

A Study on University Patent Portfolios: Portfolio of Patent Application from Tohoku University

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Abstract

In Japan, the number of joint research projects is increased as well as the number of patent applications and licenses from the national universities because of the development of the infrastructure of the intellectual property system in universities. This study aimed to clarify the realities of intellectual contributions of the university in patent applications. All the information related to patent applications from Tohoku University among the results of research and development carried out at the university was analyzed. The survey provided quantitative clarification that Tohoku University researchers had made many intellectual contributions through creation of intellectual property as inventors rather than as right holders. Approximately 95% of Tohoku University related patents (1993-2004) were made with Tohoku University researchers as inventors and belonged to individual researchers or business entities.

1. Introduction

Recently in Japan, the infrastructure of the intellectual property system and the formulation of the associated rules have been established in universities. The number of joint research and funded research projects are also increased, as well as the number of patent applications and licenses from the national universities. However, the fact is that the whole patent application activities have not necessarily been fully understood by their own researchers at individual national universities prior to their conversion to independent administrative institutions.

Under this survey, a specific university is chosen as a model. Then, all the information related to patent applications among the results of research and development carried out at the university is collected and analyzed. The study aims to clarify the realities of intellectual contributions of the university in patent applications by utilizing the information.

2. Survey Method

A variety of survey methods have been used for the investigation of patents related to universities. The extraction method, which views the applicant, has been mainly used in the

past. Through the method, the intellectual contribution of universities to patent applications has been supposedly underestimated since the university was seen only as a holder of rights.

In this survey, therefore, all patents where the researchers of universities are involved are assumed as the invention by universities and the related patents are extracted¹. (These patents are hereafter referred to as the ‘university related patents’.) In other words, this survey attempts to understand wider intellectual contributions by universities to the society by studying all patent applications, which university research personnel are associated with.

The method of this survey comprises three main points:

- 1) In addition to those university related patents that belong to the state and to the university, there are also patents belonging to TLOs, to partners in joint research projects (primarily business entities), and to individual researchers. An understanding of these patents is essential to the analysis of university related patents. In this survey Tohoku University is chosen as the model university and its related information is converted to a database and analyzed.
- 2) The dynamism of the academia-industry relationship and intellectual creativity is investigated by tracking the change in university related patents over time.
- 3) To analyze the impact of university related patents on the technology development in specific areas, the patent map method is used to visualize the results.

3. Selection of a Model University and Extraction of University Related Patents

Tohoku University was selected for this survey, since it poses the large number of university related patents (See Fig. 1), and has technical areas of significant interest. The university was also willing to cooperate through its intellectual property division.

rank	Applicant	Number of patents	rank	Applicant	Number of patents
1	Tohoku Univ.	315	21	Tokushima Univ.	59
2	Tokyo Institute of Tech.	264	22	Kyushu Institute of Tech.	59
3	Kyoto Univ.	215	23	Doshisha Univ.	58
4	Univ. of Tokyo	161	24	Univ. of Electro-Communications	55
5	Osaka Univ.	160	25	Shizuoka Univ.	55
6	Hokkaido Univ.	151	26	Yokohama National Univ.	52
7	Hiroshima Univ.	139	27	Nagaoka Univ. of Tech.	51
8	Nagoya Institute of Tech.	118	28	Kobe Univ.	49
9	Nagoya Univ.	114	29	Kinki Univ.	48
10	Keio Univ.	110	30	Toyohashi Univ. of Tech.	43
11	Yamaguchi Univ.	103	31	Okayama Univ.	43
12	Tokyo Univ. of Science	92	32	Kanazawa Institute of Tech.	41
13	Waseda Univ.	91	33	Kanazawa Univ.	40
14	Shinshu Univ.	83	34	Kumamoto Univ.	38
15	Kyushu Univ.	83	35	Tsukuba Univ.	37
16	Tokyo Univ. of Agriculture and Tech.	81	36	Nara Institute of Science and Tech.	36
17	Nippon Univ.	71	37	Gifu Univ.	36
18	Chiba Univ.	67	38	Fukui Univ.	35
19	Tokai Univ.	67	39	Kagoshima Univ.	35
20	Gunma Univ.	64	40	Ritsumeikan Univ.	32

data:Japan Patent Office (05.01.2008)

Fig. 1 Numbers of patents from universities in Japan (2006)

¹ All the data extracted in this survey is based on published applications for patent (not on registered patents).

In order to extract all Tohoku University related patents, it is necessary to consider patent applications that belong to business entities participating in joint research projects and those belonging to individual researchers in addition to selecting those belonging to the University and the TLO (Tohoku Technoarch Co., Ltd.). This survey extracted all patent applications in which Tohoku University researchers were included as one of the inventors. Duplications were excluded when creating the database. As shown in Fig. 2, Tohoku University related patents between 1993 and 2004 amount to 3,627 (published as unexamined patents) in total.

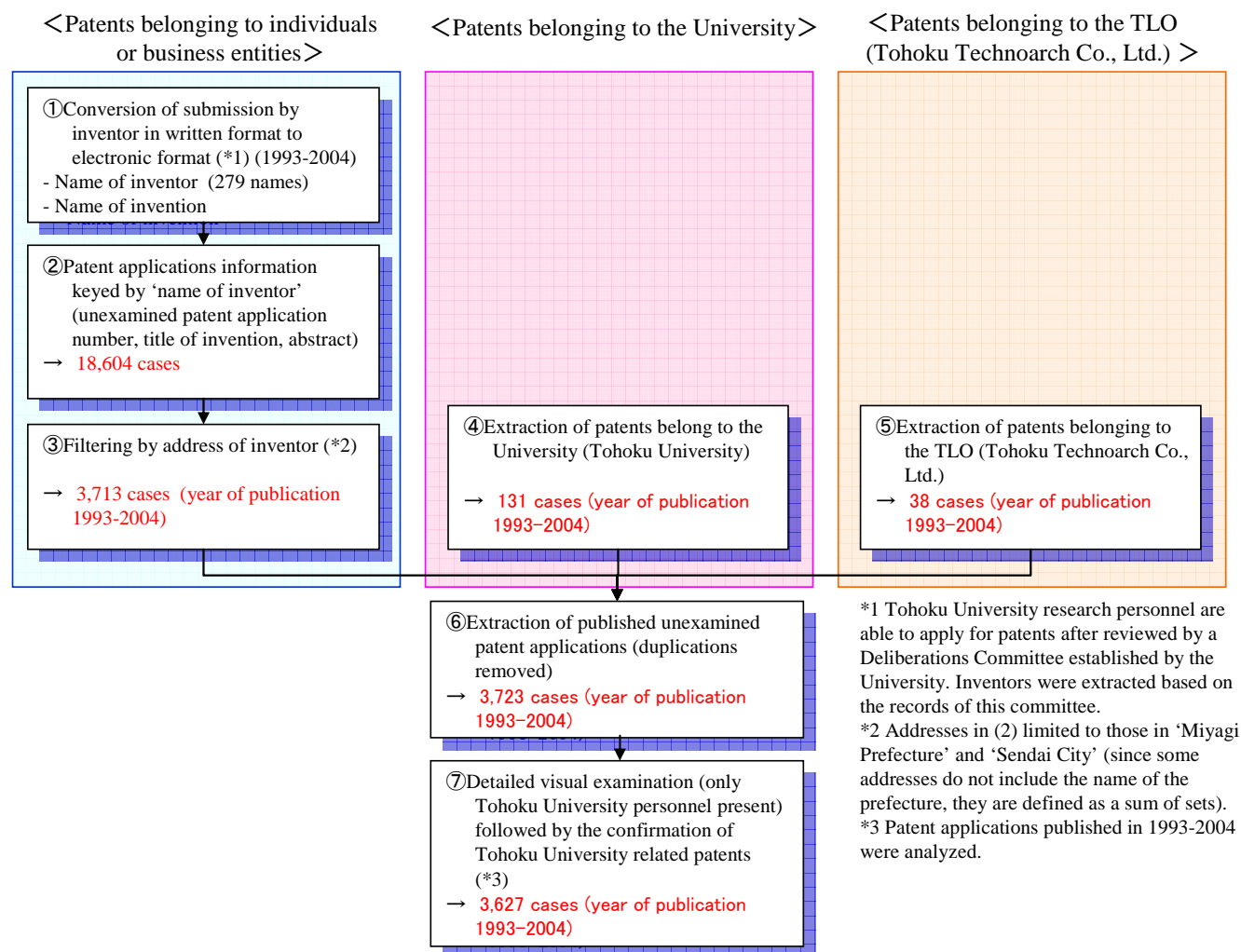


Fig. 2 Tohoku University related patent extraction flow

4. Overall Trend in Tohoku University Related Patents (1)

Fig. 3 shows the trend in Tohoku University related patent applications (shown in pink line) during the period of the survey. The general trend shows an increase of applications, although there has been some fluctuation occurred over the years. From this figure it is apparent that Tohoku University researchers were actively contributing to patent

application activity from prior to becoming an independent administrative institution. Furthermore, a breakdown shows that approximately 95% of the 3,627 Tohoku University related patents published during the period of the survey belong to individuals or business entities (shown in blue line). Conversely only approximately 5% (shown in orange line) of the patents belong to the University and TLOs, while these have been frequently considered and discussed as organizations that university related patents belong to. In other words, it is clear quantitative evidence that Tohoku University researchers have made the considerable intellectual contribution through associating with creation of intellectual property as inventors and not as right holders.

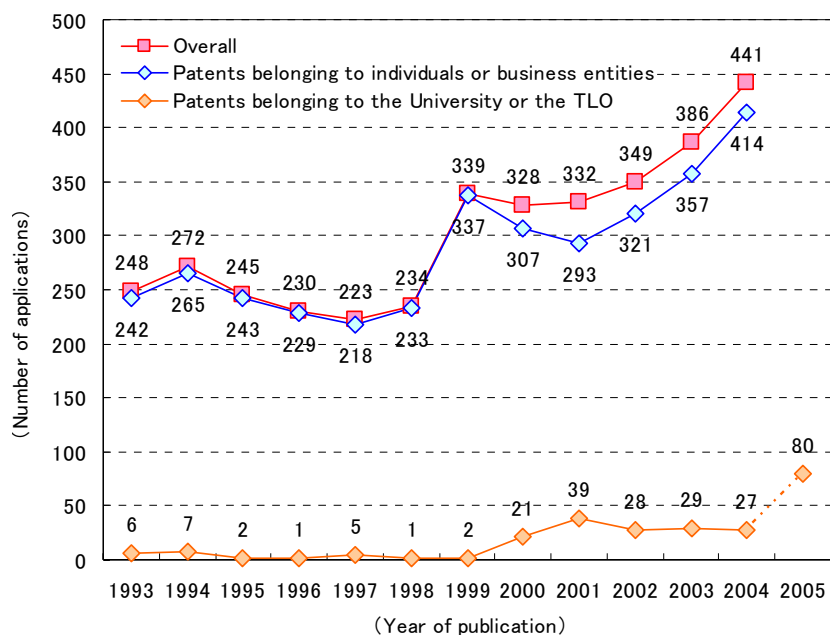
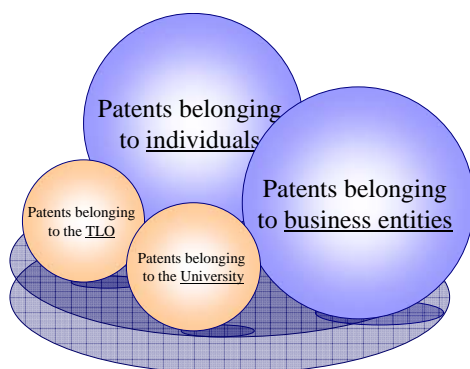


Fig. 3 Trends in ownership of Tohoku University related patents



Note: Joint ownership is often the case in practice.

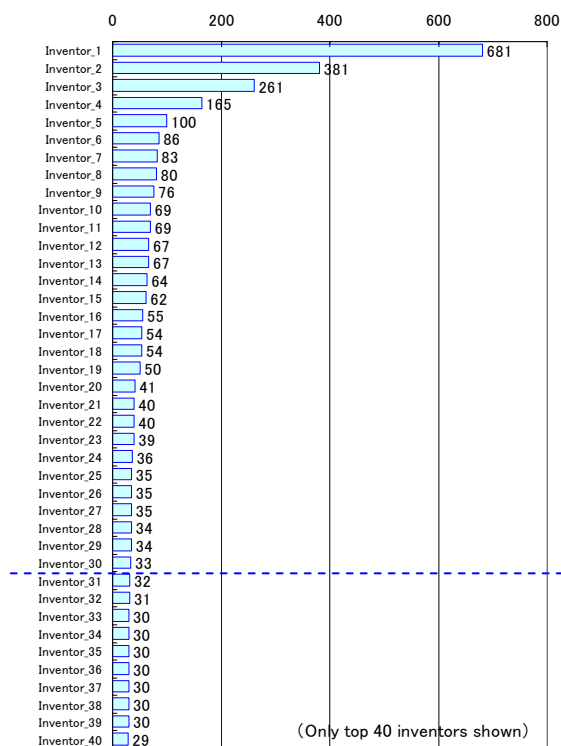
Fig. 4 Proportions of ownership of university related patents during survey period

4. Overall Trend in Tohoku University Related Patents (2)

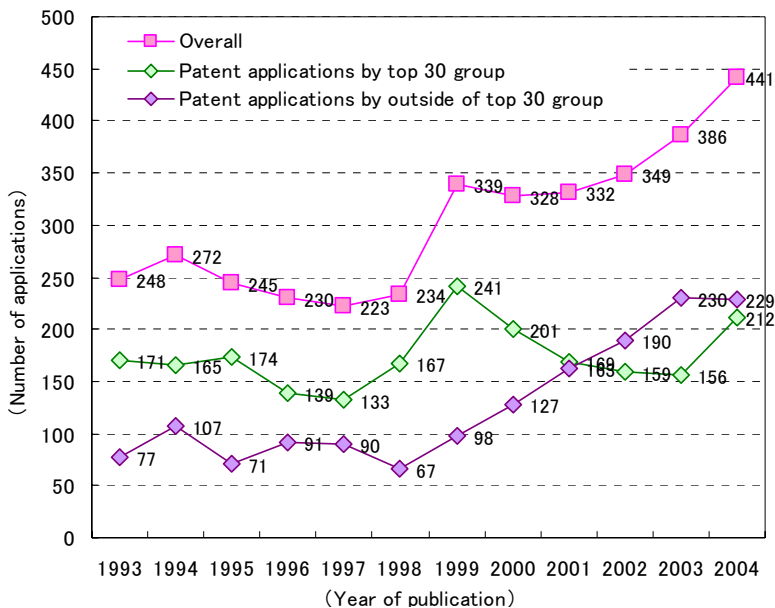
Fig. 5 (a) shows the frequency distribution of top 40 inventors with a number of total appearance in Tohoku University related patents. From the graph, it is apparent that a few of top inventors have made a large number of patent applications.

Within the total of 3,627 patents, 2,087 (more than half; shown in green) were attributable to inventors in the top 30 group. However, in terms of changes in the number of patent applications over time (Fig. 5 (b)), apart from a peak in 1999, the number of patent applications by the top 30 inventors was constant over the years. On the other hand, the number of patent applications of the inventors not in the top 30 group (shown in purple) begins to increase significantly in 1999 and exceeds that of the top 30 group in 2001 and 2002. Consequentially, the patent applications by inventors not in the top 30 group are the increasing factor of the total number after 1999.

Following the establishment of the Technology Licensing Organization Law in 1998, Tohoku Technoarch Co., Ltd. received approval as a TLO in December of the same year, as far as Tohoku University concerned. Moreover the Law Concerning Special Measures for Regeneration of Academia-Industry Activities (a Japanese equivalent of the US Bayh-Dole Act) was implemented in 1999. Therefore, the effects of these academia-industry measures and TLO activities was not on those who had previously been very active in making patent applications, but both on researchers who had previously made few applications, and on those making their first applications.



(a)



(b)

Fig. 5 Distribution of total appearances of inventors (a) and trends in patent applications (b)

5. Patent Maps of Technical Areas of Significant Interest

In the next step, specific technical areas were extracted where the Tohoku University related patent applications were frequently made. Patent maps for the whole of Japan in these areas were constructed to provide a visual understanding of the relative position of Tohoku University. Patent applications were extracted based on the IPC (International Patent Classification) allotted to the patent. ‘Alloys and materials’ and ‘semiconductors’ are technical areas with large numbers of patent applications.

The patent map for ‘alloys and materials’ is shown in Fig. 6. A total of 4,422 patent applications were identified in this area for the whole of Japan. The patent map in Fig. 6 shows the relationship between these 4,422 patent applications by clustering them with the degree of similarity of the technical terms included in the patent specifications. A total of 200 Tohoku University related patents were found in this area.

In Fig. 6, clusters for the ratio of Tohoku University related patents exceeding 50% are shown in dark red and clusters including at least one Tohoku University related patent are shown in light red. Tohoku University researchers have actively contributed to patent application activity in this technical area (alloys and materials), however the proportion occupied by Tohoku University is particularly high in the area of amorphous alloys (technical area 6).

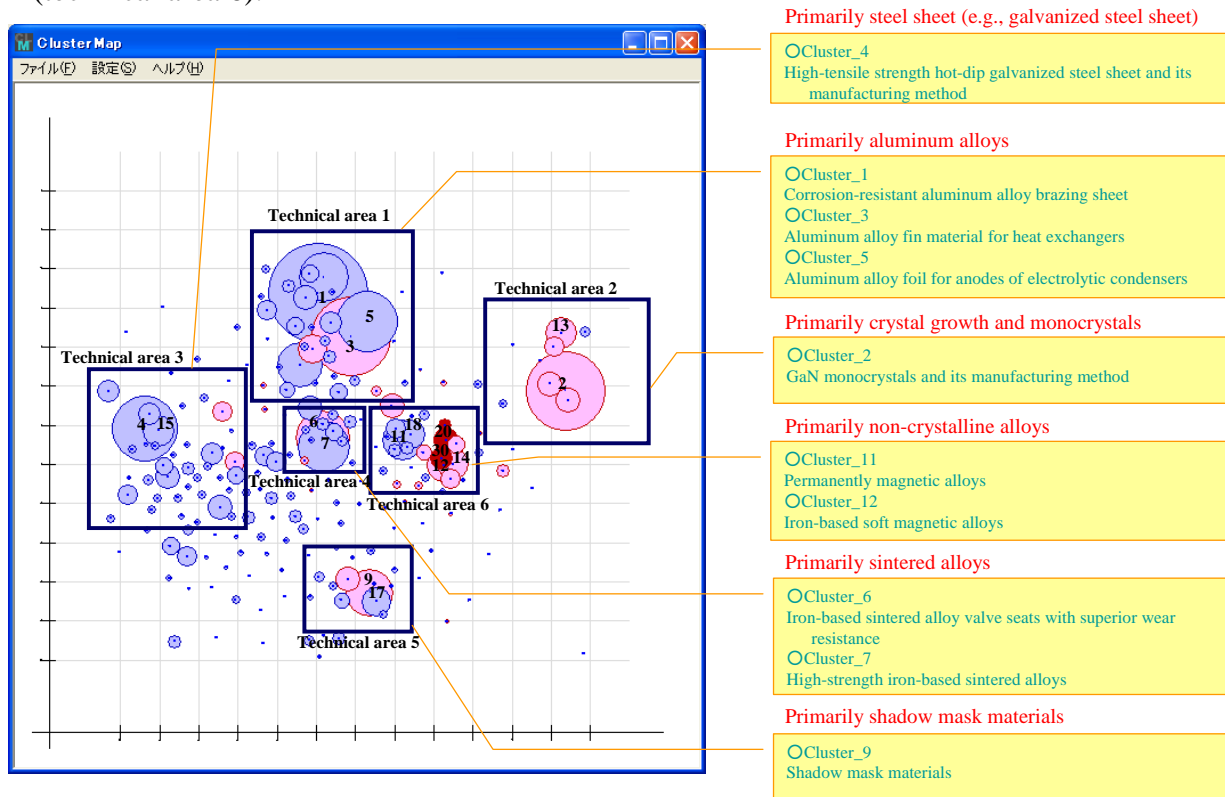


Fig. 6 Patent map for ‘Alloys and Materials’ for the whole of Japan and relative position of Tohoku University related patents (Mapping method: Mitsubishi Research Institute, Inc. ‘Pat Chart’)

6. Summary and Future Development

(1) Overall Trend in Tohoku University Related Patents

* Similar studies on universities in the past have been unable to give the understanding of the realities of activities involved in intellectual contributions since they have mostly only dealt with patents belonging to universities and TLOs. This survey has comprehensively provided almost all patent applications by Tohoku University researchers.

* Researchers at Tohoku University had actively contributed to patent application activity prior to becoming an independent administrative institution. The survey clarified that approximately 95% of the 3,627 Tohoku University related patents during the survey period (1993-2004) were made with Tohoku University researchers as inventors and belonged to individual researchers or business entities.

* The survey provided quantitative clarification that Tohoku University researchers had made many intellectual contributions through creation of intellectual property as inventors rather than as right holders.

* Tohoku University has some researchers who have contributed to a large number of patent applications (in the hundreds), and some who have started patent application activity in recent years, increasing the number of their applications. In particular, it is thought that researchers who were previously not involved in patent applications have become active by the implementation of the policies of academia-industry cooperation and the Intellectual Property Division of the University, and have gradually become involved in making patent applications.

(2) Analysis by Technical Area

* Creation of a patent map focusing on the specific technical areas of many Tohoku University related patents enabled to understand the relative position of Tohoku University within the whole of Japan in the relevant areas. For example, the position of the University was verified in terms of patent applications in the area of 'alloys and materials', which is considered to have strength in Tohoku University.

(3) Future Development

* With a few exceptions, patent applications by national universities generally belong to the organization after the establishment of independent administrative institutions in April 2004. A further survey to investigate the situation after the establishment of independent administrative institutions is needed.

* This survey would significantly contribute to future university intellectual property strategy by expanding the scope of this survey beyond Tohoku University

to provide comparisons with other universities and to determine their unique characteristics.

Note: This survey was conducted as a joint project of the National Institute of Science and Technology Policy, Tohoku University and Mitsubishi Research Institute, Inc.

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