

Patent Trend in Research Centers at Cibinong Science and Technology Park Surrounding for Determining Technology Focus

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Abstract. Focusing in a specific technology sector would be a great strategy for early developed Science and Technology Park (STP) especially in Indonesia. Each STP has its own concept considering the resources and technology supply. This should be main considerations in determining STP focus. Cibinong Science and Technology Park (CSTP) is surrounded by 4 research centers, and Center for Innovation. Their patent database within 5 years has been studied to determine CSTP focus. By using qualitative method and descriptive analysis, the results showed that the top priority is agriculture, followed by pharmaceutical. Moreover, the strategic areas for development in agriculture sector include: soil working; horticulture; preservation of bodies; and biocides. And in pharmaceutical sub sector includes: preparations for medical, dental, or toilet purposes; specific therapeutic activity of chemical compounds or medicinal preparations; and heterocyclic compounds. Furthermore, China can be a benchmark for technology development in agriculture, while US for technology development in pharmaceutical.

Keywords: *Technology focus, patent trend, CSTP surrounding, research center, STP*

1. Introduction

In many countries, Science and Technology Park (STP) has known as an accelerator for economic growth, and an effective tool to promote new technology oriented firms, and facilitating the commercialization of scientific research (Colombo & Delmastro, 2002; Link & Scott, 2003). Furthermore, each country has its own concept and uniqueness regarding the development of STP, some prefer as a “generalist”, while other focus on few technology sectors. For example, South Korea developed 4 Innopolis, 12 Techno Park (TP), and 6 National Techno Park (NTP), most of them are generalist (facilitated more than 4 technology sectors) (Hidayat, 2015). They are capable in facilitating many technology sectors because they have enough resource and infrastructure. In terms of technology supply, most of TP in South Korea rely on University’s inventions.

Meanwhile in China, during 1988 until 2008 there are 54 Science and Technology Industrial Parks (STIPs) have been established by the Chinese government (Zhang & Sonobe, 2011). These parks are largely focused on electronic, information technology, new material, and biomedicine industrial sector (MIG, Inc., 2011). Zhongguancun Science Park (Z-Park) as the oldest and largest park in China, focused on Information Technology (IT) sector. Now, Z Park has become a very successful park and a home for over 20,000 companies and 950,000 employees.

On the other hand, Indonesia has already planned to established 100 STP/TP/SP from 2015 until 2019 (Bappenas, 2015), but the concept and development guidelines is not yet clear. Until 2016, 60 parks were established but not in a complete form, and most of them are generalist. Largely, these

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parks have similar difficulties, which are: lack of supply of technology, lack of human resource (researchers, technology transfer officers, and business managers), lack of funding for construction, and lack of commitment from stakeholders.

One of STP that has been established in 2015 was Cibinong Science and Technology Park (CSTP), this park was managed by Center for Innovation LIPI. This park is different with most park in Indonesia, it has reliable entities as technology provider, which are research centers that located in CSTP surrounding. Recently, CSTP has difficulty in acquiring funding for construction and development of its 15 ha area. Meanwhile, CSTP is a generalist park, it facilitated 9 industrial sectors to grow in this park, which are: food, health and medicine, environment and water treatment, new and renewable energy, marine, advanced material and manufacture, transportation, information and communication technology, defense and security (Center for Innovation LIPI, 2015).

To be a generalist park, CSTP requires more funding, area and resources, on the contrary the availability is very limited. Difficulties that faced by CSTP in completion of its facilities are : limited construction, machineries and equipments procurement budget from central government (required 34.978.467 US\$), minimum political advocacy and commitment, requires large number of

employee, requires a special policy regarding private sector to establish facilities in the park / government owned land.

So, focusing in few industrial sector would be a crucial policy that need to be taken by top management of CSTP and policy maker in LIPI. This study is trying to identify what industrial sector that CSTP should focus, by investigate patent trend and population using LIPI's and International paten database. The scope of this research is to see the focus of technology on CSTP implementation through supply technology aspect provided by research center in the form of technological / patent invention.

2. Literature Study

Science and Technology Park (STP) is an area designed and used to create cooperation in innovating. The goal is to advance science and promote technological and economic development. The science and technology park is a platform that allows an enterprise to innovate in an open system with their network of Universities, research laboratories, start-ups, SMEs and Large Companies (Yildirim, 2016). STP is an open innovation catalyst. The global factors used in STP are Governance, Growth, Sustainability and Future trends & External Factors (Wasim, 2014).



Figure 1.
Factors for Science Park (SCP) Planning (Wasim, 2014)

Governance is one of 4 important factors that needs to be defined in the STP. STP governance consists of environmental planning and preparation, Stakeholders, Target groups, Capital, Technology Focus and Eco-Settings. The selection of technology focus will determine the whole concept of STP, it will affect on its infrastructures design, resources, and businesses. The choice is whether it will have a strong technology focus or a general one.

Meanwhile, STP growth mostly influenced by its services. These services include the provision of sophisticated infrastructures, networking, access to business opportunities, economic incentives, access to leading organizations and cultural establishment with entrepreneurship. The sustainability of an STP is measured by how STP can measure its performance through the evaluation of objectives, linkages, and tenants periodically.

The last factor that determines STP growth is STP should be able to generate economic trends, technology trends and foster innovations that can create a profitable business environment. In addition, other external factors that may affect STP growth are policy instruments and monetary environment that can significantly influence.

According to Kharabsheh in the paper "Critical Success Factors of Technology Parks in Australia", STP has a role to connect research, technology, capital and knowledge to create entrepreneurship, accelerate the development of new technology-based enterprises, and accelerate the commercialization of technology (Kharabsheh, 2012). Factors influencing the success of STP are 1) The risk-taking culture of "entrepreneurship"; 2) Independent park management independent of university officials and government bureaucrats; 3) Attendance of knowledge workers and skilled workers in tech park environments, availability of appropriate communications and real estate infrastructure, availability of IP offices within technology parks; 4) The critical mass of internationally renowned innovative companies, and finally 5. A shared vision among stakeholders of technology parks. The first factor is more emphasis on generating innovation and intellectual property (Kharabsheh, 2012).

Ramezanzpour (2014) ranked 5 critical success factors in Science and Technology Park consisting of 1) support and services factors; 2) management factors; 3) location factors; 4) external factors; and 5) human resources factors (Ghasem Ramezanzpour Nargesi, 2014).

Not much different from the success factors that have been identified by Moudi (2011) is the success factor in science and technology park is 1) location; 2) facilities and providing the necessity; and 3) support mechanisms (Moudi, 2011).

3. Methodology

This research is using qualitative method with comparative study and descriptive analysis. LIPI's and International Patent database within 5 years period (before 2016) is being used to visualize patent population and trend. At first, patent from CSTP surrounding (research centers) were listed and clustered in targeted industrial sector. There are 9 sectors and 56 subsectors referring to Jakarta Stock

Industrial Classification (JASICA) Index (IDX, 2010). Furthermore, the highest populated cluster of patents in CSTP surrounding will be compared with international patent trend using World Intellectual Property Organisation (WIPO) Patentscope. As result, recommendations can be drawn by using descriptive analysis.

4. Findings and Discussion

CSTP was surrounded by 4 research centers, 1 training center and also Center for Innovation itself (figure 2). The 4 research center are: Research Center for Biology, Research Center for Limnology, Research Center for Biotechnology, and Research Center for Biomaterial.



Figure 2.
Institutions in CSTP Surrounding (Center for Innovation LIPI, 2015)

In total, there are 47 registered patents in CSTP surrounding. This number is about 10% from total LIPI's registered patent. In term of patent productivity, the Research

Center for Biotechnology has the highest number (40%), followed by Research Center for Biology (26%) (Figure 3).

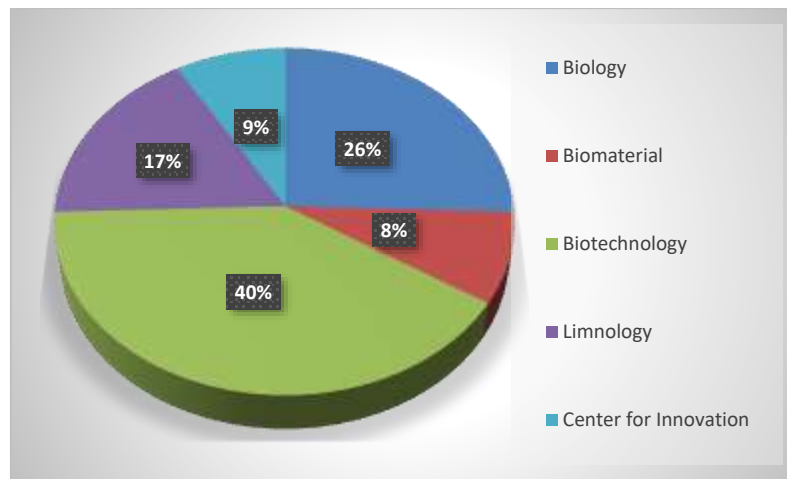


Figure 3.

Patent productivity within 5 years in CSTP surrounding

The patents that have been listed were classified by industry sector and sub sector. The classification is refer to Jakarta Stock Industrial Classification (JASICA) (Table 1.). For this initial classification, author is not using International Patent Classification (IPC) is because the database was not provide IPC information for each LIPI's patent. Moreover, the patents were classified by using JASICA to be more applicable and easier to see the target market for each patent.

As result, the highest number of patent in CSTP surrounding classified by industry sector is agriculture (17 patents), followed by consumer goods (15 patents) and basic industry and chemical (12 patents) (figure 4.). While if the patents breakdown in more detail classification (sub sector of JASICA), the highest number for patent by industry sub sector classification is pharmaceutical (13 patents), followed by food crops and fishery (figure 5.). This means, on technology supply aspect, CSTP should focus in the agriculture sector and/or in pharmaceutical sub sector. While the top 3 can be a good alternative sector also.

Table 1.

Jakarta Stock Exchange Industrial Classification Index (IDX, 2010)

Sector	Sub Sector	JASICA	Systematic
1		AGRICULTURE	Primary Sector
		11 Crops	
		12 Plantation	
		13 Animal Husbandary	
		14 Fishery	
		15 Forestry	
2		MINING	Primary Sector
		21 Coal Mining	
		22 Crude Petroleum & Natural Gas Production	
		23 Metal & Mineral Mining	
		24 Land / Stone Quarrying	
		26 Others	
3		BASIC INDUSTRY AND CHEMICALS	Secondary Sector
		31 Cement	
		32 Ceramics, Glass, Porcelain	
		33 Metal & Allied Products	
		34 Chemicals	
		35 Plastic & Packaging	
		36 Animal Feed	
		37 Wood Industries	
		38 Pulp & Paper	
		39 Others	
4		MISCELLANEOUS INDUSTRY	Secondary Sector
		41 Machinery & Heavy Equipment	
		42 Automobile & Components	
		43 Textile, Garments	
		44 Footwear	
		45 Cable	
		46 Electronics	
		49 Others	
5		CONSUMER GOODS INDUSTRY	Secondary Sector
		51 Food & Beverage	
		52 Tobacco Manufactures	
		53 Pharmaceuticals	
		54 Cosmetics & Household	
		55 Household	
6		PROPERTY, REAL ESTATE AND BUILDING CONSTRUCTION	Tertiary Sector (Service)
		61 Property And Real Estate	
		62 Building Construction	
		69 Others	
7		INFRASTRUCTURE, UTILITIES & TRANSPORTATION	Tertiary Sector (Service)
		71 Energy	
		72 Toll Road, Airport, Harbor And Allied Products	
		73 Telecommunication	
		74 Transportation	
		75 Non Building Construction	
8		FINANCE	Tertiary Sector (Service)
		81 Bank	
		82 Financial Institution	
		83 Securities Company	
		84 Insurance	
		85 Investment Fund / Mutual Fund	
9		TRADE, SERVICES & INVESTMENT	Tertiary Sector (Service)
		91 Wholesale (Durable & Non Durable Goods)	
		93 Retail Trade	
		94 Restaurant, Hotel And Tourism	
		95 Advertising, Printing And Media	
		96 Health Care	
		97 Computer And Services	
		98 Investment Company	
		99 Others	

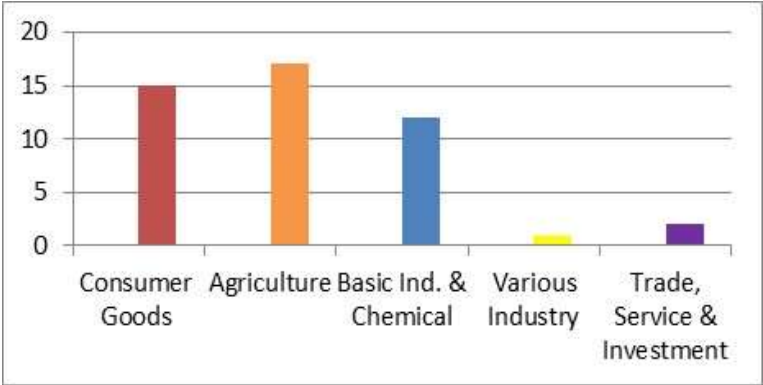


Figure 4.
The Number of Patent in CSTP Surrounding Classified by Industry Sector

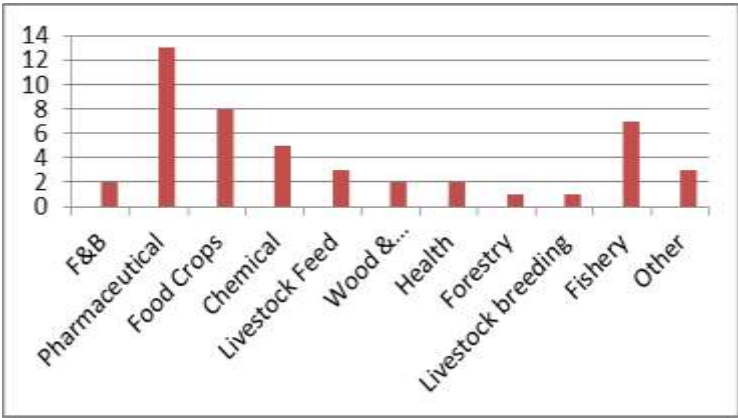


Figure 5.
The Number of Patent in CSTP Surrounding Classified by Industry Sub Sector

So based on technology supplies from RC in the park surrounding, CSTP has 2 priority option for its technology focus, which are agriculture and pharmaceutical. As the

alternatives there are consumer goods, basic industry-chemical, food crops and fishery (figure 6).



Figure 6.
Priority in Technology Focus for CSTP

Furthermore, the result on CSTP technology supply analysis is being compared with the international trend. The trend can be showed by utilising WIPO Patentscope database analysis, and the main keywords for this analysis are “agriculture” and “pharmaceutical” (within 5 years before 2016).

As a result, the analysis by using keyword “agriculture” showed that there are 3.830 patents. The highest number for patents amount classified by country was China, followed by United States and Republic of Korea (Figure7.). These 3 countries should be main target as technological benchmark for agriculture.

Moreover, the top 3 number of patent related to agriculture by IPC are (Figure 8.):

- A01B : Soil working in agriculture or forestry; parts, detail, or

agricultural machines or implements, in general.

- A01G : Horticulture; cultivation of vegetables, flowers, rice, fruit, vines, hops, or seaweed; forestry; watering.
- A01N : Preservation of bodies of humans or animals or plants or parts thereof; biocides. E.g disinfectants, pesticides or herbicides.

Inline with the market, patents in these 3 most populated IPC has the biggest potency to be commercial. These 3 will be suitable as target for CSTP in agriculture sector.

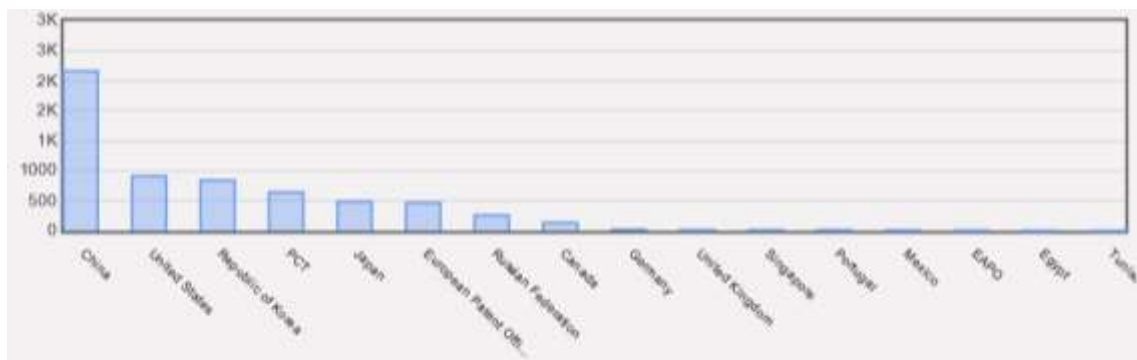


Figure 7.

The Number of Patent Related to Agriculture Classified by Country

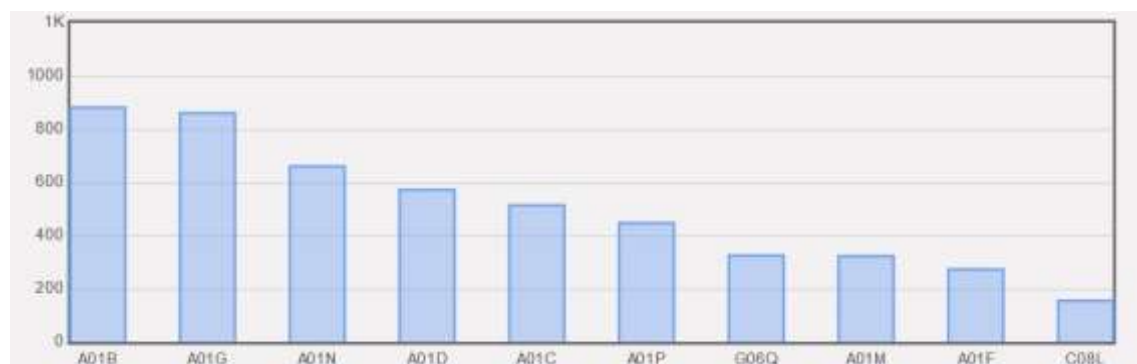


Figure 8.

The Number of Patent Related to Agriculture Classified by IPC

The result for analysis using keyword “pharmaceutical” showed that, there are 111,812 patents. The highest amount of patents classified by country was from United States, European countries and Canada (Figure 9). International patents or patents registered through the Patent Cooperation Treaty (PCT) has the second most number of patents. But PCT is not included in the assessment in this study

because PCT can come from several countries, although on the other hand PCT has a global market.

CSTP should do benchmark in term of pharmaceutical invention to US, European countries and Canada. These 3 are countries with the most advanced pharmaceutical inventions and industries..

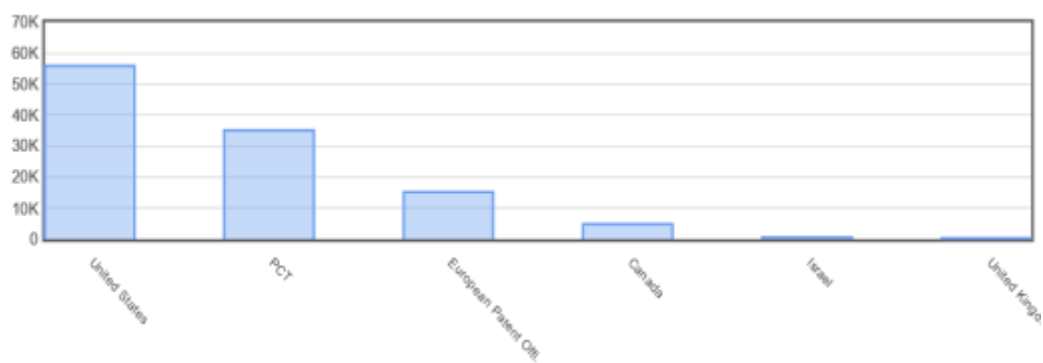


Figure 9.

The Number of Patent Related to Pharmaceutical Classified by Country

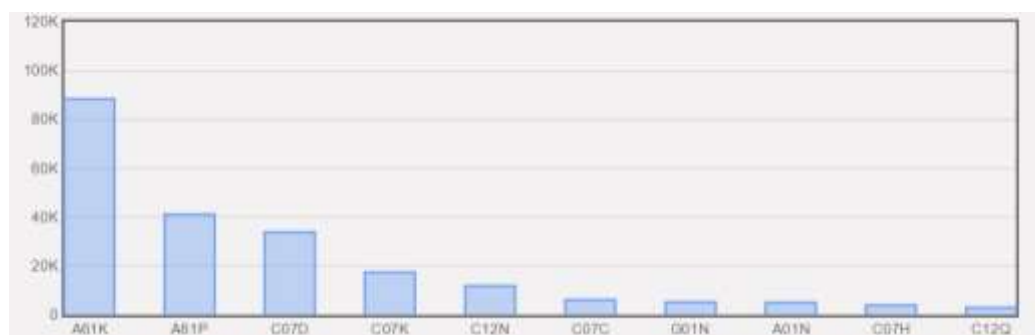


Figure 10.

The Number of Patent Related to Pharmaceutical Classified by IPC

Moreover, the top 3 number of patent related to pharmaceutical classified by IPC are (Figure 10.):

- A61K : Preparations for medical, dental, or toilet purposes (devices or methods specially adapted for bringing pharmaceutical products into particular physical or administering forms; chemical aspects of, or use of materials for deodorisation of air, for disinfection or sterilisation, or for bandages, dressings, absorbent pads or surgical articles; soap compositions)

- A61P: Specific therapeutic activity of chemical compounds or medicinal preparations
- C07D: Heterocyclic compounds

Conclusions

As a conclusion of this study, the top priority for CSTP regarding technology focus is in agriculture sector. The other alternatives are consumer goods and basic

industry and chemical sector. Meanwhile, in more specific sub sector CSTP can determine its focus on pharmaceutical, and food crops and fishery as alternatives.

In more detail, the strategic areas for development or commercialisation project in agriculture sector should aim for: (1) soil working (fertilizer and machineries); (2) horticulture and cultivation; and (3) biocides (disinfectants, pesticides or herbicides). While in pharmaceutical sub sector includes: preparations for medical, dental, or toilet purposes; specific therapeutic activity of chemical compounds or medicinal preparations; heterocyclic compounds. China can be used as benchmark for development of technology in agriculture sector, while US as benchmark for pharmaceutical sub sector.

Research Implications, Limitation and Further Study

The result in this study recommends CSTP to focus in agriculture and pharmaceutical. Furthermore, the implementation of this study can change the majority of existing CSTP concept from generalist (facilitate 9 sector) into a specific “park”. But it still not too late to change the concept while CSTP still in early stage of development. This will help CSTP utilised its limited fundings and resources to optimize its services and facilities in 1 or 2 technology sectors not 9. This study limits the analysis and aim on helping CSTP which operated by Center for Innovation, implementing the study for other “parks” will require more observation and analysis. Further study is required to map the external environment of CSTP that highly related to its development, such as: natural resources, human resources, local industries, and market.

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