

## II-8-1 Research level

**Japan's international competitiveness in information technology (IT) has been weakening.**

The Science and Technology Agency carried out a study to measure the level of Japanese achievements in each area of both basic and applied research and development in several industrial fields, in comparison with the U.S. and European countries.

A comparison between Japan and the U.S. showed that the latter was evaluated as superior to Japan in the IT and electronics fields, for both basic research and applied R&D. This trend has not changed for the past several years.

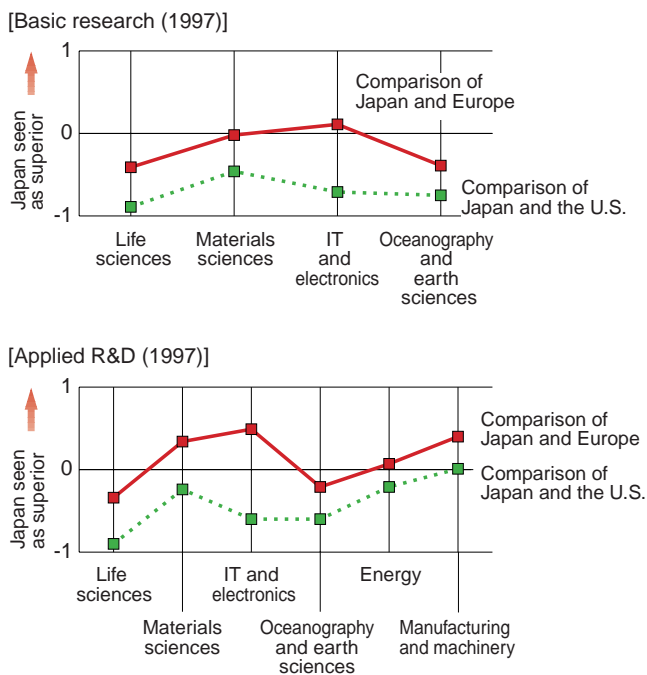
Comparing Japan and European countries, the study revealed that Japan was evaluated as being superior in IT and electronics for basic research and applied R&D. However, the evaluation for Japan

has been on a downward trend, despite gaining a higher score for applied R&D in 1996 than the year before (Figs. 1 and 2).

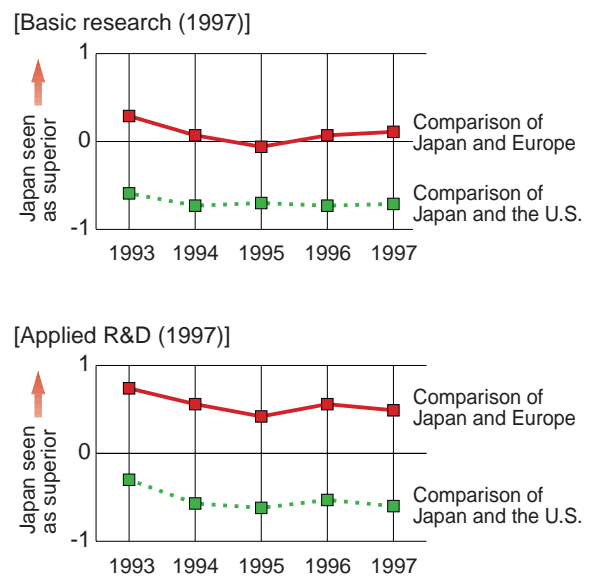
Furthermore, Japan seems to be missing out on important industry alliances. U.S. studies carried out every five years since 1982 show that, as a percentage of all international strategic technology alliances, those between U.S. and European IT companies have been increasing year by year, while Japan's alliances with U.S. and EU firms have been decreasing, making Japan increasingly isolated (Fig. 3).

For all these reasons, Japan's international competitiveness in IT has been weakening, especially in comparison with the U.S.

**Fig. 1 International comparison of R&D**

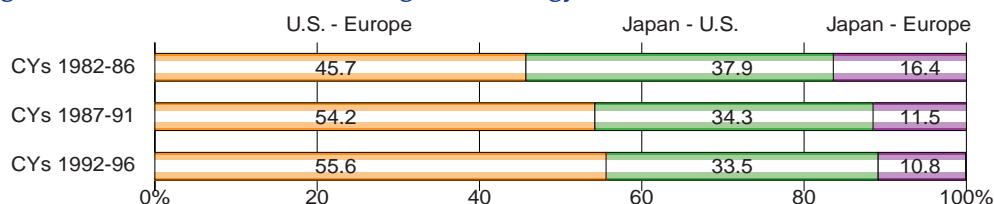


**Fig. 2 Trends in IT research level**



Note: Figs. 1 and 2 are based on the following formula: one point was awarded for each response evaluating Japan as superior; zero points were awarded for responses saying Japan was about equal to the U.S. and European countries, and minus one point was awarded for each response saying the U.S. and European countries are superior. The total points were then divided by the total number of respondents.  
Source: "Research report on the status of research activities in Japan," Science and Technology Agency

**Fig. 3 Ratio of international strategic technology alliances in the IT field**



Source: "Science & Engineering Indicators - 1998," U.S. National Science Foundation

## II-8-2 R&D investment

Japan's info-communications sector spent over three trillion yen on R&D in fiscal 1997, accounting for nearly 30% of all industrial spending on R&D.

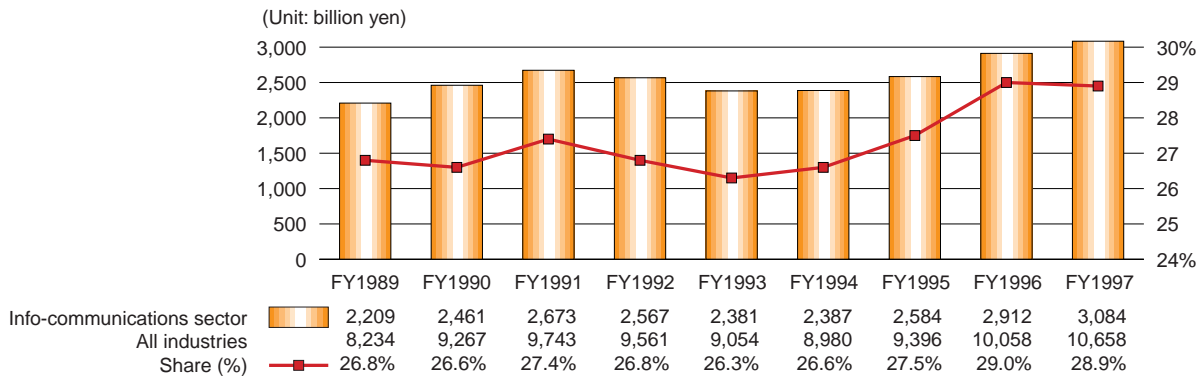
Since fiscal 1993, there has been increasing investment in research and development by Japan's info-communications sector (comprising the telecommunications equipment, electronics, electronic instruments and software industries, as well as telecommunications carriers). In fiscal 1997, total spending surpassed three trillion yen for the first time, reaching 3,084.4 billion yen.

The ratio of R&D investment in the info-communications sector compared with all industries in Japan has also been on an upward trend since fiscal

1994. In fiscal 1997, although the share was down 0.1 percentage point from the previous fiscal year, it still stood at 28.9% of the total R&D investment by all industries (Fig. 1).

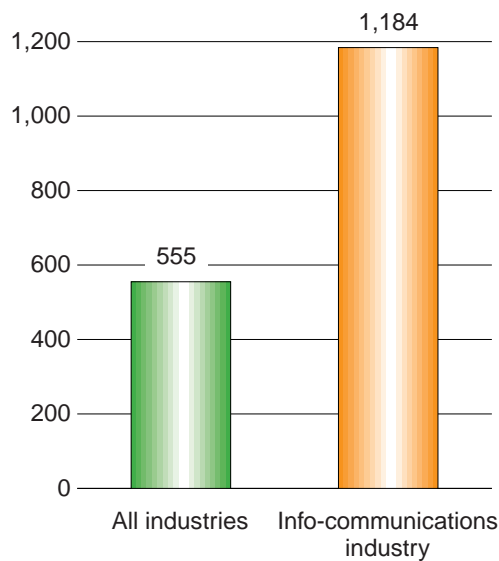
In the info-communications sector, the number of researchers per 10,000 employees as of 1 April 1998 was 1,184, and the ratio of R&D expenditure to total revenue in fiscal 1997 was 5.6%. Both figures far surpassed the average for all industries, indicating that info-communications industries are highly reliant upon R&D (Figs. 2 and 3).

**Fig. 1 Trends in R&D investment by the info-communications sector and its ratio of total industrial R&D investment**

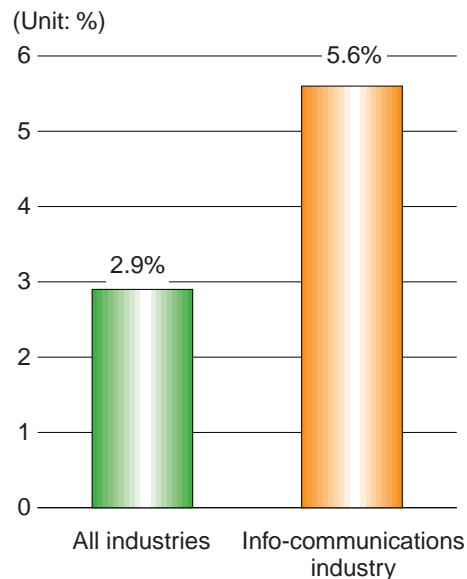


Sources: "Report on the Survey of Research in Science and Technology," Management and Coordination Agency; "Report on the Survey of Facilities and Equipment Investments in the Info-communications Industry," MPT

**Fig. 2 Number of researchers per 10,000 employees (as of April 1, 1998)**



**Fig. 3 Ratio of in-house R&D expenditure to total revenue (fiscal 1997)**



Source: "Report on the Survey of Research in Science and Technology," Management and Coordination Agency; "Report on the Survey of Facilities and Equipment Investments in the Info-communications Industry," MPT

## II-8-3 Standardization

### (1) Standardization activities

**Standardization activities for establishing forum and consortium standards have been conducted vigorously.**

As globalization of info-communications gathers pace, alongside the diversification and growing sophistication of markets, standardization has become increasingly important, not only in securing interconnectivity and interoperability, but also in developing new markets and providing conditions for competition. At present, standardization is being carried out in various forms, as outlined in the Table below.

Amid accelerating technological innovation, companies generally aim to become the providers of de facto industry standards, by placing their own tech-

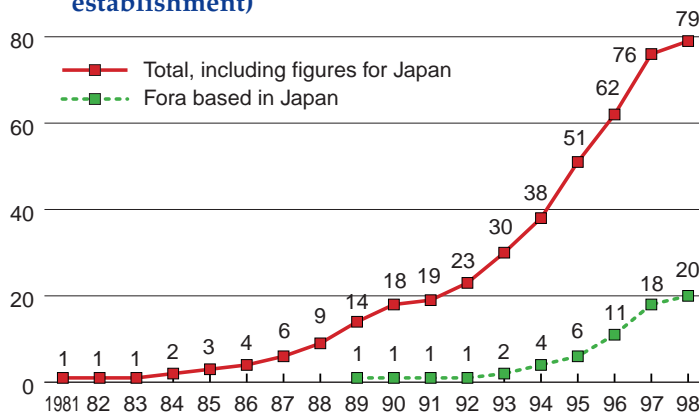
nology and products on the market as soon as possible to encourage their spread. However, since in the area of info-communications it is vital to secure interconnectivity between a variety of devices, there have been vigorous attempts (especially in the U.S.) to establish forum or consortium standards, which are considered to be somewhere between de facto standards and the de jure standards that have official recognition.

At present, 20 standardization fora have their headquarters in Japan and the number has been increasing year by year (Figs. 1 and 2).

**Table Major forms of standardization system**

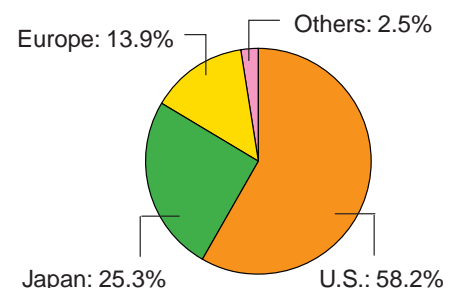
Type of standard	Standardization organizations	Examples standardization organizations	Remarks
De jure standards	International	Standardization organization recognized internationally	Transparent and open procedures for setting standards
	Regional	Standardization organization recognized in a region or in a country	
	National		
Forum standards	Standardization organization voluntarily established for setting a standard in a certain technology area	ITU, IEC, ISO, JTC1	Standards reflect regional conditions
Consortium standards	Consortium of companies which supports a specific system	ETSI, ASTAP	Speedy and flexible standardization
De facto standards	Standardization settled upon by a company or an organization	TTC, ARIB, T1, TIA	
		ATM Forum, Frame Relay Forum, TM Forum, Internet Society, IrDA	Competition among several organizations in the same area
		DVD Consortium	Products become standard after succeeding in market competition
		OS for personal computers, microprocessors and other items	

**Fig. 1 Growth in numbers of standardization fora (accumulated figures based on year of establishment)**



Source: "Report by the study group on globalization of info-communications technology," MPT

**Fig. 2 Location of standardization fora headquarters (1998)**



## (2) Involvement in standardization activities

**U.S. companies have been most active in efforts towards standardization.**

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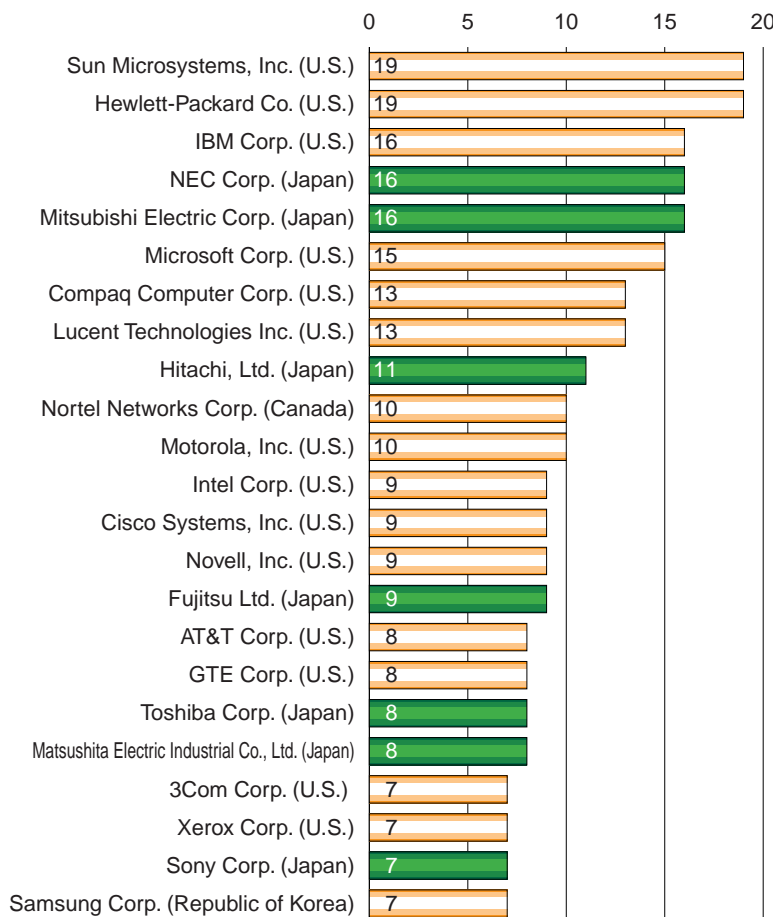
Technology

In order to gauge the involvement of IT companies in setting forum and consortium standards, the site of headquarters and activities of companies participating in 88 fora and consortia that have publicly released the participants' names were surveyed. In the top 20 list for standardization organizations participants (companies are promoting either forum or consortium standard), NEC Corp.

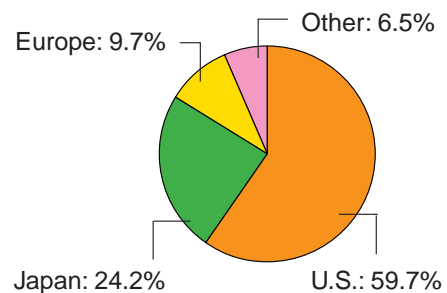
and Mitsubishi Electric Corp. tied in third place, both participating in 16 organizations (Fig. 1).

However, among companies participating in three or more organizations, 59.7% were U.S. firms, showing how they are tending to lead the way in such activities in the info-communications field (Fig. 2).

**Fig. 1 Participation in forum or consortium standardization by company (January 1999)**



**Fig. 2 Distribution of companies participating in standardization activities (headquarters location for 62 companies involved in standardization activities)**



Sources: Various sources