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The Effects of Patent Cooperation Treaty (PCT) on High Technology Industry Export Development

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ABSTRACT

Patent Cooperation Treaty to which all industrialized and developed countries are membered is characterized by many advantages for owners of high-tech goods in the global market. This treaty makes companies to prevent competitors entering in to the market with similar technologies and also makes taking advantage of the priority much more difficult. WIPO releases an annual report of the patent applicants registered in the treaty and technology in which competition of countries and companies is much more highlighted. In the present paper, evaluation of nationality of countries with the greatest demand for registration in this Treaty and statistics offered by world bank on countries with highest exports of high technology products (in dollar value), it is concluded that all countries take advantages of the Patent Cooperation Treaty at the forefront of international policies for their products. Finally, some suggestions for practitioners for proper use of PCT as well as its benefits and limitations is presented.

Keywords: Patent Cooperation Treaty, High Technologies, International Patent, World Intellectual Property Organization, World Bank

Introduction

Export serves are one of the most known and easiest ways to enter into the global market and the main reason for its popularity is less resources-intensity and subsequently low risk among many others. However, this requires some preliminary investigations so that ignoring this may cause wasting human resource and financial investments. Intellectual property rights registered in the target country is an important subject that demands a comprehensive research before entering the market in a given country.

For instance, if an innovative product is produced in a country and its owners decided to export their product to another country, the similarity of the target market and its percentage should be evaluated. An invention might be registered but has not been commercialized, hence, lack of it in target market does not mean that it is not patented.

It is worth noting that inspection of intellectual property rights is not limited to patents, other cases such as brands and industrial designs should be taken into account which is beyond scope of this paper. The present paper aims to shed light on the effect of Patent Cooperation Treaty on high technology exports to understand the relationship between them and importance of this Treaty for products owners. In recent years, trading and commercializing High-technology goods and products have received a great deal of attention. Review of related literature stresses on the process of internationalization of firms by superior technology. Focusing on Invention, innovation and export efficiency, Dipietro, W. and Anoruo, E evaluated the impact of innovation activities on export. They conceived export development as a strategy which has great contributes in the growth of every country. This study suggests capital imports as an important tool to transferring knowledge among nations, innovation and the development of exports. It is found that exports are associated with innovation in the following manner (Dipietro & Anoruo, 2006).

The "disruptive innovation" theory states that capitalist system develops and emerges through the destruction of innovation. Old production and technology are constantly replaced by new innovations and it also provides temporary monopoly opportunities for inventors. The stronger disruptive innovation in an economy, the faster moving toward economic growth will be (Mehrgan, Dehghanpour & Dehmboud, 2011) Innovation is a powerful and great force, as it creates a comparative advantage. Innovative activities will lead to the emergence of new and cost-effective approaches for goods and services production, improving the country's competitive position. Introduction of new and state-of-art products provides a unique opportunity to improve the country's terms of trade.

Patent Cooperation Treaty (PCT)

To understand the role of the Patent Cooperation Treaty in exporting high-tech and state of art goods and products, it is necessary to evaluate existing solutions and laws to protect patents internationally. In this case, the benefits of the treaty on the protection of intellectual property for such type of products will be understandable and reasonable.

National patents protection

According to the Paris Convention, protection of an invention is limited to the country or region in which its invention has been patented (Paris Convention, 1979). This means that if an invention is patented in country A and is infringed in country B, it cannot be prosecuted without filing in country B (with respect to priority date in country A). Therefore, if an innovative

product which has great merchantability in countries, it is required to take some necessary actions to protect its intellectual property rights before entering the global market.

Inventions protection in other countries

The first international solution to support and protect patents in other countries is Paris Convention, which was signed in 1883. Rights outlined in the convention include patents, industrial designs and trademarks. As for inventions, the signatory countries pledged that the inventor since filing date, have 12-month to apply for the same invention, using the advantage of the priority date in other countries (Paris Convention, 1979).

One pros for priority date is that if in target country after the date of the first application, a similar application is filed by someone else (or even that application has been patented), by filing and inserting priority date, an innovative condition of someone else claimed can be challenged. Novelty is the first condition for any patent. Paragraph 1 of Article 27 TRIPS Agreement¹ explicitly stated mentioned condition as a substantive condition of patent (Sadeghi, 2012).

But what is the advantage of priority date in Paris Convention for inventors? If the inventor patented the invention in one of the convention member states and wanted to apply for other member states, he/she might enjoy the advantage of priority date for the Claims. (Paris Convention, 1979). This means that if inventor **1** filed an invention in state **A** at 2010/01/01 and inventor **2** filed the same invention in state **B** after 2010/01/01, in case that inventor 1 filed the invention in state **B** with state **A** priority date and number, inventor **2** cannot get the patent.

As previously noted, the inventor since first filing date has 12 months to apply for countries that expects this invention requires supporting and after this date inventor can no longer patent the same invention in Paris Convention states. The arisen question is that whether 12 months is enough time for prototyping, attract investment, production line, target market research and entry into the global market? Perhaps, answer "NO" to this question is one of the reasons for the need for a global treaty in the field.

Patent Cooperation Treaty (PCT)

Patent Cooperation Treaty is an international treaty which supports patents in all Member States with only one application. In other words, an inventor who filed his application in this treaty, could file a national application based on PCT application as priority documents in all member states (PCT, 2001). The Patent Cooperation Treaty (PCT) was concluded in 1970 and the treaty entered into force on 24th January 1978, initially with 18 contracting states (Manilal, 2011). As

¹ *Agreement on Trade- Related Aspects of Intellectual Property Rights (TRIPS Agreement) (1994)*

of 31st December 2016, there were 151 contracting states to the PCT and utilized terms of benefits of the international patent for its members (figure1).



Figure 1. Map of the patent cooperation treaty member states

AE United Arab Emirates	CJ Cuba	IR Iran (Islamic Republic of)
AG Antigua and Barbuda	CY Cyprus (EP)	IS Iceland (EP)
AL Albania (EP)	CZ Czechia (EP)	IT Italy (EP)
AM Armenia (EA)	DE Germany (EP)	JP Japan
AO Angola	DJ Djibouti	KE Kenya (AP)
AT Austria (EP)	DK Denmark (EP)	KG Kyrgyzstan (EA)
AU Australia	DM Dominica	KH Cambodia
AZ Azerbaijan (EA)	DO Dominican Republic	KM Comoros (OA)
BA Bosnia and Herzegovina	DZ Algeria	KN Saint Kitts and Nevis
BB Barbados	EE Estonia (EP)	KP Democratic People's Republic of Korea
BE Belgium (EP)	EG Egypt	KR Republic of Korea
BF Burkina Faso (OA)	ES Spain (EP)	KW Kuwait
BG Bulgaria (EP)	FI Finland (EP)	KZ Kazakhstan (EA)
BH Bahrain	FR France (EP)	LA Lao People's Democratic Republic
BJ Benin (OA)	GA Gabon (OA)	LC Saint Lucia
BN Brunei Darussalam	GB United Kingdom (EP)	LI Liechtenstein (EP)
BR Brazil	GD Grenada	LK Sri Lanka
BW Botswana (AP)	GE Georgia	LR Liberia (AP)
BY Belarus (EA)	GH Ghana (AP)	LS Lesotho (AP)
BZ Belize	GM Gambia (AP)	LT Lithuania (EP)
CA Canada	GN Guinea (OA)	LU Luxembourg (EP)
CF Central African Republic (OA)	GQ Equatorial Guinea (OA)	LV Latvia (EP)
CG Congo (OA)	GR Greece (EP)	LY Libya
CH Switzerland (EP)	GT Guatemala	MA Morocco
CI Côte d'Ivoire (OA)	GW Guinea-Bissau (OA)	MC Monaco (EP)
CL Chile	HN Honduras	MD Republic of Moldova
CM Cameroon (OA)	HR Croatia (EP)	ME Montenegro
CN China	HU Hungary (EP)	MG Madagascar
CO Colombia	ID Indonesia	
CR Costa Rica	IE Ireland (EP)	
	IL Israel	
	IN India	

MK	The former Yugoslav Republic of Macedonia (EP)	SE	Sweden (EP)
ML	Mali (OA)	SG	Singapore
MN	Mongolia	SI	Slovenia (EP)
MR	Mauritania (OA)	SK	Slovakia (EP)
MT	Malta (EP)	SL	Sierra Leone (AP)
MW	Malawi (AP)	SM	San Marino (EP)
MX	Mexico	SN	Senegal (OA)
MY	Malaysia	ST	Sao Tome and Principe (AP)
MZ	Mozambique (AP)	SV	El Salvador
NA	Namibia (AP)	SY	Syrian Arab Republic
NE	Niger (OA)	SZ	Swaziland (AP)
NG	Nigeria	TD	Chad (OA)
NI	Nicaragua	TG	Togo (OA)
NL	Netherlands (EP)	TH	Thailand
NO	Norway (EP)	TJ	Tajikistan (EA)
NZ	New Zealand	TM	Turkmenistan (EA)
OM	Oman	TN	Tunisia
PA	Panama	TR	Turkey (EP)
PE	Peru	TT	Trinidad and Tobago
PG	Papua New Guinea	TZ	United Republic of Tanzania (AP)
PH	Philippines	UA	Ukraine
PL	Poland (EP)	UG	Uganda (AP)
PT	Portugal (EP)	US	United States of America
QA	Qatar	UZ	Uzbekistan
RO	Romania (EP)	VC	Saint Vincent and the Grenadines
RS	Serbia (EP)	VN	Viet Nam
RU	Russian Federation (EA)	ZA	South Africa
RW	Rwanda (AP)	ZM	Zambia (AP)
SA	Saudi Arabia	ZW	Zimbabwe (AP)
SC	Seychelles		
SD	Sudan (AP)		

Figure 1. List of the member states of patent cooperation treaty in 2016

The following presents, advantages of the PCT which is directly related to exports domain.

Increasing priority date

The applicant shall furnish a copy of the international application and a translation thereof (as prescribed), and pay the national fee (if any), to each designated Office not later than at the expiration of 30 months from the priority date (PCT, 2001). As mentioned, this time in the Paris Convention is 12 months. As a result, in case of the apply patent in PCT, the inventor should register its application in target countries within 18 months. After an International Preliminary Examination, an inventor is recommended to the patent in national level.

This should be done before 30 months deadline expires. If time expires, the inventor no longer can apply for patents claims. To assure patent registration in States, the inventor care quest PCT international preliminary examination into International Search Authority (Sternitzke, 2009).

Postponing National patent filing fees

As mentioned above, given a lingering registration time in other countries from 12 months to 30 months, Patent owner has more time to marketing and submit a declaration to target countries.

Getting information on the same patents (prior art)

Almost 16 months after the date of the filing date the results of international search in the previous inventions will be announced. The report can be one of the criteria to study the market before the entry into other countries. Applicants may also request a supplementary search for complete search (PCT, 2001).

In case the international and supplementary search for patent is favorable, one would hope that in exports to studied countries there will no problems in the field of intellectual property from the other side inventors and companies will not come before and there will be a great chance to be successful in a patent (Sternitzke, 2009).

To understand importance of PCT treaty for global enterprises, it is needed to look the statistics through the number and nationality of legal applicants for this treaty in 2015. In the year, 19 Japanese, 13 Americans, 7 Chinese, 4 German, 3 Korean companies and companies from Sweden, Netherlands, France and Canada were among the 50 top companies in terms of number of patent in PCT Treaty.

In this statistics, the 50 top Japanese companies in 2015 had a total of 14,862 patent in PCT Treaty. In the same statistics, American and Chinese companies submit 11257 and 9761 patent applications to the treaty respectively. Looking at the names of these companies, makes it clear that the biggest manufacturing companies with high technology have benefited from the advantages of PCT treaty to protect intellectual property at the international level for their innovations. This makes it more difficult to enter in to designed offices.

As noted in next parts, customs of developed countries examine importing goods intellectual property rights. As a result, if the technology has been patented by a company in a country and another company with the same technology enters to the market, technology owner can perform administrative procedures to prevent entering and selling the product. This is very important in market sustainability.

Table 1
Top 50 PCT Applications

Overall rank	Applicants	Origin	Applications	Change from 2014
1	HUAWEI TECHNOLOGIES CO., LTD.	China	3,898	456
2	QUALCOMM INCORPORATED	United States of America	2,442	33
3	ZTE CORPORATION	China	2,155	-24
4	SAMSUNG ELECTRONICS CO., LTD.	Republic of Korea	1,683	302
5	mitsubishi electric corporation	Japan	1,593	0
6	TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)	Sweden	1,481	-31
7	LG ELECTRONICS INC.	Republic of Korea	1,457	319
8	SONY CORPORATION	Japan	1,381	399
9	KONINKLIJKE PHILIPS ELECTRONICS N.V.	Netherlands	1,378	-13
10	HEWLETT-PACKARD DEVELOPMENT COMPANY, L.P.	United States of America	1,310	484
11	SIEMENS AKTIENGESELLSCHAFT	Germany	1,292	-107
12	INTEL CORPORATION	United States of America	1,250	-289
13	ROBERT BOSCH CORPORATION	Germany	1,247	-124
14	BOE TECHNOLOGY GROUP CO.,LTD	China	1,227	674
15	TOYOTA JIDOSHA KABUSHIKI KAISHA	Japan	1,214	-164
16	PANASONIC INTELLECTUAL PROPERTY MANAGEMENT CO., LTD.	Japan	1,185	918
17	HITACHI, LTD.	Japan	1,165	169
18	HALLIBURTON ENERGY SERVICES, INC.	United States of America	1,121	321
19	SHARP KABUSHIKI KAISHA	Japan	1,073	-154
20	TENCENT TECHNOLOGY (SHENZHEN) COMPANY LIMITED	China	981	-105
21	FUJIFILM CORPORATION	Japan	947	-125
22	NEC CORPORATION	Japan	895	-320
23	MICROSOFT TECHNOLOGY LICENSING, LLC	United States of America	860	860
24	LG CHEM, LTD.	Republic of Korea	739	186
25	BASF SE	Germany	735	-45
26	GOOGLE INC.	United States of America	721	-196
27	SHENZHEN CHINA STAR OPTOELECTRONICS TECHNOLOGY CO., LTD	China	710	-194
28	DENSO CORPORATION	Japan	704	39
29	3M INNOVATIVE PROPERTIES COMPANY	United States of America	676	-20
30	UNITED TECHNOLOGIES CORPORATION	United States of America	661	-352
31	MURATA MANUFACTURING CO., LTD.	Japan	658	70
32	OLYMPUS CORPORATION	Japan	614	342
33	SCHAEFFLER TECHNOLOGIES AG & CO. KG	Germany	608	245
34	KABUSHIKI KAISHA TOSHIBA	Japan	595	-261
35	PROCTER & GAMBLE COMPANY	United States of America	546	72
36	KONICA MINOLTA, INC.	Japan	516	-3
37	GENERAL ELECTRIC COMPANY	United States of America	500	-107
38	KYOCERA CORPORATION	Japan	459	-13
39	HUAWEI DEVICE CO., LTD.	China	442	22
40	ALCATEL LUCENT	France	419	-76
41	FUJITSU LIMITED	Japan	418	-134
42	DOW GLOBAL TECHNOLOGIES INC.	United States of America	411	-60
44	APPLE COMPUTER, INC.	United States of America	383	-131
45	APPLIED MATERIALS, INC.	United States of America	376	-19
46	SCHLUMBERGER CANADA LIMITED	Canada	374	12
47	NISSAN MOTOR CO., LTD.	Japan	368	-252
47	MITSUBISHI HEAVY INDUSTRIES, LTD.	Japan	368	-119
49	NITTO DENKO CORPORATION	Japan	366	-26
51	KIMREE HI-TECH INC.	China	348	267
52	HITACHI AUTOMOTIVE SYSTEMS, LTD.	Japan	343	53

(Source: Businesses, 2015)

According to statistics released by the World Bank on the dollar value of high-tech products export countries in 2015 (Figure 2), China with more than 554 billion dollars have the greatest high-tech products export followed by Germany with 185 billion dollars and then America with 154 billion dollars.



Figure 2. Statistics on dollar value of exporting high technology products in countries

- Up to 130 billion dollars
- 69 - 130 billion dollars
- 34-69 billion dollars

Singapore is fourth country by the highest financial volume of sales of products with high technology in the timeframe with more than 130 billion dollars followed by South Korea as fifth country with more than 126 billion dollars. France, having sales more than 104 billion dollars and Japan up to 91 billion dollars assigned sixth and Seventh ranks respectively. Eighth and ninth ranks in this list belong to United Kingdom with sales of over 69 billion dollars and the Netherlands, with sales of over 59 billion dollars.

Upon comparing the nationality of top nine countries in list of Patent Cooperation Treaty applicant companies in the list published by the World Intellectual Property Organization and nine top nine countries for high-technology sale published by the World Bank it was found that seven countries of Japan, America, China, Germany, Korea, the Netherlands and France are in common in both lists.

The reports of World Bank on exports of high technology goods in the world in 2015 (Figure 3) is taken into account.

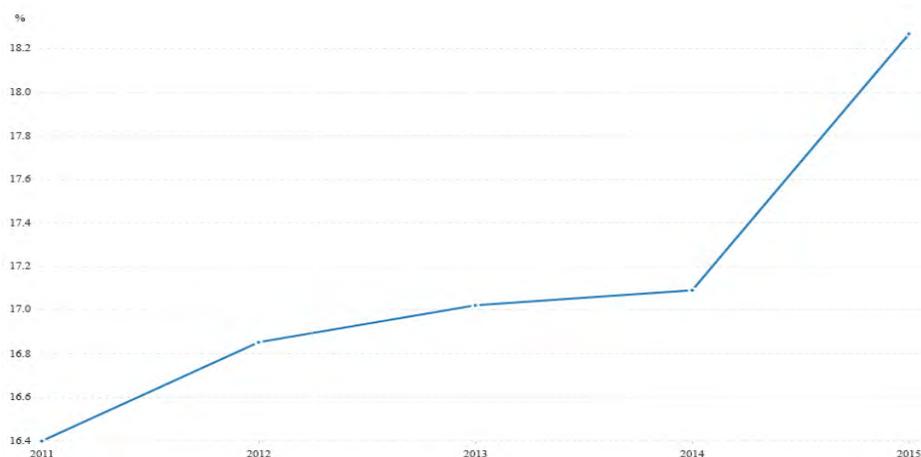


Figure 3. Percentage of high technology exports compared to total world exports

According to the report above, the percentage of high technology exports to total world exports in 2011, 2012, 2013 and 2014 are 16.403, 16.852, 17.022, and 18.268 percent, respectively. It is found that, in each year, the percentage of high technology exports to total exports has experienced a growing trend in worldwide. The followings are the statistics released from patents on the Patent Cooperation Treaty in the same period.

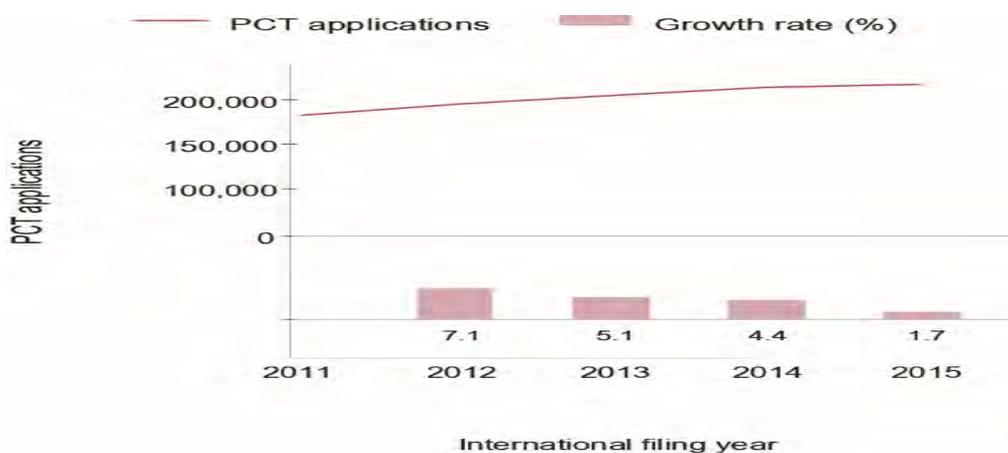


Figure 4. Statistics on the number of patents in the Patent Cooperation Treaty

According to the table, number of application in 2012, 2013, 2014 and 2015 were respectively estimated to be 194,344 with 7.1% growth, 205,000 with 5.1% growth, 214,800 with 4.4% growth and 218,000 with 1.7% growth over the previous year. As it is clear, industrialists with high technology products by increasing percentage of selling their products at the international level, have been benefited from most of unique advantages of the Patent Cooperation Treaty for international protection from their inventions. Moreover, the number and

branch of technology filed in the Patent Cooperation Treaty in 2015 which has been published by the World Intellectual Property Organization is as follows.

Table 2
PCT Applications by Field of Technology

	Technical field	Year 2015	2015 share (%)	Change from 2014 (%)
I	Electrical engineering			
1	Electrical machinery, apparatus, energy	14,612	7.3	-4.4
2	Audio-visual technology	6,583	3.3	-3.7
3	Telecommunications	4,851	2.4	-10.8
4	Digital communication	16,047	8.0	-1.0
5	Basic communication processes	1,258	0.6	-2.9
6	Computer technology	16,385	8.2	-7.6
7	IT methods for management	4,032	2.0	-4.2
8	Semiconductors	6,435	3.2	-10.6
II	Instruments			
9	Optics	5,858	2.9	-2.0
10	Measurement	8,581	4.3	-5.0
11	Analysis of biological materials	1,661	0.8	-9.9
12	Control	3,005	1.5	-4.3
13	Medical technology	12,633	6.3	-10.0
III	Chemistry			
14	Organic fine chemistry	5,398	2.7	-10.1
15	Biotechnology	5,613	2.8	-4.8
16	Pharmaceuticals	7,691	3.8	-10.4
17	Macromolecular chemistry, polymers	3,691	1.8	-2.4
18	Food chemistry	1,820	0.9	-3.1
19	Basic materials chemistry	5,447	2.7	-4.7
20	Materials, metallurgy	3,767	1.9	-7.4
21	Surface technology, coating	3,292	1.6	-5.8
22	Micro-structural and nano-technology	358	0.2	-13.3
23	Chemical engineering	4,301	2.1	-6.6
24	Environmental technology	2,544	1.3	-8.2
IV	Mechanical engineering			
25	Handling	4,696	2.3	-2.1
26	Machine tools	3,622	1.8	-4.0
27	Engines, pumps, turbines	6,186	3.1	-10.4
28	Textile and paper machines	2,404	1.2	5.0
29	Other special machines	5,602	2.8	4.2
30	Thermal processes and apparatus	3,004	1.5	-0.1
31	Mechanical elements	5,909	2.9	0.5
32	Transport	8,627	4.3	-0.5
V	Other fields			
33	Furniture, games	3,807	1.9	-0.1
34	Other consumer goods	4,385	2.2	9.6
35	Civil engineering	6,330	3.2	-2.5

(Source: World Intellectual Property Organization)

The data revealed that, the owners of various fields of technology in order to gain support for their innovation, seek international support for their achievements in Patent Cooperation Treaty as well as applying for National patent.

Conclusion and Future Perspective

Given the above discussion, the major countries exporting high- tech products take advantages of Patent Cooperation Treaty as one of the protective measures in order to prevent the reproduction and copying their technology.

Having patent their inventions in their country, manufacturers of these types of products in all countries to gain full support to their achievements should apply to the Treaty to gain benefit from its advantages entering the market in other countries. It should be noted that technology owners should apply national patent after filing in the treaty and determining the target countries, as applying for Patent Cooperation Treaty has no benefit for inventors and technology owners without involving in national phase. Before the expiry of 30 months from the date of the first application, inventors must submit patent application to target countries with the PCT application number.

In case of patent granted in target countries, technology owners can prevent entering competitors with similar technology and this can be important to maintain a competitive advantage. On the other hand every applicant who selects a country as designed office, a copy of all documents will submitted to patent office of that country. As a result, it is not patentable technology for others in mentioned country as in Patent Cooperation Treaty it will be considered as Disclosure of Invention. Consequently, in case inventors and technology owners do not take actions for patent, they may lose patent benefits even in their home country.

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