

# **Engineering Education Accreditation and Its Practice for IT Program in China**

**Yu Shouwen**

Tsinghua University, Beijing, China

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# Background

- **Higher requirements for engineers and technicians.**
- **“Big Engineering”.**
- A large number of **manufacturing businesses**
- It is definitely important **to train out** a large number of **high-quality engineers and technicians** in China.
- China’s **industrial structure is bound to be changed**

# Engineering Workforce Development and Challenges

- Transform the **R&D system** from a type of “**following up**” to a type of **innovational**
- In the recently announce China’s scientific and technological development plan of the period 2006-2020, the **R&D investment** will be increased to **2.5%** of its total GDP.
- Many Chinese enterprises will have to **establish their R&D** departments to have their own ability of technological innovation.

# Developments in Engineering Education - China

- **i.** Brief introduction --- Chinese engineering education
- **ii.** Quickly developing in the period 1999--2005
- **iii.** **Enhance the quality** of higher engineering education

***Table . Number of total graduates and engineering graduates in China between 1949 and 1999***

**• Total Graduates      Engineering Graduates**

<b>year</b>	<b>total number</b>	<b>Engng. Graduates</b>
	<b>(Thousands)</b>	<b>(Thousands)</b>
• 1949 ---	21	5
• 1979-----	85	21
• 1999-----	847	326

**Table . Number of engineering graduates and their percentages among all graduates of the same level in China between 2000 and 2007**

• Year	Total Number (thousands)	(%)
	<b>( engineering graduates )</b>	
• 2000	380	37.5 (%)
• 2004	<b>868</b>	34.2 (%)
• 2007	<b>~1/3x2264=755</b>	

# Questionnaire survey

- According to the recent **questionnaire survey** of **122** Academicians of the Chinese Academy of Engineering, most of the academia (almost over 80%) think that engineering education is **facing challenges** when to meet the needs of the harmonious and sustainable development.

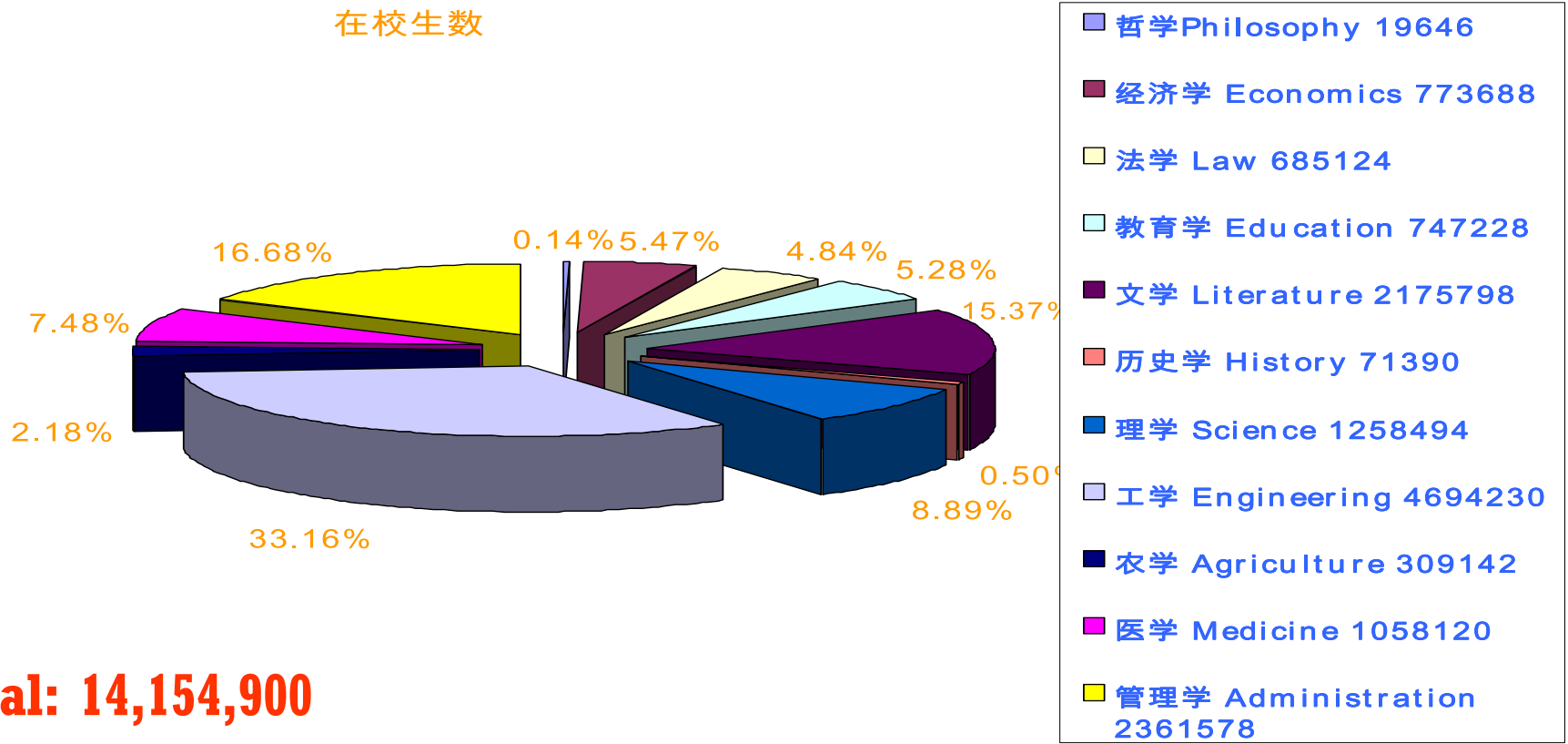
- Training future engineers to work in **globalized environment**.
- Promoting **international cooperation** in engineering education.
- Establishing an **international equivalence accreditation system**
- To establish international **collaboration** on the accreditation of engineering programs

# **An Overview of China's Higher Education (中国高等教育概况)---Prof.Ge D K,**

The **total number of students** in regular higher education  
in **2007:~ 27** millions

2004-----	14.1549 millions
2006-----	~23.00 millions
2007-----	~ <b>27.00</b> millions

# Student Population in Different Academic Fields in Regular Higher Education in 2004, 2004年普通高等教育分科学生数



**Total: 14,154,900**

**Engineering program: 4,694,230--- ~ 1/3**

# Types of Higher Educational Institutions

## 办学机构类型(2006)

普通高等学校1867所(其中民办226所)

**1867 Regular HEIs**  
**(226 non-state)**

本科学校720所

**720 Universities**

专科(高职)学校1147

**1147 Tertiary Colleges**

另外，独立院校~250所

**In addition, ~250 Independent Colleges**

**70%----- ICT Programs**

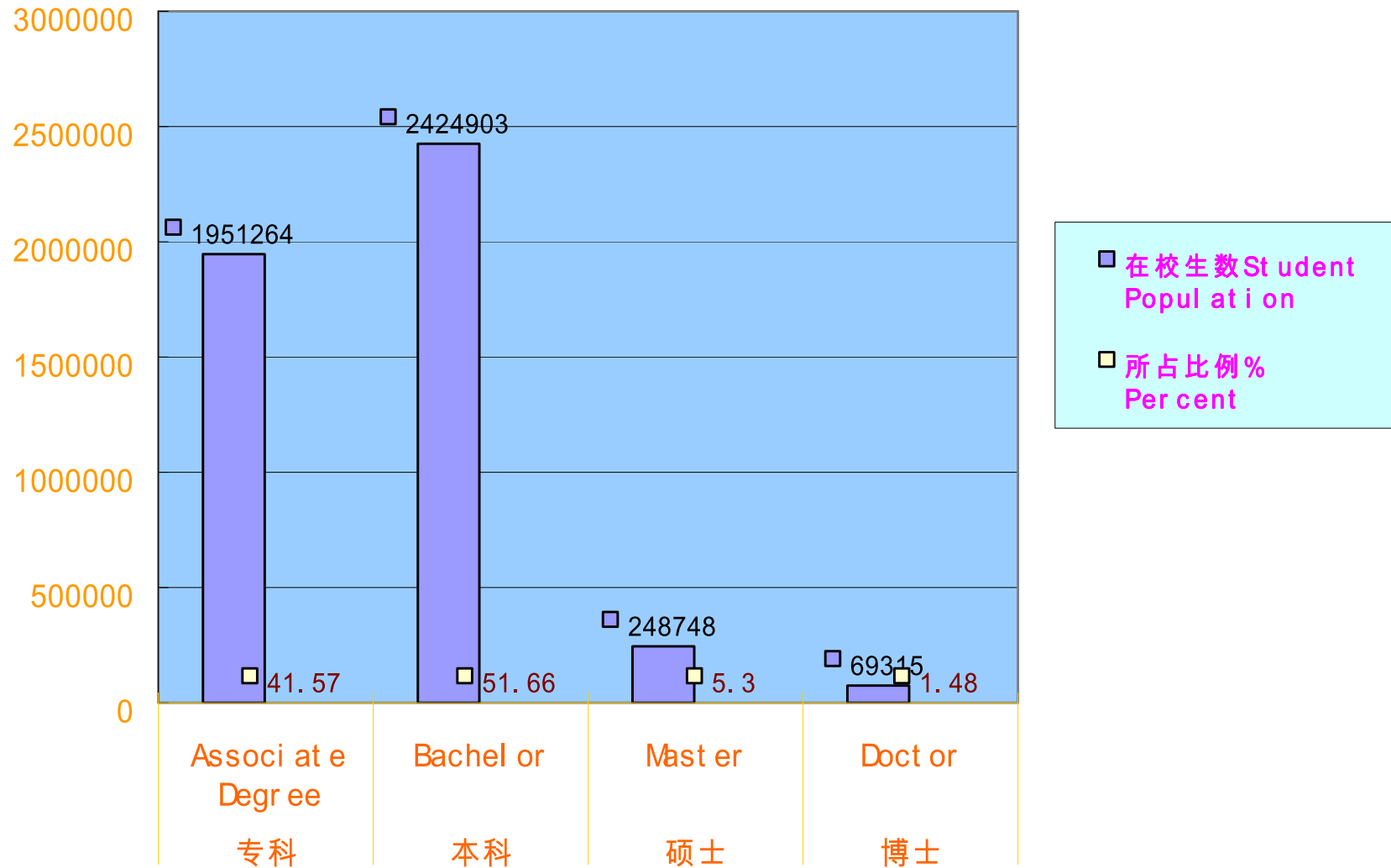
# **An Overview of China's Engineering Education in 2004**

## **2004年中国工程教育概况**

- ◆ **中国工程教育经过百年的发展已形成多类型、多层次的工程教育培养体系**

**With 100 year's development , a  
training system  
with multiple layers and various kinds  
in engineering  
education has taken shape.**

# Number of students at Different Levels of Engineering Education in 2004 ,2004年工程教育在校生层次结构



# Number of HEI Offering Engineering Education in 2005

## 2005年举办工程教育的高校教育

	设工科专业学校数 Number of HEI Offering EE Programs	学校总数 Total Number of HEI
合 计 Total	1528	1751
本 科 Bachelor	604	704
专 科 ~Associate Degree	924	1047

# Number of Engineering Programs in 2005

## 2005年工科专业点数

	<b>工科专业点数 Number of Engineering Programs</b>	<b>所占比 例% Percent</b>	<b>专业点总数 Total Number of Programs</b>
<b>合 计 Total</b>	<b>19718</b>	<b>33.00</b>	<b>59748</b>
<b>本 科 Bachelor</b>	<b>7753</b>	<b>28.63</b>	<b>27076</b>
<b>专 科 ~Associate Degree</b>	<b>11965</b>	<b>36.62</b>	<b>32672</b>

# The Development of China's Engineering Education During 1998-2004 1998-2004年中国工程教育的发展

## The Increasing Scale of Engineering Education

✓1998-2004年工程教育在校生

### Number of Engineering Students During 1998-2004

年 度 Year	1998	1999	2000	2001	2002	2003	2004
在校生数 Number of Engineering Students	1439160	1712511	2278128	2645701	3282277	3949155	4694230
增长率% Increasing Rate		18.99	33.03	16.13	24.06	20.32	18.87

**✓ New Enrollments in Engineering Education**  
**During 1998-2004 1998-2004年工程教育招生数**

<b>年 度</b> <b>Year</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>
<b>招生数</b> <b>New</b> <b>Enrollments</b>	<b>441553</b>	<b>646665</b>	<b>887408</b>	<b>955314</b>	<b>1136727</b>	<b>1345638</b>	<b>1587209</b>
<b>增长率%</b> <b>Increasing Rate</b>		<b>46.45</b>	<b>37.23</b>	<b>7.65</b>	<b>18.99</b>	<b>18.38</b>	<b>17.95</b>

## Graduate Students

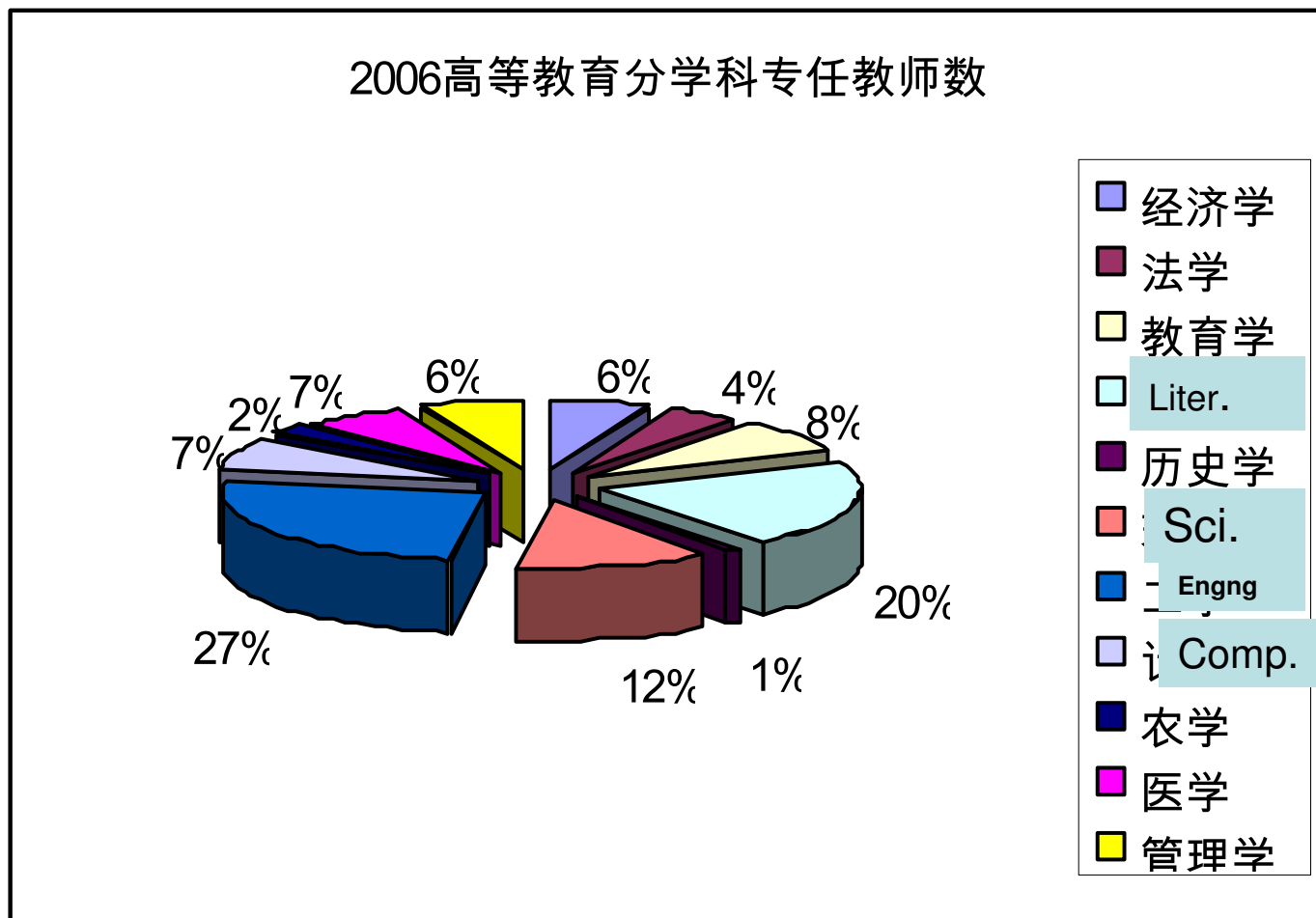
- **1999—up to 2004**:—average increasing rate of total number **V=30.2%**
- 2000—**V=40.0%**
- 2003---**V=32.7%**
- Enrolments of freshman ( Candidates):
  - 1999—**92** thousands
  - 2004---**326** thousands
  - 2007---**418** thousands

## New Enrollments ( Mil.)

• Year	Univ.	college	Total	Ma.	Dr.	Total
	(			(		
	Under			Candidates		
	graduates)			)		
• 2005	2.30	2.35	4.65	0.316	0.054	0.37
• <b>2006</b>	~ 2.53	~ 2.93	~ 5.46	0.344	0.056	0.40
• <b>2007</b>	<b>2.82</b>	<b>2.84</b>	<b>5.66</b>	<b>0.360</b>	<b>0.058</b>	<b>0.418</b>

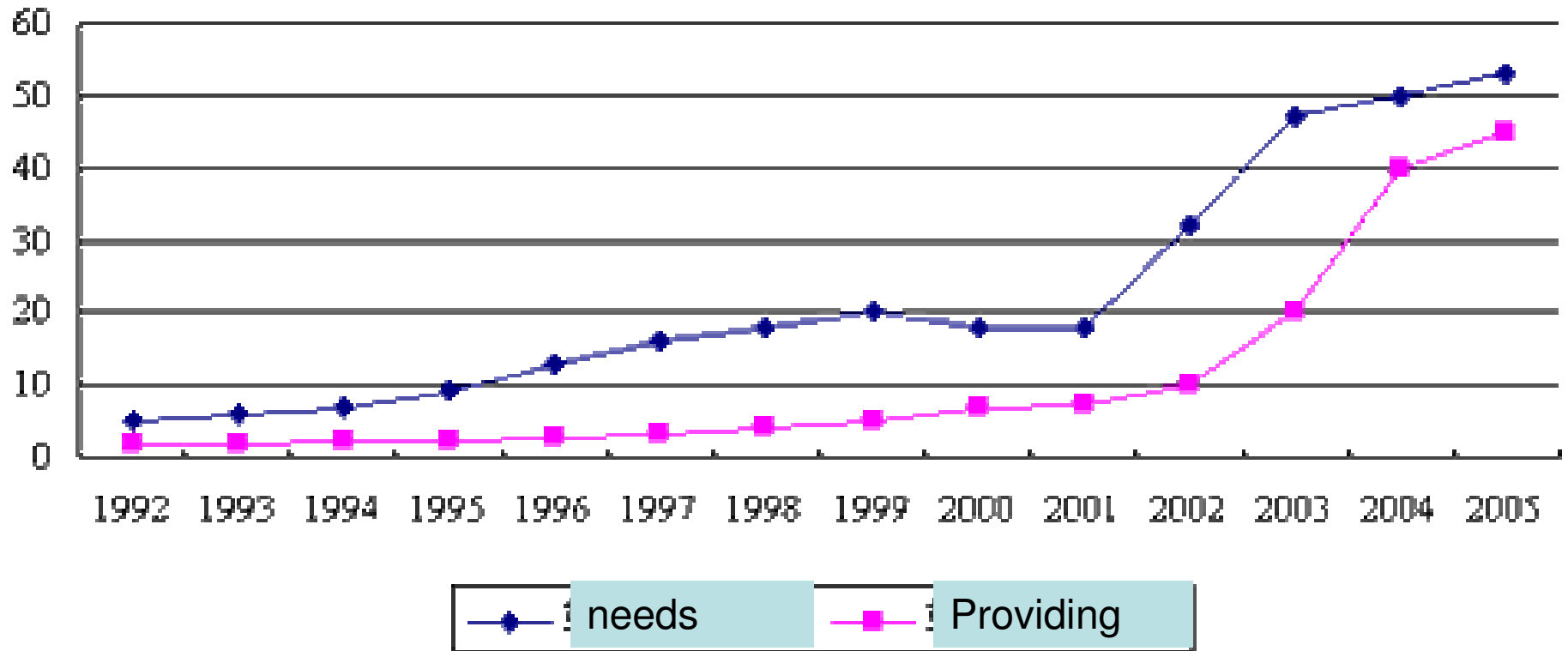
# Teacher number (2006) in **computer Sci. & Tech. in China-- 85158.**

It is **7%** of the total number of teachers in University and colleges of China



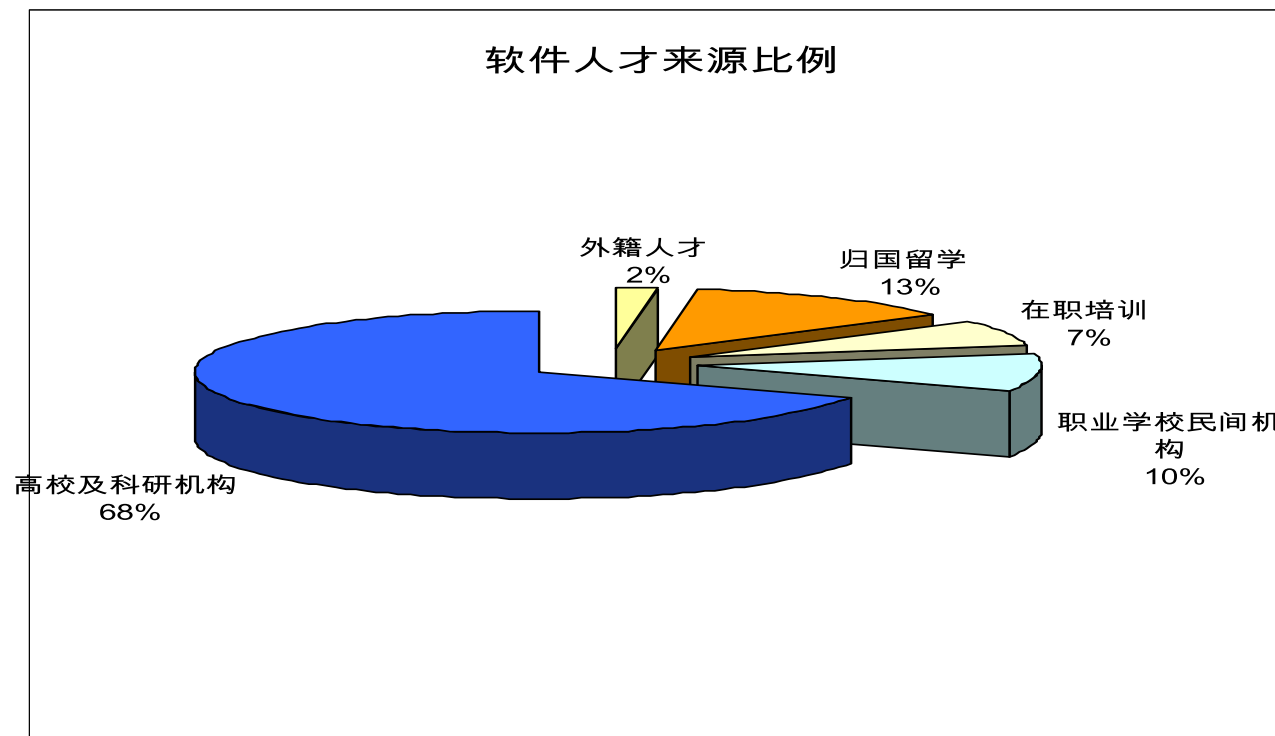
Requirement (blue)---Providing (red one)

**unit of Coordinate—10 thousands**



# Ratio of human resources in software field

- Univ. +Institutes—**68%**; Back from abroad—**13%**; Vacation school-**10%**;



# Distance education system-CERNET

- Engineering technology circles distance education system,--**Continuum Education**
- To accomplish course concerned with engineering technology and administration or courses **for postgraduates**
- Such a distance-education approach important form of **continuing education for engineering technicians**

## --Distance education system

- Engineering technology circles distance education system,--**Continuum Education**
- **CERNET—big network.**
- To accomplish course concerned with engineering technology and administration or courses **for postgraduates**

**Development of  
China's Engineering  
Education Program  
Accreditation System**

# Purpose of the accreditation system

- To enhance **the qualities** for Eng. Education
- To promote China's reform of engineering education, strengthen the **engineering practice** education,
- To set up an accreditation system for engineering education program in coordination with the certified or registered **engineer system**
- Further strengthen relations between the engineering education and **the industrial circle**, Improve the compatibility of engineering **talent training** with the industries
- To promote China's participation in the international engineering education **exchange and reach the international mutual recognition**

- **Since 1992:-----Accreditation on:**
- Architecture,
- Urban planning,
- Civil engineering
- Architectural environment and equipment engineering
- Engineering management,

# Organization and new pilot Accreditation

- Chinese **Experts Committee** of Eng. Education Accreditation has been established;
- New **Pilot Accreditation—Other 5 Programs—2007**
- **10 Programs—2008**

## By June. 2006—in Civil Engineering

- The programs of the civil construction that had passed the accreditation were as follows:
- 30 --- architecture
- 13---- city planning,
- 9 -----civil engineering
- 16 ----architectural environment and equipment engineering,
- 9----- water supply and drainage
- 17--- engineering management.

## Since 2005 :

### EEA--Organizational structure

- Documentations preparation
- Pilot accreditation
- 4 programs were selected as **pilot accreditation** ( 1<sup>st</sup>,2<sup>nd</sup> batch completed in 2006)
- **Electrical engineering and automation**
- Mechanical engineering and automation
- **Computer engineering.**
- Chemical engineering and technology

## II. Documentation

- (1) “The Policy and Procedure (Provisional) of Engineering Educational Programs Accreditation”
- (2) “The Engineering Educational Programs Accreditation Criteria (Provisional)”
- (3) “The Evaluators Selection and Training Methods (Provisional) for Engineering Educational Programs Accreditation”
- (4) “The Working Guidance (Provisional) for the Program Evaluators”
- (5) “The Preparation Working Guidance (Provisional) for Programs to be Accredited”

# Procedure:

- Review application report
- Review of self evaluation report
- Review of visit report and make decision
- Appeal and Arbitration
- Visiting team work: Organization of visiting team(4-6 members)
- Arrangement of visit

# Organizational Structure for Accreditation System

- **Engineering Educational Program Accreditation Board**
- China Association for Science & Technology, together with other departments,
- actively in preparation to establish a National Engineering Educational Program Accreditation Board.

## **2. National Engineering Educational Programs Accreditation Experts Committee**

- under National Engineering Education Program Accreditation Board
- members
- include the representatives from various academic societies, various professional associations, the industrial circle and the educational circle
- main duties of the Committee
- to formulate or approve the accreditation policies, accreditation criteria and relevant working documents
- organize the accreditation activities.

# In mid-October of 2006

- second batch of pilot accreditation
- electrical engineering and automation of Shanghai Jiaotong University,
- mechanical engineering and automation of Zhejiang University, c
- chemical engineering and technology of Tsinghua University
- computer science and technology of Beihang University

# Criteria-EEA( General Criteria)

- 1-Main Goal of the Program
- 2-Quality Assessment
- 3-Courses-Curriculum
- 4-Human Resources
- 5-Supporting Condition ( Hardware)
- 6-Development of Students
- 7-Administration
- 8-Additional Criteria

# **Additional Criteria for IT Program-( Case Study)**

- **Double E Programs-----including :**
- **Electronic Eng.;、 Communication Eng.;、 Electronic Information Eng. ;Electronic Sci. and Tech.;、 Automatic Controlling;、 Optic-electronic info.Eng.; Microelectronic;、 Security of Information .....**
- **1 . 1 Course**
- **1 . 1 . 1 Math. And Natural Sci. ( Min.400Hr )**
- **1 . 1 . 2 Fundamental Courses ( Min.500Hr. )**
- **( 1 ) Electrical circuit theory : ( 2 ) Electro-Magnetic Fields :  
( 3 ) Electronic Tech. : ( 4 ) Signal analysis and its approaches : ( 5 ) Computer Tech. : ( 6 ) Network and Communication ( 6 ) Automatic Control ( 7 ) Fundamental Mechanical design**

**1 . 1 . 3 Basic specialized course ( not less than  
130 hr )**

- ( **Communication Engineering** )
- ( 1 ) **Electronic Circuit of Communication**
- ( 2 ) .....

• **1 . 1 . 4 elective courses ( not less than 200  
hr )**

- **1 . 2 Practical activities---- 24 weeks )**

# Requirement of Practice

- Practice of Metal processing ( 2 weeks )
- Project of design ( 2 weeks )
- Comprehensive Experiments ( 2 weeks )
- Graduation field work ( 2 weeks )
- Graduation project ( Design or thesis) ( 12 weeks )
- Special training ( 2 weeks )
- Practice of Sci. and tech . ,And /or innovative-social-practice (2 weeks)

# Summary

- The development and some data of higher engineering education in China ( Engineering;--examp. Double E )
- Engineering Education Accreditation in China ( Case study—IT and other programs)

Thank You !!!