

# Study on the Trend of Research and Development from Patent Application

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2nd Theory-Oriented Research Group

## [Purpose of the Study]

The data on patent are rather easily obtainable and they are regarded as one of the indicators of the achievements in R&D activities. A variety of studies have been done on the patent data mainly in the United States and Europe. NISTEP also has adopted the patent data as a "science and technology indicator" mainly to measure the R&D activities of the industrial sector.

When the R&D in the whole industrial sector is studied, the data should be classified according to the Standard Industrial Classification. The patent data already classified in this way are not available from the existing databases. Therefore, the study group has broken down the patent data into the industrial classifications.

This report presents first the numbers of patent applications to the Japanese Patent Office by the major Japanese companies classified according to the Standard Industrial Classification and also to the Patent Classification, and second analyzes the present status and trends of R&D activities of each industry. Certain mathematical methods were employed to compile the huge number of data to highlight the features unique to each industry.

## [Results of the Study]

### I. Compilation of Data

The numbers of applications to the Japanese Patent Office by the Japanese companies in 1985 and 1976 were compiled according to the Standard Industrial Classification and Patent Classification. The companies were broken down into slightly more than 20 industrial classes using the "Quarterly Corporate Report." The patent applications were classified into 118 classes by using the 3-digit International Patent Classifications. The criteria used to select the sample companies were as follows: (1) they are listed companies on the stock market; (2) they are Japanese companies which applied for more than 20 patents or utility models in 1985.

The companies were thus screened and the subjects of the study totaled 640 companies; their patent applications were 212,308 and 90,021 in 1985 and 1976, respectively. These numbers respectively accounted for 78 and 66 percent of the total applications by the residents.

### II. Results of Data Compilation the their Features

#### 1. Present Status of Patent Applications (Analysis of Patent Applications in 1985)

(1)The electrical machinery manufacturing industry is predominant in the number of applications followed by the transportation equipment manufacturing industry, precision instrument manufacturing industry and industrial chemicals and chemical fibers industry.

The electrical machinery manufacturing industry occupied only 22 percent in the number of enterprises but accounted for 54 percent in the number of patent applications in 1985.

(2)The electrical machinery industry had substantial shares in all patent classifications and had predominantly large shares in electricity-related patent classes. To the contrary, the transportation equipment manufacturing industry and the industrial chemicals and chemical fibers industry notably submitted applications to specific classes.

(3)In all industrial classes substantial shares were accounted for by the companies

specializing in these respective fields. Nevertheless, applications in the electricity-related patent classes by the industrial chemicals and chemical fibers industry and precision instrument manufacturing industry were noticeable.

(4) In every industrial class, the greater part of patent applications are submitted by the companies which have more capital. In the electrical machinery manufacturing industry, the five greatest companies in capital represented 51 percent in number of patent applications, although they accounted for only four percent in number of companies.

(5) The patterns of patent applications by the manufacturing industry may be broadly broken down into the electric and machinery industry type and the chemical industry type.

## 2. Trends in Patent Applications (Comparison between 1985 and 1976)

(1) The ratios of patent applications by class in 1985 were about the same as those of 1976.

(2) Such industries as drugs and medicines, other manufacturing, textile manufacturing showed signs of change in area of patent applications. The industries like other chemical products and electrical machinery manufacturing showed little sign of change.

(3) Companies in the same industry class are becoming more diverse recently in the class of patent application. This trend is particularly pronounced in such industries as drugs and medicines, oils and paints, textiles manufacturing, iron and steel manufacturing, food manufacturing, industrial chemicals and chemical fibers, other manufacturing, generally machinery manufacturing.

(4) In such industries as textile manufacturing, iron and steel manufacturing, general machinery manufacturing, the companies with large capital which used to lead patent applications in their respective industrial classes are now leading the trends for patent diversification.

(5) In the industrial classes in which the number of patent applications is increasing, the difference in corporate policy on patent is small.

## 3. Relation between Patent Applications and R&D Expenditure

(1) There is correlation between the number of patent applications and R&D expenditure in the whole industry; however, this correlation is not very clear among companies.

(2) The number of patent applications per unit R&D expenditure is large in such industries as electrical machinery manufacturing and precision instrument manufacturing; it is small in the drugs and medicines industries and the likes.

(3) In the transportation equipment manufacturing industries and the likes, the motor vehicle industry in particular, there is more correlation between the number of utility model applications and R&D expenditure than between that of patent applications and the R&D expenditure. A good portion of R&D expenditure effort is directed toward obtaining utility model rights.

## 4. Summary and Discussion

(1) The electric and electronic technologies, the electronic technologies in particular, are leading recent R&D and such industries as electrical machinery manufacturing, other chemical products, non-ferrous metals and products manufacturing are playing important roles. The increase in the number of patent applications is outstanding in these industries. These industries show little sign of changing the courses of R&D. These industries are submitting an increasing number of applications in the patent classifications of photography and printing in addition to the electricity classification.

(2) The chemical technologies, like the electric and electronic technologies, constitute one of the mainstream technologies common to many industries such as industrial chemicals and

chemical fibers, textiles manufacturing, drugs and medicines, oils and paints. Recently however, every industry shows signs of change in the direction of R&D. The change of direction significantly varies from one company to another. As may be exemplified in the cases of the textiles manufacturing industry submitting applications of drugs and medicines and the industrial chemicals and chemical fibers submitting applications of electric devices, patent applications by companies out of their traditional lines of business are becoming noticeable.