the decision making power is not controlled by CEO or managers but on the contrary actually possessed by the so-called Secretary of CPC Party Committee appointed by CPC government. As for this kind of firms, government or its representatives have the authority in alliance partner selection, choosing alliance geographical location, alliance industry etc. As for Chinese start-ups, intervention from government appears positive because at that time the intervention is taken in term of government support. However, on-going government interventions cause many state-owned firms to loose original enterprise function and make the alliances go into failure.

Third, besides the problems that we propose in the questionnaire, our Chinese interviewees point out that the imbalanced cooperative position in the Sino-Foreign alliances is their hot potato. They complain about foreign partners who are not actively transferring advanced technologies to them, but simultaneously they acknowledged that the technology storage is the root cause of their weak bargaining power. It is explained that with more multinationals entry into Chinese market, the traditional rule of “exchange market with technology” is not as attractive as before. Foreign partners begin to emphasize their local partners’ competence and technology capability. For most of Chinese firms which are much laggard behind their foreign partners in technology, they eventually get into the corner where they use the Chinese market as the jetton but finally loose it without getting the most advanced technology.
Fourth, Sino-Foreign technology alliances are likely to centralize in high-tech industry such as Information technology. Technology alliances were established less in traditional industry. Even though the Chinese domestic technology capability has increased dramatically with comparison to before, the majority of alliances with foreign side are still at the lower level (joint manufacturing or joint marketing) and the position of Chinese firms assigned in MNCs’ roadmap of globalization strategy is still downstream-oriented. This allows the most Chinese firms to have less opportunity learning advanced technology, skills and managerial methods.

In the cross-nation alliances the problem of culture conflicts appears more serious. In our investigation, each respondent stressed the culture conflict. It is pointed out that Chinese corporations engaging in international alliances are due to the motivation to improve corporation’s competitive value. However, over two thirds of Sino-Foreign international alliances went into failure (Yang, 2006). Most are partially derived from the culture conflict in which three types of conflicts are very common. The first one is the difference of operation objectives between Chinese firms and foreign companies. As for typical Chinese stated-owned enterprises, the maximum profit is not the only goal for Chinese firms to engage into international alliances. Social effect, employment ratio increasing and playing example role etc. are considered more significantly. The second culture conflict is demonstrated by the sharp difference of leadership and willingness of CEOs of both sides to grasp more control rights, by which mutual understand is difficult to achieve. The third culture conflict is shown up in terms of the conflict in management method, reward system and bonus plan. The failure cases prove that once the both sides are not consistent with each other’s politics, economy, culture and law etc., or they do not immediately adjust their missions, strategies, leadership, culture management, going for failure will be the final destiny.

As for the perspective of foreign side toward Sino-Foreign technology alliances, the Mckinsey survey in executives around world in 2008 provides a set of valuable data. Of there, three significant worries that troubled Western part doing business in China are figured out. The first one is the Chinese unique competitive advantage in low cost production which according to the survey will not be as competitive in the coming three years as right now. The second one is the support from Chinese government which provides Chinese side much more favorable benefits when competing with multinationals. The last ranked one is the Chinese side “not being subject to stringent enforcement of patent and copyright regulations” which gives Chinese companies more opportunity to access market with incremented-innovation offerings based on foreign side’s radical technology.

7.4 The strategies for dealing with the risks of loss of technology advantage from MNCs perspective

Just as displayed in the previous section, our Chinese respondents expressed that technology transferred to them is basically characteristics of less-advanced and less comprehensive. Even though Chinese policies have already announced that FDI which bring in new and advanced technologies could obtain special bonus in tax and politics, still, few MNCs choose transferring advanced and completed technologies as their strategies, which is due to the intention to prevent technology leakage and protect their lead technical position. Bennett, et al. (2001) address that MNCs select more than one strategies for
protecting their competitive technological advantage in China; in the investigated foreign companies 90% of them expected to use R&D as a means to keep their competitive advantage in the Chinese market; 50% of the them collaborate with Chinese partners; half of the firms restrict the amount or types of technology transferred to China as the means to protect their competitive position.

As for the technology transferred into China, technically, it can be distinguished into high (advanced) and low in terms of level; and the completeness of the product or process in terms of comprehensiveness; comprehensiveness may range from a small part of the product or process technology at one extreme (for example a final assembly of a product from imported parts), to a complete product and process technology at the other extreme.

According to these two terms, we conducted the following Risk Model to analyze how and why MNCs protect their competitive advantages. In this model, besides the main actor MNCs, the other two participants are the Chinese enterprises and Chinese government. Considering the Chinese real situation, there are two assumptions needed to be made. First we assumed that each behavior choice of MNCs is affected by the responses from other two participants. Secondly, it is assumed that the importance of a technology is not only based on the extent to which it is advanced but also on the value of the technology, especially the value of what it produces.

Figure 7.4.1 Risk Analysis based on level and comprehensiveness of technology transferred

The analysis starts from the Block 1 in which the risk of leaking core technology to partners is very low since the type of technology they transferred stays at the low level and only partial set of technology is obtained by local partners. In the current China context no longer Chinese partners will accept this kind of business deal but also Chinese government does not grant this behavior in any political favors. Therefore, it is not the wise choice for MNCs because of Chinese policy stress and local partners’ demands.

Thereafter, 3 directions are there for MNC’s choice. The first direction, we assume that MNCs go to Block 3 and plan to transfer technologies at high level because this can help them deserve more political favors and more satisfaction from local partners. However, because the technology transferred in this case belongs to high advancement which enables Chinese side to contact technology frontier, if viewing from a
long-term perspective, MNCs will consider it as a non-suitable point because more competitive threat might come from local partners in the near future as a result of their increased technology capability.

The second direction, MNCs perhaps choose the Block 4. This time, the risk of losing core technology is obviously high. The completed set of technology transferred does help local partners absorb in a systematical way, furthermore, through technical communication and training to localize advanced technology, what MNCs behave does just like nurturing a forceful competitor of future. Of course, this is also not the result that MNCs want.

Therefore, finally, the safest place considered by MNCs is the Block 2, where they don’t have to worry about high technology transferred while being able to get “bonus” from Chinese government and Chinese partners. Despite they will lose somewhat existing technologies during the transfer, comparing with the situation 3, this is an absolutely optimal choice.

As a consequence, it can be seen that transferring less-advanced but comprehensive technology is the long term theoretical choice for MNCs.
8. Barriers for technology alliance in China

8.1 Culture

To explain the barriers for the technology alliances, in this section culture is arranged as the first category in alliances between China and the Western country. The reason does dramatically derive from two surprised statistic figures: (1) until 2007 it is reported that 82% of failed international technology alliances in China were due to Sino-Foreign culture conflict/differences (Zhou, 2007); (2) one thirds of Sino-Foreign joint ventures are still suffering management confliction because of inappropriate across-culture attitudes (Zhou, 2007). Additionally, insight from literature study, it is found that significance to research culture-related barriers may helpful for Sino-Foreign Joint Ventures to make corporate strategy formulation (Schneider, 1989); fix leadership styles and managerial values (Graham et.al, 1994; Tung, 1991) as well as manage myriad human resources (Hodgettes, 1993).

According to the definition of culture stated by Hofstede (1980), culture is “the collective programming of the mind which distinguishes the members of one group from another”. Narrowly categorizing culture in geographic term, it can be national culture, corporate culture and professional culture. In this section, we will not pay attention on corporate culture and professional culture in that people in the technology/R&D alliances do normally possess the similar professional knowledge background and since joint venture is considered as the research platform for technology alliances in this section corporate culture difference is assumed having less impact on performance of alliances or innovation than national culture difference. Therefore, besides listing the main culture conflicts in the Sino-Foreign (especially the Western) alliances, the root cause behind them will also be interpreted.

8.1.1 List of Culture Conflicts ever happened in the Sino-Foreign Joint Ventures

Perrow (1970) stated that barriers to effective managerial practice are derived from two situational characteristics: complexity and unpredictability. According to the contribution of Smith et al. (1996), complexity occurs when problems that managers encounter are multifaceted and methods for dealing with them are diverse. Although it is said that the most of barriers to manage R&D activity in China result from both complexity and unpredictability at the intra- or inter- organizational level (Oliver and Zheng, 2004), we argue that the culture difference is the root cause of most barriers. In this section, barriers will be listed and in the next section explanation in terms of culture dimensions will be addressed as well.

Difficulty in management due to Chinese language and the culture gap:

- Majority of upper R&D management are staffed by foreign expatriates. They are not familiar with management experience in Chinese context. Most of local engineers only have limited English capabilities even though they have good command of English.
- Difficulties occur in the daily communication due to lack of understanding on the culture gap. Western managers coming mostly from low context cultures (US, Germany) are used to capture the message meaning with words alone. They believe spelling it out clearly is the only way to avoid ambiguity. On the contrary, the Chinese culture is very high context culture (Hofstede,
1994). A message is delivered with nonverbal signals (e.g. one of voice, use of silence, facial cues, and body language), unspoken assumptions, and the context or surrounding the conversation. People from high context cultures assume that the receiver of the message is intelligent 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. A Western manager may have done everything correctly according to his understanding of good management style. However, lack of Chinese mentality and culture will usually translate to managerial inefficiency, wrong decisions and inadequate leadership.

- Diversity of R&D staff. The R&D teams of MNCs in China are diversified and are typically composed of three groups of people: local graduates make up the majority. The other two groups are Western expatriates and Global Chinese (which includes mainland Chinese returnees with education and working experience abroad; Chinese from Greater China-Taiwai, Macao and Hong Kong and overseas-born ethnic Chinese). Although this diversity can improve the creativity and innovation, it is also the source of potential conflict. Different working style and perception and in particular the huge gap at various levels become the barriers to cooperate each other.

- Low individual initiative and innovative mindset. The R&D staffs from mainland have solid education and are highly skilled in solving certain well-defined tasks, lack of practical experience and individual initiative is main problem. As Wash (2003) stated, developing a more innovative mindset among Chinese staff is a primary concern of foreign R&D managers. Risk taking behavior and entrepreneurship in the widest sense have to be promoted.

- High employee turnover rates and lack of loyalty. Three main reasons cause staff turnover: a better paid job elsewhere; go abroad to obtain graduate degrees; leave to work for or establish high-tech start-up enterprises. Compensation strongly influences the affiliation and loyalty of Chinese R&D staff. High turnover rate made some R&D managers reduce trust in local people, since they are afraid that this lack of loyalty will lead to a brain drain to competitors.

- Remaining governmental influence within the company. Even if the intervention on foreign enterprises’ activities by the Communist Party of China (CPC) has decreased in recent years and the party branch (i.e. party secretary) within some wholly owned foreign companies is not involved in the business at all, strong governmental influence still existed. There are still numerous possibilities for Chinese government to make everything difficult.

8.1.2 Dimensions of Culture as the basis to explain confictions

In the study of national culture differences, the work done by Hofstede (1980) is most comprehensive, in which culture is understood from decomposed segments: individualism, power distance, masculinity, and uncertainty avoidance. The fifth dimension, Confucian Dynamics, was identified in the research of Chinese Culture Connection (1987) where a new indicator of whether a culture is particularly short-term or long-term perspective is addressed.

*Individualism*
This dimension is about the desire to promote one's self-interest over the interests of the group. As Hofstede (1980) described, individualism is the relationship between the individual and the collectivity which prevails in a given society and can be reflected in the way of living, working and interacting. In the study of individualism, it is labeled by primary concern with one's self or family, emphasis on individual initiative or achievement, and the freedom to make decision; collectivism is the opposite concept in this continuum, with characteristic of family, group or organizations belonged and loyalty and emotional dependence.

Different ratings on the individualism between China and most Western countries are able to explain a partial reason why creative ideas are more likely to be introduced by the Western whereas Chinese engineers are always complained having less innovative capability. Generally speaking, China ranks higher in the collectivism in which individual aspirations and initiatives are subordinate to the group. But it is not advantage for innovativeness development since it must be established on the condition that people embrace high degree of personal and professional freedom, autonomy and independence which are favorable to innovative efforts.

**Power Distance**

Power distance is about the acceptance of social stratification. Hofstede (1980) addressed that it reflects the degree to which individuals in a society, or its organization and institutions accept an unequal distribution of power. To rate nations in this continuum, China is absolutely highly rated and on the contrary most of Western countries rank the other pole. Like China, the high power distance society is characteristic by greater social stratification, centralized decision making, formal vertical communication flows, top down control, formal rules & procedures and resistance to change. Conversely, the low power distance countries share power more equally, prefer more decentralized decision making and allow regard superiors and subordinates equal.

Similarly, this dimension does also exert effects on innovativeness and other performance. Centralized decision making, unequal power distribution among superiors and subordinates and top down control enable innovativeness hardly to be achieved because information is difficult to exchange freely in both vertical and horizontal directions. Additionally, another negative effect of large power distance can be reflected in the communication between superiors and subordinates. An example from Philips Lighting Co. in China reflects that why a foreign manager turned out to be angry with his Chinese subordinates due to the culture difference. As a Human Resource Manager in Philips Lighting (China), a Dutch would like to collect subordinates' opinions in their long-term personal career plans in purpose to design a localized management tool to reduce the employees' turnover rate. He asked several Chinese employees about which position they are planning to achieve in Philips. All the answers from subordinates however were totally far away from the question and related to the Philips's development in China. This manager felt angry and was rather confused about this answering way. However, actually in China's high rated power distance environment, the context culture is very high and indirectly addressing opinions about long-term career plan in terms of opinion in the company's development is the normal way. Due to unequal power distribution between leaders and subordinates it is accustomed for Chinese people to keep some words
unspoken but release them in the indirect way (voice, facial or body language), which also to some extent results from Chinese’s higher risk avoidance (which will be mentioned in the next sub-section). Example can also be the title addressing. High power distance in China determines that addressing people’s title either in public area or in private area is the advocated way. Addressing managers or professors without “his title” could be regarded by people as discourteousness.

**Uncertainty Avoidance**

Hofstede (1980) addresses that uncertainty avoidance reflects the desire to avoid risks associated with uncertainty by emphasizing technology, laws, rules and procedures, religion and other constructs that serve to dampen ambiguity. It is the dimension about need for rules and procedures to deal with ambiguity and uncertainty. High avoidance countries such as Japan are anxious about ambiguous situations and actively design ways to release stress as well as create a sense of control. On the contrary, low level of uncertainty avoidance countries, or say uncertainty accepting nations, such as U.S. and Germany, exhibit strong tolerance for change and ambiguity. In the research of Chinese culture dimension uncertainty avoidance, some researchers give the result that China rates in low uncertainty avoidance (such as Eric Izraelewicz, Quand la Chine change le monde (When China changes the world)) but some however argue that this result is deceiving even though their survey result remains same (such as Simon Kriss presents his argument at www.customerthink.com/article/hofstedes_five_cultural_dimensions). In our opinion, this difference on the results may result from the surveying location and respondents’ social and economic status. Since China is still suffering imbalanced region development (Eastern is much developed than Western, South part is developed than North part), people’s attitudes toward uncertainty avoidance are naturally varied, which are closely associated with social welfare system, level of economy development. Therefore, based on Chinese GDP per capital, relatively high in uncertainty avoidance is reasonable.

Low level of uncertainty avoidance countries, characteristic of acceptance of competition and colleague dissent, present to have positive effect on the innovativeness; whereas countries represented by higher uncertainty avoidance, such as need for consensus, resisting conflicts, are typical to inhibit innovation. Examples given in the power distance is also related to this dimension. Because employees fear to present the opinion different from their managers, which properly cause unpleased atmosphere, indirect answering is thereafter considered by them as the safest way. Also, high rate of employee turnover in MNCs can also be explained in this dimension. The strong risk avoidance does also reflect by the Chinese concern about their future uncertainty. Without completed guarantee from insurance and pension system in China, obtaining high salary and career promotion becomes the primary motivation of job-hopping. This is consistent with the result of our interview where for example IBM engineers’ “jumping out” is noted as this. Also, the intensive competition in the domestic labor market leads to an unwritten rule that only having sufficient money in hand can people have condition to deal with unexpected uncertainties in the future.

**Masculinity**
This culture dimension is the one about task oriented versus relationship oriented. As Hofstede (1980) argues, masculinity reflects a culture’s dominant values with respect to achievement, recognition, competitiveness and interpersonal relationships. Such as individualism and collectivism is a pair of items, masculinity and femininity opposite each other and characteristic by assertiveness versus nurturance. More masculine society place greater value on achievement, tasks, money, performance, and purposefulness; whereas more feminine countries emphasize personal relationships and social interaction. With respect to this dimension, China ranks higher in masculinity than U.S but lower than U.K. Generally, China can be scored 60 in the 100-grad system (see figure 8.1.1)

Different from all the other dimensions, the effect of masculinity and femininity on the innovation is not absolutely opposite, instead, feminine societies are less supportive of innovation than masculinity because in femininity society reward is not based on achievement and degree to accept conflicts is not as high as that in the masculinity society. Therefore, in the dramatically relationship-based society of China footprints of femininity can be used to explain why rapport with government is very important (this is also partially explained by Chinese Confucianism, see below). Nurturing good relationship with local government is a necessary lesson that foreign companies have to take because the case of good collaborating with government will help them deserve reward in preferential policy otherwise the footing in China context will be paid much more.

Confucian Dynamics

Confucian Dynamics is the last culture dimension that was discovered. This dimension generally distinguishes the difference between dynamic, future-oriented society (sometimes it is also named positive Confucian Dynamics in the long term perspective) versus static, past or present-oriented society (sometimes it is called negative Confucian Dynamics in the short term perspective). Confucian Dynamics was researched based on East Asian Culture; therefore, both of these perspectives are simultaneously possessed by Chinese people. In the positive pole of this spectrum, Chinese people reflect more future-oriented perspective such as perseverance, hard working, and shame, which has been studied to associate with high levels of innovation. On the other side, negative Confucian Dynamics shows as well. Chinese people can pay more attention on present and past-oriented perspective including face giving/savings, reciprocation, concerns for tradition and fulfilling social obligations (Bond, 1987). The negative pole of Confucian Dynamics can be as a reason to explain why the “market trading technology” expired and turned to be “technology alliances”. From Chinese psychological culture, the imbalanced reciprocation in the deal of “market trading technology” is the main reason to induce the new mechanism.

In order to give China the general evaluation in these five culture dimensions by comparing with other countries, the rank list summarized by Hofstede (2001) from his 20 years empirical study can be referred. However, besides the long-term perspective of Confucian Dynamics, China was not incorporated in the comparison in the first four continuums. Without the national survey method, the only way to approximately locate China in terms of these four dimensions is to refer to the countries or regions which have the same culture origin with China. Therefore, Taiwan, Singapore and Hong Kong are selected that were already involved in the rank list of Hofstede (2001). For the purpose to locate Chinese culture, the
term “high level” equates to the rank from 1 to 15 in the Hofstede’s study; “medium level” equals to the rank from 16-38; and “low level” equals to rank 39-53; low/medium equals to 27-53 and medium/high equates to 1-26. Considering more developed economy of these three regions, the dimension of uncertainty avoidance might be lower than the Chinese. Thus, with considering the macro-economic factor, the general evaluation can be concluded in the following table. Except the continuum of uncertainty avoidance that are currently the most disputed to locate, the other entire assumed proposition are consistent to the result of Eric Izraelewicz (2003) (see figure 8.1.1).

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<th>Individualism</th>
<th>Power Distance</th>
<th>Uncertainty Avoidance</th>
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</tr>
<tr>
<td>Hong Kong</td>
<td>37</td>
<td>15~16</td>
<td>26</td>
<td>18~19</td>
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</tr>
<tr>
<td>Tai Wan</td>
<td>44</td>
<td>29~30</td>
<td>49~50</td>
<td>32~33</td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>Low Medium/high</td>
<td>Medium/High*</td>
<td>Medium/High*</td>
<td>Low/Medium</td>
<td>l=positive</td>
</tr>
</tbody>
</table>

* This is a little bit away from levels of those three referred regions because China Economy has a large gap with them. As addressed before, medium/high level of uncertainty avoidance does largely result from Chinese incomplete insurance & pension system as well as intensive domestic labor competition (similar to Japan).

![Figure 8.1.1 Location of China Culture Dimensions](https://www.ppiblog.com/?318-china-report-cultural-dimension-of-china)

Source from Izraelewicz (2003)

Gary and Herbert (2000) argue that “Firms whose primary focus may be described as locally-oriented support/adaptation” are more suitable to locate in the region or country which exhibit high power distance, high uncertainty avoidance, low individualism, high masculinity and positive Confucian

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32 Characterized by adaptation of centrally-developed technology to meet local market needs and requirements;
dynamics”. Also, they continue to argue that “firms whose primary focus may be described as locally-oriented research and development” are more suitable to locate in the region or country where power distance is low/medium, uncertainty avoidance is low/medium, individualism is medium/high, masculinity is low/medium and Confucian dynamics is positive”. This gives us a good explanation of why MNCs’ cooperation with Chinese entities evolves from the technology transfer for adaptation to the market (develop specific technology/product which is adapted to China local market in home country and transfer it to China) to the localized research/development. Besides the individualism, long-term orientation, other three culture dimensions are changing which will be accompanied with China’s economy growth, completeness of social system, equalization of human rights etc. It can be forecasted that in the coming 50 years when Chinese system/rules becoming perfect (including education system reform) and Chinese firms becoming more of globalization, the culture might be less traditional and Chinese might become less risk-avoiding, low in masculinity and medium in power distance as Taiwanese and Hong Kong-nese; and naturally without restraints by the culture dimensions, complains in Chinese people are less innovative will definitely gradually fade away. At that time, if the individualism could be reduced till low level, Globally-oriented Research and Development might be in vogue in China.

According the Chinese culture dimensions, the analysis of some culture barriers mentioned in section 8.1.1 can be explained. Please refer to figure 8.1.2.

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33 It is used for accommodating the local (or regional) market by underlying applied research efforts as opposed to only development and recognize the potential supply of technical resources in the local environment.

34 Developing new products and processes for simultaneous application in world markets, internationally interdependent laboratories and research units. In many cases, it is called global technology unit (Ronstadt, 1978) and now only few multinational corporations such as IBM and NOKIA etc. established it in China.
Besides the above interpretation of barriers in terms of culture dimensions, some important notice for Chinese culture (the tips working in China) need to be mentioned additionally, which might be helpful for foreign business in China.

Firstly, culture is not a science, which is most obvious in China. In China, Confucianism culture controls the most people’s behavior, where rule of law is less powerful than rule of man. Hierarchy position or say the title of certain people decides what can be done and what can be said. “Face” is a sensitive topic in which besides what has been discussed before gaining face also indicates trying to give others (your cooperators, or competitors) your “respect” and make them not lose identity.

Secondly, Guanxi belongs to Chinese Confucianism dimension, which has influenced China for thousands of years. Even in current international cooperation, Guanxi is also the first lesson that MNCs must take and understand well. Guanxi is similar to the definition of network in the alliances theory but it involves the broad scope including relationship with authorities, personals, organizations etc. In China, the broader Guanxi network is and the more diversified multi-principals in the Guanxi network (for instance, this is a good Guanxi network where government, professionals, Bank, insurance company and etc. are included ) By getting the right “Guanxi” the organization can minimize the risk, frustrations and
disappointments when doing business in China. Often, the extent to which you can acquire right Guanxi with relevant authorities determines the extent to which you can obtain the competitive standing in the long run in China because inevitable risks, barriers, and set-ups you will encounter in China will be minimized if you have the right Guanxi network working for you.

Third notion is about dinning culture. If doing business in China or cooperating with local partners, foreign parts must be aware that dinning dramatically determines your successful cooperative business in China. Normally in China, negotiations are mostly informally taken on the dinning table where Chinese part uses it to develop their relationships or test their partners at the beginning. In most cases especially if your business partner comes from north part of China, alcohol is a big part of dinning. In many cooperation cases, we found that foreign partners who are not actively accepting this dinning culture do mostly loose the most valuable opportunities; sometimes cooperation is therefore terminated.

Fourth, different from Western countries, in China communist party manages everything. In addition to absolute control politics, even in the social micro-cells such as firms and universities, the highest command is controlled by the party representative appointed by Chinese communist party. This is quite obvious in north part of China because a large number of biggest stated-owned firms were originally built there. Ignoring significance of communist party will directly damage the cooperation development.
8.2 The sources and implications of trust in Chinese context

Multinationals enter into Chinese market with their globalization strategy as well as purpose of maintaining low cost. The cooperation with Chinese partners has established a new business environment which incorporates different cultures, different normative attitudes and diversified or even contradictory working manners. Because global collaboration in product development, in joint research & development or in cross-board marketing & trade reinforces the ties between the different countries, we have to admit that in the modern global economy, establishing global collaboration successfully is of primary importance, which is particularly true in international alliances and business networks.

However, in the international alliances, trust is a significant factor which is frequently quoted by managers and scholars as the potential root cause of failed cooperation or the successful international alliances. Superficial understanding on the cooperation trust does normally concern about whether cooperation contracts are well negotiated; it ignores that formal contracts just play a part role in establishing performance milestones for collaboration, but informal and tacit mutual understanding, mutual respect, and understandable compromising based on trust are more of significance. Trust is not a simple term despite many values is placed on it. Trust is still somewhat “mysterious” from which an under theorized, under-researched, and poorly understood phenomenon is there. Particularly within a new-established relationship, what is trust? Why one part has to give their positive faith in their partner? And how they can evolve this virtuous psychological linkage? What factors damage their good impression about others? How should they overcome it? A large number of questions are around trust and of course this appears much more obvious when entities are involved in cooperation with those who are not behaving under the same national culture because the common normative value is difficult to be recognized.

To distinguish the special effect of trust on the inter-people or inter-firm collaboration, scholars provided many diversified definitions of trust from different theoretical basis. However, they all agree on that trust concerns willingness of one person or group to relate to another in the belief that the other’s actions will be beneficial rather than detrimental, even though this cannot be guaranteed (Child, 2001; Creed and Miles, 1996; Brenkert, 1997). Trust being considered rather important not only for individual people but also for collaborative organizations is because uncertainty can be offset and complexity might be deal with. With holding rigorous trust between cooperators, collaborative risks in any partner’s opportunistic behavior or reneging on mutual understandings could be reduced or offset dramatically; and expectations that people have of one another can be stabilized. Nevertheless, something that needs to be noticed is that trust is established on the basis of a certain degree of knowing and understanding; and blind trust without any basis would probably induce collaboration going dead.

Before discussing the existed trust problems (sometimes in China it is called trust crisis) in the Sino-Western collaboration, in order to allow reader have a thorough understanding about Chinese-characteristic trust, it is necessary to primarily introduce the Chinese trust basis and general differences of understanding on trust between two parts. Any person who knows well about China might understand that China is a typical paradoxical society where trust-based relationship is effective within a defined local
group, especially the family whereas high level of trust is hard to be established outside of local networks. One of the five culture dimensions, collectivism, appears positively effective when people protect their small scale of relationship network against high level of opportunism. From this point of view, China can be categorized into high trust environment. However, if looking outside of relational network, China is also a low-trust society where people’s assumption in cooperating with others is based on no-trust ground. In other words, in spite of working together very well, each partner has to keep on reminding themselves that motivation of counterpart may not be advantage for mutual development and they should be prepared psychologically in advance to face the risk of opportunistic behavior. Therefore, it is not surprising that Chinese relationship is characteristic of high-trust (close) within network (family) but very low-trust (loose) outside.

Seeking for the root causes, we argue that it does come from the absence of extensive legal protection and technically it can be called lack of institutional basis of trust. Besides the intelligent property protection, legally enforceable contracts or recognized certificate in guaranteeing competence and quality are also belonged to legal protection issues. Advantages of legal protection society is that it encourage people to highly value honesty, openness and treating individuals equally and fairly and this is ensured by highly developed system law. Although it has been recognized that China keeps on developing legal system and provides sufficient law, especially after China entering into WTO, this country is still considered as a low-trust environment since the implementation of those laws is arbitrary and ineffective since sufficient guarantees against the trust betrayal can not be provided by the institutional environment in China. Most of Chinese scholars agree on that “the Chinese trust crisis” is the consequence of “lack of clear ownership rights” which we additionally argue that it is also because of arbitrary implementation of law. Chinese economic reform brings out China’s rapid growth, but at the same time this reform did not have the ownership in Socialism System “nominally” changed. Logically, the economic reform should be supported by a series of social revolutions; however, even after many years of Chinese reform, property ownership reform was not clearly distinguished. Citizens were on the one hand educated that “people are the host of the country; all the properties are belonged to the citizens and individuals must obey to social and country interests when there is conflict between them”; but one the other hand people are confused about this announcement since they recognized that there is no actual properties are physically belonged to them and the real decision right is retained by the government. This is called “codifying law in one way while doing explanation and implementation in another way in the reality”. Moreover, different bodies that introduce and interpret the law aggravate this problem. Even the law that is promulgated by Central government, each law term might be interpreted by different people at the subordinated governments. Governed by man in China is somewhat becoming “governed by the real man” who has the government authorities. Therefore, without the consistent and rigorous institutional protection, people have no choice but to intend to rely on the traditional trust that normally maintain in the family membership or possibly the friendship.

Based on the above part, readers might have a brief overview about Chinese trust. In order to exploit more specific trust barriers and trust benefits in the cooperation, especially the relationship across the national board multi-culturally, we interviewed several Sino-Foreign joint ventures, some of which have suffered from uncertainty because of low-level of trust; some of which have developed healthy system and does
Tule keep on rapid growing due to the long-term trust. By interviewing the Chinese side managers of the joint venture, a very important academic conclusion that “the key ingredient in successful alliance is trust” was coincided with our investigation; and it is proved that positive effect of trust on the joint ventures performance could be increased exponentially whereas trust corrupt is definitely damaging the collaboration and more likely to induce the alliance termination. In the next paragraphs, the detailed argument will be given and three-stage model will be used to make the analysis.

During our interview, when involving the barriers of collaboration, 80% answers are associated with trust and culture difference. As for the Chinese part, most of the managers complained that although they are very cherishing the opportunity to work with foreign part, it seems that the relationship is not able to be getting closely; foreign part does not care about the private personal relationships and of course the trust between them is hardly established. One Chinese manager has ever addressed like this “sometimes we can feel strongly that there is an unequal position between us. Foreign partners control all the overseas marketing issues which they don’t allow us to involve…however, you know, most of our market shares are abroad but we are forbidden to touch it”. On the contrary, the voice from foreign part: a Danish manager who was the representative of Danish side in a Sino-Danish joint venture told us that “Well… we were collaborating pretty smoothly at the beginning of alliances, especially when we decided to work together and bought land, registered at government…at that time, everything looked positive… however, after the business started, approximately two years later, our relationship was becoming abnormal…there are more qualms being generated… I cannot see trust, I mean trust in the business… something unexpected issues happen which caused us headache…” why it would happen like this? Based on the corresponding literature study, we found that the “stage-wise evolution of trust” model proposed by Lewicki and Bunker (1996) is the best to make an interpretation.

In the stage-wise evolution model, it is argued that trust develops gradually as the parties move from one stage to another. Conceptually, this evolution constitutes three transitions including calculative stage, cognitive stage and normative stage. Each of them is vitally important to generate the next one and each stage is corresponded to three phases of collaboration development (formation, implementation and evolution) over time respectively. Trust starts to develop on the basis of calculation where activities serve to confirm the validity of the trust and thus encourage repeated interaction and transaction. Lewichi and Bunder (1996) argue that this form of trust is based on the assurance that other people will do as they say because the deterrent for violation is greater than the gains. Trust at this stage involves expectations about another, based on calculations which weigh the cost and benefits of certain courses of action to either the trust-ors or the trustees. People are prepared to take risk in entering into dependence on others and take advantage of institutional safeguards or deterrents against reneging. As for some relationships, trust may remain at this level and many business and legal relationships begin and end in calculative trust. But on the contrary, if collaboration goes well, knowledge base about each other will be developed and generates the conditions for a transition to cognitive trust. Cognitive trust lies in the sharing of cognitions, including common ways of thinking among partners concerned. This cognitive sharing offers partners basis to understand counterpart and possibly to predict the other part’s behavior. It is true that partners entering into this stage will feel comfortable with each other in the knowledge because their relationship proved to be reliable and consistent, which in turn is resulted from the positive feedback obtained from calculative
trust stage. However, other possibilities cannot be excluded. For instance, trust will be broken or partners will have little willingness to undergo the shift to cognitive/the knowledge-based trust if partners receive negative feedback from previous stage or even in the case where the experience of calculative trust is not strongly positive, or if the relationship is heavily regulated. As partners build in-depth knowledge gradually and mutual confidence in relationship captured, cognitive trust could be transited into next stage, the normative trust which depends on common sharing values, common concept of moral obligation. It does not only require partners’ effective understanding but also the appreciation about other part’s wants. This trust stays at a high level because partners must establish mutual consideration and “feel” and “act” from their partner’s standpoint. Thus, collaborative relationship at this stage appears more of “business-friendship”. But one point that must be noticed here is this kind of trust that based on shared values and identification is less common especially in the multi-cultural collaborations; in the Sino-Western alliances, as one of our interviewees who are the senior manager in the marketing department of a Sino-Spanish joint venture addressed “…any peaceful atmosphere in the national-cross collaboration cannot be completely believable; This will not last long time because the different interests we hold are usually inherent in the relationship…”.

Being grounded by the stage-wise trust evolution model, now we get back to the complaints and trust problems happened between foreign and Chinese side. By in-depth interviewing the Chinese side, we are informed that the attitude Chinese side holds towards their foreign partners is not very positive. They release that their partners seem to be unwilling to contribute evolved trust in their relationship. Also, we heard from foreign side that normally if having relationship with Chinese part in the mode of joint venture, they are not willing to be much of in-depth since they reckon that using financial and technological advantage is more reliable and is able to reduce dependence on the Chinese partners. This is consistent with the idea which we have mentioned before that many relationships remain at the cognitive stage and by tracking the reason of this pair of attitudes; it is found that in the putative international strategic alliances, Western part has the contrary understanding about continued negotiation from their Chinese side. From the Western companies’ point of view, they interpreted the continued negotiation which takes place after signing alliances contract as signal of the other partner’s unsolidified faith concerning the fundamentals of the alliances; whereas the Chinese side regards it as a common experience that formal contract might not be the final version, more stepwise negotiations informally or formally held could be continued, which is the process that real trust is established. Therefore, only at the first stage of trust that corresponds to information collecting and negotiation stages of alliances phase, cultural distance in the trust interpretation in some relationships is possible to lead to many qualms when they execute collaboration.

Moreover, given the size and reputation of the foreign companies that stand the better position than their local partners and seek equity control, potential trust crisis is concealed in the characteristics of asymmetrical partners’ power and control and greater commitment in trust of the Chinese side than that of the foreign side. The Chinese managers complaint that it is difficult or even impossible for them to know foreign counterparts well since except the routine meeting where both sides will discuss together, in the off-working time foreign managers don’t socialize with Chinese colleagues. Therefore, even in the stage where trust is beyond calculative stage, cognitive trust is hard to be developed. However, one point
that makes us surprised is that most of our interviewees additionally comment that even though they feel very uncomfortable of this calculative trust that takes account of foreign part’s reputation, competence and financial return, in order to pursue the collaboration and have chance to obtain the complemented resource which they lacked such as fund, technology and skills, they must accept this low-trust option and agree on the leadership position of their foreign partners in the cooperation.

Discussing this issue until now, at the level of calculative trust where Chinese side does not account for the control position and seems that they have less complaints about it and would like to survive in this way, our tips for foreign side are that “don’t let this make your eyes shortsighted” because this will never be the permanent game rule. As what we have investigated from interview, cases might be occurred that foreign partners are possible to be dumped by Chinese side even on the step-way of their collaboration. It is noted that when Chinese side realizes that they have no necessity to persist on this type of “formalized trust based on contract” without a good grace as before; and if they believe that some start-up technologies and skills have been sufficiently grasped or more importantly their foreign partners still doesn’t consider guanxi and face-giving to the acceptable norms of business practice, they will actively terminate this un-equal control power distribution and probably seek for another cooperator.

However, in some international alliances, we also found that high-level of trust can be possibly established between foreign part and Chinese side, which is beyond the calculative stage and goes towards cognitive or even to the normative phases; According to our interviews, this does usually happen if Chinese side (a) is basically proficient in technology and is relatively strong in fund as well as (b) foreign part is not as highly internationally reputed as that of those companies we discussed above and (c) foreign part has least acquaintance with Chinese market, Chinese government authorities or Chinese workforce management. In other words, if both sides possess each other’s core complementary resources but still embracing the overlap in each other’s knowledge base, trust will easily go for the cognitive and normative level because repeated exchanges can live up to the parties’ expectations which increase the multi-confidence that each of them is capable of delivering on promises. Of course it must be founded primarily on the positive feedback from previous trust step (calculative stage) and significantly foreign part must show up active willingness to learn Chinese business culture and Chinese business mentality such that open communication, mutual consideration of each other’s interests and close relations between key managers of both sides are likely to come.

To achieve the mutual understanding in the Sino-Western alliances, accumulating more knowledge which is aimed to develop the common ways of thinking is of crucial importance. This also involves the sensitivity to each other’s culture. As what we have showed before, trust loss appears more obvious especially at the time when alliances proceed into implementation stage where people are appointed, technology and systems installed and operations commenced. By discussing with the interviewed senior managers, it is said that besides the cultural understanding about trust, the system that are used for control and information reporting at the stage of implementation of alliances are very significant. For example, one of our interviewees who is now working in the Sino-Danish joint venture told us that he cannot directly contact with the representatives of the foreign party even though his work is closely associated with them. The information reporting system in that joint venture blocks Chinese employees reporting...
directly to their foreign boss. It seems that the person whom foreign part only believes in is the one who was the representative (Chinese) of foreign part before alliances implemented. "It’s strange…" he said, "if we are working in the same company and each part has the control power in the joint venture, why does foreign part introduce this one-way reporting system?…in Chinese words, it is ‘using people but not trusting people’ ". In order to demonstrate whether the kind of case is general in Sino-Western joint ventures, we re-discussed another 3 Chinese interviewees who are working in the mid-sized joint venture and a local Chinese government staff who is charge with foreign business management. The conclusion is that even though they didn’t violate the basis of calculation trust at the initial stage of alliances, at the implementation stage, foreign part’s insensitivity to Chinese culture without localized reporting system causes both sides to loose multi-understanding and the worst case where two sides give up faith in trust.

So, the final consequence is different from Western society, Chinese culture concerns very significantly the “relationship building” because of Chinese typical trust tiers (family-based trust is more effective than the social-based trust) in the situation of absence of Chinese legal protection. The term of “relationship building” is closely associated with the third phase of trust (bonding trust) where people establish trust by having strong personal relationships, sharing a common identity, or similar values etc. *Psychological bond* which amounts to this relationship’s philosophy requires that not only accumulated knowledge about each other tends to reinforce the relationship but also growing emotional ties can nurture the trust and cooperation. The importance of this bonding trust in the Chinese business can be recognized from the well-known example that Chinese is prefer to set up family-based business based on close membership. In many alliances especially the Western-Chinese cooperation, bonding trust is expressed by Chinese part as the *initial basis* for establishing cooperation or even sometimes the starting point to cooperate with people who are not known well. This is the original reason why trust between Chinese part and foreign part is difficult to be established. And also it is the cause why alliances established with Chinese part must have intermediate introducer or agency. Partner’s selection or even the degree to which the Chinese part can give to the other side are mostly determined by the degree to which Chinese part give trust on the intermediate agencies. Personal relationships play the important role to adjust this degree since bonding trust in China is built within Guanxi networks. Therefore, one important lesson to enhance trust in the Sino-Western alliances is to have a couple of trust guardians who can promote mutual trust between individuals of two sides.
8.3 Intelligent Property Rights (IPR) in China

During the interview, we found that Intellectual property (IP) concerns significant for foreign side as one of the factors to withdraw the technological cooperation with Chinese side. Even though China’s access to WTO requires Chinese intellectual property system should be in accordance to international laws, infringements of intellectual property rights still appear common in China due to Chinese incomplete IP management and law. IP protection is definitely becoming a serious barrier of the technology alliances between China and the Western.

In this section, in order to exploit the root of weakness of IP management in China, the intellectual property system and problem existing in IP system will be systematically investigated.

8.3.1 IP management

As Schumpeter noted, innovations should lead to temporary monopolistic profits in order to harvest previous R&D investments. A strict legal intellectual property system with little uncertainty for the innovator is a prerequisite for technological process and high rates of innovation.

The current Chinese IPR system has been in existence for less than two decades. Yet, it is still out of solid. Based on the thorough study on literature, multinationals have three concerns about Chinese IPR: (1) piracy of IP remains rampant in China. (2) Weak IP infringement enforcement at the international level. (3) Long patent application procedures and a lack of public acceptance of IPR legislation. In this sense, the lack of IP protection in China stops many foreign firms transferring their core technologies, research, or equipment to China.

In order to define IP management, the definition of Knowledge Company and IP companies should be firstly clarified. According to Sullivan (1999), knowledge companies are the companies whose predominant profits are from converting knowledge into commercial value. Therefore, the knowledge itself and the structure of sustaining and converting the knowledge profitably are two important components in knowledge companies (Koenig 1997). IP companies are the ones whose main profits are generated by converting legally protected IP into commercial value in the market. IP management refers to the management with a significant IP focus, whose goal include the generation of IP and leveraging IP into market value (Sullivan 1999).

Either for the knowledge company or the IP company, protecting the intellectual property within a certain time span and use strategies to transfer creative knowledge into profit are very important. In this sense, four strategies have been indicated by Hufker & Alpert (1994) relevant to patent management in companies involved with IP flows: defensive strategy, prospecting strategy, co-operative strategy and marketing strategy.
- Marketing strategy consists of licensing and R&D.
  - Licensing: is the authorization in the form of contract between the owner and the recipient of the technology. It is used to benefit from IP flows because it can bring quick returns and avoid the risks of undertaking in-house R&D. This strategy is very commonly used by
foreign companies in China.

- In-house R&D-based strategy is more costly in time, money, and human assets with a high risk of failure and a danger of infringement.
- Defensive Strategy comprises accumulating strategy and patenating improvement and process strategy.
  - Accumulating related patents refers to the purchase of IPRs for a new product that is threatening the existing product. This strategy can prevent direct competition from competitors by introducing substitutes. But its process is costly and can be viewed as violation.
  - Patenting improvement and process is to conceptualize in advance all the improvements and modifications that may be made to current technologies, including those of competitors.
- Co-operative strategy can be divided into collaborative agreement and cross licensing
  - Cross-licensing is the most commonly used method by co-operative arrangements in developed countries. This collaboration can result in more rapid standardization and diffusion of technology. Meanwhile, it promotes alliances.
  - Collaborative agreement is always applied with cross-licensing.
- Prospective Strategy consists of bibliometrics and benchmarking
  - Bibliometrics relates to a statistical analysis of scientific papers and patent specifications in order to isolate those that are important to the companies’ current and potential future lines of business (Hufker & Alpert 1994).
  - Benchmarking is a method by which effective management of technology can be provided in the process of data survey.

This strategy is broadly used by technology-driven companies because it allows them to monitor competitors’ technological activities, keep abreast of development in relevant technologies, and assess their technological competitiveness with other competitors.

8.3.2 Intellectual Property System in China

IP system in China is triple constructed, which includes legislation guidance, administrative control and judicial enforcement. In China, triple IP system refers to the three interrelated national powers of IP.

Legislative Guidance

Legislative Guidance, which means the Chinese legislative system and mechanism in guiding the IP activities and protecting IPRs, is carried out by two layers of legislative organizations where both the central government and its ministerial and provincial government organizations have the power to introduce legislation and regulations. The highest layer is the National People’s Congress (NPC) whose function consists of enforcement of the constitution and enactment of laws; supervision of the enforcement of the above laws; and nominations and removals of presidents of the Supreme People’s Court. The Second tier of the legislative power organization includes the local people’s congresses and their standing committees in provincial, autonomous regional, municipal city level governments and the ministerial governments under the State Council. It functions with regard to issuing rules and regulations based on local needs and requirements, which must be in line with the Constitution and laws from the first tier. Besides that, it has to report these issues to the first tier directly for approval.
China IP mechanism began taking shape in 1982 when the trade mark law was promulgated. Over a period of progress in revision, the legal framework has been gradually evolved from ambiguity to relative clarity.

- **Patent Laws.** The current patent law is based on the patent law in 1984 by major amendment in 1992 and 2001. It, together with other patent regulations, protects three rights---inventions, utility models and industrial designs that must possess novelty, inventiveness and practical applicability. Patent protection can last 20 years for an invention, 10 years for a utility model and industrial design from the date of filing. *Patent applications by foreign applicants are treated in accord with international conventions or bilateral agreements between China and the applicants’ countries. Furthermore, a patent agency designed by the State Council in China must be appointed by foreign applicants to deal with patent-related matters.*

- **Trademark Law.** It is based on the law in 1982, with major amendment in 1993 and 2001. Like the patent law, it also authorizes a first-to-file registration system. The requirements for the foreign applicants are the same as those for the patent law. Differently, the valid period for a trademark is ten years from the date of registration approval. Indefinite renewal is permitted with renewal at every ten years. Additionally, China has also stipulated rules for special marks such as collective marks, certification marks and well-known trademarks.

- **Anti-unfair Competition Law.** It was announced in 1993 which categorizes 11 acts of unfair competition, including business secret infringement.

- **Copyright Law.** It was enacted in 1990 with major amendment in 2001. It protects the authors’ rights in literary, artistic and scientific works, and other related rights, comprising neighboring rights, moral rights and special rights. *Foreigners’ work can be protected under international conventions or bilateral agreements to which China is a party.* The term of protection is an author’s life-time plus 50 years after his or her death. Moreover, computer software is protected as well. *If software is first made public outside China, it is protected under international conventions or bilateral agreements between the foreigner’s countries and China.* The protection duration is for 25 years. Extension can be made for another 25 years, but the maximum protection period is 50 years in total.

**Administrative Control**

Administrative control can be defined as the administrative organs and their function in IP applications, examinations, approval and protection.
As seen in figure 8.3.1, the administrative control of IP in China includes the following functions:

- **SIPO.** It was established in 1980 directly under the supervision of the State Council. It is responsible for the preliminary examination and approval of patent applications, and interpretation of patent law and regulations. It is also responsible for international patent applications, interpretation and other international patent issues.

- **PRB.** It is within SIPO and is responsible for re-examination of rejected applications, which have requested re-examinations. SIPO and PRB have additional roles such as the supervision of patenting activities and settlement of administrative disputes.

- **Trademark Office.** It is responsible for mark examination, preliminary approval, registration and administration throughout the country. It has the right to cancel a trademark in question at any time. TRAB within the trademark office is accountable for receiving and resolving applications for adjudication and administrative handling of trademark disputes.

- **SCA.** Its principle task is the nationwide administration of copyright which also includes approval of foreign copyright agencies. The China Copyright Protection Centre is responsible for the computer copyright registration and administration.

**Judicial System and its enforcement**

Judicial system refers to court system and its function in supervision of personnel management of judicial staff, the organization of training of legal workers, the allocation of funding to the courts and the exchange of legal research with foreign judicial bodies. Its principal task is to deal with the IP disputes.
The judicial system can be viewed from the three aspects: *the court system, judges and lawyers and dispute settlement.*

1. The court system, which can be overviewed in the following graph.

![Diagram of the Court System in China]

2. Chinese Judges and lawyers. This group of people is called "legal workers of the state" by the government. Judges are elected or appointment by the people’s congresses at national or local levels. They usually serve a maximum two terms of 10 years (Worden et al. 1987). Different from Western trials where a judge administers the trials impartially between two contending attorneys, Chinese judges and assessors both play an active role in questioning all witnesses. Lawyers are qualified when they satisfy one of the following four conditions. (a) Law graduates with minimum two-year experience in people’s courts, public security department. (b) With legal training. (c) With minimum three years experience in economics, science or technology and well acquainted with the laws in a particular area. (d) With education, experience and legal knowledge similar to above three categories.

3. The conventional Dispute Settlement. Foreign enterprises operating within Chinese territory should abide by the Chinese laws for contract dispute settlement. Four available ways are offered by Chinese government to settle the disputes among contract parties.
   - *Consultation.* Solving problems by negotiations among them; reserving differences while seeking common ground by internal consultation. Co-operation and compromise are important working methods.
- **Mediation.** Solving problems through co-ordination by the third party which differs itself from the consultation method. It is the flexible and simplest way to settle dispute and well popularly used in China. There are two types of mediation: private and the people’s mediation (O’ Connor & Lowe 1996). Thereof, the first one is mediation with informal involvement by a third party. The later one can be mass organization, administrative mediation and judicial mediation. It has to note that *Beijing Mediation Centre* is the only mediation organ for settling foreign-related matters.

- **Arbitration.** It is a quasi-judicial procedure with rigor and criteria. It is always occur when parties in dispute agree to submit the dispute to a non-governmental arbitration institution to be solved. It is more flexible than litigation in terms of time and money. For international disputes, China International Economic and Trade Arbitration Commission are well accepted with high reputation.

- **Litigation.** It happens when one party submits a lawsuit against the other party to the People’s Courts. Litigation proceeding is usually so long and adversarial in nature which tends to a lack of co-operation in the future and to be detrimental to the parties involved. Therefore, it is the last option when solving problems.

### 8.3.3 The problem of existing IP system in China

In the previous part, we generally introduced the triple structure system of Chinese IP. Although it looks logical and completed controllable at the each level, it is after all a rudiment system which was only received attention for couples of years. We have to say, some real serious drawbacks makes this system being controversial which needs more efforts for optimization. In this part, we will pay more attention to explore the problems existing in the Chinese IP system which could be more interesting to foreign investors in China.

The first group of problems which always occur is at the legislation level, in which,

- We have mentioned that there is only one patent law to protect three different forms of patent rights: invention patents, utility model patents and industrial design patents. It is unreasonable since (a) for examples international stipulation (according to the WTO’s TRIPS agreement, Article 25.2) requires that textile design should also be protected through industrial design law or through copyright law. However, in China, patent law covers all protection including textile designs. (b) Innovation holders can be motivated by separate protection better than only one protection law. As is known, both invention and utility model need to be novelty, inventiveness and practical applicability. However, invention and utility model have distinct requirement on these requirements. For instance, invention emphasizes “prominent substantive feature and notable progress” while utility model represents “substantive features and progress”. Obviously, innovators at different modules have different expectation on their right to be protected. (c) From the customer’s perspective, non-distinct patent law may lead customer to misunderstanding. In China, invention patents, utility model and industrial design are all named patent rights.
Customers easily regard a patented utility model as an advanced technology which is recently introduced. In this case, customers are cheated unintentionally and manufacturers feel difficult to satisfy customer’s expectation.

- Two tiers of legislative system are hard to guarantee consistence. Chinese government says that the introduction of this structure is due to the intention to grant flexibility to second levels. However, on the one hand, no special code is stipulated to guild the second tire, provincial organs if they are ready to introduce inner province rules; on the other hand, the first tier of this system did not establish an coordinating organs to deal with confictions across provinces and ministerial governments. This is different from the system of U.S. in which each province and ministerial government can be isolated each other. In China the legislative system is not designed suitable to China’s reality, in which, foreigner always bewildered which one is right when two regulations are inconsistent. The other further problem caused by inconsistency is that the different names in Chinese in IP system are translated to the same English name. Even in the four major entities which have authority to promulgate laws and regulations: NPC and its Standing Committee, the State Council, Ministerial organizations and the provincial People’s Congresses. For instance, laws and regulations, rules and regulations issued by government department with different meaning in Chinese are all translated into “law” in English with the same meaning, which to large extent confuse foreign businessmen who have investment or business in China.

- China’s patent law and trademark law were promulgated in line with the Paris Conventions in 1982 and 1984. In the following years, Chinese Patent law made corresponding amendments according to the requirement for IPP and IPs introduced by TRIPS in 1992, 1993. However, some inconsistence and ambiguity also exist since in 1994 the most comprehensive agreement signed by TRIPS was formed, but China IPs was not changed with them and the higher standard never incorporated into China’s IPs. For the ambiguity, the most famous case is the well-known trademark protection. All the trademarks which have different meanings in Chinese are translated to the same English name—well-known trademark. This not only confusing to foreigners, but also misleading to Chinese users. The following table shows the differences of well-known marks in terms of reputation between World Intellectual Property Organization (WIPO) and China starting from low level. It is argued that the unclear description of well-known trademarks which leads to inconsistent usage and is due to (a) the broad definition of well-known trademarks made by China (‘‘...registered trademarks which are of high repute and well-known to the relevant sector of the public’’) (b) lack of coordinated and unified standard for provincial level well-known trademarks.


Table 8.3.1 the meaning of trade marks in Chinese, English and literature translation

<table>
<thead>
<tr>
<th>WIPO</th>
<th>China</th>
<th>Law in English</th>
<th>Literature Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>well-known trademark</td>
<td>zhong suo zhou zhi</td>
<td></td>
<td>publicly known trademark</td>
</tr>
<tr>
<td>Exceptionally well-</td>
<td>zhi ming shang biao</td>
<td></td>
<td>well known trademark</td>
</tr>
<tr>
<td>known</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Famous mark</td>
<td>zhu ming shang biao</td>
<td></td>
<td>well-known</td>
</tr>
<tr>
<td>Marks of high</td>
<td>chi ming shang biao</td>
<td>trade mark</td>
<td>prominently famous</td>
</tr>
<tr>
<td>reputation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High known marks</td>
<td>chi ming shang biao</td>
<td></td>
<td>trademark</td>
</tr>
</tbody>
</table>

The second group of problems happens at the level of **administration level**
- Lack of co-ordination and co-operation in different administrative organizations, especially the ones at the same level. Even though there is a far more complex bureaucratic network operating IP administration at different levels, the complicated relationship between different layers leads to conflicts amongst administrative organizations. Multi-administrators of one IP affair and no cooperation and consistency among different levels make IP administration into out-of-order. It is argued that it results from the absence of administrative guild-line. Without clearer guidance, it is impossible to exert unified and effective administrative enforcement.
- No specific guidance for organizational leakage problem. As mentioned before, Chinese laws have been stipulated to prevent and punish infringement; there are no specific guidelines about what should be done when an organization dealing with IP issues unintentionally or inadvertently leaks relevant IP secrets.

The third set of problems can be seen at the **enforcement level**
- As problems at the administration level, lack of co-ordination and co-operation did exist in the judicial organs. Even though it can be argued that independent judicial powers might lead to efficiency and effectiveness when judging certain case, it inevitably causes inconsistencies in different judicial judgments. Thus, we conclude that harmonized judicial proceedings are crucial to effectively and efficiently resolve IP infringement (Liu, 1996).
- The quantity and quality of judges and lawyers are not satisfied. Since the legal enforcement was resumed in 1980, it is impossible to build up a large group experienced lawyers and judges in such a short time. O'Connor (1996) noticed that “perhaps the visible difference between the legal structures of the countries...is reflected by the current number of lawyers each country has”. By 2004, there were 114,500 lawyers in China in contrast with 900,000 lawyers in U.S. in 1994. The quantity of lawyers indicates that individual in U.S. has easier access for litigation as a remedy than in China. In addition, the quality of judges and lawyers was questionable comparing to
international levels. The requirements to be a lawyer in China are difficult to sufficiently make a qualified lawyer.
9. Discussion and suggestions

This research is conducted based on 3 sub research questions that we proposed in the beginning: Chinese domestic technology capability, the effect of Sino-Western technology alliances and Chinese firms’ catching-up model. We started our research from strategic international alliances in China by which the Chinese policy on technology transfer via FDI, the role of foreign investment, the mechanism of technology transfer, the characteristic of technology transfer and the factors that influence the performance of cooperation were discussed. By doing investigation in these sub-sections, the characteristic of Chinese domestic technology capability was concluded.

Chinese firm’s technology capability stays at developing level and if comparing with their foreign partners it is much more laggard, which leads to the case that the technology alliances between Chinese side and Western side are hard to make R&D cooperation smoothly. Moreover, Since Chinese technology capability is characterized by heterogeneousness in the perspective of geography and industry, the firms which locate in the developed regions are likely to absorb “software” technologies whereas on the contrary those in the less developed district tend to purchase “hardware” technologies. The capability development is stimulated by internal intensive competition and promoted based on the cooperation between domestic and abroad institution; thirdly, Government policy plays a significant role in preventing certain Chinese key enterprises from abortion at early growing stage. However, the shortage in design and innovative capability makes Chinese companies still cooperate with foreign partners in production know-how transfer, which largely impedes the technology capability development.

Catching-up model of Chinese side was investigated by table cases. Three sub-models for different type of Chinese firms were analyzed. Based on three catching-up models discussed in chapter 6, it is concluded that China’s catch-up is based on the path-creating way. Sino-Foreign technology alliances are embedded in this path and based on that some of Chinese firms realize the taking-off. In the comparison of Chinese catching-up strategy and foreign companies’ investment in China, it is found that they hold the vis-à-vis market penetration strategies when carry out overseas action. Comparing with multinationals that are exploiting Chinese segmented market, Chinese firms have mastered to serve home mass market and some of them who are capable in technology development with strong fund basis have started to extend business antenna to the developed countries. This group of firms exerts globalization strategy by primarily putting their attention on the neighborhood market of targeted developed countries, which is aimed not only for reducing the investment risk and preparing marketing research but also for self-nurturing overseas investment capabilities. Some of companies catch up from the multinational’s OEM originally to independently sell and produce self-branded products. This can be proved by Chinese motorcycle enterprises such as Dachangjiang, Longxin and Cixi Zhongshen Motorcycles companies which have accounted for more than 50% of all global motorcycles market with the price under $200 in 2002\textsuperscript{35}. Therefore in order to survive in the Chinese market and compete with Chinese firms in the

\textsuperscript{35} A certain number of multinationals complain that Chinese partners “steal” their design; however, in many ways Chinese firms have gone well beyond copying to redefine the product architecture; they embrace their own powerful R&D team by orchestrating the intra-country network to encourage significant local innovation at component and
international market, companies from developed world needs to reposition themselves because of two factors. One is the large group of low-income of consumers who cannot afford high-priced offering provided by multinationals in China. The other is the spending behavior of this immense group of consumers (Since they are typical in unusual youthfulness, demanding, open-mindedness and adventurousness which implies that they have less loyalty to established brands and greater receptiveness to new participants and product features). In order to penetrate this vast market, Western companies must charge price that the majority of its consumers can afford and rethink the way they develop and deliver their offerings. The Dell example (which was forced by Chinese local companies’ price competition in August 2004 to retreat from their effort to sell low-cost consumer PCs in China) indicates that for Western firms which are willing to survive in Chinese market, the solution is not just to bring their products and business practice to the developing world, more importantly they must instead redesign their products and processes from a “clean-sheet” perspective. Nokia and Sony Ericsson which have achieved successful performance in selling mobile phone acknowledged that when serving Chinese market that is the world’s largest market for mobile phones, they must go back to the drawing board to redesign the product which must incorporate many interdependent systems and subsystems to meet majority of Chinese consumers. One point that is of significance to note is that redesign must be conducted based on customer-driven modularity which means that by modularizing a product for distinct needs of different kinds of customers and channel partners, the total cost of ownership and of sales can be cut down to a dramatic extent. Also, big companies might learn from positive lessons of Chinese companies that more concerning on incremental innovations instead of disruptive innovation is more important because it is to effectively reduce the cost both from R&D and design perspective as well as promote the bootstrapping power to sustain the institutional capacity and keep a rapid improvement pace. Therefore, our suggestion for the Western companies which are suffering in the Chinese market is that trying to target the specific and demanding needs of lower-income consumers instead of just focusing on the affluent segments of emerging/Chinese market.

Sino-Foreign technology alliances are the main line of this research. Of there, we discussed about motivations and attitudes and even the barriers & problems towards alliances from the Chinese side perspective. As what we have addressed before, to illustrate this topic not only from Western companies side but also discussed in-depth from Chinese side is our main contribution. Since fewer studies have ever paid attention on Chinese perception, we propose that with fast catching-up of Chinese firms, the Chinese attitude and motivation to cooperate with foreign side will be evolved timely. Admittedly, China is now changing from previous large pool of cheap labor and raw materials market to the one in which a substantially sizeable group of skilled engineers are provided. As for Western companies, the first rationale to invest in China is to establish an innovative “listening post” in a clearly important and potentially sizable consumer market. To locate R&D functions alongside already off-shored manufacturing and production is a justified reason of foreign investors who select China. The second reason to locate technology alliances in China is to appease PRC officials who demand it. Doing so is viewed by many foreign investors as essential to furthering other, long-term interests in the China market. Another reason is based on idea of where technology leaders go, others follow. Competitors, suppliers
and partners establish their own R&D programs on the mainland China once their industry leader has gone there. But over time, the purpose has become complex. Multinational corporations seeking access to overseas markets through offshore R&D programs are additionally drawn by Chinese ready-made high tech and specialized industry zones (such as Beijing zhong guancun Science Park) as well as by Chinese loose regulatory environment, tax incentives and other investment-related enticements.

Chinese populace’s attitude towards foreign investment in China is divided, with many advocating the promise that foreign investment affords while others feel overly exploited by foreign interests. PRC officials and analysts appear to disagree on MNC investment in R&D can or will contribute value to China’s own science and technology capabilities. They, however, do agree that PRC continues to need foreign technology and R&D investment but must make better use of these inputs or risks.

In the research of Sino-Foreign technology alliances, fewer studies provide insights into the effect of growing amounts of foreign R&D investment in China on China’s indigenous science both at macro (national) level and a micro (firm) level. Making research on this sub-topic is one of our research contributions. As described in the World Investment Report, “...no country can rely entirely on knowledge within its borders” (UNCTAD, 2005a), Chinese R&D capabilities are enhanced by learning from foreign collaborators whereas the stimulated R&D capability of domestic firms in China, in turn, influences the foreign R&D investors to further intensify their R&D activities and improve the R&D investment on the mainland China. As increasing number of inventions are created based on cooperation between Chinese and Western side (such as Intel’s processor-based Open Research compiler chip designed by Intel China Researchers etc), China was cited by UNCTAD as one of only few developing countries that holds the potent ia stimulation is formed, in which foreign R&D input in China that leads to Chinese technology capability advances could be in turn re-charged by the increased Chinese firm’s technology capability. Chinese government policy plays a crucial role in positively catalyzing this interaction. In the latest China’s 11th FYP 2006-2010(Five-Year Plan) that is for releasing National Guideline on China’s Long- and Medium-Term Plan for Science and Technology Development (2006-2020) it calls for continued openness to foreign technology investments as a means to improve China’s own scientific and technological capabilities. It also calls for that China’s reliance on foreign technology will have a reduction to 30% in 15 years, down from the present estimated dependence rate of over 50%. People’s Daily (2006) comments that this stressed independent innovation doesn’t mean to resist introduction of advanced technologies from abroad, instead Chinese entities are expected to make good use of both domestic and foreign resources to push forward the independent innovation. Jefferson (2004) argued that China is now nearing a critical technology “take-off” point if judged from Beijing’s current pace of national R&D spending; it is believed that added billions of foreign dollars and related assets that if is effectively absorbed and applied could hasten the realization of this technological turning point. However, even though a large amount of foreign R&D investment is located in China and increases at a fast rate, what we argue is whether China can leverage foreign R&D to enhance the domestic scientific and technology development is dramatically depended on the extent to which China can effectively absorb foreign technologies, research, and know-how and apply it to China’s own scientific and technology development
efforts. Otherwise, China’s own technology development will suffer, again, a zero-sum outcome where MNCs investment are perceived as unfairly exploiting China’s human, tangible and intangible resources. To effectively leverage foreign R&D investment, we suggest that interactions between foreign and Chinese domestic research is necessarily important (which is however very low currently). If willing to achieve “success breeds success”, China has to additionally make lessons from success and try to share and absorb them effectively. Enhanced horizontal communications between researches, strong support to prosperous entrepreneurs, greater freedom in expression, and mandated merit-based promotions should be specially advocated so that innovation and technology, skills and tacit practice can be broadly disseminated.

Research about Chinese firms learning through technology alliances concerns another contribution. Under this topic, we discussed the framework of learning strategy of Chinese side and conclude that the learning strategy is associated with development of Chinese side’s knowledge base. With the increased technology capability, the learning strategy presents a sequence from bring in strategy to replicable imitation strategy towards the innovation imitation. In line with the research on Chinese catching-up and effect of knowledge attributes on technology transfer (section 5.3), a triangle-shaped reciprocity model is brought out. Thereof, knowledge base is positive related to the technology capability meanwhile the later one simultaneously promotes the knowledge accumulation; the learning strategy is designed according to the current technology capability and therefore catching-up model can be conducted to enlarge the knowledge base (see figure 9.1).

![Figure 9.1 a triangle-shaped reciprocity model](image)

More specifically, based on our investigation and thorough study in the literature we list the noticeable barriers in the Sino-Foreign cooperation in chapter 8. In-depth root causes are considered as the national

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36 This is true which can be demonstrated in our survey. It’s the common attitude hold by almost half of Chinese populace especially those people working in the multinational firms. Two reasons may result in this outcome. One is R&D achievements conducted in China are always hidden by MNCs due to their low-pitched attitude about activities conducted in China, which can diminish backlashes from their homelands, where people concern over outsourcing and off-shoring grows while high- and low-tech jobs and opportunities in many areas have visibly reduced. The other reason is about division of global R&D activities. The contribution made to research and product development by China-based team may constitute only a small fraction of an innovation, which might be hidden as one component of a larger product. The logic follows that, if above two factors enact simultaneously, significant advances in foreign R&D efforts might be masked while possibly Chinese capability is rapidly rising which however can not be recognized. To avoid this danger, both sides have to make concerted and collaborative effort to understand this dynamics in the setting. It is necessary for both-side to demonstrate how this coloration aid each side’s long-term R&D and innovative goals.
culture differences as well as typical Chinese business rules. In order to explain a number of Chinese business phenomenon, the five dimensions of national culture are selected and by which we found that the Chinese typical network (Guanxi) and Chinese Trust are the two parts that foreign organizations need to understand well. We also make a good effort to research the Chinese IP system and more importantly its potential problems are released as well.

All in all, we conclude the following 11 points to be as the ruminations for this research on Sino-Foreign collaboration. We expect that these 11 apothegms can offer both sides of Sino-Foreign alliances a somewhat managerial implication and thereafter help them to achieve the reciprocal performance.

1. Balanced learning (and mutual gain) is crucial for the success of an alliance as it motives partners and decreases frictions due to mistrust.
2. Learning in an alliance is neither automatic nor simple. It is very much contextual and depends on the capabilities, experience, and commitment of both the supplier and recipient of the technology.
3. Trust between partners (and the process of building it) is instrumental for the success of the alliance. Larger firms can use their ‘reputation capital’ to build trust with their partners. Lacking reputation capital, smaller firms need to demonstrate extensive commitment as a basis of trust.
4. Both codified and tacit knowledge are involved in technology transfer. Tacit knowledge is difficult to transfer across organizations. Learning progress must take tacit knowledge explicitly into account. Alliances can be an effective mechanism for transferring tacit knowledge.
5. Tacit knowledge is a source of competitive advantage for a firm. Its successful transfer often distinguishes a successful strategic technical alliance from the rest.
6. Culture and communicational factors play a large role in the success of alliance and are related to the extent of tacit-ness of the information to be transferred.
7. Optimal alliance strategy varies according to the technology/industry and specific needs of an organization. Different types of alliance will be more appropriate for different technological areas and kinds of partners.
8. Optimal alliance strategy towards a specific technological target may well evolve through time as the capabilities of the organization and the features of the target technology change.
9. Careful ex ante selection of partners seriously increases the chances of success of an alliance.
10. Government policy can make indigenous firms more attractive. In particular, the government can supplement the indigenous company’s reputation capital, underline the company’s commitment to the alliance, and provide the company with a desirable asset by creating a market for the output of the alliance through procurement.
11. Joint ventures are less effective than simpler and flexible alliances structures. In China, the average life span of JVs is seven years. Our interview released that nowadays managers are much more likely to prefer simpler alliance structure such as contractual alliances. The reason is reported that it does not need commitment and governance structure as significantly as JVs.
Appendix

Appendix 1 Questionnaire for Chinese companies

Introduction

As technology alliances and technology transfer play an important role in increasing micro-firms technology capability, we would like to conduct a research to exploit long-term implications and impact of technology transfer from developed countries to China. We would be most grateful for your a few minutes completing this form. We promise that all information you provided will be treated in the strictest confidence!

Please mark X in the box if you don’t mind to let your company be identified in the research.

We hope this questionnaire of information can be provided by someone at a senior level who is familiar with the technical and commercial aspects of the arrangement, either in the operating unit or subsidiary or company management. We expect that the cooperation between your company and Western country companies is in line with certain mode of technology transfer and here in a broad way we interpret technology transfer modes as including purchase of machines and drawings, purchase of drawings by themselves, technical consultancy service and training etc. Also specific to China, we define that transfer can be in forms of transactions and collaboration arrangements like one-off purchase of equipment and services, licensing agreements, subcontracting, co-production, R&D activities in form of joint ventures, joint R&D centers/laboratories, research and/or cooperation agreements/partnerships as well as relationship with foreign wholly owned subsidiary which can be the case in which your company has ever employed someone who ever before worked in certain foreign wholly owned subsidiary and later-on make certain contributions to your own company.

<table>
<thead>
<tr>
<th>Name of the company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of the company thirty-seven</td>
</tr>
<tr>
<td>(State-owned or private company or others)</td>
</tr>
<tr>
<td>Name of your operating unite or subsidiary which transferred technology</td>
</tr>
<tr>
<td>Your Name and your Position in the company</td>
</tr>
</tbody>
</table>

37 According to the Chinese Corporation Law, the nature of the company can be divided into six types: state-owned enterprise, collective ownership enterprise, joint venture, Sino-Foreign joint venture, private company and others.
1. Please indicate the main industry sector of your company and R&D area in which your company operate.

<table>
<thead>
<tr>
<th>Whole company</th>
<th>R&amp;D area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer and telecommunications</td>
<td></td>
</tr>
<tr>
<td>Life science, pharmaceutical and biotechnology</td>
<td></td>
</tr>
<tr>
<td>Electronics (opto-and audio-electronics)</td>
<td></td>
</tr>
<tr>
<td>Machine tools</td>
<td></td>
</tr>
<tr>
<td>Computer Integrated Manufacturing</td>
<td></td>
</tr>
<tr>
<td>New materials and processing</td>
<td></td>
</tr>
<tr>
<td>Power generation</td>
<td></td>
</tr>
<tr>
<td>Energy management</td>
<td></td>
</tr>
<tr>
<td>Motor vehicles and components</td>
<td></td>
</tr>
<tr>
<td>Aerospace and Aviation</td>
<td></td>
</tr>
<tr>
<td>Others (please specify)</td>
<td></td>
</tr>
<tr>
<td>Others (please specify)</td>
<td></td>
</tr>
</tbody>
</table>

2. What is your opinion on the usefulness of strategic alliances for your organization?
(1= not useful, 5= very useful)

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>not useful</td>
<td></td>
<td></td>
<td></td>
<td>Very useful</td>
</tr>
</tbody>
</table>

3. In which year your company started the cooperation with Western country companies? Or how many years of alliance experiences your company has already have? You can indicate by the number of alliances that have been constructed.

4. Please indicate by X the percentage of employees engaged in R&D and expenditure on R&D as percentage of turnover for your operating unit or subsidiary or the whole company if appropriate.

<table>
<thead>
<tr>
<th>% of employees engaged in R&amp;D</th>
<th>Expenditure on R&amp;D as % of turnover</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>1% ~ 5%</td>
<td>1% ~ 5%</td>
</tr>
<tr>
<td>5% ~ 10%</td>
<td>5% ~ 10%</td>
</tr>
<tr>
<td>10% ~ 20%</td>
<td>10% ~ 20%</td>
</tr>
<tr>
<td>&gt; 20%</td>
<td>&gt; 20%</td>
</tr>
</tbody>
</table>

5. Please briefly describe the main technologies which are transferred from Western countries companies and essential for the commercial success of your operating unit or subsidiary or the whole company if appropriate. Please additionally indicate their characteristics (by indicating it in terms of product, process or product & process technology) and your original manner to collaborate (passive transfer or active transfer: in other words, which side propose transfer or collaboration firstly) as well as the name of transferor company.

<table>
<thead>
<tr>
<th>Specification of Technology</th>
<th>Passive transfer or active transfer</th>
<th>Name of Foreign Transferor Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6. Please indicate with X your perception of each technology transferred from foreign companies. To what extent these transferred technologies are advanced. Please consider it by comparing to the advanced international level related to your preferred technology.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Technology 1</th>
<th>Technology 2</th>
<th>Technology 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>The most advanced innovation you know</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The lead technology over competitors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generally used technology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specialized technology for sectors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mature technology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transferred by purchase of equipment and training</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not transferred without practical training and learning through experience over time</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7. Please indicate with X the features of your technology transferor

<table>
<thead>
<tr>
<th>Feature of technology transferor</th>
<th>Technology 1</th>
<th>Technology 2</th>
<th>Technology 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Producer in the same sector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplier</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others (please specify)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8. Please indicate with X how important were the following motives for establishing the strategic technology alliance from your perspective?

1=not important 5=very important

<table>
<thead>
<tr>
<th>Motive</th>
<th>1 Not important</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 Very important</th>
</tr>
</thead>
<tbody>
<tr>
<td>To effectively compete with existing competitors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To maintain competitive position in existing market</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To reap the benefits of economy of scale</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To facilitate international expansion</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>To enable faster entry to the market</td>
<td></td>
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</tr>
<tr>
<td>To facilitate exchange of complementary technology</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>To spread investment cost and risk</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>To establish presence in the market</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>To enable diversification of product or service</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To cooperate with existing or potential competitor to reduce competition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To share R&amp;D cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To access to partner's knowledge of local market condition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To accommodate Chinese government policy</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
9. How important were the following criteria for your partner selection?

1=not important 5=very important

<table>
<thead>
<tr>
<th>Criteria</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production technology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distribution channels</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Links with major buyers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>International regulatory knowledge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reputation of the partner</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge of partner’s culture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product-specific knowledge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial stability of the partner</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital/finance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>International market knowledge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trust between the top management teams</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial stability of the partner</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relatedness of partner’s business</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The partner company’s size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
10. Please indicate with Xs the mode of technology transferred and future strategy in cooperating with foreign companies.

<table>
<thead>
<tr>
<th>Mode of technology transferred (could be a combination)</th>
<th>Technology 1</th>
<th>Technology 2</th>
<th>Technology 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>One-off purchase</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Licensing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subcontracting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co-production</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joint R&amp;D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R&amp;D activities in joint venture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relationship with foreign wholly owned subsidiary(^{38})</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Future strategy of your collaboration</th>
<th>Technology 1</th>
<th>Technology 2</th>
<th>Technology 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce commitment to foreign companies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expand current operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improving bargain power to import more advanced technology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaborating with local high-tech companies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others (please specify)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

11. Please assess your company’s absorbing capability, in other words, how many years are used or expected to absorb and use the technology transferred in your operating unit or subsidiary (or the whole company if appropriate)?

<table>
<thead>
<tr>
<th></th>
<th>Technology 1</th>
<th>Technology 2</th>
<th>Technology 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within 1 year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-10 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 10 years</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^{38}\) Relationship with foreign wholly owned subsidiary can be such a case in which your company has ever employed someone who ever before worked in certain foreign wholly owned subsidiary and make certain contributions to your own company.
12. Please make brief assessment of your company on the ability to replicate the transferred technology or pose a competitive threat to your partners.

<table>
<thead>
<tr>
<th></th>
<th>Technology 1</th>
<th>Technology 2</th>
<th>Technology 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within 1 year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-10 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 10 years</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

13. Please indicate with X that whether there is Chinese Government Intervention (CGI) (which also include the local regional government) before and during the process when your company collaborates with foreign companies. If yes, please describe the intervention briefly.

<table>
<thead>
<tr>
<th></th>
<th>Technology 1</th>
<th>Technology 2</th>
<th>Technology 3</th>
<th>Description of CGI on specific technology alliance/transfer</th>
<th>Your attitude toward CGI (positive, negative or useless impact on the success of the collaboration)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, a lot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, some</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, a little</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No, never</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
14. How many percentages of the alliances your company have established were failed?

And failed due to which perspective? Please indicate and describe them.

<table>
<thead>
<tr>
<th>Conflicts</th>
<th>Indicate with X</th>
<th>Describe it with your case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intellectual Property Rights &amp; Laws</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication and working style</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chinese government intervention</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trust between each other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shortage of complementary technology and skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sharp difference of leadership and willingness of both sides to grasp more control rights</td>
<td></td>
<td></td>
</tr>
<tr>
<td>National culture differences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corporate Culture differences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional Culture differences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others (please specify)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
15. Please indicate with X about your company’s current role in the cooperation with foreign partners. And if possible, notice that in which sequence of catching up way your company followed.

<table>
<thead>
<tr>
<th>Role</th>
<th>Indicate with X</th>
</tr>
</thead>
<tbody>
<tr>
<td>OEM</td>
<td></td>
</tr>
<tr>
<td>ODM</td>
<td></td>
</tr>
<tr>
<td>OBM</td>
<td></td>
</tr>
</tbody>
</table>

The sequential steps of Catching-Up | Indicate with X
-----------------------------------|
OEM→ODM→OBM                      |
OEM→OBM                          |
ODM→OBM                          |
Others                            |

Please state here your company’s strategy on the future role:

---

39 Original equipment manufacturer, or OEM, refers to containment-based re-branding, where a company uses a component of another company in its product, or sells the product of another company under its own brand. OEM refers to the company that originally manufactured the product.

An original design manufacturer (ODM) is a company which manufactures a product which ultimately will be branded by another firm for sale. Such companies allow the brand firm to produce (either as a supplement or solely) without having to engage in the organization or running of a factory. A primary attribute of this business model is that the ODM owns and/or designs in-house the products that are branded by the buying firm.

Original Brand Manufacturer (OBM) refers to that company produces and sells their own brand products and service.
关于中外企业技术合作、技术联盟的问卷调查

您好，我们是荷兰埃因霍温理工大学 (Technology University of Eindhoven) 以及联合国大学纳米技术与创新研究学院（UNU-MERIT）关于西方企业与中企企业间的技术合作及联盟的研究小组。由于近年来中外技术合作联盟日益频繁，技术转移成为合作企业最关注的问题。为了深入了解国际技术合作联盟中的动机、问题以及中国企业的合作能力等诸多问题，我们设计了这份问卷，希望您在百忙中能抽取时间填写。对于您所提供的信息我们在此表示感谢，并且我们承诺，对于您所提供的信息，我们严格保密！

在这份问卷中，您将会遇到一些概念：技术转移，技术转移，OEM，ODM，和OBM。为了便于您的填写，如果您所在的公司曾与外企公司发生过设备贸易、技术贸易、交换/联合培训、专利使用权转让、合作开发项目、联合合同、合作实验室等等，或者您所在的公司拥有外籍人员或归国人员，都可以理解为您公司曾经接受过不同程度的技术转移。当然如果您所在的企业本身就是合资企业，也同样适用于技术转移的概念。

<table>
<thead>
<tr>
<th>公司名称</th>
</tr>
</thead>
<tbody>
<tr>
<td>公司性质（合资，国有或私营）</td>
</tr>
<tr>
<td>公司规模（公司员工总数或注册资本）</td>
</tr>
<tr>
<td>您所在的部门（涉及技术转移）</td>
</tr>
<tr>
<td>您的姓名以及所在职位</td>
</tr>
</tbody>
</table>
1. 贵公司以及研发部门或者与国际伙伴合作的相关部门的相关行业

<table>
<thead>
<tr>
<th></th>
<th>公司</th>
<th>研发部门/相关部门</th>
</tr>
</thead>
<tbody>
<tr>
<td>计算机，通讯</td>
<td></td>
<td></td>
</tr>
<tr>
<td>生物科学，制药以及生物技术</td>
<td></td>
<td></td>
</tr>
<tr>
<td>电子</td>
<td></td>
<td></td>
</tr>
<tr>
<td>机械加工</td>
<td></td>
<td></td>
</tr>
<tr>
<td>计算机集成或生产</td>
<td></td>
<td></td>
</tr>
<tr>
<td>材料加工</td>
<td></td>
<td></td>
</tr>
<tr>
<td>电力</td>
<td></td>
<td></td>
</tr>
<tr>
<td>能源管理</td>
<td></td>
<td></td>
</tr>
<tr>
<td>机油制成及配件</td>
<td></td>
<td></td>
</tr>
<tr>
<td>航空航天</td>
<td></td>
<td></td>
</tr>
<tr>
<td>其他（请注明具体领域）</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. 请根据贵公司的实际情况对国际合作对贵公司的作用进行评价。
   1 = “没有作用”，2 = “有点作用”，3 = “有作用”，4 = “非常有作用”，5 = “至关重要的作用”。您可以根据您的判断在1至5之间选择。

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>

贵公司有多少年的国际合作经验？

请回忆一下贵公司过去的合作经历中，大概有多少比例的合作以失败告终。

3. 在贵公司中，有多少比例的人员正在从事研发工作，占营业收入多少比例的经费用于研发。

<table>
<thead>
<tr>
<th>研发人员在总员工的比例</th>
<th>研发费用占营业额的比例</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1%</td>
<td>&lt; 1%</td>
</tr>
<tr>
<td>1% - 5%</td>
<td>1% - 5%</td>
</tr>
<tr>
<td>5% - 10%</td>
<td>5% - 10%</td>
</tr>
<tr>
<td>10% - 20%</td>
<td>10% - 20%</td>
</tr>
<tr>
<td>&gt; 20%</td>
<td>&gt; 20%</td>
</tr>
</tbody>
</table>

4. 请列举贵公司通过国际合作成功掌握的技术，贵公司在启动合作时的态度（主动寻找合作伙伴，或被动被合作伙伴选中）以及贵公司的合作伙伴公司名称以及所属国家。

<table>
<thead>
<tr>
<th>合作1</th>
<th>技术名称</th>
<th>主动还是被动</th>
<th>合作伙伴公司名称及国家</th>
</tr>
</thead>
<tbody>
<tr>
<td>合作2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>合作3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>其他</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

129
5. 请注明这些技术的先进性以及特点。（可以多选）

<table>
<thead>
<tr>
<th>技术/知识 1</th>
<th>技术/知识 2</th>
<th>技术/知识 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>技术所知的本行业最先进技术</td>
<td></td>
<td></td>
</tr>
<tr>
<td>比主要竞争对手所掌握的技术先进</td>
<td></td>
<td></td>
</tr>
<tr>
<td>普遍使用的一般水平技术</td>
<td></td>
<td></td>
</tr>
<tr>
<td>过时技术</td>
<td></td>
<td></td>
</tr>
<tr>
<td>行业特殊技术</td>
<td></td>
<td></td>
</tr>
<tr>
<td>成熟技术</td>
<td></td>
<td></td>
</tr>
<tr>
<td>通过购买设备或借阅掌握的技术</td>
<td></td>
<td></td>
</tr>
<tr>
<td>该项技术未通过实际情形无法获得</td>
<td></td>
<td></td>
</tr>
<tr>
<td>其他情况</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. 请注明在以上的三项合作中，贵公司的国际合作伙伴的性质

<table>
<thead>
<tr>
<th>合作伙伴</th>
<th>合作 1</th>
<th>合作 2</th>
<th>合作 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>同行业的生产厂商</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>客户</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>供应商</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>其他（请注明具体性质）</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

130
7. 请在下表中注明贵公司开展国际合作项目的原因。对下表中提出的每一项您需选在1至5中标注您的态度，1=不重要，2=有一点重要，3=很重要，4=重要，5=非常重要。

<table>
<thead>
<tr>
<th>原因</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>为了更好地与中国竞争对手竞争</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>为了保障在市场上的竞争地位</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>为了通过规模扩大而得到的经济效益</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>为了加速国际化进程</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>为了更快的打入主流市场</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>为了获得互补技术</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>为了分散投资成本和投资风险</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>为了产品/服务的多样化</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>和竞争对手合作以降低彼此竞争</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>为了摊分研发费用</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>为了获取合作伙伴所在国家的市场信息</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>为了迎合中国政府提出的加速国际合作的政策</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8. 在贵公司以往的合约中，以上提到所掌握的技术是通过什么方式获得的，以及贵公司对今后国际合作的战略是什么。

<table>
<thead>
<tr>
<th>获取技术的方式</th>
<th>技术 1</th>
<th>技术 2</th>
<th>技术 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>设备技术（一次性）购买</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>专利使用权转让</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>转包合同</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>合作生产</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>合作研发</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>在所属合资公司中的研发</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>与外商独资企业的合作</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>未来合作意向</th>
<th>技术 1</th>
<th>技术 2</th>
<th>技术 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>逐步降低对国际合伙伙伴的依赖</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>扩大合作范围</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>提高本公司在技术转让中的谈判能力</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>寻求拥有更先进技术的国际合作伙伴</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>其他意见（请具体说明）</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
9. 贵公司需多久时间掌握以及成功在本公司适用以上提到的三项技术

<table>
<thead>
<tr>
<th></th>
<th>技术 1</th>
<th>技术 2</th>
<th>技术 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>少于 1 年</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3 年</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-10 年</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 年以上</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
10. 在贵商的国际合作中，是否有当地政府的参与？如果有，请简要说明是什么形式的参与或干预以及您对此所持的态度。

<table>
<thead>
<tr>
<th>政府的参与形式</th>
<th>过程 1</th>
<th>过程 2</th>
<th>过程 3</th>
<th>您的态度</th>
</tr>
</thead>
<tbody>
<tr>
<td>没有干预</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>有些干预</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>重大干预</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

（您是否认为这些干预是有效的，或者根本不起作用。如果不是这些，请简要说明您对此独特的见解。）
11. 你认为是什么是国际合作中产生冲突的主要原因，你们合作的主要障碍是什么？

| 冲突原因 | 合作障碍 | 多少 | 如何可以，简要说明
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>知识产权保护</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>法律纠纷</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>沟通以及工作方式不同</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>政府干预</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>信任问题</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>合作双方没有得到尊重的技术</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>双方管理层争夺控制权</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>国家文化不同</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>企业文化的差异</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>专业技术的差异</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>其他（请具体说明）</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
12. 如果贵公司的在国际合作中的角色。

<table>
<thead>
<tr>
<th>角色</th>
<th>选择</th>
</tr>
</thead>
<tbody>
<tr>
<td>OEM (Original equipment manufacturer)</td>
<td>贵公司所生产的产品被合作方看中，合作方委托贵公司按照要求生产，并加上合作方的商标，由合作方收购。行业内习惯称为代工生产，贴牌生产。</td>
</tr>
<tr>
<td>ODM (Original Design Manufacturer)</td>
<td>贵公司设计出一种产品后，在某些情况下可能会被另外一些品牌进行生产，甚至配成他们的品牌名称来进行生产，又或者稍微修改一些设计来生产</td>
</tr>
<tr>
<td>OBM (Original Brand Manufacturer)</td>
<td>生产并销售自己品牌的产品和服务</td>
</tr>
</tbody>
</table>

贵公司在成长当中，是否经历以下的过程。

<table>
<thead>
<tr>
<th>过程</th>
<th>选择</th>
</tr>
</thead>
<tbody>
<tr>
<td>OEM→ODM→OBM</td>
<td></td>
</tr>
<tr>
<td>OEM→OBM</td>
<td></td>
</tr>
<tr>
<td>ODM→OBM</td>
<td></td>
</tr>
<tr>
<td>其他（请具体说明）</td>
<td></td>
</tr>
</tbody>
</table>

贵公司今后的角色定位是？


Technology University of Eindhoven 以及 UNU-MERIT
非常感谢您的帮助！！
谢谢
Appendix 2 the Database

The databank provides information on strategic alliances and is the property of the firm Securities Data. This databank can be used via on-line access with specific data sample being extracted. Our sample contains information on more than 500,000 worldwide strategic alliances which covers China focused alliances during period 1985-2005. This information is arranged in several data files. Alliances database includes information on the year the alliances established and company information.
## Appendix 3 Technology capability and Maturity Model

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Well Developed</th>
<th>Developing</th>
<th>Under Developed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technology Vision and Leadership</strong></td>
<td>• Technology assets are seen as investments rather than expenses. Development and fundraising efforts have focused on technology or accounted for a technology component to support a new program. • The organization sees a clear link between technology and achieving their mission. • The organization engages in technology-enabled process improvements.</td>
<td>• The idea of mission-based technology is not a foreign concept; however, day-to-day issues often overshadow realizing these goals. • Some effort has been made to target fundraising efforts toward technology or solicit specific technology donations. • Some departments or programs engage in technology enabled process improvements, but the effort may not be integrated across programs.</td>
<td>• The organization does not use technology in support of its mission. Information systems, if any, are used for routine business processes. • No development or fundraising has been undertaken specific to technology. • The organization does not actively look for ways to use technology to support new service offerings or develop new programs.</td>
</tr>
<tr>
<td><strong>Technology Management</strong></td>
<td>• There is a designated individual or committee to oversee technology issues. • Technology is budgeted for in the organization’s operating budget. • Technology is included in the strategic planning process and acknowledged to be a managed resource of the organization. • Comprehensive technology policies and procedures are developed and used.</td>
<td>• There is at least one individual in the organization with the capability to assess technology needs. • Processes around technology decisions and purchases are informal but have been mostly effective. • The organization may have participated in some planning around technology but not on a consistent basis. • Policies and procedures are in development.</td>
<td>• Technology is generally not regarded as an asset requiring regular attention. • The organization does not have a process or forum to examine their technology needs nor is there a technology budget. • There is no strategic or technology plan.</td>
</tr>
<tr>
<td><strong>Technology Support</strong></td>
<td>• There is a designated individual or team of support specialists available to users. • A structured process exists for reporting and tracking problems. • Support is reliable, timely and consistent.</td>
<td>• There is generally someone on-site or on-call to respond to technology problems. • Processes for reporting are informal but appropriate for the size of the organization. • Support is not always timely but users have learned workarounds while awaiting help.</td>
<td>• Support is ad hoc or based solely on manufacturer’s warranty. • Users with computers are responsible for finding their own solutions. • Timing of support response is unpredictable.</td>
</tr>
<tr>
<td><strong>Technology Infrastructure</strong></td>
<td>• Technology infrastructure supports the organization’s business and clinical processes fully. • There is reliable connectivity between sites and adequate bandwidth for Internet use. • Equipment is up-to-date and interoperable.</td>
<td>• Technology infrastructure has been pieced together, but most business processes are supported. • Connectivity is limited; bandwidth needs to be conserved for priority access to the Internet. • Equipment is a mix of older and newer.</td>
<td>• Most business processes are not supported by technology. • No connectivity between sites or Internet access. • Equipment, if existing, is outdated or the personal property of individual employees.</td>
</tr>
<tr>
<td>Evaluation Criteria</td>
<td>Well Developed</td>
<td>Developing</td>
<td>Under Developed</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------</td>
<td>------------</td>
<td>-----------------</td>
</tr>
</tbody>
</table>
| **Technology/Systems Training** | • Super Users for each business or clinical application have been identified and time is allocated for this function in their job description.  
  • IS training needs are assessed on an annual basis and included in the overall technology planning process.  
  • Training is an integrated part of a new hire’s orientation. | • Training is mostly provided by outside vendors, classes or consultants, but is available on an as needed basis.  
  • Training is included as part of a new system implementation; follow up training is limited to new employees when there is turnover.  
  • New hire training is generally available but not systematic. | • Training is provided by observation or “passed down” among volunteers or employees.  
  • There are very limited professional training resources available to staff, if any.  
  • IS training is not considered part of the organization’s planning process. |
| **Data Management** | • The organization has defined and documented its data needs for program management and financial purposes.  
  • All data elements are clearly defined for each report and each clinic program.  
  • Data input documents and report specification documents are well designed with clearly written procedures for data entry. | • Some of the organization’s data needs have been clearly defined, but are not uniformly documented.  
  • Some reports are documented as to underlying calculations or algorithms, but not all.  
  • Some data input documents are well defined with some procedures for data entry. | • There are no clear definitions of data needs; only minimal data is collected for billing and reporting purposes.  
  • Clear definition of data elements is lacking throughout the organization.  
  • Data is entered from a variety of sources without defined procedures. Many times reported data is based on an estimate or extrapolation of a small sampling. |
| **Use of Data** | • The organization values data and prioritizes efforts to manage, collect and utilize data to promote community and individual health improvement and advocacy.  
  • Reporting requirements for funders, governmental agencies, and internal management are met by mining data from the organization’s info systems.  
  • The organization shares data with other CCHCs and state organizations for improvement of the health status in the community and to promote effective advocacy efforts. | • The organization pays attention to data collection mainly for internal financial management.  
  • Reporting requirements for funders, governmental agencies, and internal management are mostly met but with some inconsistencies.  
  • The organization engages in limited collaboration with one or two other organizations or consortia members to examine comparative data. | • Data collection and management is not a high priority for the organization.  
  • Reporting requirements are not well met, data is not easily accessible and sampling is sometimes used to generate reports.  
  • Only data required for reporting is shared; there are no ongoing collaborative efforts with other organizations. |
Appendix 4 China Growth Fact

People's Republic of China's Nominal Gross Domestic Product (GDP) Between 1952 to 2005

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>GDP (millions of USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>----</td>
<td>World</td>
<td>53,640,000</td>
</tr>
<tr>
<td>----</td>
<td>European Union</td>
<td>16,370,000</td>
</tr>
<tr>
<td>1</td>
<td>United States</td>
<td>13,790,000</td>
</tr>
<tr>
<td>2</td>
<td>Japan</td>
<td>4,346,000</td>
</tr>
<tr>
<td>3</td>
<td>China (PRC)</td>
<td>3,299,000</td>
</tr>
<tr>
<td>4</td>
<td>Germany</td>
<td>3,259,000</td>
</tr>
<tr>
<td>5</td>
<td>United Kingdom</td>
<td>2,773,000</td>
</tr>
<tr>
<td>6</td>
<td>France</td>
<td>2,515,000</td>
</tr>
<tr>
<td>7</td>
<td>Italy</td>
<td>2,068,000</td>
</tr>
<tr>
<td>8</td>
<td>Spain</td>
<td>1,415,000</td>
</tr>
<tr>
<td>9</td>
<td>Canada</td>
<td>1,406,000</td>
</tr>
<tr>
<td>10</td>
<td>Brazil</td>
<td>1,314,000</td>
</tr>
</tbody>
</table>
Reference

A


B


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G


K


L


M


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P


Z


