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Mapping Potential Commercialization of Research Results Through Valuation and Technology Readiness Levels

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Abstract: Downstreaming the results of 'lecturers' research is a strategic activity to improve the performance of a higher education institution (HEI) which requires research on mapping the commercialization potential. This research aims to understand the role of research centres in the commercialization process and increasing start-ups at one Indonesian university, Universitas Jambi (UNJA). Besides, this research maps the potential for commercialization assessed from the valuation system and technology readiness levels (TRL). This research is important for achieving the institution vision of " a world-class entrepreneurship university based on agroindustry and environment". The results are expected to contribute to empirical thinking for formulating research policies. This type of research is descriptive qualitative, with research lecturers and leadership elements as the informants. The TLR of the research is 5, and the research output is in the form of publications in indexed international journals, international seminar certificates, and registered textbooks. The results of the study indicate that policies and programs to increase the commercialization of research results have been carried out. A start-up planning and valuation system has also been done and has a good opportunity to increase the commercialization of research results.

Keywords: Potential Commercialization, Research Results, Valuation, Technology Readiness Levels

INTRODUCTION

Entrepreneurial process involves all activities, functions and actions related to seeing opportunities and creating organizations (Barot, 2015). According to (Sarwoko & Hadiwidjojo, 2013) entrepreneurial characteristics have a significant influence on business performance. entrepreneurial competence as a mediation in the relationship between entrepreneurial characteristics and business performance. An entrepreneur is a person who has the characteristics of being responsible for compiling, managing and measuring the risks of a business venture. If in conducting research, lecturers have an entrepreneurial spirit and behavior, the effect on the achievement of UNJA performance is expected to be positive and

significant. One of the characteristics of an entrepreneurship university is how the results of 'lecturers' research can be used not only for education and teaching, but also to increase networking and commercialization. Research is one of the evidences of the scientific contribution of researchers in universities, so research results must be able to be utilized and commercialized. The strength of an entrepreneurial university is its ability to develop networking in the context of commercialization with many potential partners, especially international. This is in accordance with what is regulated in Law Number 12 of 2012 concerning Higher Education, in particular article 46 which describes the obligation to parse research results. For this reason, the process towards the commercialization of research results requires an integrated system and scheme. To be commercialized, of course, industry is the right way. Industry requires innovation, which of course is born from research (Suryahartati, 2019). But the problem is, not all research lecturers evaluate research. So it is difficult to determine the value of the technology found for the marketization or commercialization process.

Determination of the feasibility of research results for commercialization depends on the level of research readiness (TRL). Commercialization will be successful especially for research products that have passed laboratory testing and entered the actual market conditions. Many research results can not lead to commercialization because some obstacles that ultimately are in the ''valley of 'death', stop at one stage and cannot continue at another stage. TRL is motivated by the need for a shared understanding of technological maturity (Salazar & Russi-Vigoya, 2021). TRL can inform assessment and planning activities. TRL assessments can be used to monitor progress in emerging technologies, and to identify and manage risks associated with specific technologies (Olechowski et al., 2020). This identification is very important to see research products that can be commercialized to provide information based on empirical studies that are very useful for UNJA to determine strategic policies related to the commercialization of lecturer research results. Four research problems are formulated.

1) What is the contribution of research and community service institutions in the process of commercializing the research results of lecturers and the positioning of UNJA as an entrepreneurship university?
2) What is the potential for pre-startup to lead to start-up (scaling) and start-up sustainability at UNJA?
3) How is the mapping of the potential for commercialization of the research results of lecturers at UNJA based on the valuation system?.
4) How to map the commercialization potential of UNJA 'lecturers' research based TRL?.

METHOD

The study

UNJA's development program towards a world entrepreneurship university based on agroindustry and environment refers to eight important issues, namely: 1) the participation of lecturers and students in international academic activities, 2) UNJA's role as host of international academic activities, 3) the number of foreign students and lecturers, 4) the number of international publications and intellectual property rights, 5) the number and quality of collaborative research and international service activities, 6) accredited laboratory facilities and libraries, and 7) business unit as a source of funding and 8) creative and innovative research that supports the implementation of entrepreneurial education that quality, both at the national and international levels. The strategic objectives of the UNJA 2010-2025 are divided into 3 stages with different themes but in a continuous pattern covering the following stages: a) Phase I (2012-2020) with the theme of Institutional and Facility Capacity Building Research (Institutional Capacity Building and Educational Facility). At this stage the objectives include increasing the number and quality of research conducted distributed to various fields of science,

integrated based on the leading research roadmap of UNJA, as well as increasing the dissemination of research results, patents, publications, and textbooks; b) Phase II (2016-2024) with the theme of Strengthening Research Governance towards competitive research. At this stage, the targets include increasing excellence-based research and partnerships, increasing the dissemination of research results and patents and industrial applications, national-scale research collaborations, national seminars, publications, patents, and textbooks; and c) Phase III (2021-2025) with the theme Internationalization. The targets at this stage include increasing local resource-based research for global competitiveness and industrial needs, increasing national and international research collaborations, increasing the dissemination of research results and industrial applications, and generating income, and generating sustainable income, seminars, publications, patents. and textbooks.

Each theme rests on 3 main pillars, namely: Equity and Expansion of research access; Improving research quality, relevance, and competitiveness of results study; and improved governance, accountability, and public image research. UNJA research centre (URC) policy direction is based on performance achievements and SWOT analysis. URC seeks to plan activities to optimize strengths, overcome weaknesses and obstacles, as well as responding to opportunities in the achievements of previous years. Quality improvement and research development is an important part for UNJA. Based on the SWOT analysis and the current condition of Phase III (2021-2025), the policy direction until 2024 is as follows: 1) Improving the competence of Unja lecturers in the field of research, community service, scientific publications, and the acquisition of intellectual property rights; 2) Supporting the acceleration of the acquisition of professors at Unja lecturers by providing grants research and facilitate the publication of reputable international journals; 3) Improving research collaboration between domestic and foreign universities; 4) Involving students in research activities and community service; 5) Increase cooperation in research activities and community service with community partners, industry, and government; 6) Increase the number of study centers and encourage status changes to become centers excellence in science and technology or center of excellence (CoE) or Center for Institutional Excellence (PUI); 7) Encourage research results-based entrepreneurship in an effort to commercialize the results obtained; 8) Improving the management of research journals and community service journals on URC; 9) Making URC as a place for research information and community service; and 10) Creating a path to a world class entrepreneurship university by building sustainable data-driven system.

To encourage entrepreneurship based on research results in an effort to commercialize the results obtained for achieving the vision of becoming an entrepreneurial university, research is needed that can map the results of ’lecturers’ research that is ready to be commercialized. In 2021, UNJA research fund is IDR 20,342,065,000, which is grouped into basic research, applied research and development research with a total of 800 research titles. In each title funded by researchers, lecturers are required to show research performance in the form of research outputs or outputs in accordance with their Technology Readiness Level. Based on observations, the amount of research funds spent is still relatively small to produce research results in the form of technology, models or policies that can be marketed or offered to partners. On the one hand, UNJA has launched a vision for the future that must be achieved, namely, to become a world class entrepreneurship university based on Agroindustry and the environment. Of course, to achieve this vision, strategic policies, programs and procedures are needed that lead to this achievement. From the aspect of research, both lecturers and research results must be able to be used to strengthen the achievement of the vision, it is necessary to provide empirical information on how the research carried out by lecturers relates to the acceleration of achieving ’UNJA’s vision.

This type of research method is descriptive qualitative with the aim of getting a complete picture of the phenomenon under study, carried out in stages to know and understand the truth

through: (a) interpretation: data collected from text descriptions, references, facts, or historical events captures the value, meaning and intent through library research, (b) internal coherence; namely an attempt to understand correctly to obtain the essence by showing that all structural elements are seen in a consistent structure, so that they are internal structural or internal relational, and (c) analytical description; that is, all research results must be able to be described. Description is one of the essential elements to find the basic idea in a certain reality. An attempt to represent the reality perceived by the five senses (signified), which is followed by a comprehensive analysis of all existing understandings (content analysis).

The data is collected from text descriptions, references, facts or historical events, the values, meanings, and intentions are captured through library research (library research). Data collected from various sources. The extracted data consists of primary data comes from the construction of ideas of lecturers who embodied in research products at URC and secondary data is data that supports the completion of this research to achieve universal values derived from literature studies, journals, and other reports. The samples of this research are key informants, namely people who are used to provide information about the situation and conditions behind the research. The samples were lecturers that the number of UNJA's lecturers in 2021 and those involved in research activities were 794 people. If 10% -15% is taken for informants, then the research informants are 80 -119 lecturers from UNJA

Data were obtained from various sources, using various data collection techniques (triangulation), and were carried out continuously until the data were collected. Data analysis in this study was carried out through three activities that occurred simultaneously, namely data reduction, data presentation, and drawing conclusions or verification. Data reduction is a data analysis process carried out to reduce and summarize research results by focusing on things that are considered important by researchers. Data reduction aims to facilitate understanding of the data that has been collected so that the reduced data provides a more detailed picture. Display data, namely data from research results that have been arranged in detail to provide a complete picture of the research. Data collected in detail and thoroughly then look for patterns relationship to draw the right conclusions. Data presentation then compiled in the form of a description or report in accordance with the results research is obtained. Finally, conclusion is the final stage in the research process for give meaning to the data that has been analysed.

RESULTS AND DISCUSSION

Entrepreneurship

Entrepreneurship is a discipline (Croci & Croci, 2016). Entrepreneurship becomes a discipline (Croci & Croci, 2016) also defines entrepreneurship with autonomous disciplines that can operate independently or interdisciplinary. (Jo Chang & Wyszomirski, 2015) stated that "art entrepreneurship is a relatively new research topic and its focus area is exploring entrepreneurial management processes such as creativity and autonomy, adaptability, and creating artistic and economic and social value". Meanwhile (Barot, 2015) states that the entrepreneurial process involves all activities, functions and actions related to seeing opportunities and creating organizations to pursue them. Entrepreneurs are the founders, owners, and managers of small businesses (Stam et al., 2014; Zhao et al., 2010). Entrepreneurs are the backbone of almost all countries around the world (Jamak et al., 2014).

An entrepreneur is a person who thinks in an emergency, but can still help him out of the difficulties he faces, including overcoming poverty without the help of government or social institutions and in normal circumstances (not an emergency) an entrepreneur is able to make himself advanced, rich, physically and mentally successful. (Utami & Mulyaningsih, 2017). Baumol (Baumol, 1990) defines entrepreneurs broadly as 'people who are astute and creative in finding ways to increase their own wealth, power and prestige (Szirmai et al., 2019). Meanwhile (Hermanto & Suryanto, 2017) states that an entrepreneur has an important role both

internally and externally. Internally, an entrepreneur can reduce the level of dependence on others, increase self-esteem, and increase purchasing power. While externally, entrepreneurs are employers. Meanwhile, Chang concluded that entrepreneurship is an activity that changes old habits into new habits with full discipline and independence. Entrepreneurship is an art (Jo Chang & Wyszomirski, 2015).

Entrepreneurial Characteristics

According to (Sarwoko & Hadiwidjojo, 2013) entrepreneurial characteristics have a significant influence on business performance. entrepreneurial competence as a mediation in the relationship between entrepreneurial characteristics and business performance. An entrepreneur is a person who has the characteristics of being responsible for compiling, managing and measuring the risks of a business venture. They are carriers of change in the business world who are individuals who do not easily give up in the face of various difficulties to pursue the success of the business they have started in a planned manner (Machfoedz, 2015). Meanwhile (Yaakub et al., 2020) entrepreneur personality consists of two broad dimensions; traits and demographics, entrepreneurial traits refer to the beliefs, values, and principles held by an individual. Traits are used to describe certain entrepreneurial attributes related to entrepreneurial tasks, such as need for achievement, locus of control, innovation, propensity to take risks, and self-efficacy. Meanwhile, the demographic characteristics of entrepreneurs show a person's attributes, such as gender, age, family background, academic qualifications, and experiences that entrepreneurs have accumulated throughout their lives.

Valuation and Commercialization

Higher Education is one of the institutions that become research centers around the world. Research requires support both in terms of material and non-material such as policies and systems. Research in higher education at its best is beneficial to human life. Higher education has the task of tri dharma. Research is one of the evidences of the scientific contribution of researchers in universities, so research results must be able to be utilized and commercialized. This is in accordance with what is regulated in Law Number 12 of 2012 concerning Higher Education, in particular article 46 which describes the obligation to parse research results. The process towards the commercialization of research results requires an integrated system and scheme. To be commercialized, of course, industry is the right way. Industry requires innovation, which of course is born from research (Suryahartati, 2019).

Research results must have their rights protected by law. John Kirkland stated: “The extent to which universities actively manage their research activity varies substantially from country to country. Even in more advanced systems, however, there is recognition that robust systems and procedures have only developed with any force during the last 20 years, and that the process is by no means complete”. (John Kirkland. 2008). The results of the research can be transferred to the technology through legal mechanisms. There are several ways to describe technology, whether it is about technology transfer or technology acquisition, such as delivery by sale (assignment, license, and know-how contract. According to Suyud Margono, by contractual), this naturally means that the owner of the transfer rights (the transferor) of the technology has a good intention to transfer the rights (consent to transfer) and the transferee has the intention to obtain the license rights (John Kirkland. 2008)

Higher Education must be able to create a management system and utilization of research results. According to Yuan-Chieh et al, research work involves many parties and staff involved to work on it, the basic financial framework is put in place and the results are written. Historically, however, much of this has been delegated to individual researchers, assuming that the agency's role is limited to engaging high-quality staff, and providing a basic framework within which they can perform to the best of their abilities (John Kirkland. 2008). able to create

a management system and utilization of research results will be able to stand tall in the face of various challenges. However, all of this cannot be separated from the policy of setting Intellectual Property Rights in a country.

There are many aspects related to the management and commercialization of research results. This has something to do with the research culture that occurs outside the campus, namely the industrial research culture which is quite fast moving. The research culture in universities is different from the research culture in industry. In the industrial world the Main Requirement is Intellectual Property Rights. This is where university research policies that are national to local in nature need synergy. The Industrial World will not take the risk of unsafe research results.

The Ministry of Finance stated that research funds for 2019 were allocated by the APBN amounting to 35.7 trillion spread across 45 ministries, which is still less than 20% of the budget for education. Of the allocation, only about 43.7% were actually used for research, the remaining 56.3% was spent on research support activities such as operational expenditures, science and technology services, capital goods, training and education. Even the use of the results of his research has not been felt by the public. The use of the research results, apart from not being felt directly by the user, the inventors have not felt the economic benefits as a form of downstreaming the research results.

In Indonesia, the downstreaming of research products and science and technology products has many obstacles. The weak level of technological readiness is the cause of delays in the downstreaming of research results from universities to industry. Technology transfer in a research is very necessary. This is where the commercialization of IP will be seen. With the transfer of technology, there will be a situation where every party involved in research should be appreciated without any disappointment. Technology transfer like it or not, like it or not, becomes important. Not all and or all of the inventions can be used without a legitimacy for: The exclusive right to work on or use the invention belongs to someone, Not all of the inventions used are useful for the work of an invention.

There are three principle mechanisms that can be used in describing the commercialization of an invention, namely: Assignment of rights with sale (Assignment); License (License) and Know-how Contracts. These methods and methods are produced from a research that meets the level of applicability that is usually used in higher education research. The level of readiness is measured by how mature the technology can be applied and adopted by potential users and users. In transforming research results to the public, it is necessary to know 9 levels of technological readiness. Which can be categorized into 3 groups, namely the concept and technology design group occupying levels 1 to 3. The prototyping and laboratory group occupies levels 4 to 6 and the industrial prototyping group level 7 to 9.

There are 4 things that must be considered so that a science and technology product can be utilized, namely: (a) Ease of reaching the market. (b) The form of organization used. (c) Developing partnerships. (d) Mapping risk factors. The university's policy regarding marketing is not yet supportive. Whereas university policies regarding intellectual property management are important to promote the inventions owned by the University. Then next find buyers or users of the technology. According to Rosenberg, collaboration between industry and academic research activities is needed to mobilize resources and test practical applications. This also has the opportunity to reach out to university networks and increase industrial collaboration and is useful in providing freedom of learning including internship opportunities and student work (Daniel, 2020).

To provide opportunities for research results to be accepted by the market, a good valuation system for research results is needed. Valuation of research results is a series of activities that provide an estimate of a research product. It is a process of identifying, measuring, and assessing the usefulness and significance factors. It is carried out by an

exchange system that involves a competent appraisal team (Subagyo). There are several valuation methods that are often used, namely cost-based, market-based, and income-based valuation. The three methods have advantages and disadvantages (Wibowo, 2017).

The process of commercialization of IP involves ideas, research and development, study results. Dissemination of information known as Transfer of technology has become part of research. Technology transfer brings benefits to technology in corporations or universities where a product becomes marketable. Many research results in universities are less marketable. This is due to the use of technology that is not well targeted, low quality and high costs. The popularity of using licenses for patents in Indonesia is also still low. Purchases of patents from abroad must be immediately reduced and the government must encourage the industrial sector to switch to universities. In fact, fellow researchers are already oriented to the needs of the world, the implementation of their research has gone through the correct stages. Meanwhile, to get to the consumer, there are stages that must be passed, namely the planning stage, the laboratory or prototype stage, the pilot or semi-commercial stage, and the commercial stage. Therefore, it is necessary to have policies that support commercialization efforts in universities.

Technological Readiness Level

The concept of Technology Readiness Levels (TRL) was first developed in the United States (US) by NASA (Alzahrani & Elsaadani, 2018; A. Olechowski et al., 2015). There are nine TRLs. Levels 1 through 6 are technology development carried out as part of a research project. From the 7th level and higher, industrial development work begins, or demonstration of technology performance on real developed devices. The use of TRL enables consistent and uniform discussion of technical maturity across different types of technology and research (Salazar & Russi-Vigoya, 2021). Historically, the US Department of Defense has used scale for procurement since the early 2000s. In 2008 this scale was also used at the European Space Agency (ESA). The European Commission recommends EU-funded research and innovation projects to adopt the scale by 2010 (Héder, 2017). TRL was consequently used in 2014 in the EU Horizon program. In 2013, the TRL scale was further standardized by ISO 16290:2013. A critique of the EU's adoption of the TRL scale was published in The Innovation Journal, stating that the concreteness and sophistication of the 9 TRL scale gradually diminished as its use spread outside its original context (the space program) (Héder, 2017; Kujawski, 2013).

However, the TRL scale provides a number of benefits for its users, researchers and technology product developers (Olechowski et al., 2020). TRL is motivated by the need for a shared understanding of technological maturity (Salazar & Russi-Vigoya, 2021). This is achieved through a standardized language that can be used across disciplines, organizations, and functions to better communicate and deal with risks. TRL assessment complements project management, systems engineering, and monitoring or evaluation processes (Aqidawati et al., 2022; Jesus & Jr., 2018). TRL can inform assessment and planning activities. TRL assessments can be used to monitor progress in emerging technologies, and to identify and manage risks associated with specific technologies (Olechowski et al., 2020). The TRL assessment does not eliminate risk itself, but can be used to explain risk. When choosing between several alternative technologies and research that fulfill the same function, planning maturity assessed through TRL can be very informative (Persons, 2020). T is also very useful when transferring and utilizing research technologies because it can facilitate the exchange of information between different groups within the same organization (e.g., R&D and experimental research projects) or between technology producers and technology users (Granich et al., 2020).

In the Indonesian context, the Indonesian Directorate General of Higher Education, Research and Technology also applies and adapts 9 TRL scales, consisting of: The basic principles of technology researched and reported (1), Concept formulation and/or application of formulation (2), Functional proof of concept and/or analytically and experimentally important

characteristics (3), Validation of components/subsystems in a laboratory environment (4), Validation of components/subsystems in a relevant environment (5), Demonstration of models or prototypes of systems/subsystems in a relevant environment (6), System prototype demonstration in the real environment (7), The system is complete and reliable through testing and demonstration in the real environment (9), The system is really tested/proven through successful operation.

Discussion

The Role of URC in the Commercialization of Research Results and Positioning Entrepreneurship University.

Based on the Decree of the Minister of Finance number: 782/KMK.05/2017 dated November 1, 2017, UNJA was officially declared a university with the status of a Public Service Agency (BLU). Support provided by URC as part of the UNJA institution in terms of managing and facilitating the implementation of research according to national priorities, superior and relevant to the needs of the community. URC encourages an increase in scientific publications in national and international accredited journals, including the acquisition of Intellectual Property Rights (IPR). In the field of community service, URC periodically disseminates innovative research results in order to encourage the creation of innovation and technology experts. This activity is expected to have an impact on increasing the entrepreneurial spirit of the community.

The main tasks and functions of the URC are to coordinate, monitor and evaluate the implementation of research and community service activities carried out by the academic community and to participate in managing and controlling the administration of the necessary resources. URC is an institution appointed at UNJA to carry out pure research, carry out science and technology research to support development, carry out applied research and development. In carrying out research and community service activities, URC has 13 Study Centers and Service Centers, namely: (1) Center for Environmental Studies, (2) Center for Gender Studies, (3) Center for Regional Development Planning and Finance Studies, (4) Center for Islamic Studies and Malay Culture, (5) Center for Halal Studies, (6) Center for Mitigation and Disaster Management Studies, (7) Center for Law and Development Studies, (8) Center for Public Health Studies, (9) Center for Reproductive Health Studies, (10) Center Scientific Publication Service, (11) Kukerta Service Center, (12) IBT Service Center and (13) Intellectual Property Rights Service Center.

In supporting UNJA to become A World Class Entrepreneurship University, there are several Science and Technology Excellence Centers (PUI) as the realization of an integrated innovation agenda. Several Centers of Excellence have produced several researches funded either from the centre or from PNBP UNJA. PUI at UNJA include (1) PUI-REKLA (Land Reclamation), (2) PUI BLAST (Biodiversity and Land-use Transformation System), (3) PUI-E2 KOLIM, (4) PUI GEMAR (Geotourism Merangin), (5) PUI WAHYD (Watershed Management and Hydropower), (6) PUI SIFAS (Sustainable Integrated Farming System), (7) PUI BIGME (Bio-Geo Materials and Energy), (8) PUI E-Medical (Ethno Medical and Nutrasetical), (9) PUI ICT and (10) PUI PEDAS.

The development of science and technology (IPTEKs) demands a big role from URC UNJA to be able to make a greater contribution to regional and national development. URC has the support of human resources and other supporting facilities, so it is expected to be a pioneer in achieving UNJA vision. Based on this vision, research orientation is actively organized and synergized with the Tridharma of Higher Education as a forum for improving human resources and developing lecturer competencies in the field of research while involving students according to their respective competencies.

Based on the achievement of KPI 5 in 2021, the achievement exceeded the target by 142.05% compared to other KPI achievements. However, the achievement of KPI 5 was not accompanied by an increase in achievement growth compared to the previous year. This low growth is one indicator that needs attention.

Table 1. Shows the involvement of research lecturers and PPM in the period 2019-2021

No	Indicator	2019	2020	2021
1.	Titles	679	605	823
2.	Researchers	2.037	1.851	2.469
	Total	27.159.870.750	24.236.246.400	27.441.985.055

Table 2. Number of Lecturers' involvement in PPM in 2019-2021

No	Indicator	2019	2020	2021
1.	Total cost	290	318	312
2.	Researchers	1.160	1.272	1.248
	Total	4.048.999.300	4.826.911.000	6.095.106.466

As for the development of lecturer publications in 2019-2021. For 2022, the amount of funds for research activities is 28,616,541,200, - of which there are 532 titles with 1,596 lecturers involved. While the PPM is 2,500,000, with a title of 356 and the lecturers involved are 1,424 people.

Table 3. Research publications and journals for 2019-2021

No	Indicator	2019	2020	2021
1.	Published research	551	358	528
2.	Unpublished research	114	114	152
3.	Unaccredited	154	160	91
4.	Accredited	161	114	171
5.	Q1 Journal	24	15	11
6.	Q2 Journal	16	12	5
7.	Q3 Journal	29	28	1
8.	Q4 Journal	137	24	8
9.	Non-Q Journal			56
10.	Internasional publication	25		180
11.	Global indexed journal	5	5	5

URC's strategic plan for 2020-2024 has been prepared, where the preparation of this strategic plan refers to the UNAJ Strategic Plan 2020-2024. Along with the plan to change of UNJA's future, a new strategic plan has been prepared with the theme reframing and transformation, several policies for strengthening research results and commercialization of research results have also been prepared. Policies to strengthen research and innovation include:

1) Program to increase reputable scientific publications in order to increase the number of reputable international and national publications, number of international proceedings, number of reputable citations. In its implementation in 2022, there are 5 activities carried out through the URC budget. The activities in question are workshops on managing national journals, workshops on managing international journals, workshops on journal management based on clusters, workshops on writing SINTA accredited national journals and workshops on writing reputable international journals. The workshop resource persons came from internal universities and external sources. URC provides funds for DOI subscription of Rp. 21,000,000, and anti-plagiarism as much as Rp. 150,000,000.-. Its use

is for journal managers to improve quality and is very important in the accreditation process. Through the help of publishing articles.

2) Program to increase publication of other research products, such as research monographs and prototypes. Through the assistance of book publishing and research development funds. In 2022, 31 research titles received TRL 7-9.
3) Research cooperation improvement programs include, among others, Cooperation research funds, joint publications, joint book chapter writing, both nationally and internationally. Cooperation Funds with other PT, at home and abroad. Cooperation Funds with institutions outside the university. In 2022 there will be 4 titles of Cooperation with foreign universities and 11 titles with domestic universities. Meanwhile, with other institutions, there are 15 activities with a total budget of IDR 2,150,000,000, both with the Regional Government and with private companies.
4) National competitive grant enhancement program. The programs carried out include workshops on writing research proposals and workshops on writing proposals for community service. In the last three years, there has been a downward trend in the number of research grants. In the following table can be seen:

Table 4. National competitive grant research scheme

No	Skema	2019	2020	2021
1.	Decentralization grant	8	3	1
2.	Centralization grant	9	8	4
3.	Public service	13	2	1
	Total	30	13	6

In order to increase the number of research and PPM that get national competitive grants, proposal writing programs are arranged in the form of research proposal writing workshops and PPM. The enthusiasm of the lecturers to take part in the workshop was very high, this was evidenced by the number of registrants and participants who took part in the activity from the beginning to the end of the activity. In 2022, several national competitive grants were received, including from DRTM Kemdikbudristek, BRIN, BPDPKS and LPDP. One PUI received a funding grant from the Ministry of Education and Technology, namely PUI Blast (Biodiversity and Land-use Transformation System).

5) Excellent research programs through the Study Center and Center for Excellence in Science and Technology, UNJA. Cooperation with partners. There are 13 Study Centers and 13 Centers for Excellence in Science and Technology, UNJA. In 2022, through internal competition grants, there were 11 PUIs that received development funds of Rp. 150,0000.00, - per title with research outputs in the form of patent registration, feasibility studies and international publications.
6) Other research support strengthening programs such as improving URC services by registering with an ISO 9001:2015 external audit certificate. In addition, for lecturers and education staff, assistance is provided to participate in training / technical guidance to various institutions or universities. This effort is to improve the competence and experience of individuals who are very important in improving quality.

Innovation strategic program:

1) Business incubator development program. Under URC there is a technology business incubator service center which has the function of providing guidance to inwall and outwall tenants. In 2022, there will be three start-up companies funded through the BRIN program, namely “Agromushroom” Mushrooms, Digital Resitivymeter (Digirei) and Arkawa Black Beauty Skin Care. Meanwhile, there are 8 (eight) start-up companies.

2) STC development program. Currently, the Science technopark campus has not yet been established, but efforts have been made to establish an STP. Among other things, by strengthening the lecturers' research, especially those with TRL 7-9.
3) Cooperation program to strengthen innovation. Cooperation is carried out with several higher education institutions and outside universities. Through this collaboration, it is expected to increase the number of lecturer publications and the application of lecturer research results that are utilized by the community. The flagship program is in the form of Integrated Laboratory Village (DLT), which is a research program and application of science and technology in locations that are designated to be the target villages. In accordance with the Chancellor's Decree number 519/UN21/EP/2021 there are 60 villages of integrated laboratory spread across all regencies and cities in Jambi.
4) Student innovation development program. In accordance with the manual, every researcher is required to involve students in their activities. Currently there are 1,097 students involved in research activities and 600 students in PPM activities.
5) Innovation assistance program with patents. In order to increase the number of patents available at UNJA, every year an IPR registration assistance program is provided and a simple patent drafting workshop is budgeted through the URC RKAL. Currently as of August 2022, there have been 9 titles in the process of simple patent certificates and 72 copyrights that have been registered.

2. Potential of Start Up

Law number 11 of 2019 concerning the national system of science and technology is a legal umbrella in developing science and innovation that is integrated with the funding system, this is in line with the goal of higher education to produce science and technology products that can provide benefits for the progress of the nation (UU RI Number Ll YEAR 2OI9, 2019). The Higher Education Pre-Startup Program (PT) is a program that was originally issued by the Ministry of Research and Technology / National Research and Innovation Agency (BRIN) which is now the Ministry of Research and Technology Culture (Kemendikbudristek) as a funding instrument since 2016 to apply the results technological innovations that exist in universities that have commercial value to be downstream (Implementation et al., 2021). The pre-startup incubation program is carried out through incubator institutions in State/Private Universities where the coaching model is still at the pre-incubation stage to form an entrepreneurial ecosystem (Startup) so that it can be continued at the downstream stage, namely product commercialization. Although in reality in the last 5 years many of the products produced have not yet reached the stage of commercialization, this has also happened in many countries not only in Indonesia as stated by (Nanda & Rhodes-Kropf, 2013) that financing radical innovations, however, requires more than just capital. This requires an experimental mindset and a willingness to fail.

Pre-start up from higher education is a candidate for a new business/start up/technology-based start up originating from a university that has the potential to be developed and the product is still in the form of a prototype or draft application program (ICT sub-field) with a minimum level of technological readiness (TRL) for its innovation products. at TRL 7 and directed at TRL 8 with a coaching model at the pre-incubation stage to form an entrepreneurial ecosystem (Implementation et al., 2021).

Based on the TRL, the product prototype that is in the prestart up stage is a product that has passed the testing phase in the operational environment, or the product is declared complete through a series of trials and is ready for the mass production stage.

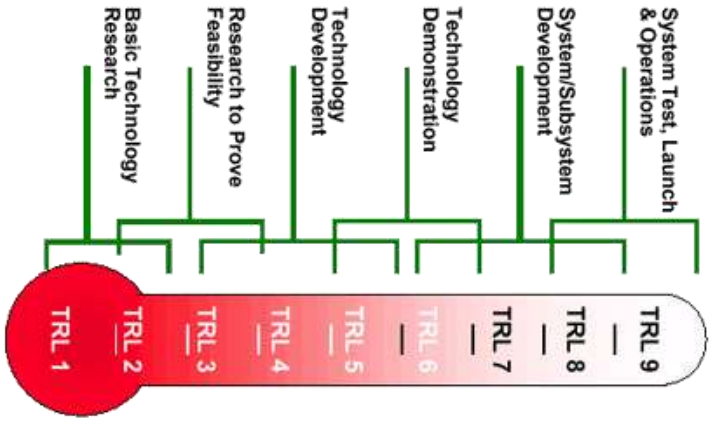

Figure 1. Technology Readiness Level (TRL)

CONCLUSION

Based on the TRL, the product prototype that is in the Prestart up stage is a product that has passed the testing phase in the operational environment or the product is declared complete through a series of trials and is ready for the mass production stage. The research scheme included in the potential for prestartup and startup is development research with TRL 7, 8 and 9 with the expected outputs, namely patents, product prototypes, academic manuscripts, cooperation agreements with industry partners and business feasibility studies (SKB). Research categorized into pre-start-up is research with TRL 7 and 8 with data on the number of studies in the last 3 years recorded at the UNJA URC.

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