The research commercialisation office of the University of Oxford, previously called **Isis Innovation**, has been renamed **Oxford University Innovation**

All documents and other materials will be updated accordingly. In the meantime the remaining content of this Isis Innovation document is still valid.

URLs beginning www.isis-innovation.com/... are automatically redirected to our new domain, www.innovation.ox.ac.uk/...

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IP commercialisation in China: suggested answers to common questions

There are plenty of opportunities for innovative companies to undertake R&D and get involved in collaborative projects in China, but to succeed they have to be able to navigate what is often a very unfamiliar business culture and regulatory regime

By **David Baghurst** and **Yu-Chun Su**

The Chinese government's most recent business plan – the 12th Five-Year Plan – includes many references to priorities and policies aimed at promoting technology development, industrial upgrading and the creation of both service and product-based sectors (see Box 1).

While the Chinese government is investing heavily in projects to foster indigenous research and the development of innovative products, there is still an opportunity for western companies to collaborate and partner with Chinese organisations to their mutual benefit – hopefully positioning themselves as long-term strategic partners as the Chinese economy continues to grow. Unfortunately, for many people their perception of China has been influenced by horror stories in the western press, such as the recent murder of British businessman Neil Heywood and episodes recounted in numerous bestselling books. One of the most popular and entertaining – Tim Clissold's *Mr China* – tells the story of a Wall Street banker who went to China with US$400 million in the 1990s and left with considerably less. Chapter after chapter highlights issues with Chinese bureaucracy, blatant IP theft and creative accounting. For an insight into operational challenges, and in particular the quality of manufactured goods, Paul Midler's book *Poorly Made in China* recounts the frustrations involved in managing suppliers where, over time, there is a tendency to deviate from agreed specifications.

While there are western commentators who persist in portraying China as the land of copyright theft and patent infringement, some recent publications report, with a certain inevitability, that the country needs to be taken more seriously in terms of future innovation. According to a recent KPMG survey of global technology company executives, the most likely sources of disruptive innovations in the next two to four years will be the United States and China. More widely, it is acknowledged that in order to shift to a more innovation-based economy, the level of protection afforded to rights holders – both domestic and foreign – needs to be improved.

Over the last five years Isis Innovation, a leading technology commercialisation company owned by the University of Oxford, has been working increasingly closely with organisations in China. Isis works on research from Oxford and other leading universities in more than 50 countries. Its role is to find partners, including equity investors and joint development partners, with the capacity to transform university research results into innovative new products and services. China is an obvious source of both investment and manufacturing capacity.

With guidance from Oxford researchers – many of them Chinese nationals – Isis has learnt the joys and challenges associated with doing IP business in China.This article sets out answers to common questions that we wish we had known when we started out. We believe that we have embarked on a steep learning curve and continue to reform

on a daily basis our model of working in the Middle Kingdom.

Where to start?

According to 2011 figures from the International Monetary Fund, the European Union remains the leading region in terms of GDP (US$17,577 trillion), closely followed by the United States (US$15,094 trillion), with China in third (US$7,298 trillion) and Japan fourth (US$5,869 trillion). Europe is a collection of around 50 countries. The United States is a collection of 50 states. China's highest-level administrative division comprises 33 provincial level territories made up of 22 provinces, four municipalities, five autonomous regions and two special administrative regions (SARs) – Hong Kong and Macau.

As with European countries and the US states, these provincial divisions vary in terms of size, population, productivity, GDP, GDP per capita and the strengths and weaknesses of the innovation community. The leading Chinese provincial level territories in terms of GDP per head are currently Hong Kong SAR, Tianjin, Shanghai, Beijing, Jiangsu and Zhejiang. These predominantly coastal areas to the east and south have led economic growth in China over the last 30 years, as many were awarded status as special economic zones and became focal points for foreign investment.

Economic activities in these coastal regions are evolving, keeping pace with economic development. Shanghai and Hong Kong are no longer hubs for manufacturing; the financial sector now dominates both. Over time, manufacturing has migrated to the western provinces. Where cost competition is fiercest, Chinese manufacturing has become uneconomic and industries have shifted to neighbouring countries such as Vietnam (eg, textiles) or even different continents (eg, automobile assembly is moving to Africa).

If you are currently looking to locate an innovation hub or R&D centre in China, then there are two types of location to consider: one of the older industrial areas undergoing upgrading of its industrial bases or one of the newer areas associated with so-called second-tier cities. The locations in this latter category often provide more generous packages of government support and have officials who are highly motivated to make sure that their regions join the list of prosperous cities. However, in comparison with the older areas, it can be more difficult to find, recruit and retain qualified technical staff.

Box 1: **Excerpts from the Chinese National 12th Five-Year Plan**

- "Technology Development" (Chapter 1) – targets include the following:
  - R&D expenditure at 2.2% of GDP.
  - A filing-to-population ratio of 3.3 invention patents filed per 10,000 people.
  - A 16% reduction in energy consumption.
  - An increase in non-fossil fuels to 11.4% of total consumption.
  - A 17% decrease of carbon emissions per unit of GDP.
- To achieve these goals, policies aim at:
  - Supporting "uses of technology innovation to upgrade industries".
  - Guiding innovation resources - including funding, talent and technology - towards enterprises.
  - Encouraging strategic alliances between industry and academia.
  - Establishing a "Complete mechanism for motivation and control of energy saving and reduced carbon emissions".
  - Introducing systems for determining resource, product and environmental taxation.
  - Creating regulations and standards.
  - Strengthening monitoring processes to achieve energy savings.
  - Promoting environmental protection across the production and supply chain, and in specific industries.
- "Industrial Upgrade" (Chapter 3) – envisages the upgrading of manufacturing by enhancing basic techniques, materials, system integration and similar. Key sectors of focus include shipbuilding, automotive, petrochemicals, green construction, light industries such as batteries, intelligent home appliances.

  The focus on emerging technology relates mostly to the Internet, green energy and solar, new materials, biotechnology and automotive (particularly green-powered automobiles). The target is for revenue generated by these emerging areas to reach 8% of GDP.
- "Green Development" (Chapter 6) – aims at "implementing pragmatic collaboration with international partners in scientific research, technology development and capability building", by promoting funding, international technology transfer collaboration platforms and management systems to provide support and assistance.
- "Innovative Behaviour" (Chapter 7) – aims at "strengthening self-innovative and encouraging transformation of technology outcomes to production", by accelerating enterprise-focused innovation systems and encouraging strategic alliances between enterprises and universities, as well as entrepreneurship.

What is the prevailing business culture?

The first-tier and eastern coastal cities are populated with western companies and their employees. Business practices are mixed, but predominantly with a western flavour; in Shanghai and Hong Kong in particular, the prevailing business culture is indistinguishable from that in London, New York and Berlin.

In second/third-tier cities away from the coast, the business culture remains authentically Chinese. In these areas there is more of an emphasis on developing relationships before business. Business hosts tend to be generous with their time; extended lunch and dinner meetings often go on into the small hours. The details in contracts are often secondary to what was discussed over dinner, even though it may not be clear to both sides whether points were actually agreed.

In contrast to Japanese firms, Chinese companies are capable of making quick decisions. Any contractual process involving the government can take some

Box 2: **Protecting your IP in China – a checklist**

- Have you worked with this company before?
- Have you taken references from someone you trust?
- Will your own team be involved in product development and/or exploitation for some time to come?
- Is the royalty rate fair to all partners?
- Do your contracts insist on sales information provided in an appropriate format?
- Do you have access to the company's accounts?
- Have you registered your rights in China and the appropriate markets?
- Does working with this company create risks for the reputation of your brand?
- Have you considered using utility patents to afford supplementary protection?
- Do you have people monitoring potential infringement?
- Do you have a process for auditing licensees?

time. High-level government support and patience are both essential, particularly in emerging innovation regions, where the various government bureaux may not have extensive experience of working on projects with foreign companies.

How is the government involved?

National government creates the framework and programmes at the highest level. A good example is the 12th Five-Year Plan.

As you navigate down from national to provincial to city to district level, there can be flexibility in how national level initiatives – and to some extent laws – are implemented at local level. There is also a great deal of variation in terms of local priorities: some cities are interested in innovation, while others are more interested in tourism.

Many innovation projects begin at city level, catalysed by partners whose interests lie firmly in supporting the creation of new innovative businesses or absorbing new innovative products into local companies. The Changzhou Biopharmaceutical Incubator is a facility created to house 60 new biopharmaceutical companies. The project is the brainchild of a local pharmaceutical company founder, Mr Ge. Unusually for a Chinese CEO, Ge is an accountant rather than engineer by training. His project team have travelled the world to attract bright Chinese nationals recently educated at the world's leading universities, institutes and companies. These new entrepreneurs will benefit from special financial packages from the government as returnees. They will also benefit from the existing marketing infrastructure of Fangyuan Pharmaceuticals, as well as the uncompromising views of Ge himself.

Building on initial success, innovation projects can be awarded provincial and later national level status. One of the big advantages of direct involvement of government officials in supporting the growth of industry is that they often have a clear picture of the needs of industrial companies within their patch. The scattered network of science and technology bureaux and productivity centres can be good sources of introductions to firms seeking new technologies.

How do you access funding for new innovations?

While there is demand for new innovative products in China, the streets are certainly not paved with gold. Products established in overseas markets are highly sought, but any innovation requiring more than a few months of further development can be more difficult to fund.

At the level of business angel funding – investment by a high-net-worth individual – the reasons for this include the following:

- Most Chinese businesspeople have made money in traditional manufacturing industries such as textiles, and lack the experience and networks to be comfortable in investing in more innovative and riskier projects
- Until recently, most wealthy Chinese businesspeople were surrounded by an abundance of very high-yielding property-based investment opportunities.

The children of wealthy Chinese businesspeople may have a different outlook. Trained in the latest technologies, many are keen to make their mark in more modern industries – for example, biomedical devices rather than toys.

The venture capital industry in China is developing rapidly, but again there are challenges in terms of securing investment from investment firms in this sector:

- The historic poor performance of early stage investment funds in Europe has discouraged Chinese funds from investing in early stage projects; most Chinese venture capital firms have focused on later stage investments, particularly at the stage just before companies go public.
- The process of moving capital outside of China to invest in overseas companies is not straightforward.

The Chinese government can be a more promising source of funds. Many regions have special schemes to support research collaborations and investment in projects. Some regions even offer support to qualifying teams of foreign nationals, provided that they are prepared to start their companies in China. For example,

the Foshan government offers grants of RMB3 million to RMB6 million, travel packages, free office/laboratory space for up to three years, free private accommodation and healthcare/schooling benefits for key individuals.

What is the difference between Chinese and European academia?

The quality of science published by researchers who are Chinese nationals is increasing. Recently, Nature Publishing Index 2011 reported the following: "China now publishes more than 6% of the papers published in *Nature* journals, according to the Nature Publishing Index 2011 China. Papers with authors from China represent 6.6% (225) of the 3425 papers published in *Nature* journals in 2011. China also presents a new analysis of ISI Web of Knowledge data, showing that China now publishes more than 10% of the world's most cited scientific research."

According to its data, the top 10 Chinese institutions of 2011 are the Chinese Academy of Sciences (CAS), the University of Science and Technology of China (USTC), Peking University, Tsinghua University, Hong Kong University of Science and Technology (HKUST), Xiamen University, Shanghai Jiao Tong University (SJTU), the University of Hong Kong (HKU), Nanjing University and BGI Shenzhen.

The same source suggests that by 2014, the number of highly cited academic papers will exceed those involving German and UK authors, leaving China second only to the United States.

Chinese people in general seem to be naturally entrepreneurial. Perhaps this is a result of a combination of factors: Confucian teaching that individuals have a duty to serve the needs of society, memory of the years of poverty and hardship suffered by earlier generations, knowledge of the poverty that still exists today — particularly in rural areas — and so on.

While it is very dangerous to generalise, it is the authors' opinion that most Chinese academics are more motivated than their European counterparts to see the results of their research applied in an industrial setting. While research and teaching remain the prime objectives of many universities in Europe, Chinese universities are more directly tasked with supporting economic development. For example, Tsinghua University is one of the leading universities in China. Around 25 years ago, the government asked Tsinghua to establish the first of a series of research institutes creating an environment for academics to undertake applied research projects.

China also has, through the Chinese Academy of Sciences, a network of applied research institutes through the country tasked with supporting their local companies. Indeed, many Chinese companies do not have their own internal product research and development units; instead, they rely on innovations coming from outside sources, including universities, research institutions and overseas organisations.

What is the preferred structure of collaborations?

Chinese partners seem to prefer creating joint ventures to cement business relationships rather than entering into more distant licensing relationships. Joint ventures that can secure land rights from the Chinese government are particularly popular because most Chinese view land as a very valuable asset.

A legal contact has suggested that Chinese company law was developed from Russian company law — law designed for large infrastructure projects, such as building bridges. Joint ventures created to

Box 3: **Top 10 domestic invention patent applications in China 2011**

Rank	Enterprise	Number
1	ZTE	4,685
2	Huawei Technologies	3,617
3	China Petroleum and Chemical	3,122
4	Hongfujin Precision Industry (Shenzhen)	2,908
5	Ocean's King Lighting Technology	1,212
6	Tencent Technology Shenzhen	850
7	AU Optronics	758
8	PetroChina	722
9	Chery Automobile	718
10	Semiconductor Manufacturing International (Shanghai)	635

Box 4: **Top 10 domestic college and university invention patent applications in China, 2011**

Rank	Name of university/college	Number
1	Zhejiang University	2,342
2	Tsinghua University	1,809
3	Southeast University	1,398
4	Shanghai Jiao Tong University	1,348
5	Beihang University	1,253
6	Harbin Institute of Technology	1,171
7	Tianjin University	1,115
8	Jiangnan University	1,033
9	South China University of Technology	1,011
10	Xi'an Jiaotong University	803

Box 5: **Selected criteria for recognition of a national level incubator**

Clause 9
The following criteria must be met to apply for a recognised national incubator:
- It must have an effective leadership team and appropriate organisation; 90% of the management personnel and 30% of the personnel trained by the incubator shall be at least university graduates.
- 30% of companies in the incubator must have patents or patents pending.
- 70% of the personnel employed by companies in the incubator should be at least college graduates.

Clause 10
The companies in the incubator must meet the following criteria:
- When the company was founded, the registered capital besides IP equity should be no more than RMB3 million. For special entrepreneurial businesses in the fields of biomedicine or integrated circuits, capital should not exceed RMB10 million.
- The products or projects companies under development in the incubator must have a well-defined IPR with no disputes.

Clause 11
Graduated companies should meet at least two of the following criteria:
- Have obtained independent IP rights.
- Have accumulated operating income for over RMB10 million within two years.
- Have been acquired, merged or listed on Chinese or foreign stock markets.

undertake these projects involve a group of partners which invests cash over a few years to undertake the project. This creates challenges when the same law is applied to innovative companies:
- The default assumption is that everyone pays cash for their shares — not intangible assets.
- It is assumed that the funds will be provided to the project within two years; this in no way matches the funding pattern for a biotech company.
- It is not envisaged that projects will require further rounds of follow-on investment.

There is legislation for the valuation of certain kinds of intangible assets, such as patents. The law is new and the mechanisms are not transparent. A few organisations are approved to provide valuations, but the law still does not recognise the value of other intangible assets. In practice, away from the major foreign enclaves of Beijing and Shanghai, it is unlikely that the government officials in the business bureaux will have the necessary background and training to assess the creation of a joint venture where intangible assets form part of one or more partner's contribution to a joint venture.

Naturally, there are pragmatic solutions. Some include keeping the more sophisticated legal agreements outside the Chinese legal system in a more familiar territory, such as Hong Kong (one country; two legal systems). In the long term, the good news is that local government authorities in south China are considering creating local versions of company law based more closely on the Hong Kong model — itself based on UK company law.

How do you protect your IP?
Most of our experience in Isis involves patent and know-how transfer, rather than trademarks. When dealing with these valuable intellectual properties, the principles of managing risk are the same the world over. Choose your partners carefully, get to know them well, remunerate them appropriately (so that they are less tempted to cheat) and provide access to information on a need-to-know basis. Where systems are comprised of divisible parts, there is always the option to outsource manufacturing of some but not all parts. A suggested checklist is provided in Box 2.

Why do Chinese organisations file so many patents?
According to data from China's State Intellectual Property Office (SIPO), the number of invention and utility patent applications in China reached a record 1.63 million in 2011, up 33.6% up from 2010. In January 2012 the Chinese government announced: "As of the end of November 2011, the number of authorised and effective invention patents totalled 684,163, of which domestic inventions amounted to 342,466 and foreign-owned inventions were 341,697. Domestic inventions accounted for 50.1%, surpassing foreign ones for the first time. It marks that the development of China's patent work has entered a new stage."

Chinese companies, universities and colleges are growing enormous portfolios of domestic and some international patents (see Boxes 3 and 4). While some of these applications are filed with the intent to provide market protection, large numbers are almost certainly junk patents filed for other reasons. For example, progress in academia is not only linked to the publication of papers in respected scientific journals, but also depends on the number of patent applications. Also, many government subsidies depend on companies achieving the status of a high-tech company where one of the criteria is ownership (or exclusive licences) of intellectual property. Financial incentives for creators of business incubators also depend on the intellectual assets of their clients (see Box 5).

What R&D do western companies perform in China?
Discussions with technology firms from outside China would suggest that there seems to be a natural progression for

Case study: Oxford Multi Spectral Limited

A scanner which combines the convenience of a desktop scanner with the functionality of a powerful laboratory imaging device has been developed at the University of Oxford's Classics Department, and is being commercialised by a new company, Oxford Multi Spectral (OMS) Limited, which was spun out by the university's technology transfer company Isis Innovation in September 2011.

The scanner was developed for imaging ancient papyri and the technology has been used to successfully scan, restore and archive over 250,000 historically significant manuscripts.

OMS secured an investment of £250,000 from Chinese investor Changsha Yaodong Investment Consulting Co, and its UK-based partner RTC Innovations, to commercialise, manufacture and market the scanners globally.

OMS is focused on the applications in restoring manuscripts and art, as well as the huge potential market for detecting forged security and border control documents, bank notes and forensic evidence.

Collaborating with product designers in Hong Kong, OMS rapidly converted the university prototype into a commercial product, launching its flatbed A4 multispectral scanner at an event at the Ashmolean museum in Oxford in March 2012.

companies entering the territory and building up their local R&D resources. "Employ a sales agent" leads to "create your own direct sales office", which needs an "application support lab", which becomes an "applications development lab", which leads to "global responsibility for the development of components", which leads to "global responsibility for R&D for entirely new products".

Headquartered in the United Kingdom, GSK is a world-leading pharmaceutical company. In 2007 GSK announced the establishment of a research facility in Pudong, near Shanghai. Today, this China R&D centre is GSK's global hub for R&D work, taking global responsibility for the development of all new products relating to neuroscience, and is a key element in GSK's global R&D portfolio. In the past 20 years GSK has invested more than RMB1 billion in R&D in China. It has also established clinical research centres in China, with over 200 drug development projects conducted in collaboration with over 30 leading medical universities/hospitals.

What if it does go wrong?

In terms of patent litigation, the Chinese Supreme People's Court has reported that it received 420 new IP-related cases in 2011, with year-on-year growth of 34%. The majority of cases concern pharmaceuticals, chemicals and communications. To help improve the quality of legal decisions made by courts in patent cases, eight new law schools and study centres have been created around China.

Some recent court decisions have been interpreted as indicators of an improvement in the level of expertise in the Chinese judiciary. For example, Bayer Schering successfully sued Shilang Pharma for infringement of patents related to moxifloxacin, an antibiotic used to treat respiratory infections. Bayer originally sought RMB1 million in damages to compensate its loss on the market. The court believed that Shilang Pharma had sold moxifloxacin as a chemical ingredient instead of a medicine. The existing evidence was insufficient to prove that Bayer's market loss was directly caused by Shilang's product. Therefore, the damage awarded to Bayer Schering was RMB400,000, considering the efforts of Bayer, the infringing activities of Shilang and the date on which the patent was filed. This is one of the few cases in Chinese patent litigation that involved lots of scientific data, rather than legal analysis of the patents. Notably, the judge had a chemistry background and could understand the scientific arguments.

Looking ahead

At Isis, we look forward to working with more and more Chinese partners. One of the first pieces of advice we were given on entering China is that so many things are different that western companies – even direct competitors – can benefit enormously by sharing experiences. We would be keen to network with other organisations entering the Chinese innovation community. In the boxed out case study, we describe one of our projects, Oxford Multi Spectral. Unusually for a university spin-out project, this company was created on technology from the Classics Department at Oxford. The company raised

Action plan

Companies seeking to commercialise their technology inventions in China need to be aware of the following:

- In terms of complexity and fragmentation, the Chinese market more closely resembles the European Union, as opposed to the more uniform US market.
- Horror stories published in the western press do an injustice to the general state of affairs and are particularly misleading in the most developed regions of China.
- Local Chinese governments offer a wide range of incentives for innovators prepared to exploit their intellectual property through international licence agreements or joint ventures with Chinese organisations. These incentives are available to foreign teams as well as those containing Chinese nationals.
- Nationwide incentive programmes have encouraged both Chinese university researchers and early stage or mature companies to accelerate the rate of registration of IP rights.
- Western firms are increasingly engaged in IP development within China; they can benefit from access to well-trained staff and the research outputs of well-funded government research universities and institutes.
- The national Chinese government has identified intellectual property as central to the country's economic development; as a consequence, the competence of Chinese courts to adjudicate on IP related disputes is increasing rapidly.

seed funding from a Chinese investor, developed a product with input from a Hong Kong design company, launched the product onto the global market and achieved its first sales – all within seven months. We look forward to generating more examples of this kind based on technologies developed at Oxford and other leading research organisations. *iam*

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