Research for the Situation of Technology Transfer in European Countries*

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Acquisition of useful technologies by technology transfer (TT) is one strategy to promote technological development by reducing development costs and the time investment. Research results by universities and others can become basic patents in the future, and there is a high probability that technology required by companies is present in the research results. For smooth international TT, it should be noted that the legislations and systems concerning TT differ among countries.

Japan concluded the Economic Partnership Agreement with the European Union (EU), and the economic relationship with the EU will be strengthened. In order to facilitate TT between Japan and Europe, it is necessary to understand the noteworthy points and the actual conditions of licensing in each country. In this research, the legislations and systems relating to industry-academia collaboration (IAC) among European countries and between Japan and Europe, and Europe are analyzed for consideration of the institutional harmonization necessary for smooth TT and relevant measures.

I. Introduction and TT in Europe

Licensing is subject to agreement between the parties based on the principle of freedom of contract but the content of the contract should be competitive[1]. Licensing activities relating to TT are basically competitive both in Japan and Europe[2]. Therefore, in this research, IAC in European countries and the attribution of university inventions, which are subject to licensing in patent law, are analyzed.

The TT system depends on the economic and science and technology policies of the governments of each country, and in many cases special laws are formulated. Therefore, this research also considers each national policy and TT system of European countries.

As legal framework on European TT, at the European level, there is the European Function

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1 Jiyoung Han, 'Study on Intellectual Property Licensing under Antimonopoly Law in the U.S., Europe, and Japan,' (Institute of Intellectual Property) (2005) p.1-5

2 R&DBER Prefaces(6)(8); R. Oshikamo, 'Comparative Analysis of Issues on Patent Laws for Medical Invention on Recent Drug Development between Japan and Europe' (Japan Patent Office FY2016 Industrial Property Research Promotion Project (Heisei 28-30) Report)(Foundation for Intellectual Property Institute of Intellectual Property) (2018), p.26-27, 31-33.

Treaty (TFEU), and the European Council establishes rules, directives, etc. based on the proposal of the European Commission. Study is conducted on TT and attribution of university inventions in Germany, the UK, France, Belgium, Switzerland, Finland, Sweden, Denmark, the Czech Republic, Poland and Latvia.

1. Trends in TT Policy

Common science and technology policies of European countries tend to expansion of government R&D investment, promotion of IAC and technological innovation of SMEs[3].

(1) Difference in TT policies among European countries

The TT policy of the centralized states is government-led from policy planning to promotion. In the decentralized states, the technological innovation policy is governed by the federal governments in Germany and Belgium while in Switzerland the authority of the federal government is limited to backward support for realization of technological innovation[4]. The TT policies of the Scandinavian model countries are promoted by the central state governments. Though the countries are relatively small, they are evaluated as innovation leaders[5].

(2) Background of TT Policy Conversion

In Germany, the economic downturn after the East-West unification was the turning point of their national policy[6]. In Switzerland and Finland, TT was promoted during the economic recession period in the 1990s[7]. In the UK, a drastic policy of university budget reduction due to the introduction of a liberal economy triggered universities to start TT business[8]. The Belgian TT was introduced to compensate for labor shortage[9]. For Central and Eastern European and the former Soviet Union countries, the end of the Cold War and the accession to the EU ware the turning points. But due to

[3] Tokyo Institute of Technology (TIM), 'Research Report on Cooperation Policy between University Intellectual Property Headquarters and TLO' (2004) p.9.; J. Edler, K. Stefan, and B. Maria, 'Changing Governance of Research and Technology Policy: The European Research Area' (2003), p.169-175.

[4] National Center for Industrial Property Information and Training (INPIT), 'Research Report on Trend of Technology Transfer Market in Western Europe (March 2018)' (2008) p.5-6.; ASTP-Proton Annual Conference 23-25.5.2018 Liège, Belgium 'LIÈGE SCIENCE PARK: GUIDED TOUR' on 23.5.2018.; R & D Strategy Center (CRDS) 'Overseas Research Report Science and Technology Trend of Competitive Small Countries' (2014) p.21-24.

[5] CRDS2014, p.46.; European Commission (EC),'Country Report 2018 Sweden,'p.1, 4-5, 46-47.; EC, 'Country Report 2018 Denmark,'p.1, 38

[6] Edler, p.88-89.; N. Andoh, T. Sukagawa, K. Tamai, 'Current State of Technology Transfer from Universities / Industry-Academia Collaboration in the World (1) European Countries (Germany and Austria)' PATENT Vol.58, No.4, (2005) p.54.

[7] T. Maki, Tokugikon, Vol.24, No.260; CRDS2014, p.24-27.

[8] S. Nakazawa, 'On the Present State of Technology Transfer in UK Universities,' Tokugikon, no.270 (2013) p.110.

[9] Gee, p.56-58.

aftereffects of the Communist era, the problem of private enterprises not being involved in TT still exists[10].

Belgium and Switzerland are small countries and technological innovation is essential to their industrial structure. However, fundamental industries have been established for a long time and each province performs TT in accordance with its own culture[11]. Belgium adopts a strategy specialized in technological innovation and Switzerland has been internationally highly evaluated for technological innovation capabilities specializing in the pharmaceuticals and watches industries which are highly profitable[12]. Finland has recognized the dominance of domestic industries[13] and the UK has high technical innovation capabilities in specific industries in specific areas[14]. TT may be considered suitable for promoting 'selection and concentration' of domestic industries.

(3) Financial Support

In European countries, tax incentives and entrepreneurship promotion funds are formulated for supporting SMEs. For example, in the UK R&D tax credit system, the deduction rate for SMEs is higher than that for large companies[15]. However, in Germany, though tax incentives are considered, they have yet to be introduced[16].

Many countries formulate tax incentives for R&D investment. In France, research tax credit (RTC) is the key to IAC[17]. Britain has a tradition that charity organizations support R&D, and since the preferential tax system for donation is also developed, companies and individuals tend to donate to charitable organizations. Tax incentives relating to the so-called patent income 'patent box' have also been introduced[18].

II. TT System of IAC

(1) TT system

The 'Fraunhofer Model' is an incentive for IAC in Germany. Under this model, the research

[10] EC, 'Country Report Czech 2018' p.36-37.; EC, 'Country Report Poland 2018' p.32.; EC, 'Country Report Latvia' p.3, 5.
[11] CRDS2014, p.4-12.
[12] Gee, p.56-58, 65-66.; CRDS2014, p.3-12, 17-18, 22-23.
[13] CRDS2014, p.46.
[14] CRDS2014, p.4-12.
[15] Y. Tsuda, 'Science and Technology in the UK in March 2015' (CRDS Overseas Trend Unit) (2015), p.52
[16] CRDS, 'Trend Report of Science Technology and Innovation in Germany (CRDS Germany)' (2015), p.32-34.
[17] S. Berger, 'Reforms in the French Industrial Ecosystem' (2016) p.13.; INPIT, p.144.
[18] J. Chapman, and, Y. Tsuda, 'Science and Technology in the UK in December 2015' (CRDS Overseas Trend Unit) (2015) p.14-15.; T. Sawada, 'Research and Development Strategy in Each Country Third German Manufacturing Industry Advanced Project "Industry 4.0' Industry-Academia-Government Collaboration Journal (2014) p.14-15, 52.; Tsuda, p.14-15, 52.

budget amounts for laboratories for the next fiscal year are set in conjunction with the previous year's amounts relating to collaborative research with the private sector[19]. In France, the Carnot Institute and RTC are incentives for collaboration with the private sector, and the TT of public research institutes is increasing[20].

In Switzerland, the Federal Government is responsible for supporting regional IAC and facilitating large-scale TT in the biotechnology field[21]. In Finland, an entrepreneurial activity system wherein research results obtained by universities are given back to the community has been established by the national innovation policy[22]. The Danish TT system is mainly composed of a plurality of organizations established within the government-led legal framework[23].

In Belgium, each regional government conducts their regional TT including universities[24]. In Germany, all states have established university-related TTOs, and there is a TT member organization as a comprehensive alignment agency of the TTOs[25]. TT in the UK is promoted by both centralized government policy and decentralized regional autonomy strategy[26].

(2) Clusters

TT seems to be compatible with regionally-oriented industrial-specialized economies. Local governments conduct TTs in Belgium and Switzerland[27]. The Catapult program, a unique cluster program in the UK, includes a high-value manufacturing catapult center with the latest research equipment that individual universities and companies cannot invest in, which supports a wide range of manufacturing industries[28]. Switzerland has some biotechnology clusters where global pharmaceutical companies are centered[29]. Many companies in the Swedish cluster IDEON commercially succeeded by IAC with the adjoining Lund University. The Copenhagen region in Denmark and the Skane region in Sweden have formed a cross-border cluster, Medicon Valley[30]. Though Germany is also in an environment where clusters are easily formed, the excessively

[19] CRDS Germany, p.24.
[20] CRDS, 'Trend Report of Science Technology and Innovation in France (CRDS France)' (2015), p.24.
[21] CRDS2014, p.22-27.
[22] Interview with Dr. Gen Tamyar (Commercialization Officer of Helsinki Innovation Services Ltd.) on 6.8.2018 at University of Helsinki.
[23] H. Iwabuchi, 'Science and Technology Policy in Denmark - as an Example of Scandinavian Science and Technology Policy - (March 2005)'(National Institute of Science and Technology Policy of Ministry of Ministry of Education, Culture, Sports, Science and Technology (MEXT))(2005), p.28-34.
[24] V. Blondel, 'The Research and Innovation Landscape in Belgium,' (ASTP-Proton Annual Conference 23-25.5.2018 Liège Belgium) on 24.5.2018.; V. Reuter, 'The Research and Innovation Landscape in Belgium'(ASTP-Proton Annual Conference 2018).; Gee, p.54-58.
[25] INPIT, p.5-6.
[26] Nakazawa, p.103.; Ministry of Economy, Trade and Industry (METI), 'Survey on Case Report on Intellectual Property Distribution and Financing,' p.4-5.; INPIT, p.4-6.
[27] Blondel.; Reuter.; Gee, p.54-58.; CRDS2014, p.22-23.
[28] Chapman, p.17, 19-21.; Tsuda, p.15, 18-19.
[29] CRDS2014, p.21.
[30] Iwabuchi, p.34.

established regional clusters have been evaluated as problematic. The French regional TTOs founded in response to SMEs have not functioned well[31].

(3) University technology transfer agencies

The common service of university TTOs in each country is to support the commercialization of university inventions and to select license partners. In addition, the TTOs of Belgian universities are in charge of TT of universities and university hospitals and play a central role in technological innovation and ecosystems, encouraging economic growth[32]. In Finland, the university TTOs functions as a hub for IAC[33].

Public research institutes that have succeeded in TT in Germany and France are advancing TT in their own way[34]. Autonomy is given to universities in the UK, and TTOs of Oxford University and Cambridge University are highly evaluated worldwide. It seems preferable that TTOs have autonomy[35].

For example, the knowledge transfer office (KTO) of Leuven Catholic University is involved in licensing activities of clinical trial data in the life science field, and income from the life science field, including blockbuster pharmaceutically active substances, is high[36]. As a result of strengthening IAC by concentrating their resources on the R&D of the pharmaceutical industry, the basis of industry in Switzerland, their international competitiveness has been highly evaluated by increasing the number of SMEs including start-up companies[37]. 'Innovation Mill,' a framework exploiting dormant patents[38], in Finland is also useful.

In Finland, Denmark, Poland, etc., TTOs evaluate the possibility of commercialization of university inventions. In Poland, when TTOs decide the commercialization of an invention, a 'special purpose medium' functioning as a startup company for preparing for TT is established and the university invention will be transferred from the university to this intermediary. The aim of the intermediary is to reduce the economic risk to the university by indirectly managing university inventions and to flexibly promote the commercialization[39]. In Finland, the national and regional financial funding organizations also support the commercialization of university inventions after

[31] ASTP-Proton.; INPIT, p.6-7, 131-132; Ando et al., p.55; Chapman, p.17, 19-21; Tsuda, p.15, 18-19; Tayanagi; CRDS France, p.21; Iwabuchi, p.34.
[32] ASTP-Proton.
[33] Maki.
[34] Max Planck Innovation (MPI), 'Connecting Science and Business' (2016) p.9-13.; INPIT, p.133-142
[35] Nakazawa, p.104-5; TIM, p.19-20.; Chapman, p.20.
[36] KU Leuven KLO Website https://lrd.kuleuven.be/en retrieved on 31.10.2018.; Hearing from Mr. Wim Fyen and Mr. Ivo Roelants (KU Leuven R&D) on 16-27.10.2018.
[37] KU Leuven KLO website; Hearing with Mr. Fyen and Mr. Roelants; CRDS2014, p.27-28.
[38] Hightech Finland website'IT'S ALL ABOUT IDEAS – AND WHAT YOU CAN DO WITH THEM' http://www.hightechfinland.com/direct.aspx?area=htf&prm1=1035&prm2=article retrieved on 22.10.2018; CRDS2014, p.46-47.
[39] Interview with Ms. Czanik-Kawecka in Uniwersytet Medyczny w Warszawie on 17.11.2017.; Oshikamo, p.31.

university inventions judged to have no prospects for commercialization are returned to the researchers[40].

III. Impact of Attribution of University Inventions on IAC

Some countries have university inventions stipulated in education-related legislation. Ideas such as that contribution to society through the commercialization of research results is recognized as one mission of universities are relatively new. The degree of penetration of the concept seemed to be reflected in the handling of attribution of university inventions in each country.

Many TTs have been carried out with the private connection between university researchers and the private sector. Before the German Employee Invention Act was revised in 2002, university inventions were attributed to researchers under the Professor Privilege system. The commercialization of university inventions was not enhanced while the researchers obtained excessive economic interests. The Act was therefore amended and universities would become responsible for the commercialization of university inventions[41].

On the other hand, the Professor Privilege system still exists in Sweden which they see as suitable for a laissez-faire approach based on market mechanisms and that the attribution of university inventions should be made on a case-by-case basis[42]. The attribution of university inventions in Poland is to university researchers, and the university obtains profits through commercialization as compensation. The aims so are to avoid financial risks for universities and to provide university TTOs with incentives for promoting TT[43].

University inventions belong to universities in the UK and France. Even in countries where university inventions are attributed to university researchers such as the Czech Republic and Denmark, universities can manage patent applications by making a decision on a claim for the transfer of rights from researchers[44].

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[40] Interviews with Ms. Czanik-Kawecka; Oshikamo; Interview with Dr. Tamyar

[41] T. Takenaka "Employee invention systems of Western countries in comparison with Japanese system" (JIPA Industrial Cross-functional Duties Inventor Forum Document); Nomura Research Institute, ‘Researchers, engineers and others from the perspective of system and operation of each country concerning employee inventions: Survey report on human resources leakage’ (2014) p.15-18; Patent Office material 5-3 Employee invention system in Germany https://www.jpo.go.jp/shiryou/toushin/shingikai/pdf/tokkyo_5/11_5-3.pdf (retrieved on 18.2.2018)

[42] Tayanagi

[43] Szkalej, p.297-299.; Interview with Prof. Dr. Justyna Ożegalska-Trybalska (Director of the IP Department of Division of Laws of Jagiellonian University), Mr. Krystian Gurba (Manager of the Centre for Technology Transfer CTTRU of Jagiellonian University), Dr. Radpslaw Rudż (Leader of Technology Transfer Section of CTTRU) at Tecnology Transfer Office of Jagiellonian University on 20.11.2017.

[44] Interview with Dr. Machu.

IV. Possibility of Institutional Harmonization Relating to IAC

TT is affected by the science and technology policy of each country. If a successful TT system in one country is introduced into other countries while ignoring the government policies, the system may not always adapt to the culture of each country. Moreover, as mentioned above, the autonomy of TTOs is one factor for successful TT. Therefore, one university TT system does not always conform to all countries and universities.

There are many university TTOs evaluating the commercialization of university inventions. It is therefore desirable that staff of university TTOs can accurately evaluate inventions. Meanwhile, making licensing contracts with their own inventions and obtaining research expenditures are incentives for university researchers who have close contact with companies. This ensures the commercialization of their inventions as well. Even KTO of Leuven Catholic University of Belgium where evaluation is extremely high worldwide, actively promotes personal connection of academic researchers as licensing partners[45]. In this respect, the German system is worth considering in that university researchers can decide whether to notify their university inventions to their university by their own will and there is room for personal TT by university researchers. From the viewpoint of reliable commercialization, the support system for commercialization of inventions by the national and regional organizations in Finland is also effective.

Through some interviews, it was found that the appointment and education of human resources familiar with international business are important for the success of university TT. The high quality of research results transferred due to the high education level also works effectively[46]. Some research institutes succeed by TT of blockbuster inventions[47].

Many university TTOs are still in the process of development and it seems premature to conclude the pros and cons of the IAC systems.

V. Conclusion = Consideration of Institutional Harmonization Necessary for Smooth TT

For smooth TT, it is necessary to conclude an appropriate contract in addition to proper approach to technical seeds. In international TT, since the national TT policy and business practice differ among countries, contracts with foreign companies involve complicated procedures and negotiations take a long time[48]. Therefore, the existence of an international TT agreement model or

[45] KU Leuven KLO website.
[46] Discussion with Mr. Miklas Vargic (Attorney), Ms. Alice komarkova (Manager of the Technology Transfer Office of Pardubice University), Mr. Tomas Kubesa (Attorney of Technology Transfer Office of Brno Technical University) etc., at the Annual Conference of Czech Bar Association on 21.9.2018; Hearing with Mr. Fyen and Mr. Roelants.
[47] MPI, p.9-13.; INPIT, p.133-142.
[48] Discussion with Mr. Vargic et al; Hearing with Mr. Fyen and Mr. Roelants.

materials for examining the content of TT agreements in other countries and business practices would avoid unnecessary conflicts and shorten the negotiation period. Some countries provide domestic TT contract models. A French public research institution provides a term sheet for reducing the negotiation period. The Belgian government also offers a similar sheet[49]. Those must be useful.

As approach to technology seeds, university researchers can often find licensing partners by themselves. However, this does not always happen. Therefore, some countries, states and universities have their branch organizations abroad to construct local networks for IAC[50]. However, university TTOs do not always have branches abroad.

In the context of approaching seeds, the Finnish 'Innovation Mill' to promote the utilization of dormant patents may be worth considering[51]. License of Light (LOR), aiming at promotion of the utilization of patent rights[52] and the German system, 'interest in granting license,' where a patentee can register their intention for licensing their invention without legally binding force[53], may also be worth considering.

"User friendliness" of the system, where anyone can easily access the information of inventions, is also important. Considering the mission of the patent specification as technical literature[54], it is believed that patent literature can be positively utilized for matching of TT[55]. It is easy to obtain information on inventions from the bibliographic page of a patent application by accessing databases of national patent offices and WIPO. Therefore, if the intention of an applicant who wishes to license with a third party can be expressed in this bibliographic page of the patent application, the period from searching seeds to negotiation with the patentee can be reduced and approaching seeds can be promoted dramatically.

[49] MEXT, 'Survey Research on Handling Research Result from Joint Research etc. Learning from Case of Intellectual Property Management at University etc -Provision of Sakura Tool-.; Oshikamo, p.28, 36.; Heinz Goddar,'University/Industry Cooperation in Europe'1.9.2017 http://www.wipo.int/export/sites/www/amc/en/docs/vienna51goddar.pdf; INPIT, p.133-142; Hearing with Mr. Fyen and Mr. Roelants.

[50] Tsuda, p.59-60; Interview with Dr. Hana Kosova in ASTP-Proton Annual Conference 23-25.5.2018 Liège, Belgium on 24.5.2018.; Nakazawa, p.103-5; TIM, p.19-20.

[51] Hightech Finland, p.46-47.

[52] German Patent Act 23(1); Dennemeyer, 'Licence of Right: A possibility to reduce maintenance fees' http://legacy.dennemeyer.com/jp/white-papers/licence-of-right/ retrieved on 18.2.2018; Oshikamo, p.29-30, 36.

[53] Intellectual Property Research Institute, 'Research Report on Fee Policy Measures on Industrial Property Rights' (2009) p. 54.

[54] S.Yoshifuji, K. Kumagai 'Outline of Patent Law (13th Edition)(Yuhikaku) p.247-8.

[55] Dr. Goddar; Oshikamo, p.36.