

The Role of Administration in Higher Education in Supporting the Commercialization of Research's Products

Carolina Lasambouw*, Ediana Sutjiredjeki, Neneng Nuryati

General Service Unit, Electrical Engineering Department

Politeknik Negeri Bandung

Bandung, Indonesia

*carolina.magdalena@polban.ac.id, e_sutjiredjeki@yahoo.com, nnuryati@gmail.com

Abstract—Polytechnic as a Vocational Higher Education in Indonesia is under pressure to strengthen the quality of their research products in order to keep going beyond the demand of the society and the industries. Research is an investment for improving people's welfare and increasing economic value. Therefore, commercialization of innovation products from higher education to industry become one of the criteria to measure the institution research performance and reputation. Consequently, the support of administration function become very important. However, nowadays the administration roles regarding the commercialization of research product at Polytechnic tends to be negligent. This paper describes the aspects of commercialization research's product as a strategy to strengthen Polytechnic research performance. The case study conducted at Bandung State Polytechnic was to understand and evaluate the activities of commercialization and functioning of its administrative support structure. Qualitative research methods and semi-structured interviews have been used toward ten respondents. Basically, the exploration shows thirteen researcher's main tasks that need administrative support which are developed into a research administration framework for higher education.

Keywords—administration; higher education; research product; commercialization

I. INTRODUCTION

Polytechnic as a Vocational Higher Education in Indonesia is under pressure to strengthen the quality of their research products in order to keep align, even going beyond the demand of the society and the industries. The Ministry of Research, Technology and Higher Education affirmed that "the results of high quality research and community service can contribute significantly to the improvement of the nation's competitiveness" [1]. Research is an investment for improving people's welfare and increasing economic value. Therefore, commercialization of innovation products from higher education to industry become one of the criteria to measure the institution research performance and their reputation. Consequently, the support of administration function become very important. However, nowadays the administration roles regarding the commercialization of research product at Polytechnic needs to get more attention in order to support the higher education responsibility which is become wider.

This paper attempt to describe the results of a qualitative study on the administration of research in Polytechnics to support the commercialization of its product. The administration is positioned as one of Polytechnic strategy to strengthen the institution research performance. The contents of this paper were developed based on case studies conducted at the Bandung State Polytechnic using a semi-structured interview method. The description in this paper consists of 3 parts, namely higher education and research, commercializes of research products, and the role of administration in supporting successful commercialization of research products.

II. HIGHER EDUCATION AND RESEARCH

In the year 2025, Indonesia is aiming at becoming a country which have human resources' that able to compete on both, the regional and international level. One among the government's efforts to achieve the goal is by strengthening the research conducted by higher education through the implementation of research decentralization policy as a part of higher education autonomy. The Indonesian Law Number 12, regarding higher education stated three main duty and function of higher education, they are education and teaching, conducting research and community services [2]. Research can be positioned as the pillar that support education and community services duties. The law also confirm that the aim is to:

- Produce research that is in accordance with the national priorities set by the government;
- Ensure the development of seed-specific research based on comparative and competitive advantages;
- Reach and improve the quality in accordance to the target and researches results' relevancy for the people of Indonesia; and
- Improve the dissemination of research results and IPR protection nationally and internationally.

The purpose of the government is to push a change in the paradigm of research which originally tends to be the rights and responsibilities of individual researchers, to become the

concern and responsibility of the higher education institutions [3,4].

Formerly, the search of science/innovative product conducted through research is an attempt to seek answers to the questions post by the researcher/s, and researchers will feel satisfied when their research obtaining the answer. Especially if the answer is in accordance with the criterion of truth of the researchers [5]. Nowadays, focus of conducting research is not intended merely to satisfy the desire of the researcher alone. It rather becoming the concerned of the university. Research's products become an important aspect to establish the reputation of the university and it gradually evolved into the basis for measuring the success of its academic administration and financial management [6].

Furthermore, research splits knowledge into disciplines and fields/programs that provide a deeper understanding in an increasingly complex world. Whereas, in its development, there is an increasing awareness that the problems faced in the 21st century require a holistic understanding of knowledge on its various aspects [7]. This makes increasingly necessary for the research to be associated with the needs of the society, and this appears as a paradigm on the policy in higher education that is "the result of research need to contribute to improving the welfare of society and the nation's economy" [8]. Herein, research activities should be viewed as an investment, so that the results of the implementation of research activities should be optimal utilized.

III. COMMERCIALIZATION OF RESEARCH PRODUCT

Bearing in mind that research is one of the Higher Education (HE) duties, it leads HE as producer of innovative products. Research output can be defined as products produced from research, which can be classified into 14 types, ranging from scientific articles to academic texts/policy recommendations, product of technology and intellectual property. Bearing in mind that the current number of HE in Indonesia is over 3500, therefore products resulted of research have high potential to be commercialized. Jobber recognized this potential by stated that an innovation is considered successful when commercialized [9]. However, not all results of innovation are successful or can be commercialized [10,11]. Commercialization in this regard is defined as "a set of business activities, tasks, and actions that run in parallel with the ideas and product development processes and complete them so that new products can become commercially viable, tradable, and eventually successful on the market" [12]. Various studies on the strategy of commercialization have been carried out by previous researchers [11,13,14]. Anthony explains that in principle the commercialization of research products is not different compared to the commercialization of ordinary products, except more difficult in its implementation [4]. The difficulty is due to the stages of processing research's results into real market products, including capturing the needs of the community and the process of identifying the market for the product.

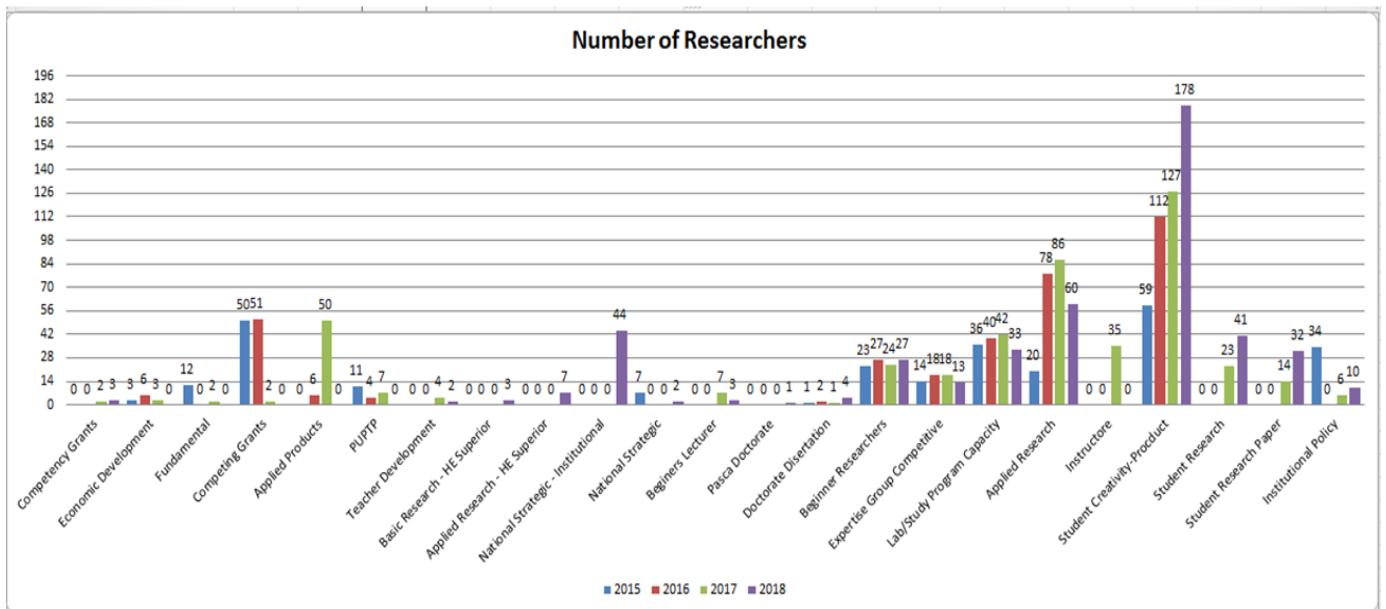
Even though the commercialization of research products in developed countries can be learned by developing countries such as Indonesia, however it is important to aware that there is a specific difference regarding the development of research product market. Commercialization of research results has long been encouraged to be done in Indonesia, but until now the results of research that has been successfully commercialized are still few in number. The process of commercializing research results has not yet become the main concern of various research institutions, especially for government-owned research institutions and universities [15]. According to Nurul the main problem of the incubation process or the commercialization of research results (patents) is a matter of funding, because commercialization can cost more than the research and / or patent process itself [16].

In regards to commercialization process, Goldsmith divides the commercialization process into three main phases [17], namely: (1) the concept phase, (2) the development phase (3) the commercialization phase. Each phase is divided again into several stages, namely investigation, feasibility, planning, introduction (full-scale), full-scale production, and maturity. Whereas according to other researchers the process of commercialization of research results consists of four stages namely: search stage for research institutions as innovative resources; the stage of selecting research products that have the potential to be commercialized and to build multidisciplinary teams; the stage of developing research output to become a new product, and the stage of commercialization that is when innovation is launched into the market [18-23].

IV. RESEARCH IN POLYTECHNIC

Politeknik Negeri Bandung (POLBAN) is one of the largest vocational higher education in Indonesia. Currently it has 10 departments that administer 41 study programs, and supported by nearly 600 permanent lecturers. In the age of more than 35 years, POLBAN has contributed considerably to improve national competitiveness, especially in the field of providing skilful human resources for the industry and public institutions through their graduates. Additionally, POLBAN is also contribute in other areas such as provide support for increasing industrial competitiveness, developing science and technology including its application, strengthening small-scale industries and medium enterprises, and solving existing problems in the community. Various ways were used to contribute, including conducting joint research, and dissemination of research products conducted by POLBAN's for the industries or the community.

Currently, the potential to optimize the utilization of innovation products produced through research are high. This is due to the large number of products resulted from the academician research. As most of the research schemes are applied research, so the nature of products resulted from the research activities tend to be applied products. Figure 1 below shows the growth of research activities in POLBAN for the last four (4) years (2015- 2018).



Source: POLBAN Research Centre 2019

Fig. 1. Growth of research in POLBAN year 2015-2018.

As can be seen in figure 1, in average every year the number of research conducted by the lecturers was increased. For the last four years approximately 986 research's titles have been conducted with more than 199 lecturers involved in the research activities each year. However, the involvement of the lecturer in research activity is low compare to the total number of lecturers. This means that there is wide opportunity to increase the lecturer capacity in conducting quality research.

In regards to the kind of research product, there is a tendency of POLBAN lecturers to pursue applied research activities. Applied research is an original investigation undertaken in order to gain new scientific practical aim or objective. Applied research develops ideas into operational forms [9]. This form of research is in accordance with the type of education carried out by polytechnics which is vocational education [2]. The aim of those kind of research is to find solutions for overcome the arise problems. Furthermore, it is stated that "people cannot foresee the future well enough to predict what's going to develop from basic research. If we only did applied research, we would still be making better spear". Since the result from applied research is a solution to the current problem in the society, applied research tends to have economic value which can be directly enjoyed by the researcher/institution.

V. RESEARCH ADMINISTRATION

Administration is a process of systematically arranging and coordinating the human and material resources available to any organization for the main purpose of achieving stipulated goals of that organization [24]. When applied to school system, the process is refer to as educational administration. The focus is the enhancement of teaching and learning. Thus educational administration can be defined as a process through which the school administrators arrange and coordinate the resources available to education, for the purpose of achieving the goals of

the educational system. While management is a term most often used to describe industrial activities. Management is getting things done through others. Management is the coordination of all resources of an organization through the process of planning, organizing, directing, and controlling in order to attain the objectives.

In regards to research, the word research management is more familiar and often been used. As a branch of science, research management has existed for over a century although it constantly faces various dilemmas in its development. It is aware that research management is a complex process, compounded with constant change and numerous challenges [25]. Currently, research management has become a more expansive concept. It does not only include the selection of individuals who will be assigned to manage research activities or efforts to improve the capacity of staff related to research management within the university environment in order to be able to manage optimally and professionally. It covers the whole holistic aspects of research management. Connell confirmed that "The growth of research management as a company is specialized and professional field of activity over the past decade has been striking" [26]. This is reinforced by Purwo Santosa findings that: "Anyone attempt to Enhance research capacity would have to encounter with the external environment, structural factor of the which serves as hardware and cultural factors roommates serve as software for allowing the research community engage in a political dynamics" [27]. There are three factors related to strengthening the ability of universities to manage research. Two factors relating to internal university matters: they are factor related to structure of the organization as a hardware and factors related to organizational culture as software. The third factor is the factors relating to the external environment of the university. Furthermore, Santoso's opinion on these three factors is in line with Green and Langley research results on research governance [28]. They suggest that

the process of conducting research governance manifested in the form a diverse set of activities undertaken by the research manager or as formerly stated by Cole that many scholars predicate the existence of research management on functions performed by the research administrator [29-31]. The role of research administrator, even if the term of “research manager” is more common, is mainly seen as entailing the function of assistance to faculty in carrying out research, to represent university interest. Bearing in mind the changing conditions surrounding research present new opportunities and challenges, the competences of the research administrator must change accordingly.



Fig. 2. Aspect of research management [32].

	Technical	Market	Business
Investigation	Technology Concept Analysis	Market Needs Assessment	Venture Assessment
Development Phase			
Feasibility	Technology Feasibility	Market Study	Economic Feasibility
Planning	Engineering Prototype	Strategic Marketing	Strategic Business Plan
Introduction	Pre-Production Prototype	Market Validation	Business Start-Up
Commercial Phase			
Full Scale Production	Production	Sales and Distribution	Business Growth
Maturity	Production Support	Market Diversification	Business Maturity

Fig. 3. Aspects of commercialization [17].

As shows in figure 2 that there are 13 aspect of research management. While figure 3 presenting six steps to commercialize product of technology. Bearing in mind that the results of research conducted by the academic community are directed to be commercialized in order to encourage economic impact for the community and researchers as inventors, therefore the role of a research manager must be able to capture competencies shown in figure 2 and 3.

Including the roles of a manager; quasi-researcher; interpreter and communicator of “scientific information” into common language, financier; lawyer; market analysis; and marketing. This current roles are additional to the research administrator traditional roles [32] which including: “understanding the principal investigator’s (PI) research; assisting the PI with pending funding opportunity information; promoting positive relationship between the PI and research sponsors; helping the PI apply for a grant or contract; especially through assistance with budgets, forms, deadlines, approvals, and signatures; recording and reporting on related institutional information; ensuring that the PI’s proposal complies with institutional policies and sponsor requirements; assisting the PI’s with financial and managerial aspects of awards; ensuring the integrity of the institution’s financial and nonfinancial process related to the research function”.

VI. CONCLUSION

The research paradigm carried out in higher education is not for the sake of research but must be encourage to become an investment that is beneficial to the community and can contribute to improving the economy. In order to optimize the potential of research to be successfully commercialized, the role of a research administrator becomes very important. The ability that must be possessed by the research administrator must include the ability to manage research carried out by the student and lecturer within their institution as well as the ability to manage the commercialization of the product of the research.

This research is still on progress and currently researchers are visiting 20 universities in Indonesia to validate the role of the research administrator in commercializing the research products. The next plan is to develop competency standards for research administrator position.

REFERENCES

- [1] Ministry of Research, Technology and Higher Education Republic of Indonesia, Guidelines for the Implementation of Research and Community Services Book, Ed. XII, 2018.
- [2] Law of the Republic of Indonesia Number 12 Year 2012 on Higher Education.
- [3] Organisation for Economic Co-Operation and Development (OECD), Higher Education to 2030, Vol 2: Globalisation, Centre for Educational Research and Innovation, 2009 [Online, retrived from: www.oecd.org/publishing/corrigenda]
- [4] Research University Futures Consortium (RUFC, The Current Health and Future Well-Being of the American Research University – A Report, 2012 [Online, retrived from: www.researchuniversitiesfutures.org]
- [5] D. Satori and A. Komariah, Metodologi Penelitian Kualitatif, Bandung: Alfabeta, 2011.
- [6] G. Tassej, “Annotated Bibliography of Technology’s Impacts on Economic Growth,” National Institute of Standards and Technology [NIST], Gaithersburg, 2009.
- [7] A. Gibb, G. Haskins, and I. Robertson, I, Leading the entrepreneurial university: Meeting the entrepreneurial development needs of higher education institutions. In Universities in change, pp. 9-45, NY: Springer, 2013.

- [8] Ministry of Research, Technology and Higher Education Republic of Indonesia, *Guidelines for the Implementation of Research and Community Services Book*, Ed.XI, 2018.
- [9] D. Jobber, *Principles & Practice of Marketing*, 3rd edition, pp. 278 – 316, Mc GrawHill publishing Company, 2001.
- [10] T. Caulfield and U. Ogbogu, “The commercialization of university-based research: Balancing risks and benefits,” *BMC medical ethics*, vol. 16(1), pp. 70, 2015.
- [11] G.B. Jordan, *A Logical Framework for Evaluating the Outcomes of Team Science*. In *Workshop on Institutional and Organizational Supports for Team Science*, National Research Council, Washington, DC, 2013.
- [12] E. Erkkö, *User Research in Commercialization - Why and How*, 2016.
- [13] L. Lipkova and D. Braga, *Measuring commercialization success of innovations in the EU*, 2016.
- [14] P. Masudian, M.R. Farhadpoor, and N. Ghashgayizadeh, “Commercializing University Research results: A Case Study by Behbahan Islamic Azad University,” *Library Philosophy and Practice (e-journal)*, pp. 2-26, 2013.
- [15] K. Mohannak and L.A. Samtani, *A criteria based approach for evaluating innovation commercialisation*, 2014.
- [16] T. Penfield, M.J. Baker, R. Scoble, and M.C. Wykes, “Assessment, evaluations, and definitions of research impact: A review,” *Research evaluation*, vol. 23(1), pp. 21-32, 2014.
- [17] H.R. Goldsmith, “A model for technology commercialization” In *Proc. Mid-Continent Regional Technology Transfer Centre Affiliate*, 1995.
- [18] K.R. Allen, *Bringing new technology to market*. Upper Saddle River, NJ: Prentice Hall, 2003.
- [19] H.W. Chesbrough, *Open innovation: The new imperative for creating and profiting from technology* Boston, MA: Harvard Business School Press, 2006.
- [20] C.M. Logar, T.G. Ponzurick, J.R. Spears, and K.R. France, “Commercializing intellectual property: A university-industry alliance for new product development,” *Journal of Product & Brand Management*, vol. 10, pp. 206–217, 2001.
- [21] K. Miller, R. McAdam, S. Moffett, and M. Brennan, “An exploratory study of retaining and maintaining knowledge in university technology transfer processes,” *International Journal of Entrepreneurial Behaviour & Research*, vol. 17, pp. 663–684, 2011.
- [22] J. Tidd and J. Bessant, *Managing innovation.*, Chichester: Wiley, 2009.
- [23] C. Karaveg, N. Thawesaengskulthai, and A. Chandrachai, “Evaluation model for research and development commercialization capability,” *Production & Manufacturing Research*, col. 2(1), pp. 586-602, 2014.
- [24] C.A. Eric, *Introduction to Educational Administration: A Module*. Harey Publication, Port Harcourt: Nieria, 2008.
- [25] L. Tauginiene, “The roles of a research administrator at a university,” *Public Policy and Administration*, col. 1(30), pp. 45-56, 2009.
- [26] H. Connel, *The Challenges of Research Management: Developing a Research Strategy and Funding It*, European University Association, Barcelona, 2004.
- [27] P. Santoso “Managing Transformation Toward An International Research University: Lesson-Learned From Gajah Mada University,” Paper presented at UNESCO Forum on Higher Education, Research and Knowledge Colloquium on Research and Higher Education Policy, 2006
- [28] J. Green and D. Langley, *Professionalizing Research Management*, Lodon: University of Bristol-PRM Report, 2010.
- [29] S.S. Cole, “Research Administration as a Living System,” *Journal of Research Administration*, vol. 38(2), pp. 14-27, 2007.
- [30] L.E. Miner, J.T. Miner, and J. Griffith, “Best–and Worst–Practices in Research Administration,” *Paradigmas: Una Revista Disciplinar de Investigación*, vol. 2(2), pp. 87-103, 2007.
- [31] C.M. Lasambouw, “Research management in Vocational Higher Education in Indonesia: policy and practice in Bandung State Polytechni,” *TVET Asia*, no. 4, pp. 1-16, 2015.
- [32] M. Landen and M McCallister, “The Research Admsinitrator as a Professional: Training and Development. In Tauginiene Loreta,” *The Roles of A Research Administrator At A University*, *Journal of Pulic Policy and Administration*, no. 30, pp. 45-56, 2006.