

琉球大学学術リポジトリ

Development of Scientific Technology in Asia

メタデータ	言語: 出版者: 琉球大学アメリカ研究センター 公開日: 2012-06-19 キーワード (Ja): キーワード (En): 作成者: Uehara, Yosei, 上原, 與盛 メールアドレス: 所属:
URL	http://hdl.handle.net/20.500.12000/24678

Development of Scientific Technology in Asia

Yosei Uehara

Professor, Ph.D.

Graduate School of Science & Engineering

Introduction

The development of scientific technology in Asian countries has been mostly done by means of importation of American scientific technology from the United State of America (The USA), and by Asian scholars (scientists and engineers) educated and cultivated in The USA. Then, in the field of Scientific Technology, Asian countries have been connected and communicated with The USA very tightly and intimately. The development of scientific technology in Asian countries, therefore, has been depending on the development and progress of scientific technology in The USA, because that great deal of Asian scientists and engineers educated in The USA have been supporting and assisting the development of scientific technology in their own countries.

I was in the University of Utah for about 5 years to proceed my Ph.D. program in chemistry. I communicated with many foreign students from Asian countries. Most of them were graduated from the most famous University in their countries and came to The USA in order to get Ph.D. degree, because there were no universities which offer the Ph.D. program in their country. They said that about 80% of students in the field of science and engineering in the famous Universities such as Seoul University in Korea and Taipei University in Taiwan came to The USA to attend to the Ph.D. program in the era of 1960. However, most of them did not return back to their own countries. They received the permanent " visa " and got job in The USA. There were several reasons why most of them stayed in The USA and got job there ; ① Did not find appropriate job in their countries, ② Receive good payment and high salary, ③ Expect fair treatment, high position for good ability, ④ Big need or demand for scholars, ⑤ very good research environment and equipment, ⑥ enough financial support for research, etc. In 1965, the Immigration Law was revised, and scientist and engineer could immigrate to The USA easily. Then many scholars were transferred to The USA from Asian countries (including Japan). They called that "export of brain". Therefore, until early 1970th, the technology and ability of such scholars worked and studied in The USA were not used for

developing and improving technology and science of their own countries.

In 1973, "Oil Shock" was happened in globalization. After "Oil Shock", the situation was greatly changed. For Asian students, it became very difficult to get "permanent visa", even for students in doctoral program, and also to get job after finishing school or research work. Therefore, many Asian scientists and engineers who worked in The USA came back to their own countries, and supported or assisted the development and progress of technology in their countries, with their knowledge and ability obtained in The USA.

In Korea, "The Korean Advanced Institute of Science and Technology" (KAIST) was established in 1974. Many Korean Scientists and Engineers were invited to KAIST from The USA. The KAIST is offering Ph.D. program now.

Development of Scientific Technology In Japan

The development of scientific technology in Japan was also depending on that in The USA. Especially, in 1960 to 1970, many Japanese scientists and engineers went to The USA to take research work or to study. Most of them received scholarship from Japanese Government, Institutes, Industries, etc. Some of them received Fulbright Scholarship from USA Government. But most of them returned back to Japan and they supported and assisted the development or improvement of scientific and industrial technology in Japan. Especially electronic technology and car technology were improved and developed very much, with such scholars and by importing many kinds of technical reports from The USA. After world war 2 in The USA, the government supported scientific technology with great amount of budget. Many kinds of technology such as computer, electronics, air plain, oil chemistry, atomic energy, etc., improved remarkably and extremely in rapid speed.

The results of the survey for the development of science and technology in Japan were reported in " Report on the Survey of Research and Development (R&D) " , published by Statistics Bureau, Management and Coordination Agency, Japan. This survey of R&D has been conducted annually since 1953 with the object of clarifying the current situation of research activities in Japan, and thereby providing the basic data necessary for the development of science and technology. This survey ha been taken as the " Statistical Survey of Research Institutions " until 1959. In 1060, it was renamed the " Survey of Research and Development (R&D) ", when the survey coverage was expanded. The main reversion in 1960

was the extension of statistical coverage. In the " Survey of Research and Development ", the coverage was enlarged to include all companies with a capital of one million yen or more (including special corporations), with exceptions in a few industries.

Here, let us discuss about one sample report, the report on the results of the Survey of Research and Development in 1985. Companies (including special corporations), research institutes, universities, and colleges are included in this survey.

The Budget of R&D from 1974 to 1984

In Table 1, the budget for R&D from 1974 to 1984 is tabulated. The total budget of R&D in 1974 is 2.716 trillion yen.

Table 1. Budget of Research and Development

year	budget of R&D			increase rate against previous year (%)	
	total	natural science	rate(%)	total	natural science
1974	27160	24214	89.2	22.6	22.2
1975	29746	26218	88.1	9.5	8.3
1976	33207	29414	88.6	11.6	12.2
1977	36513	32335	88.6	10	9.9
1978	40459	35700	88.2	10.8	10.4
1979	45836	40636	88.7	13.3	13.8
1980	52462	46838	89.3	14.5	15.3
1981	59824	53640	89.7	14	14.5
1982	65287	58815	90.1	9.1	9.6
1983	71808	65037	90.6	10	10.6
1984	78939	71765	90.9	9.9	10.3

The total budget of R&D in 1984 is 7.8939 trillion yen, and shows the increase of about 9.9% officially and of 6.9% actually compared to that in 1983. Comparing to the budget of 10 years ago, the budget increases for about 2.9 times officially and 1.8 times actually, respectively. The budget of natural science is 7.1765 trillion yen, 90.9% of total budget. Increasing rate is 10.3% officially and 7.3% actually, comparing to that of 1983.

The Classification of the Budget

In Table 2, the classification of the budget is shown with three categories, such as basic science, applied science, and development research in the field of natural science.

The budget of basic science was 959.9 billion (only 13.6% of total budget), while that of applied science 1.7808 trillion (25.1%) and that of research development 4.3402 trillion (61.3%), respectively. Especially, in industries, 72.4% of their total budget was for the research development and only 5.6% for basic science, while in universities 54.9% of the budget was for basic science and 8.5% for development.

Employee for Research Work

The employee for research work is tabulated in Table 3. The total research employee is increasing every year. The employee for natural science is more than 80% of total research employee. In 1985, total research employee was 762,800 and the employee for natural science was 672,800 (88.2% of total employee), while the employee for social science was only 50,100 (6.6%).

Table 2. The Classification of Research Budget for Natural Science

	year	total amount	basic science	applied science	research development
research budget	1979	39511	6114	10220	23177
	1980	45384	6598	11534	27252
	1981	52067	7243	13400	31424
	1982	57950	8157	14989	34805
	1983	64096	8967	16301	38828
	1984	70809	9599	17808	43402
	companies & industries	51366	2900	11286	37180
	institutes	9512	1245	2892	5375
	universities	9931	5454	3630	847
	increasing rate (%)	1983	10.6	9.9	8.8
1984		10.5	7.1	9.2	11.8
companies & industries		12.6	11.6	12.7	12.7
institutes		6.4	10.7	4.6	6.5
universities		3.9	4	3	7.3

component rate	1979	100	15.5	25.9	58.7
	1980	100	14.5	25.4	60
	1981	100	13.9	25.7	60.4
	1982	100	14.1	25.9	60.1
	1983	100	14	25.4	60.6
	1984	100	13.6	25.1	61.3
	companies & industries	100	5.6	22	72.4
	institutes	100	13.1	30.4	56.5
	universities	100	54.9	36.6	8.5

Table 3. The Research Employee

year	number of research employee (X 100)					increasing rate (%) /previous year		
	total number of employee	employee for natural science	rate(%)	social science	rate(%)	total rate	natural science	social science
1980	6248	5376	86.1	473	7.6	4.7	4.8	5.8
1981	6550	5652	86.3	491	7.5	4.8	5.1	3.8
1982	6763	5876	86.9	485	7.2	3.3	4	-1
1983	6991	6106	87.3	490	7	3.4	3.9	0.9
1984	7413	6525	88	492	6.6	6	6.9	0.4
1985	7628	6729	88.2	501	6.6	2.9	3.1	1.8

Exchange of Technology (Technology Trade)

In Table 4, there are shown several data for exported technology and for imported technology. In the exported technology, total number of items seems to increase yearly and the amount of income obviously increases every year. In the imported technology, however, the total number of items and the amount of payment are not different so much yearly.

Therefore, the ratio of (payment/income) is approach to 1.0.

Table 4. Exchange of Technology (Technology Trade)

	year	exported technology			Imported technology			payment / income
		number of items	income (X10 ⁸)	increasing rate(%)	number of items	payment (X10 ⁸)	increasing rate(%)	
T O T A L	1979	3669	1331	9.1	7012	2410	25.5	1.81
	1980	4130	1596	19.9	7248	2395	-0.6	1.5
	1981	4877	1751	9.7	7207	2596	8.4	1.48
	1982	4738	1849	5.6	6936	2826	8.9	1.53
	1983	6403	2409	30.3	7839	2793	-1.2	1.16
	1984	5426	2775	15.2	7316	2814	0.8	1.01
N E W	1979	1087	521	10.5	1020	268	-29.8	0.51
	1980	1237	743	42.6	919	277	3.2	0.38
	1981	2017	708	-4.7	844	249	-10	0.35
	1982	1970	633	-10.5	929	444	78.4	0.7
	1983	2494	759	18.3	1073	424	-4.5	0.57
	1984	1824	909	21.4	982	318	-25	0.35

Foreign Countries having Technology Exchange with Japan in 1984

In Table 5, nations which exchange technology with Japan are tabulated together with the data for exported technology and imported technology. It is found that Japan mostly imports technology from The USA and European countries, and exports it to Asian countries. The total amount of payment for the imported technology is 281.4 billion yen. Japan pay 193.0 billion yen (68.6% of total amount) to The USA and 86.7 billion yen (30.8%) to European countries for imported technology. The total amount of income is 277.5 billion yen. Japan receives 112.5 billion yen (40.5% of total amount of income) from Asian countries, 65.9 billion yen (23.7%) from The USA, and 40.7 billion yen (14.7%) from European countries for exported technology.

Now, we can understand that the budget for basic science is very low comparing to that of applied science for development in Japan. Therefore, the research to produce original technology is far behind to The USA and European countries. Consequently Japan imported many kinds of patents from such countries, and developed new technology and productions, using such patents and by means of manpower of research employee with very low salary. Such new technology and new products were mostly exported to Asian countries. Consequently, Japanese original technology had not been developed so much.

Table 5 International Technology Exchange (Number of Items and Amount of Trade) in 1984

name of nations	Exported technology		Imported technology		payment / income
	number of items	Income (x10 ⁸)	number of items	Payment (x10 ⁸)	
Asia (total)	2549	1125	63	3	0
China	918	531	53	2	0
(Taiwan)	512	100	51	1	0.01
Singapore	115	91	0		0
Korea	598	149	8	1	0
Thailand	218	83	0		0
Indonesia	228	136	1		0
Malaysia	119	50			0
Philippine	111	6			0
India	142	45			0
West Asia (total)		308			0
Iraq	386	85	2		0
North America (total)	944	719	4437	1940	2.7
The United State of America	751	659	4335	1930	2.93
South America (total)	199	37	26	0	0.01
Brazil	107	19	1		0
Europe (total)	993	407	2750	867	2.13
German	217	47	975	178	3.78
France	141	46	374	104	2.26
England	168	68	429	132	1.95
Switzerland	42	49	269	160	3.29
Netherlands	38	21	156	141	6.65
Sweden	37	2	147	34	13.59
Africa	222	128	5		0
Oceania	133	51	33	3	0.06
All Nations TOTAL	5426	2775	7316	2814	1.01

References Report on the Survey of Research and Development, Edited by Statistics Bureau, Management and Coordination Agency, Japan (1985). (科学技術研究調査報告、総務庁統計局、昭和60年)