

Make Knowledge and Technology Transfer

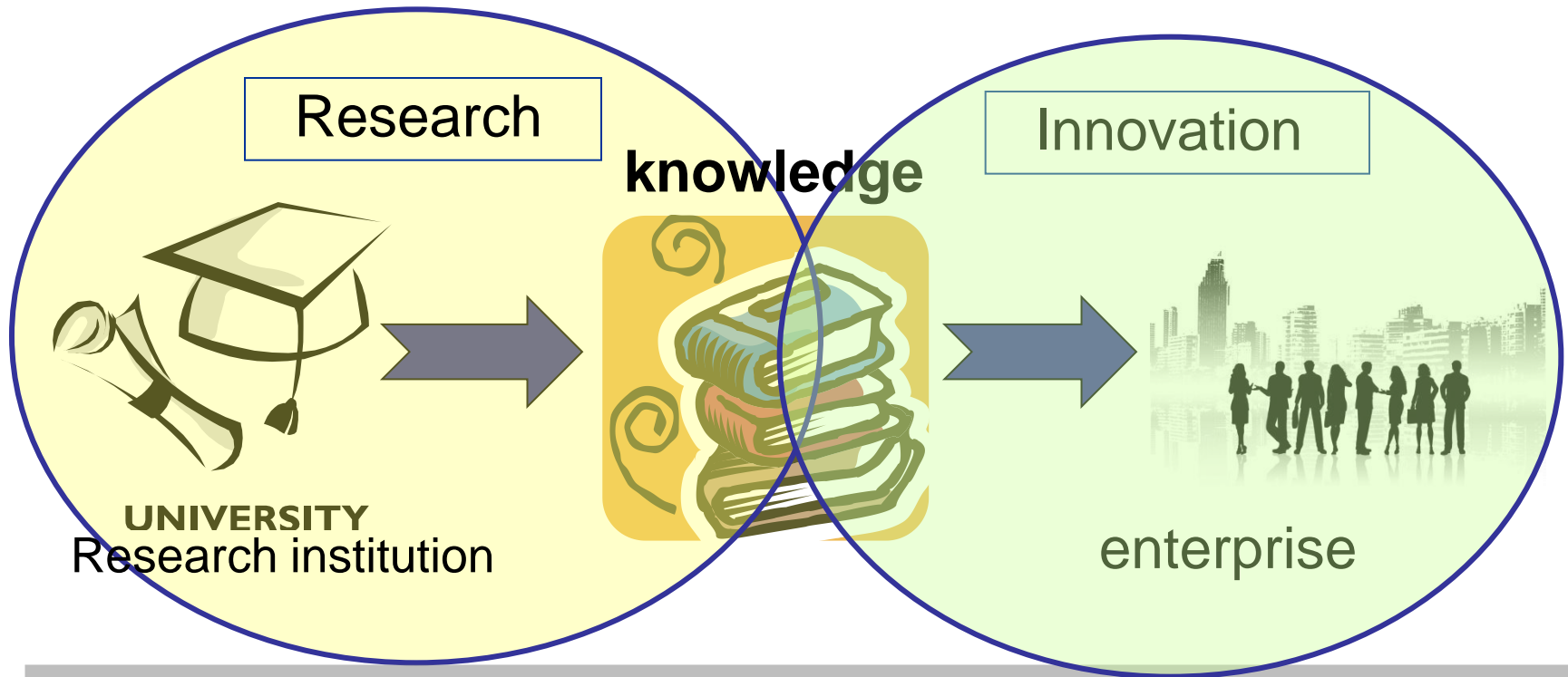
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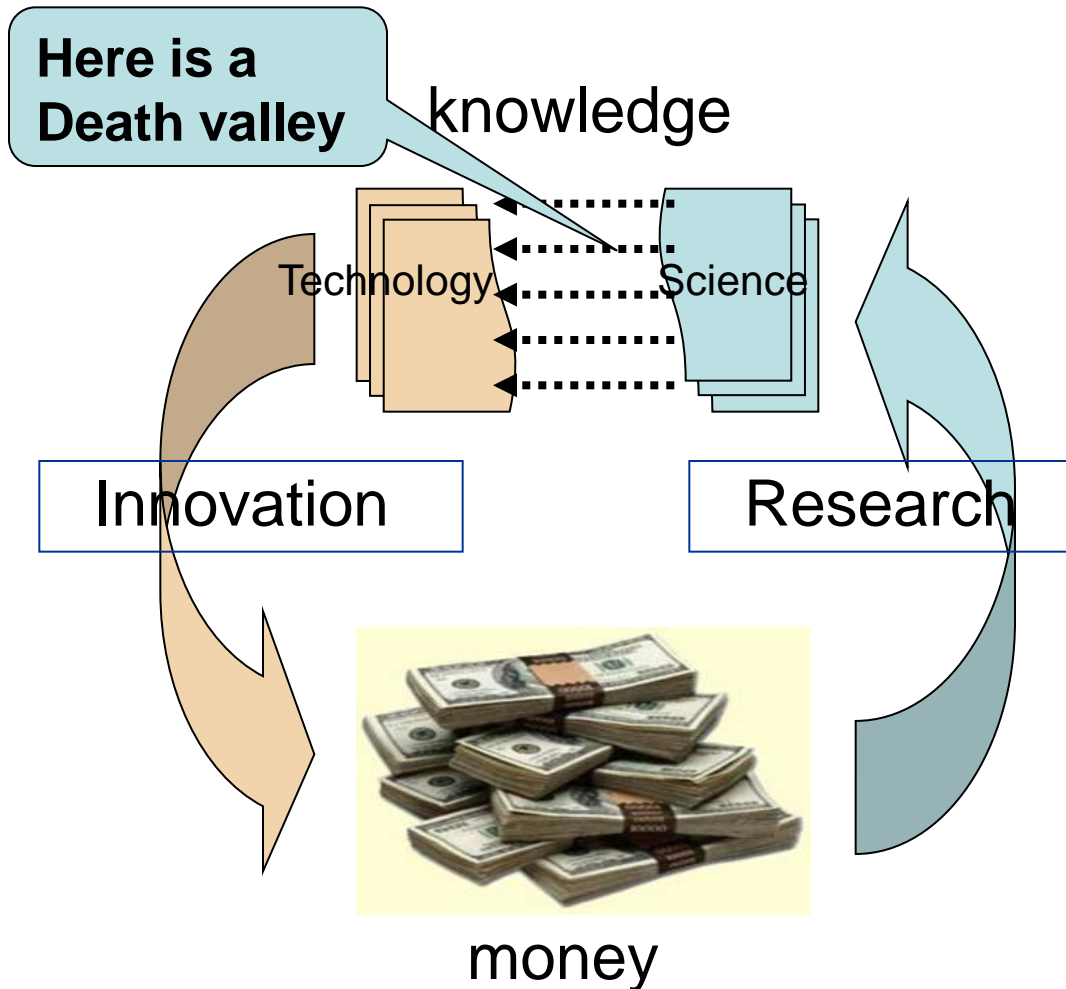
April 05, 2011

The division of research and innovation



- In General, research generates knowledge, innovation uses knowledge. Most innovation is based on **public knowledge** generated from universities and research institution.
- With respect to the social division, the research and innovation are separated two parts.

Two Types of Knowledge



- “Research is the transformation of money into “**knowledge**”; Innovation is the transformation of **knowledge** into money.”
----- Dr. Geoffrey Nicholson
- The “knowledge” itself is a innovation chain from science to technology.
- There is a “**Death Valley**” between scientific **knowledge** and technology **knowledge**

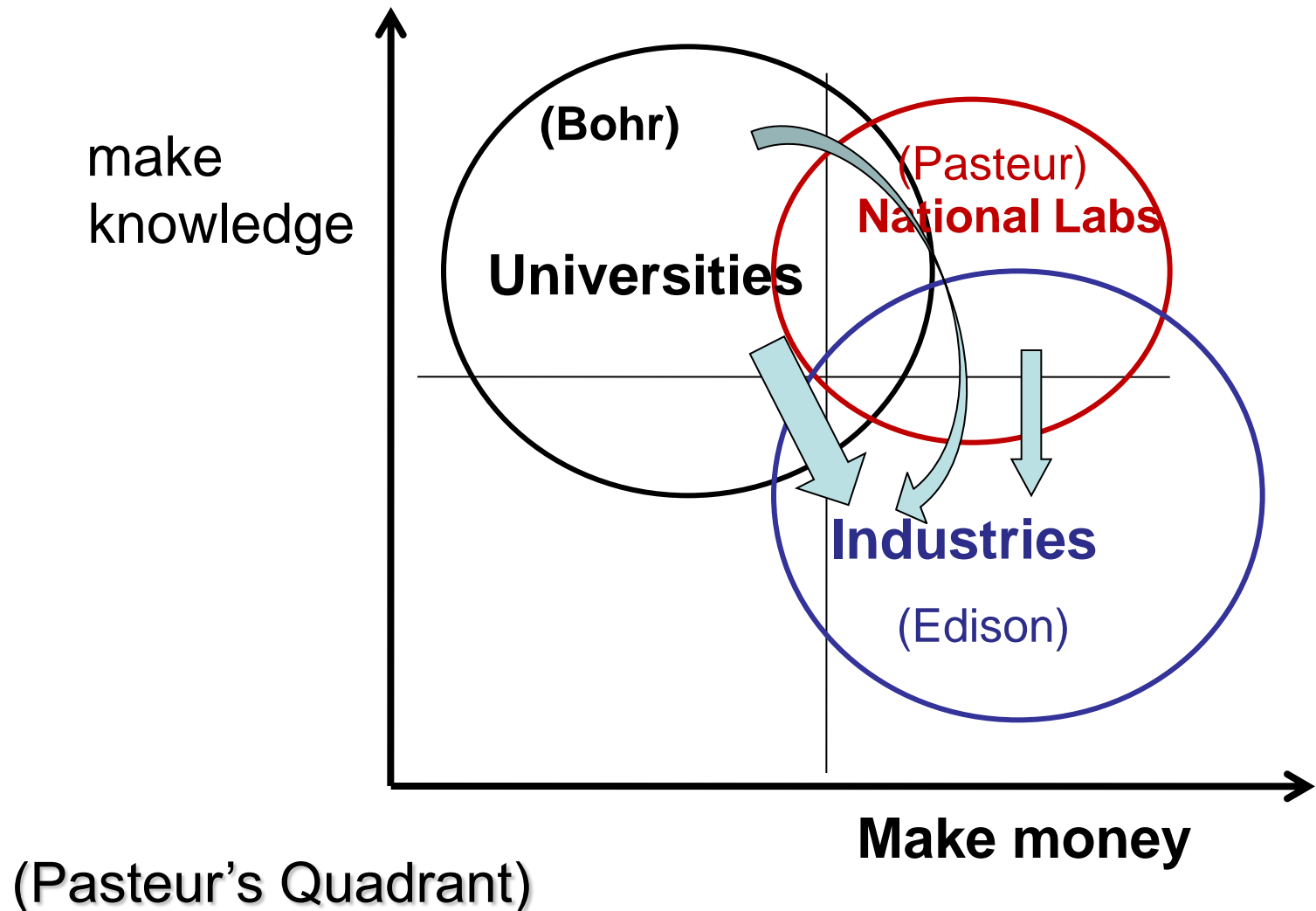
New Innovation Age

- The key aspect of innovation is not invention but innovative new business models and initiatives that bring compelling new value to the marketplace.
- In the Industrial Age, Innovation was R&D-driven and supply-push, While In the 21 century, Innovation is market driven and demand-pull.
- Today, Innovation isn't a radical breakthrough delivered by some star. Some companies have run Innovation Process Management (IPM), similar to Quality Management (QM) in the 1980s,
- The goal of university and research institution is to **make knowledge** rather than innovation (make money). However many scholars in universities and national research institutions (NRI) are still doing R&D driven innovations. A lot of efforts are wasted due to lacking of information of application requirement .

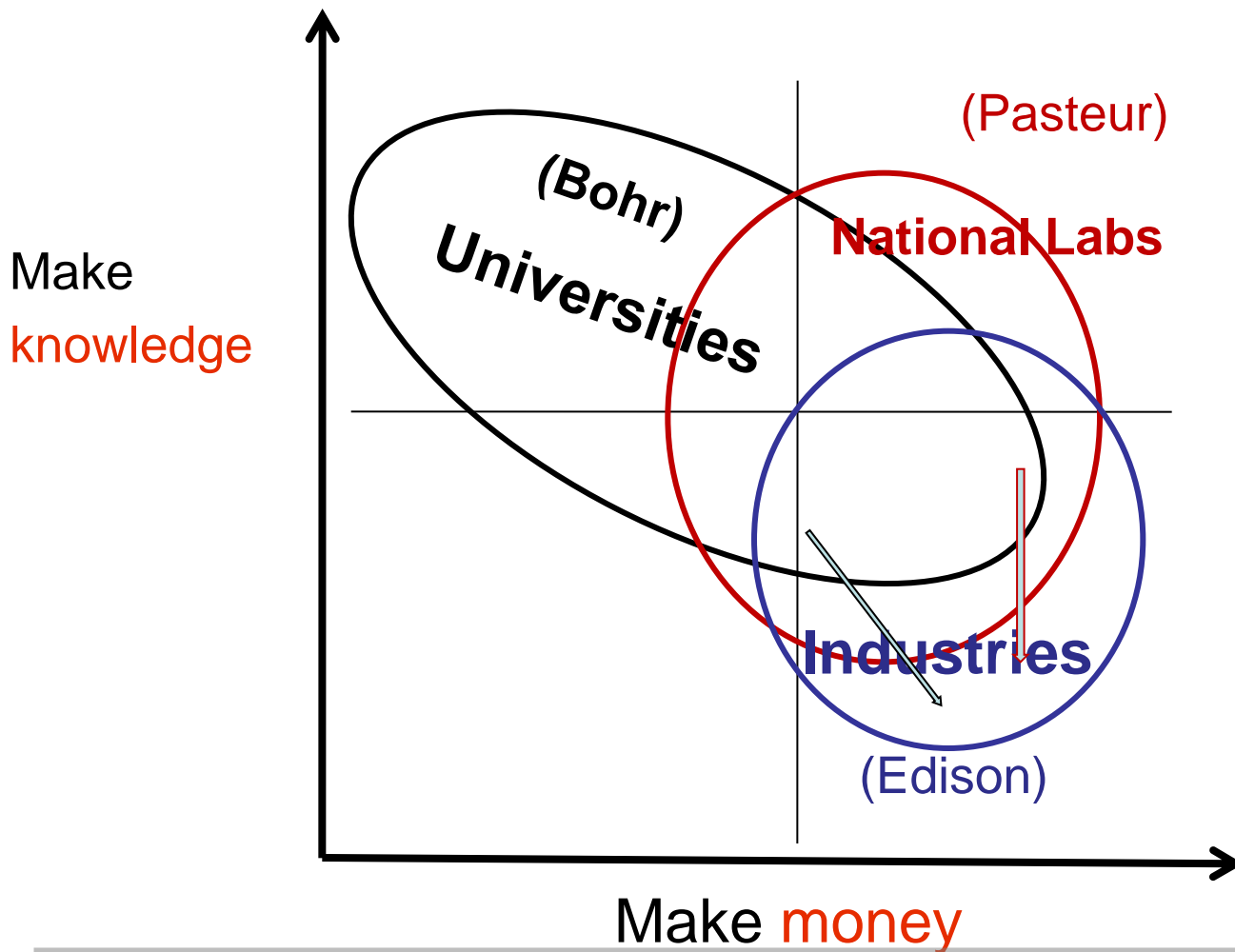
To Dissipate Misunderstanding of Innovation

- In China, many scientists believe that they can do innovation and become entrepreneurship. However, most startups created by our institute are failed.
- The research and innovation is two kinds of work , which requires different people with different capability. **Innovation is a specific tool of entrepreneurship.**
- The majority scientists do not have entrepreneur's quality, thus does not have the innovation ability
- New scientific knowledge is not the most reliable and predictable source of innovation.
- Most innovations are market or management oriented without new technology inventions.

Innovation chain in US

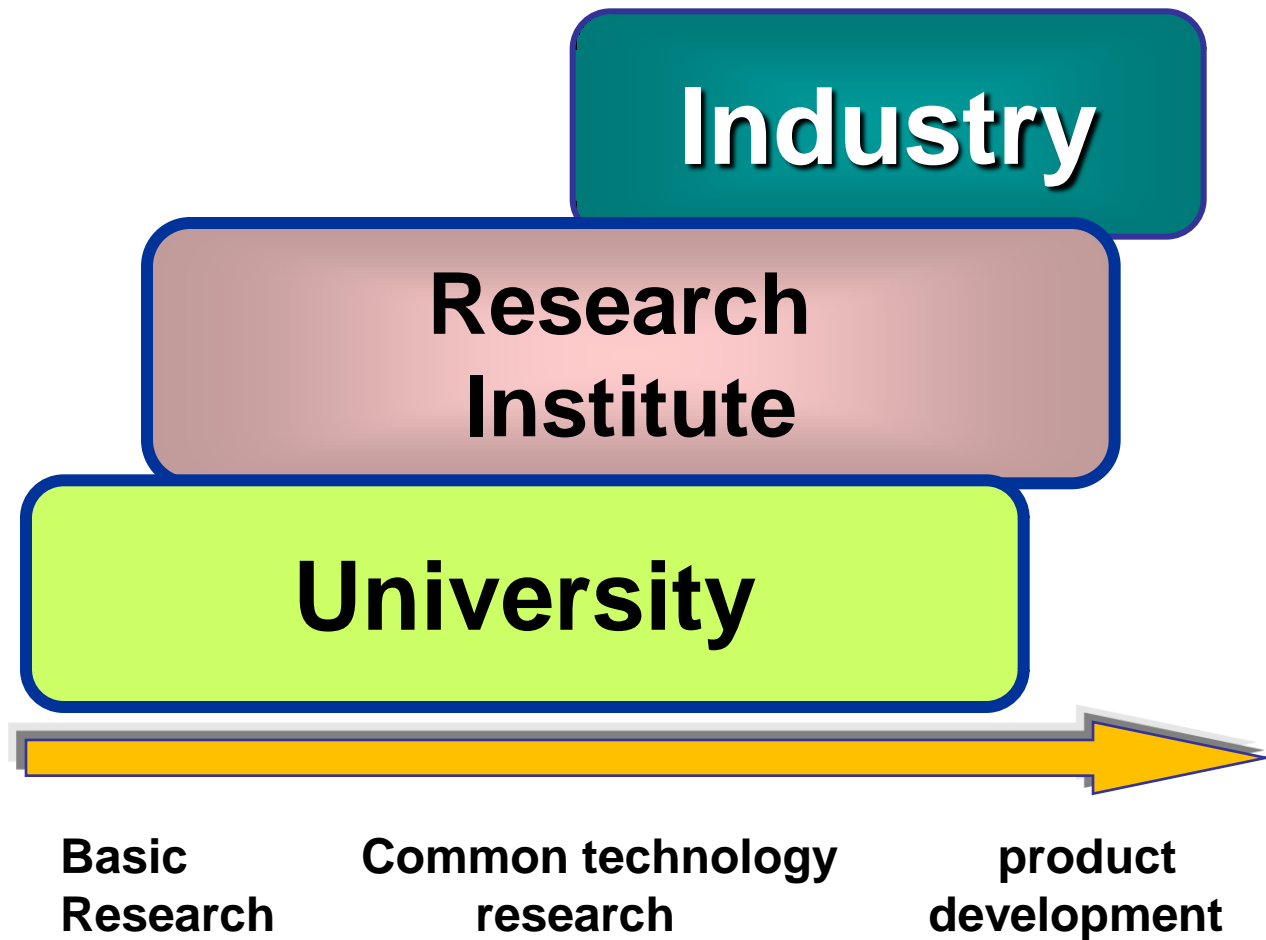


Innovation chain in China



- In China, the activities engaged in by universities, national Labs and industries are **largely overlapped**.

Technology Transfer System in China



R&D expenditure in CHINA

In China, more than 80% of R&D funds are spent for product development rather than applied researches. In order to improve the innovation capability, we need increase the R&D funds for basic and applied researches.

	Total R&D	Basic research	Apply research	Development
Total funds	58021068	2702857	7307915	48010294
Enterprises	42486030	44182	848165	41593683
Research Institutions	9959481	1106276	3509107	5344098
Universities	4681749	1455112	2500292	726344
ICT section	1575173	1164	59108	1514901

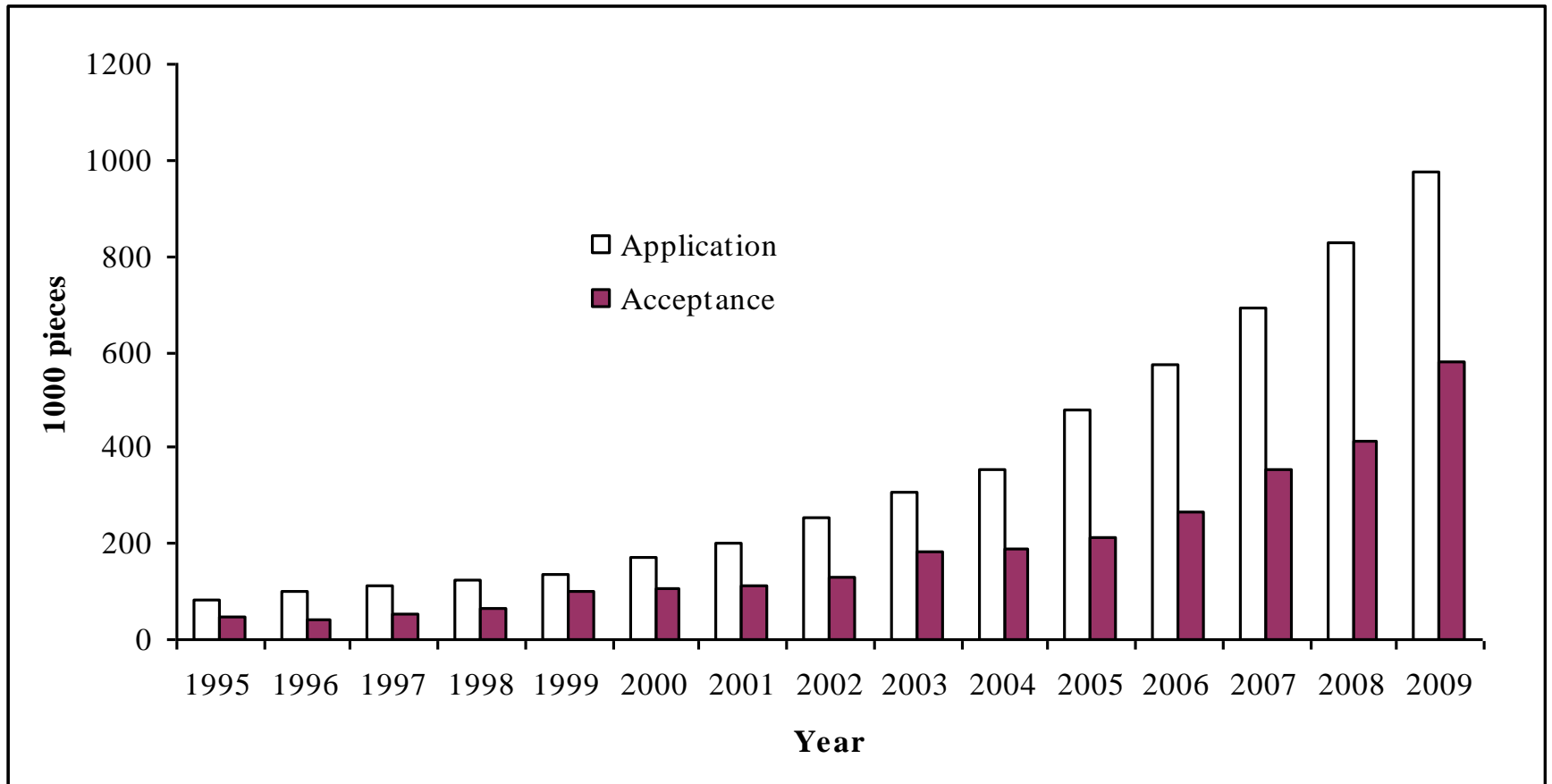
About 73B USD

Source: China statistics report 2009

Progress and Deficiency of China's innovation system

- In recent years, numbers of patents applied and accepted in China increased significantly. Number of PCT patents applied by Chinese companies are also increased. 
- In China, most of high-level researchers and engineers work in universities and NRI, however, little technology transfer occurs between university/NRI and enterprises
- The leading companies in China, such as Huawei, ZTE, Tencent, baidu , Alibaba, have not obtained key technology from universities and NRI, but most technicians in these companies was trained by national high-tech programs in universities or NRI. 
- The statistical report shows that technology transfer between manufacture companies is quite active In China. 

Numbers of Patents Applied and Accepted in China ,1995-2009



Sources: NBSC (2009, 2010) and MST (2010).

TOP 5 of TCP Applicants in the World

2010 Rank	Applicant	Country	2010 No. PCT applications	Number of increase
1	Panasonic	JAPAN	2,154	263
2	ZTE	China	1,863	1,346
3	Quancomm	US	1,677	397
4	Huawei	China	1,528	-319
5	Philip	Holland	1,435	140

Subject distribution of Patents

CISCO VS HUAWEI

SUBJ ECT	CISCO	HUAWEI
ENGINEERING	79. 62	83. 28
COMMUNICATION	99. 40	96. 72
COMPUTER	74. 39	29. 57
INSTRUMENTS	17. 56	12. 37
OTHERS	4. 34	5. 86



Two Major Innovations in China

- In the national torch-plan projects "748 engineering" , a computerized laser photocomposition system for Chinese character typesetting invented by Professor Wang Xuan at Peking University. This technology has successfully transformed and industrialization. Today, the press and publication technology occupied more than 85% of the domestic market share, and coved more than 30 countries and regions.
- The TD-SCDMA (one of 3G standard) was originally proposed by China Academy of Telecommunication Technology (CATT) and then transformed to Datang Inc.
- Both innovations above are issued from applied research in university or national research institution.



Most Patents Transfers Occur Between Enterprises in CHINA



Patents	Patent Apply	No. of invention patent Appl.	Invention Patent granted	Patent transfer	Patent license Income (K RMB)
Total	363329	154033	246870	307673	903345
Enterprise	287339	104216	133868	305505	725467
Research Institutions	15773	12361	17677	509	120824
University	56641	36241	94652	1602	56315
Manufacture	259826	90560	115408	304502	670654
ICT	7260	5062	6243	275	31167

Source: China statistics report 2009

Our Universities and Research Institutes Begin to Move Towards Foresight Researches

- **In past years, many universities and NRI in China owned their companies. The professors and researchers in universities and NRI do not only basic researches but also product developments**
- **Why does this situation happen? Because lack of innovation capability of Chinese companies, especially SME. It is usually that universities and national Labs takeover the enterprise's R&D jobs in developing countries.**
- **In recent years, the R&D capability of high- tech companies , such as Huawei, is improved notably, so our universities and research institutes begin to move towards foresight research.**

An Example: ICT/CAS

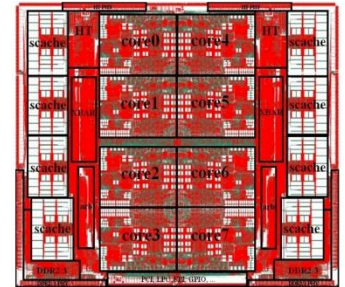
- In our Institute of Computing Technology (ICT), we have a quite long research and innovation chain. About 20% researchers in ICT do basic researches, most staffs deal with engineering work.
- Due to the long innovation chain, we are able to possess strong engineering capability, our research results are almost real products rather than a prototypes. There is a world class research platform in ICT, which may not possess in some advanced US universities. 
- But the disadvantage is that it weaken the foresight and fundamental research, the really original discovery and important invention are quite few in our institute (ICT). 

Representative Research Results Made in Institute of Computing Technology



Nebulae supercomputer system

No. 2 on the 35th TOP500 Supercomputer
Linpack performance of 1.271 PFlop/s
Designed by Institute of Computing Technology



Loongson(Godson)-3B CPU
8 cores , 1GHz
16 256bit vector accelerators
Peak perf. :128Gflops
Number of transistors: 580M
Die size: 300 mm²
Power:40W
(3.2 gigaflops per watt)



The Role of NRI in China needs adjusting

- In China, 242 national industry research institutes have transformed into enterprise, now only a few NRI engage in applied research , aiming to make technical knowledge.
- The carrier of technology transfer is **experienced people**. More than 10000 students (PhD and Masters) graduated from Chinese Academy of Sciences (CAS) every year, which is the important output of CAS .
- Some national projects undertaken by CAS is neither research nor innovation, it is nothing but producing a prototype by using existing public knowledge. CAS needs put more attention on **make new technical knowledge** .
- CAS's “knowledge innovation” (知识创新) should be “**Make knowledge + Technology transfer**” .



Question?

www.ict.ac.cn

