

The Challenges in Research Commercialization Lessons from Bandung Institute of Technology Indonesia

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Abstract:

As one of the Higher Education Institutions in Indonesia, the Bandung Institute of Technology (ITB) as a university with excellence in science and technology has brought the concept of entrepreneurial university to produce graduates who can compete in the Industrial Revolution 4.0 era. This is supported by the existence of the LPIK ITB as the Department for Innovation and Entrepreneurship Development. LPIK ITB is a medium for ITB academicians to be able to make a start up business and innovation research so that they can become entrepreneurs who can provide benefits to the community through their innovations. However, the commercialization rate of these innovation products towards the implementation of the entrepreneurial university concept is still very low. This is evidenced by the small amount of intellectual property of start up business at the Bandung Institute of Technology based on the data from LPIK ITB. The purpose of this research is to identify the reasons that cause the low success rate of the commercialization of entrepreneurial university concepts at ITB. This research is a qualitative research by conducting literature studies and in-depth interviews. The results of this study will then be used to determine what steps can be taken by the Bandung Institute of Technology to increase the success of the commercialization of the entrepreneurial university concept.

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I. INTRODUCTION

Nowadays, the 4.0 Industrial Revolution proves the rapid pace of science and technology in the global world. Indonesia as a country that has a wealth of natural resources is no longer dependent on natural resources to sustain its economy. At present, Indonesia has increased the knowledge needed to be able to compete and great in the industry 4.0. Therefore, this needs to be anticipated by qualified human resources in terms of information technology and innovation that comes from higher education.

In the era of globalization, universities in facing global challenges can take advantage of innovations

produced by the academicians. The Ministry of Research, Technology and Higher Education appreciates innovations produced by universities because science, technology and innovation are seen as factors of the nation's capabilities. One potential source of a country comes from innovation produced from universities, research & development and natural resources and human resources can become a national economic power.

KERANGKA SISTEM INOVASI NASIONAL

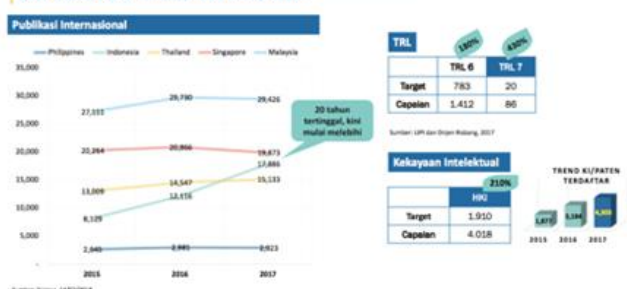


Picture 1: National Innovation System Framework

Source: Directorate General of Strengthening Innovation

The innovations produced are the coordination between 3 stakeholders including academics, industry and government in which the three have their respective roles, namely academics as innovators, industries as developers of innovation products and the government as providers of innovation climate.

KINERJA PUBLIKASI, TECHNOLOGICAL READINESS LEVEL, DAN KEKAYAAN INTELEKTUAL INDONESIA

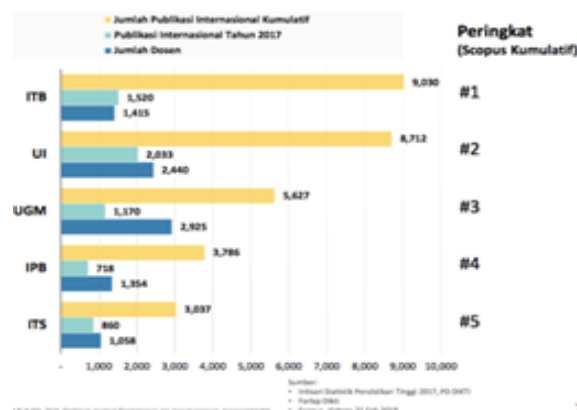


Picture 2: Publication Performance, TRL and IP Indonesia

Source : Scopus (2018)

The implimentation of the national innovation system has been proven from the performance of international publications from 2015 to 2017, always showing a positive value of 18,886 publications registered on Scopus. In addition, for the level of technological readiness, TRL also always shows achievement rates that always exceed the target. Then the number of patents registered also continues to increase until 2017 reaching 4303 patents that have been registered.

The achievement of growth every year on the performance of publications, TRL and Intellectual Property shows that the actual application of national innovation is already running and to increase international competitiveness, the innovation is needed commercialization. This is in line with the objective of the Legal Entity State University (PTNBH) being encouraged to continue to improve its international competitiveness by releasing its inventions or research results to industries and businesses, to become new innovation products. One PTNBH that is actively undertaking commercialization efforts through the inspiration of its invention (invention) to become an innovation is ITB.



Picture 3: National Innovation System Framework

Source : Directorate General of Learning and Student Affairs KEMENRISTEKDIKTI

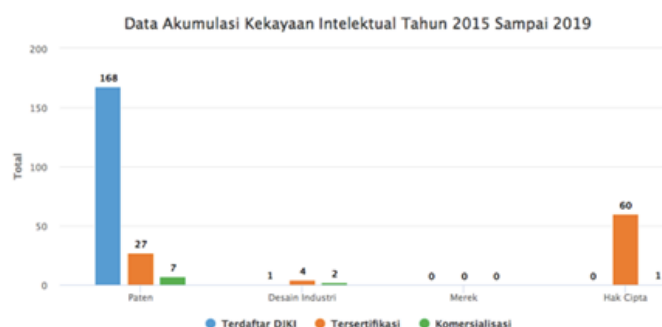
ITB is known as one of the universities that excel in science and technology which is the university with the highest rank in the cumulative scopus ranking. ITB has also a PTNBH institutional status so that it has financial autonomy in managing its funding. This makes ITB able to obtain funds from non-governmental parties pro-actively and sustainably in developing efforts to collect funds from multiple sources, one of which is by establishing a medium or business department under the coordination of ITB's vice-chancellor, the Institute for Entrepreneurship Innovation Development (LPIK).

As a university that spurred on entrepreneurial university goals, ITB formed an Institute for Innovation and Entrepreneurship Development of ITB (LPIK-ITB) aimed at encouraging the utilization of research results at ITB where as universities with superior human resources are required to have the ability to solve the nation's problems through innovation. LPIK ITB there are various program activities related to innovation, namely building an entrepreneurial culture that can be applied to the entire ITB academic community. But in its execution, ITB is still superior to the obstacles in the downstreaming of innovation products as indicated by the results of startups and research that has a lot but still little in commercialization. The reason for this is because several challenges were found both from internal and external the LPIK ITB environment, thus affecting the least amount of commercialization in LPIK ITB.

Previous researchers thought that a study had to go through a stage of commercial exploitation so that it could be called an innovation (Roberts, 2007 in Widjaja, 2011). Some experts say that the findings can be called as the results of innovation if it has gone through a commercialization process and through this commercialization process an innovation can have an impact on the economy and society. Through commercialization of the results of new research can be felt its use value by other parties. The intended use value can be in the form of financial benefits or solutions to problems in the community. Innovation will have a higher use value if it can create new jobs so that it has a direct impact on people's welfare.

One important factor to commercialize research results is to know the market potential. In this case, business or industry do better understand market conditions and needs. Therefore, in commercializing research results it is better to do it in coordination with the industry. The institution that brings together industry and inventors from the academic environment at ITB aims to accelerate the commercialization process so that the findings

produced can be an innovative product that can enter the market so that they are able to be mass produced and useful to the community.



Picture 4: Intellectual Property Accumulation

Data for 2015 to 2019

Sumber : LPIK ITB

The intermediary department that connects ITB's academic environment with the industrial environment is LPIK ITB which builds an entrepreneurial culture that aims to encourage entrepreneurial interest so that research or findings from ITB academics can be commercialized. Although there is an LPIK as an intermediary and support institution to encourage innovation, there are still challenges in ITB both internal and external in realizing commercialization. This is in line with the data obtained from LPIK ITB in Figure 4 regarding the number of patents that are still small in the commercialization stage even though the number of registered patents has been many.

The challenges in the stages of realizing commercialization in ITB show that in the ongoing 4.0 industrial revolution, although ITB is an entrepreneurial university that excels in science and technology and is proven to have researchers or graduates who have high intellectual property, ITB has not been able to optimize the results Innovative products created by the medium that facilitate ITB academics for entrepreneurship (LPIK) because the number of innovative products that are successfully commercialized are still small when compared to the innovation products that have been created. Based on the description above, the main problems that exist are divided into two questions as follows:

- What are the challenges faced by LPIK ITB in the process of commercialization of innovative products at ITB?
- What is the strategy that needs to be carried out by LPIK ITB in order to address these challenges?

The results of this study in addition to academic purposes, are also intended for practitioners. The results are expected to be a solution for entrepreneurial universities as well as institutions which are PTNBH so that they can improve innovation products at their universities. Finally, this research will describe every challenge faced by the university, both external and internal, and what are the strategies that can be taken to overcome these challenges.

II. METHODOLOGY

The research approach is used by researchers as a way to answer the main problem. Therefore, researchers choose an approach in order to answer the research thoroughly. The approach chosen in this research is a qualitative approach. In this study data were collected through a qualitative approach which is a process for understanding a social, economic and cultural phenomenon (Creswell, 2010).

In qualitative research requires researchers to collect as much data as possible about materials that will support research such as patterns, laws and applicable principles. At the end of the study, researchers can write conclusions from the analysis that has been done. The reason researchers used a qualitative approach because it is still the main in this study can be described which can form an understanding of the things being studied which are then developed with the theories used in this study.

The research instrument used was a literature study technique. Literature study is a data collection technique that is done by finding data by analyzing various sources of information as secondary data sources such as books, scientific papers, legislation or other documents that have links with this research. In addition, research instruments in data collection were also observed in depth interviews to

obtain primary data. Through the interview method, several related parties aim to explore more comprehensive information related to the process of interaction and the creation of an entrepreneurial culture and the challenges of commercialization in LPIK. With this method, the resource persons involved are the board of LPIK namely the Expert Staff of the Incubator Division or other designations are the LPIK Incubator Manager (Aprillia Annisa, S.I.P., MBA) and LPIK program participants as well as students namely Terry Dioni. To answer the research questions, the analysis will be based on the University of Entrepreneurial theory according to the OECD and to identify the challenges in commercialization several related theories will be used. Existing theories will also be strengthened from internal LPIK data.

III. RESULT AND DISCUSSION

Higher education is a very important institution in developing technology because there is potential expertise regarding science and technology, and its development. However, not all universities have been able to use research and technology and utilize it commercially. Remembering the definition of Commercialization in University is a systemic effort undertaken to provide commercial value for the development of a technology based on basic research and also for the development of a product that has a technology base that has been developed by the said University (Nasution, Djuanda, Rachmah, 2009, p .1).

Considering how important the role of the universities in making changes for the nation in producing qualified human resources in order to create prosperity for the community, universities with a suitable concept for our nation are needed. The right Universities are the ones who are able to balance the needs of the community by using technology research and innovation and also using it commercially. To answer this need, Entrepreneurial University is the right solution because Entrepreneurial University is an educational institution that can be a place for students or

academic staff to learn entrepreneurship both theoretically or practically in doing business. The existence of universities in an innovation ecosystem is in harmony with the triple helix model which proposes that the innovation ecosystem can be managed in three perspectives approach: government, universities, and industry (Etzkowitz & Leydesdorff 200, p.109).

The concept of entrepreneurial university that is discussed in this study is based on the Bandung Institute of Technology (ITB) since this concept has become a target to be achieved by the end of 2020. This study is strengthened by the concept of Entrepreneurial University listed on the ITB Strategic Plan 2016 - 2020 which contains three main points in it, namely: a) Strengthening ITB as a Research University towards Entrepreneurial University by developing an innovation ecosystem and increasing entrepreneurial programs b) Increasing the role of ITB as a pioneer in providing the best contribution to the nation and country c) Increasing the quality and quantity in the fields of education support system, research and community service activities, innovation and entrepreneurship.

In the current era of knowledge based economy, universities face increasingly complex challenges. There is a paradigm that a reformation towards Universities is needed so that in addition to producing research graduates, transferring technology to society, universities also produce innovations that can improve the competitiveness and welfare for the nation and its people.

In the concept of Entrepreneurial University, the three criterias are interconnected. Education is the basis of research. Education becomes a place of knowledge transfer that encourages the academic community to be a creator. Research is a way to apply knowledge after the knowledge transfer process occurs. Research is a synthesis of ideas in education towards a concrete thing. Innovation becomes a differentiator in research. The research does not stop at the publication of scientific journals or international seminars, but also the products and

services produced are able to be utilized by the public, industry and government at large.

In applying the concept of Entrepreneurial University, ITB uses an integrated reference resource which is called A Guiding Framework for Entrepreneurial University from OECD.

The active role of ITB as an Entrepreneurial University in supporting the government and industry is to fulfill the characteristics of 7 Entrepreneurial Universities established by the Organization for Economic Co-operation and Development (OECD), namely: 1) Leadership and Governance 2) Organization Capacity, People and Incentives 3) Entrepreneurship Development in Teaching and Learning 4) Pathways for Entrepreneurs 5) University - business / External relations for knowledge exchange 6) The Entrepreneurial University as Internationalized Institution 7) Measuring the Impact of the Entrepreneurial University.

The role of the Bandung Institute of Technology as an Entrepreneurial university is by prioritizing innovation both from a growing industry and in terms of resources owned by research institutions and universities. The potential for innovations in Indonesia is still constrained by the communication gap between research institutions, especially universities and industry. Therefore, to enhance cooperation between industry and universities in terms of innovation in national products, some form of institution is needed to provide space for industry and universities to complement each other's needs and exchange expertise.

As a university that spurs on target on The entrepreneurial university, ITB formed an Institute for Innovation and Entrepreneurship Development (LPIK-ITB) which aims to encourage the utilization of research results at ITB, where ITB as one of universities with superior human resources are demanded to have the ability to solve national problems through innovations. ITB Innovation and

Entrepreneurial Development Institution (LPIK) encourages innovation by endeavoring to undertake various program activities related to innovation by

building an entrepreneurial culture that can be applied to the progress of the nation.

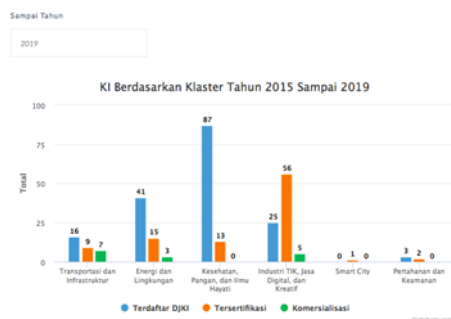
Researchers are interested in analyzing the object of ITB research because as an entrepreneurial university and also has the status of PTNBH (Legal Entity College). ITB as a university with PTNBH status has been proven to have produced a lot of innovation and startup research as shown in Picture 5.



Picture 5: Data Riset Inovasi dan Startup Tahun 2015 s/d 2019

Sumber : LPIK ITB

But the problems that occur among the innovation products that have been produced but which have been commercialized are only a few based on the data obtained from LPIK as follows:



Picture 6: IP Based on Clusters of 2015 to 2019

Sumber : LPIK ITB

In picture 6 it can be seen that intellectual property in the 4 priority clusters in ITB even though there are quite a lot of registered ones, namely 169 KI registered, but only 15 KI have been commercialized. This means that only about 8% of

the innovative products available at ITB can be commercialized.

Thus, researchers are interested in raising the issue of commercialization in ITB which is not yet optimal even though ITB is an entrepreneurial university. Therefore the analysis will be carried out using the entrepreneurial university theory according to the OECD to analyze the internal challenges encountered by LPIK ITB in commercializing:

1. Lack of entrepreneurial competence in teaching lecturers outside the faculties of business and management (faculty of engineering, faculty of, faculty of informatics etc)

The strategy used by LPIK ITB is related to entrepreneurial university theory on the third dimension, "Entrepreneurship development in teaching and learning", namely by maximizing teaching staff from business and management faculties to add workshop hours to lecturers outside the faculties of business and management. Although the actual workshop has begun, this has not yet had a significant impact on entrepreneurial competence for the lecturers. It is hoped that the added intensity of the workshops for these lecturers will increase their abilities and competencies so that the actual entrepreneurial spirit will be stronger and able to encourage students to become entrepreneurs.

2. There is still little interest from students outside the business and management faculties for entrepreneurship.

The strategy used by LPIK ITB is related to entrepreneurial university theory on the fourth dimension, Pathways for entrepreneurs. In this dimension LPIK ITB realizes to increase awareness and develop entrepreneurial skills among students, alumni, or lecturers. Especially for new students should be given a more thorough insight into the importance of having an

entrepreneurial spirit even though they are not students of the business and management faculty.

Through the divisions contained in LPIK namely the entrepreneurship division and the incubator division it is expected that not only business and management students who optimize this media but also other faculty students because the entrepreneurial university concept does not only encompass business and management faculties but should encompass the entire faculty in university.

Then for other divisions, it is the innovation park division which aims as a commercial area that is supported to spur ITB academic innovation. In addition there is a division of Law and Intellectual Property to manage intellectual property generated by ITB academics where it relates to the commercialization of innovation products.

While the external challenges encountered by LPIK ITB include:

1. Development funds are maximized for external partners

The strategy used by LPIK ITB is related to entrepreneurial university theory on the fifth dimension, namely Internal Relations for Knowledge Exchange. LPIK ITB is committed to collaborating and knowledge with external parties. LPIK has many partners and often partners to develop an entrepreneurial agenda by working with external parties rather than developing employee internal capacity. This is because the process to change it is not easy. In making changes to HR it is quite difficult so that more investment is diverted to outside ecosystems that are already ready. In connection with LPIK which is a medium or a bridge between internal and external, by doing partners it is expected that internal

parties can learn and achieve the goals expected by LPIK.

But in this case the funds owned tend to be used more to be given to external parties or initiators such as Lintasarta, therefore, if the funds can be managed and used for investment in internal development, it will be better because internal parties can be a catalyst and innovation can be achieved. more leverage so that commercialization will also increase.

2. Difficulties in costs for paying employees

The strategy used by LPIK ITB is related to entrepreneurial university theory on the second dimension, Organizational Capacity and Incentives. In the tenants at LPIK ITB, the difficulty that is not uncommon is related to the costs incurred to pay employees, even though those startups are financially just starting, but have dared to incur costs and recruit others where it will certainly be very costly.

LPIK ITB can direct conducting partners or businesses with other parties, or joint ventures and other parties can be used as co-founders so that it can benefit both parties. Therefore LPIK ITB has an innovation ecosystem model that is being implemented while being developed with ITB now where the end of the innovation from stakeholders in ITB can end in a joint venture (the product can be developed commercially).

IV. CONCLUSION

In this study the challenges identified by LPIK ITB have been identified in the commercialization process of innovative products at ITB. The role of LPIK in enhancing innovation is as a medium in learning and deepening innovation as well as acting as an intermediary between the academic environment and industry and also the community so that it will bring benefits to enrich intellectual property and the quality of ITB research while at the

same time producing solutions to community problems so as to improve welfare.

The strategies used by LPIK in overcoming the entrepreneurial agenda are increasing the intensity of hours of entrepreneurship workshop implementation for all lecturers, instilling an entrepreneurial culture mindset for all faculties, students and lecturers, maximizing capacity building for internal parties of LPIK ITB and implementing joint ventures.

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