Research Material No. 160

A Patent Portfolio of Universities and National Research Institutes by 8 S&T Priority Areas

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1. Objectives of Database Creation

Through this research, we have created a database to classify patent applications published in 2006 and 2007 from 52 universities and five public research institutes into four areas for prioritized promotion and four other areas for promotion (hereinafter referred to as "eight priority areas") as stipulated in the third Basic Program for Science and Technology.

Four years have passed since national universities were given corporate status in April 2004. Previously, patents arising from national universities had belonged to relevant researchers or business corporations as joint research partners. Since the universities were given corporate status, however, most of the patents arising from these universities have belonged to these universities (see Note). As patents applications are published 18 months after they are filed, most university-related patent applications published in and after October 2005 may be considered as belonging to the relevant universities. A comparative analysis of patent applications belonging to major universities may thus allow us to benchmark Japanese universities from the viewpoint of intellectual property. This is the same case with public research institutes that have also been given corporate status gradually since April 2001. At these public research institutes that have been given corporate status at different points of time, patents applications which were applied for after such change have, in principle, belonged to these institutes.

Through this research, we have extracted all patent applications belonging to universities and public research institutes since October 2005 and classified them into four areas for prioritized promotion and four other areas for promotion as stipulated in the third Basic Program for Science and Technology to find the features of universities and public research institutes in respect to research areas. By covering universities and public research institutes, we can survey many patent applications in Japan's public sector.

Our classification of patent applications into the eight priority areas is based on the Japan Patent Office's survey on "patent applications in eight priority areas." In order to provide timely information on patent applications in the eight priority areas, the JPO uses the International Patent Classification (IPC) and its own key words to classify patent applications it receives in the priority areas. It releases the numbers of published applications and published and registered patents in these areas through its website and written reports (see Chart 1). Our research applies the algorithm developed by the JPO for classification of patent applications into the eight priority areas for applications belonging to universities and public research institutes, allowing the data to be compared by classification with the overall data released by the JPO.

(Note) Kanama and Okuwada, "A Study on University Patent Portfolios (2): The Impact of Intellectual Property Related Policies and the Change into Corporation of National University", Research Material No. 154, National Institute of Science and Technology Policy, June 2008

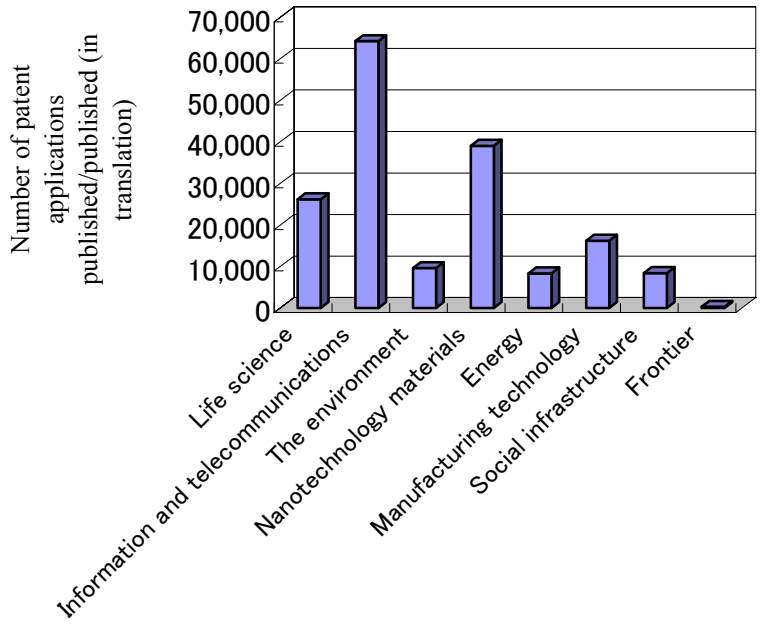


Chart 1 Annual Number of Patent Applications Published/Published (in translation) and Filed with JPO in the Eight Priority Areas (published in 2006)

(Source: JPO, "Survey on Patent Applications in Eight Priority Areas")

2. Database Creation Method and Implementation of Classification

2.1 Selection of Universities and Public Research Institutes Ranked Highly in Terms of Published Patent Applications

This research had planned to cover the Top 50 universities and Top Five public research institutes in terms of patent applications that were published in 2006. As some universities filed the same number of patents in the same year, this research ended up covering 52 universities (38 national universities, one prefectural or municipal university and 13 private universities). Therefore, a total of 57 organizations are subject to this research.

2.2 Extracting Patent Application Data

We extracted patent applications by the 57 organizations, as specified in Section 2.1, from *kokai koho*[1] released in 2006 and 2007. The extracted data are shown on Chart 2. The data resulted from our reconfirmation search in the Industrial Property Digital Library as of January 2008.

2.3 Implementing Classification

We implemented the classification of published data extracted in Section 2.2, using the PATOLIS search formula for the JPO's survey on "Patent Applications in Eight Priority Areas." The classification is indicated on Chart 3. As some patents are distributed over multiple areas, the total number is larger than in Chart 2.

The search formula is very complicated as technical and IPC terms are combined for each area. Explanations about the formula itself are thus skipped here. For details, see the following reference reports. An outline is made available on the following website.

Reference (Website: http://www.jpo.go.jp/index/toukei.html (in Japanese))

- Survey Report on Patent Applications in Eight Priority Areas -- Life Science
- Survey Report on Patent Applications in Eight Priority Areas -- Information and Telecommunications
- Survey Report on Patent Applications in Eight Priority Areas -- Nanotechnology Materials
- Survey Report on Patent Applications in Eight Priority Areas -- Environment and 4 Other Areas

[1] Publications of unexamined patents

	Applicant	2006				2007			
		Published	Published (in translation)*	Republished*	2006 Total	Published	Published (in translation)*	Republished*	2007 Total
1	Tohoku University	315	0	1	316	313	0	2	315
2	Tokyo Institute of Technology	264	0	2	266	270	0	1	271
3	Kyoto University	215	1	8	224	188	0	10	198
4	The University of Tokyo	161	15	2	178	265	0	3	268
5	Osaka University	160	0	1	161	244	2	0	246
6	Hokkaido University	151	0	1	152	151	0	1	152
7	Hiroshima University	139	0	0	139	123	0	0	123
8	Nagoya Institute of Technology	118	0	0	118	107	0	0	107
9	Nagoya University	114	0	4	118	146	0	2	148
10	Keio University	110	0	15	125	90	0	14	104
11	Yamaguchi University	103	0	0	103	113	0	1	114
12	Tokyo University of Science	92	0	4	96	83	0	0	83
13	Waseda University	91	0	6	97	86	4	1	91
14	Shinshu University	83	0	1	84	101	1	1	103
15	Kyusyu University	83	0	0	83	108	0	0	108
16	Tokyo University of Agriculture and Technology	81	0	1	82	122	1	1	124
17	Nihon University	71	0	20	91	100	3	14	117
18	Chiba University	67	0	0	67	83	0	0	83
19	Tokai University	67	0	4	71	67	0	2	69
20	Gunma University	64	0	0	64	52	0	1	53
21	The University of Tokushima	59	0	0	59	72	0	0	72
22	Kyushu Institute of Technology	59	0	0	59	67	0	1	68
23	Doshisha University	58	0	2	60	53	0	0	53
24	The University of Electro-Communications	55	0	0	55	54	0	2	56
25	Shizuoka University	55	0	1	56	90	0	1	91
26	Yokohama National University	52	0	0	52	54	0	0	54
27	Nagaoka University of Technology	51	0	0	51	73	0	0	73
28	Kobe University	49	0	0	49	58	0	0	58
29	Kinki University	48	0	0	48	47	1	0	48
30	Toyohashi University of Technology	43	0	0	43	56	0	1	57
31	Okayama University	43	0	0	43	59	0	1	60
32	Kanazawa Institute of Technology	41	0	0	41	31	0	0	31
33	Kanazawa University	40	0	1	41	27	0	0	27
34	Kumamoto University	38	0	0	38	28	0	0	28
35	University of Tsukuba	37	0	0	37	74	0	0	74
36	Nara Institute of Science and Technology	36	0	1	37	37	1	1	39
37	Gifu University	36	0	0	36	46	0	2	48
38	University of Fukui	35	0	0	35	37	0	0	37
39	Kagoshima University	35	0	0	35	39	0	2	41
40	Ritsumeikan University	32	0	0	32	39	0	1	40
41	University of Miyazaki	28	0	0	28	35	0	0	35
42	Kochi University of Technology	27	0	2	29	47	0	0	47
43	Meiji University	28	0	1	29	35	0	2	37
44	Iwate University	26	0	0	26	41	0	1	42
45	Niigata University	26	0	0	26	53	0	0	53
46	Saitama University	25	0	0	25	41	0	0	41
47	Osaka Prefecture University	22	0	2	24	127	0	3	130
48	Tokyo Medical and Dental University	25	0	0	25	39	1	0	40
49	Kansai University	24	0	0	24	28	0	0	28
50	Kyoto Institute of Technology	23	0	0	23	25	0	0	25
51	Kagawa University	26	0	2	28	56	0	0	56
52	Kanagawa University	24	0	0	24	36	0	1	37
53	Japan Science and Technology Agency	437	3	96	536	293	7	79	379
54	National Institute of Advanced Industrial Science and Technolo	1,039	6	69	1,114	1,019	2	55	1,076
55	RIKEN	216	0	34	250	189	0	23	212
56	National Institute for Materials Science	236	1	8	245	240	0	9	249
57	Japan Aerospace Exploration Agency	80	0	6	86	62	0	1	63
	Total	5,763	26	295	6,084	6,219	23	240	6,482

*Based on years when reports were released on patent applications that were published, published (in translation) and republished (reference data)

Chart 2 Patent Applications by the 52 Universities and 5 Public Research Institutes Subject to Our Research (2006 and 2007)

Area	2006				2007			
	Published	Published (in translation)	Republished	2006 Total	Published	Published (in translation)	Republished	2007 Total
Life science	1,309	21	137	1,467	1,292	12	100	1,404
Information and telecommunications	829	4	39	872	836	4	21	861
The environment	348	3	20	371	388	0	20	408
Nanotechnology materials	1,794	22	119	1,935	1,953	11	104	2,068
Energy	258	6	11	275	307	0	5	312
Manufacturing technology	580	3	35	618	601	1	30	632
Social infrastructure	320	8	24	352	337	3	23	363
Frontier	26	0	0	26	14	0	1	15
Unclassifiable	1,921	2	62	1,985	2,096	4	53	2,153
Total	7,385	69	447	7,901	7,824	35	357	8,216

Chart 3 Classification of Patent Applications Subject to Our Research into Eight Priority Areas (2006 and 2007)

2.4 Confirming the Search Formula's Consistency with JPO-Published Data

The JPO-developed search formula for classification of patent applications in eight priority areas is very complicated and the JPO database is updated in a timely manner. Even if we believe we have used the same formula as the one developed by JPO, our search results may still deviate from the JPO data. In a bid to test our search formula's consistency with the JPO data, we classified some 1.26 million patent applications in Japan filed in the three years from 2004 to 2006. Our classification results are compared with JPO data in Chart 4. For each year, the first column is for JPO data and the second for classification results based on the search formula used for our research.

As our data were all extracted in January 2008, our data for earlier years are less consistent with JPO data. Nevertheless, we finally achieved a search recall rate of more than 99%. Therefore, we can conclude that our classification results in this research are very close to the data published by JPO.

Area	2004		2005		2006	
	① JPO	② Our data	① JPO	② Our data	① JPO	② Our data
Life science	27,665	27,747	28,793	28,847	26,158	26,181
Information and telecommunications	63,220	64,029	61,507	62,242	64,251	64,482
The environment	10,347	10,379	10,136	10,150	9,626	9,636
Nanotechnology materials	36,781	36,739	38,472	38,418	39,031	39,417
Energy	7,834	7,849	8,732	8,735	8,366	8,369
Manufacturing technology	18,709	19,325	18,295	18,519	16,202	16,131
Social infrastructure	8,472	8,496	9,171	9,184	8,424	8,431
Frontier	419	424	402	405	285	285
Total	173,447	174,988	175,508	176,500	172,343	172,932

Consistency tests

Gap（①—②）	-1,541	-992	-589
Percentage gap	-0.9%	-0.6%	-0.3%
Search recall rate	99.1%	99.4%	99.7%

Chart 4 Comparison of JPO Data and Classification Results Based on the Search Formula Used for Our Research

① Number of JPO-Published patent applications

② Number of patent applications extracted through the search formula used for our research

3. Outline of Findings from the Database

3.1 Comparison of the Eight Priority Areas' Shares of Patent Applications for the Whole of Japan and for the Organizations Subject to Our Research (52 universities and 5 public research institutes)

Before analyzing the data for each organization, we compared the eight priority areas' percentage shares of patent applications for the whole of Japan and for the organizations subject to our research (52 universities and 5 public research institutes). Chart 5 indicates the percentage shares for 2006 and 2007.

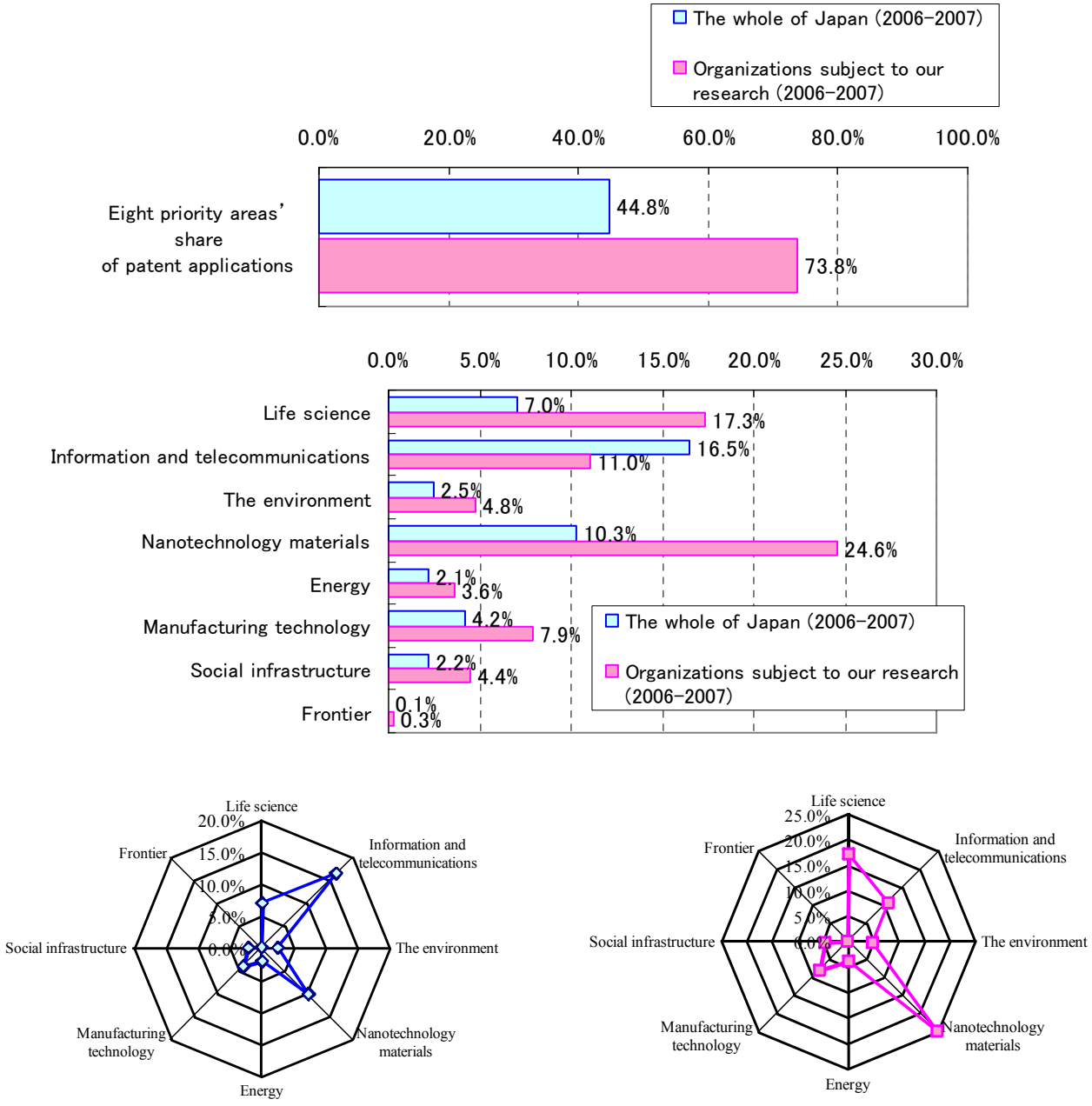
As indicated in Chart 2, the number of patent applications by the organizations subject to our research that were published in 2006 came to about 6,084 accounting for about 1.5% of 408,674 patent applications made in the whole of Japan in that year. This percentage remained almost the same in 2007.

The following findings came from a comparison of data for the whole of Japan and the organizations subject to our research:

① The eight priority areas' share of patent applications for the organizations subject to our research was higher than that for the whole of Japan. The eight priority areas covered about 45% of patent applications for the whole of Japan and about 74% of those for the organizations subject to our research.

② Among the eight priority areas, the information and telecommunications field posted the largest share of patent applications for the whole of Japan. However, the nanotechnology materials field captured the largest share for the organizations subject to our research, followed by the life science field.

Since universities and public research institutes tend to reflect national policies in research and development more than private enterprises, the eight priority areas given by the government might have ended up exerting strong influence on patents emerging from universities and public research institutes.



The whole of Japan (2006-2007)

Organizations subject to our research (2006-2007)

Chart 5 Comparison of the Eight Priority Areas' Shares of Patent Applications for the Whole of Japan and for the Organizations Subject to Our Research (2006-2007)

Upper: The eight priority areas' shares of patent applications for the whole of Japan (about 805,000 applications) and for the organizations subject to our research (about 12,000 applications)

Middle: Area-by-area shares of patent applications covered by the eight priority areas

Lower: Radar charts indicating area-by-area shares shown in the middle figure

3.2 Characteristics of the Eight Priority Areas' Shares As Seen from Single and Joint Patent Applications

Patent applications belonging to universities and public research institutes may include single applications made by these organizations alone and joint applications made by these entities and their respective partner enterprises. Here, patent applications in each of the eight priority areas are classified into single and joint applications (Chart 6). Overall, applications in each area are almost equally divided into the two groups.

	Life science	Information and telecommunications	The environment	Nanotechnology materials	Energy	Manufacturing technology	Social infrastructure	Frontier
Single applications	1,490	905	387	2,035	266	746	409	21
Joint applications	1,381	828	392	1,968	321	504	306	20
Total	2,871	1,733	779	4,003	587	1,250	715	41

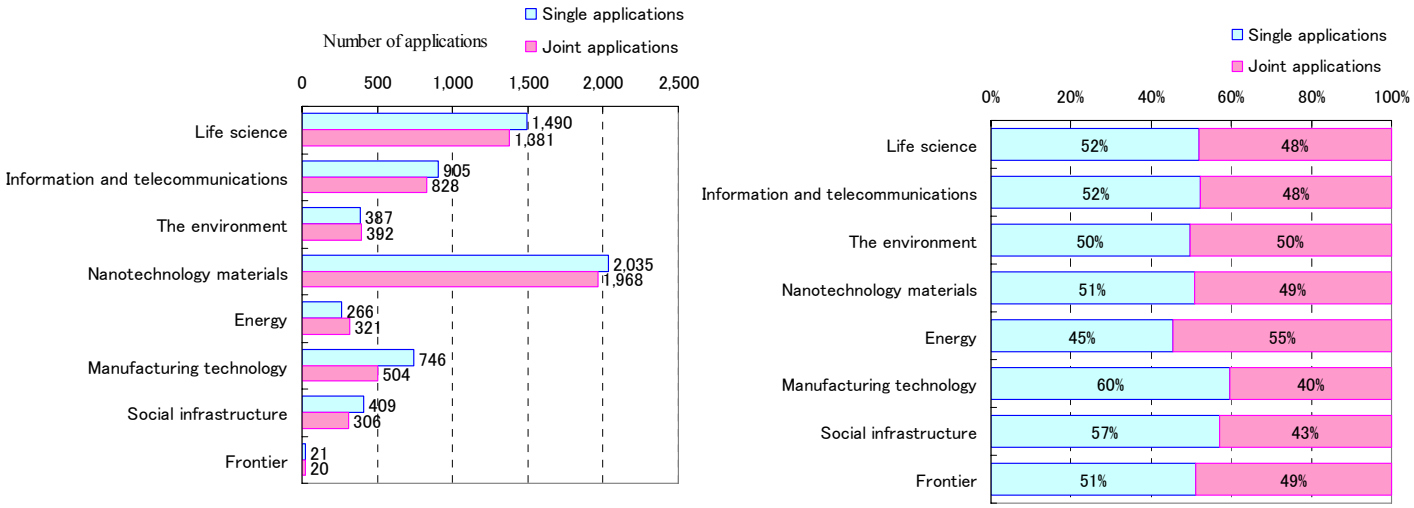


Chart 6 Eight Priority Areas' Shares of Single and Joint Patent Applications (2006-2007)

Upper: Numbers of single and joint patent applications in each of the eight priority areas

Lower: A bar chart indicating numbers of patent applications given in the upper table (left) and percentage shares of single and joint applications (right)

3.3 Characteristics of Patent Applications for Each University and Public Research Institute

We picked up organizations featuring large numbers of patent applications in distinctive fields in a bid to grasp the characteristics of each organization (Charts 7-11). Among the eight priority areas, however, the nanotechnology materials field accounted for the largest share of patent applications for most of the organizations subject to our research, leading a simple comparison of patent applications to make this area distinctive while failing to indicate the characteristics of the organizations. Here, we indicate each organization's percentage share of the total field-by-field patent applications published in 2006 and 2007 for all of the organizations subject to our research.

Patent applications in the frontier field are far fewer than in any other field. Though being treated as one of the eight priority areas, the frontier field is left out of consideration here.

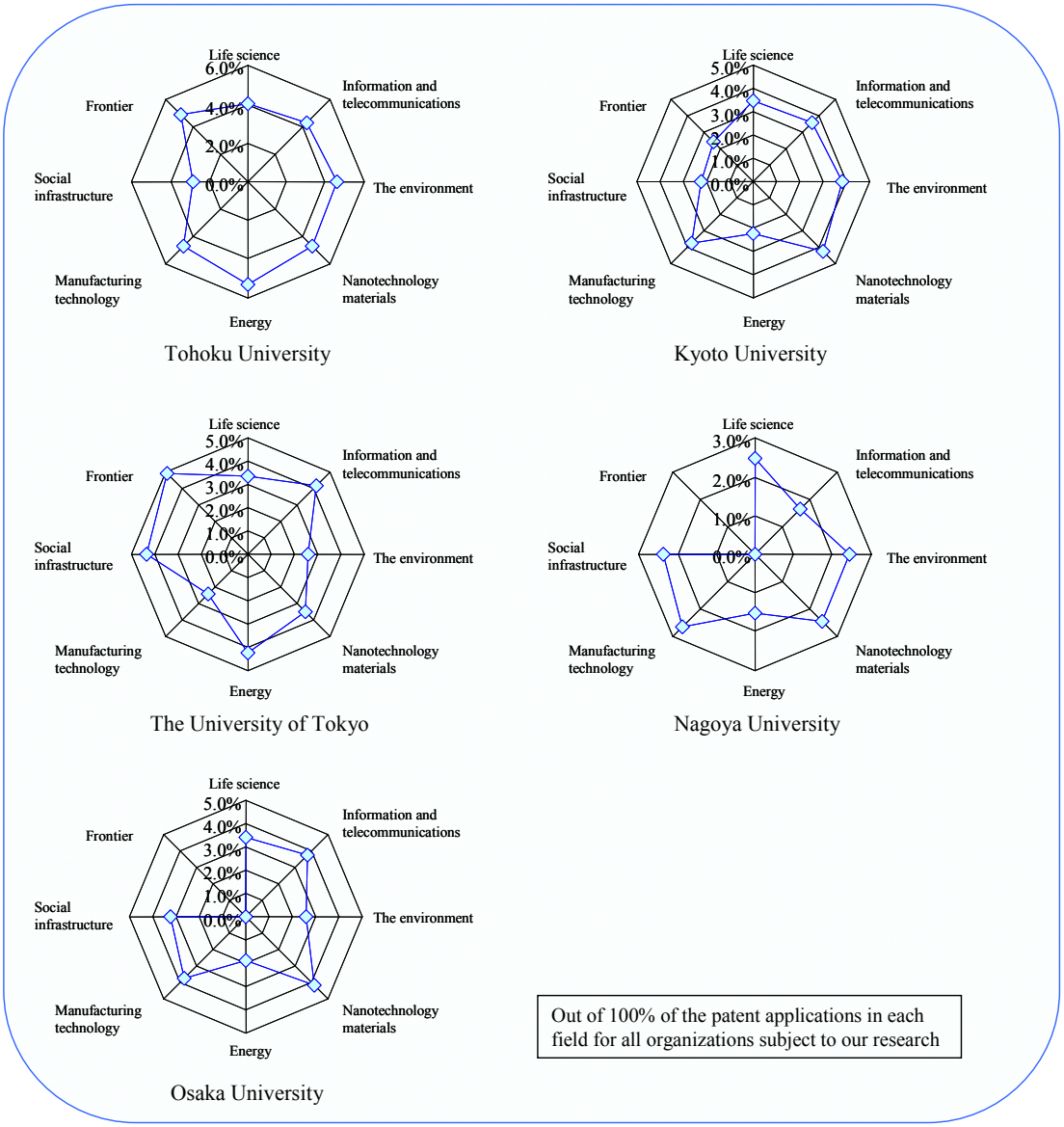


Chart 7 Organizations Featuring Higher Shares of Patent Applications Regardless of Field (in fields other than frontier) (2006-2007)

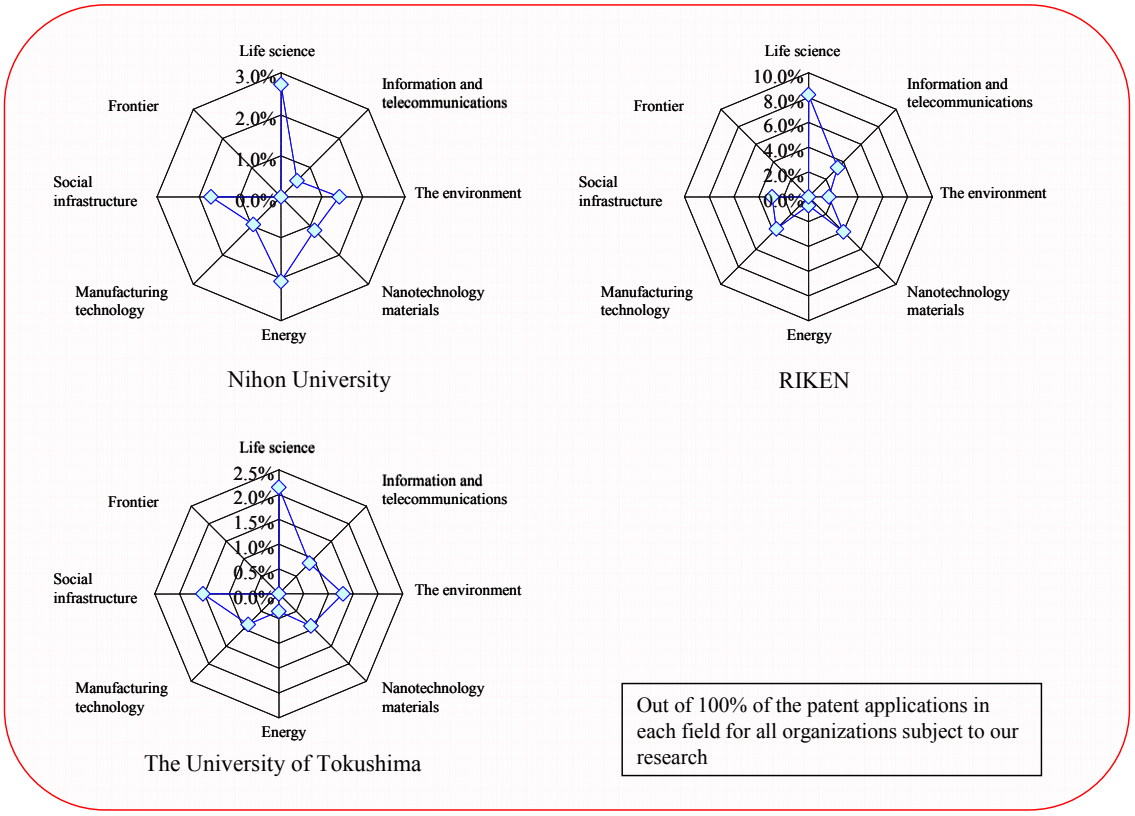


Chart 8 Organizations Featuring Higher Shares for Life Science (2006-2007)

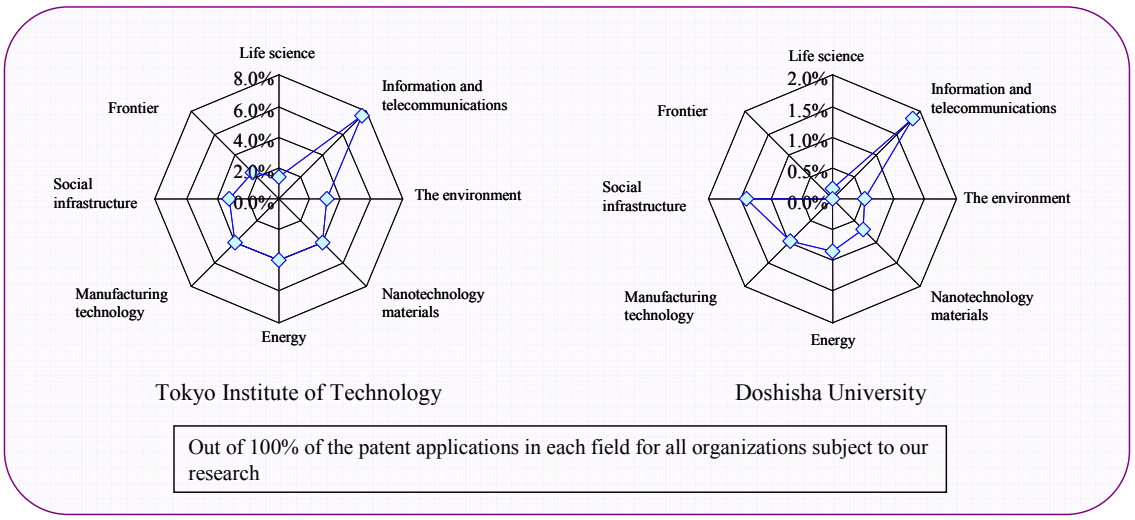
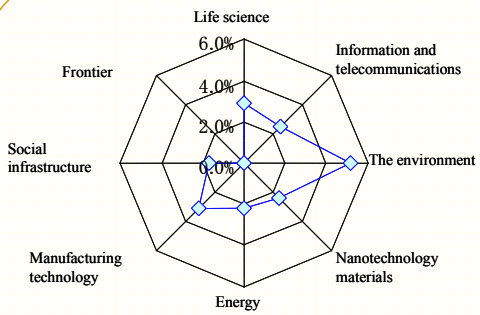
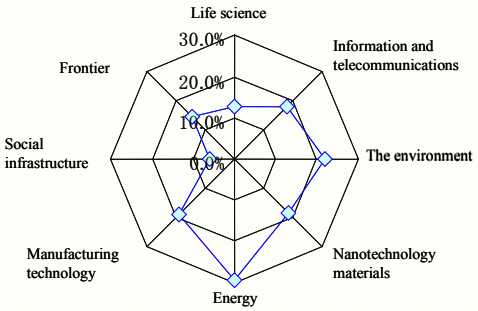


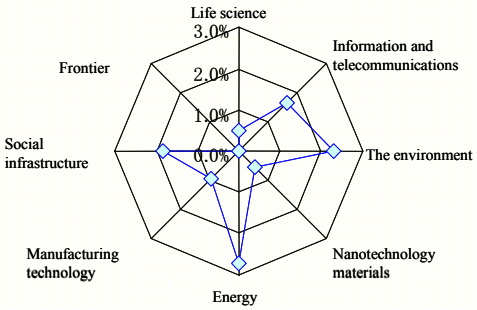
Chart 9 Organizations Featuring Higher Shares for Information and Telecommunications (2006-2007)



Hokkaido University



National Institute of Advanced Industrial Science and Technology



Kyushu Institute of Technology

Out of 100% of the patent applications in each field for all organizations subject to our research

Chart 10 Organizations Featuring Higher Shares for the Environment or Energy (2006-2007)

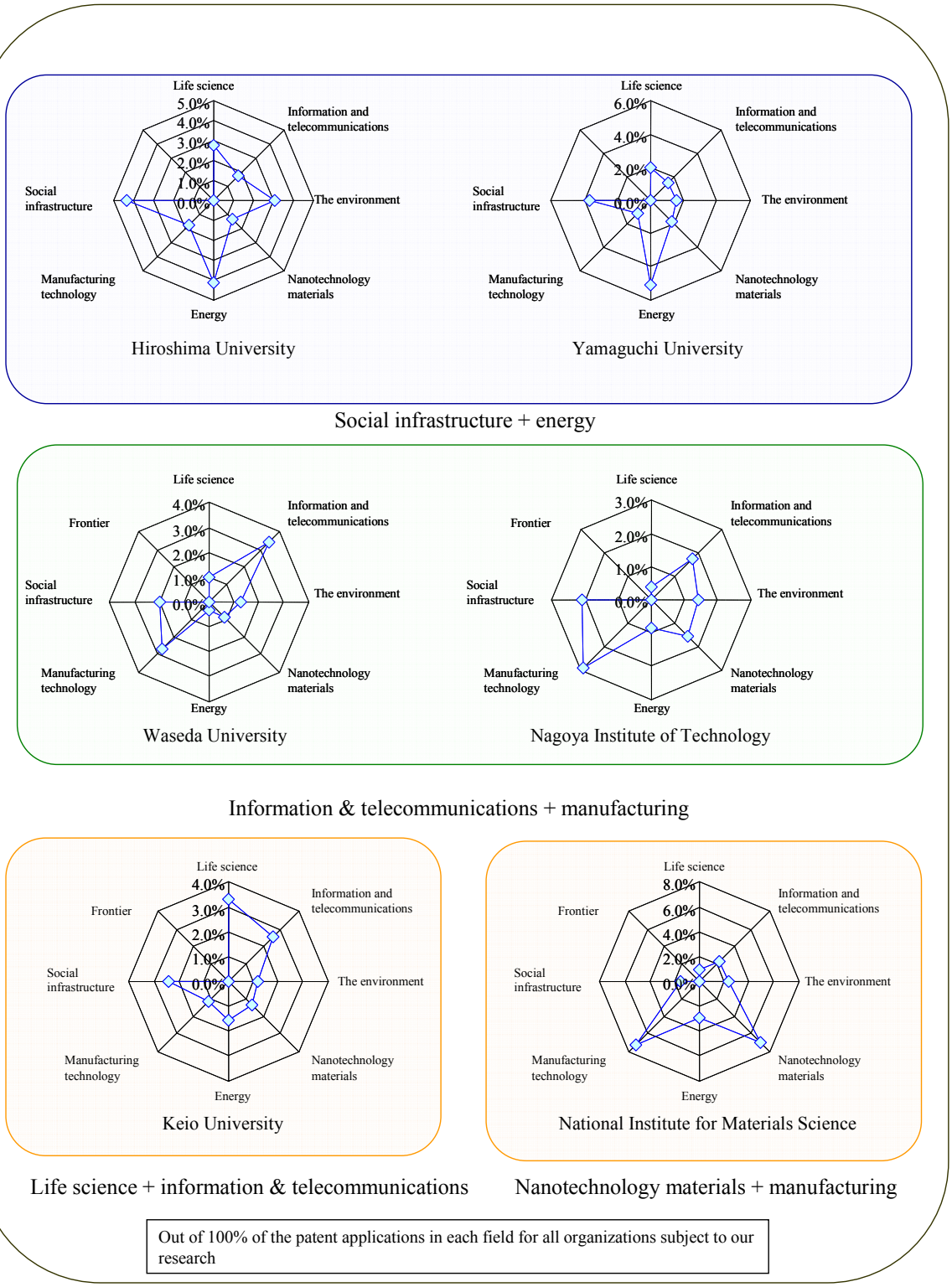


Chart 11 Organizations Featuring Higher Shares for Multiple Areas (2006-2007)