Collaborative R&D between Tsinghua University and multinational companies

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As one of the key science and innovation infrastructure of the country, Tsinghua aimed at building itself into a comprehensive, research-oriented, open world-class university in the year 2011. R&D innovation, personnel training and contribution to the society are three critical functions of university. Tsinghua is trying harder to promote R&D level to committee to China’s social and economic development. Therefore collaborative R&D between Tsinghua University and multinational companies will not only promote Tsinghua’s leading edge R&D but also as a tool to serve the sociality to further enhance China’s global competitiveness.

The historical review of collaborative R&D between Tsinghua University and multinational companies:

The level of international collaboration on research and development at Tsinghua University has increased, following the same increase in international R&D collaboration as the rest of China. The dramatic change, paralleling the reform in China and its new more open policies on world commerce, can be described in terms of two distinct stages:

(1) The Primary stage.: From 1978 to 1994, the primary mode of international collaboration was mainly through the exchange of information. During this time, the exchange of information was limited to personal training, exchange students, attendance of international conferences, and others, generally passive communication channels. Personal training consisted largely of students and scholars visiting developed countries to learn advanced technology and administrative techniques. Scholars from developed countries were likewise invited to
China to teach and train. This exchange was generally confined to the academic environment. There was very little collaboration between Tsinghua and multinational companies during this period.

(2) The overall collaboration stage.: In 1993 the Chinese government issued the “Law on Progress of Science and Technology of P.R.C.” This new policy, supported by a detailed implementation plan, serves to encourage R&D collaboration with foreign governments and international organizations, and urges the building diversified international collaboration relationships between R&D institutes, universities, social bodies and foreign counterparts. In support of this, Tsinghua University embarked on a 3-stage, 27-years plan. In the first two stages, from 1993 to 2011, Tsinghua would build a strong foundation and build on that foundation to become recognized as a world-class university. Accordingly, Tsinghua’s overseas R&D effort would be expanded into a more aggressive collaboration stage. The mode of the collaboration changed from the simple training, student exchange, and attending international conferences, to more practical and productive modes of collaboration. Tsinghua took on entrusted projects, joint R&D, joint investigations, joint designs, and joint R&D organizations, etc. There was now the opportunity to do more extensive technology transfer, exchange of administrative experience, and technology licensing. As China continues its reform and open to the world and globalization of economy and R&D, Tsinghua University also has expanded its’ involvement with multinational companies. The significant increase in the number of collaborative projects is evidence of the progress to make Tsinghua become a comprehensive, research oriented and open world-class university by the year 2011.
The current status of overseas collaborative R&D of Tsinghua

1) Research funds have increased in recent years:

The statistics show that overseas collaborative R&D funds have increased dramatically in recent years. The detailed data from years 1996 to 2003 is shown in table 1.

<table>
<thead>
<tr>
<th>Years</th>
<th>Projects</th>
<th>Contract fund US$ (1000’s)</th>
<th>Fund received</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>155</td>
<td>803</td>
<td>387</td>
</tr>
<tr>
<td>1997</td>
<td>138</td>
<td>869</td>
<td>442</td>
</tr>
<tr>
<td>1998</td>
<td>130</td>
<td>822</td>
<td>458</td>
</tr>
<tr>
<td>1999</td>
<td>130</td>
<td>1464</td>
<td>539</td>
</tr>
<tr>
<td>2000</td>
<td>124</td>
<td>1272</td>
<td>831</td>
</tr>
<tr>
<td>2001</td>
<td>121</td>
<td>1734</td>
<td>630</td>
</tr>
<tr>
<td>2002</td>
<td>134</td>
<td>1440</td>
<td>653</td>
</tr>
<tr>
<td>2003</td>
<td>180</td>
<td>1814</td>
<td>985</td>
</tr>
</tbody>
</table>

Table 1 Data of overseas collaborative R&D of Tsinghua from the years 1996 to 2003

2) The fields of overseas R&D trend to be broader:

Historically, overseas R&D was centralized in several engineering departments. With the change of the university structure, the overseas R&D effort is now broader and involves more departments. To avoid the effect of an accidental phenomena of an individual year, the statistics here are calculated for four-year periods from 2000 to 2003. The top five departments, in terms of the funds received of overseas R&D, are: Electronic Engineering, Computer Science, Nuclear and New Energy, Thermal Engineering and Mechanical Engineering. The total funds received for this four years period is 29.3 million US$. Among
5.8 million US$ is from the Electronic Engineering Department, which is about 20% of the total;
3.3 million US$ from the Computer Science Department, which is about 11% of the total;
2.8 million US$ from the Thermal Engineering Department, which is about 9.5% of the total;
2.7 million US$ from the Institute of Nuclear and New Energy, which is about 9.1% of the total;
1.5 million US$ from the Mechanical Engineering Department, which is about 5.2% of the total;
The total funds received for the top five departments is 15.8 million US$ which is 54% of the total.
Last year, the overseas R&D collaboration of Tsinghua was expanding to over 30 different departments.

3) Diversified pattern of Overseas R&D collaboration:
Overseas R&D collaborations at Tsinghua now trend to be more
diversified. The most common categories are: exchange students, entrusted R&D, joint R&D projects, technology transfer, joint organizations (joint institutes, joint centers and joint lab), and donations, etc. Statistics from 504 different projects in term of project number in recent years shows that there are:

- 179 joint R&D projects which is 36% of the total;
- 155 contract projects which is 31% of the total;
- 59 scholar exchanges, which is 11.7% of total;
- 41 donations which is 8.1% of the total;
- 40 joint organizations which is 7.9% of the total;
- 13 technology transfers, which is 2.5% of the total.

4) Tsinghua’s overseas R&D collaborative partners come from many regions and countries:

The statistics for the year 2003 shows that the total research fund for overseas R&D is 18 million US$ and that the R&D partners distributed among 21 different regions and countries. The top five of the countries and regions in term of the contribution of R&D funds are as follows: USA, 7.8 million US$, which is 43.2% of the total;
Japan, 5.4 million US$, which is 29.5% of the total;  
Britain, 1.3 million US$, which is 7.2% of the total;  
Hong Kong, 0.67 million US$, which is 3.6% of the total;  
France, 0.63 million US$, which is 3.4% of the total;  
The sum of the top five is 15 million US$, which is 87.16% of the total.  
Australia had one project with Tsinghua in the year 2003. The contract fund is 37KUS$, which is 0.2% of the total.

5) The intellectual property has attracted more and more attention:  
As a key state university, Tsinghua draws a lot of attention to intellectual property in order to make full use of the limited R&D resource effectively. An intellectual property administrative team was therefore formed, consisting of top-level individuals of the university and led by the Vice President for R&D. There are several modes for IPR practice of Tsinghua. Most common modes are:

1. Contracted project:  
   (1) Belongs to Tsinghua
(2) Belongs to companies
(3) Shared by both parties
2. Jointly R&D:
Normally IPR will jointly owned by both parties.
3. For the technology licensing, exclusive or non-exclusive right will be granted depending on the negotiation, technology itself and the funding provided by company. In terms of the licensing fee, it has following different types:
(1) Grand Total or Lump Sum
(2) Running Royalty
(3) Initial Payment and Running Royalty
4. Technology transfer.
Analysis from 303 projects states that 14% of IPR of the collaboration belongs to Tsinghua, 11% of IPR of the collaboration belongs to Tsinghua’s partners, and 75% of IPR of the collaboration jointly belongs to both parties.

Case study* of Collaborative R&D between Tsinghua University and multinational companies

<table>
<thead>
<tr>
<th>Years</th>
<th>Partners (Multinational company/Tsinghua)</th>
<th>Project</th>
<th>Mode</th>
<th>Research fund (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-2006</td>
<td>Lucent Technology Ltd.</td>
<td>Joint Computer</td>
<td>Joint R&amp;D</td>
<td>1.8M</td>
</tr>
<tr>
<td>Year</td>
<td>Partner</td>
<td>Project/Program</td>
<td>Organization/Center</td>
<td>Amount</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>1999–2004</td>
<td>Procter &amp; Gamble/Tsinghua University</td>
<td>Research Foundation Agreement</td>
<td>Foundation</td>
<td>1M</td>
</tr>
<tr>
<td>2003–2006</td>
<td>Mitsubishi Heavy Industries, Ltd /Tsinghua University</td>
<td>Tsinghua-MHI R&amp;D Center</td>
<td>Joint Center</td>
<td>1M</td>
</tr>
<tr>
<td>2001–2003</td>
<td>Ishikawajima-Harima Heavy Industries Co., Ltd /Thermal Engineering Department</td>
<td>New Cogeneration at Oji china works</td>
<td>Commissioned Project</td>
<td>2.5M</td>
</tr>
<tr>
<td>2002–2004</td>
<td>Alcatel / School of Information Science and Technology</td>
<td>Beyond 3 G</td>
<td>Joint R&amp;D</td>
<td>0.8M</td>
</tr>
<tr>
<td>2002–2011</td>
<td>British Petroleum (BP) / Thermal Engineering Department</td>
<td>Tsinghua-BP Clean Energy Research and Education Center</td>
<td>Donation</td>
<td>2M</td>
</tr>
<tr>
<td>2003–2011</td>
<td>Alstom /Department of Electrical Engineering and Applied Electronic Technology</td>
<td>Tsinghua-Alstom Research Center on Protection &amp; Control</td>
<td>Joint Center</td>
<td>0.84M</td>
</tr>
</tbody>
</table>

* The detailed case analysis will be presented and limited at the workshop for the confidential reason.