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Research Management Innovation Based on Lecturer Research Roadmap in Universities

(In order to support data information systems)

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Abstract—**Article No. 20 of 2003 concerning the National Education System states that universities are obliged to carry out research and community service in addition to carrying out education. At the time of publication, the results of research and community service were ranked first in ASEAN countries. Research products should be able to contribute to the improvement of Indonesia's economy, Pakuan University in particular offers a Bigdata-based Research Management Innovation system, namely a data information system (SIDATA) based on Lecturer roadmap research. The lecturer research roadmap must be adjusted to the field of expertise of the lecturer, with the aim that research results can be more focused and can produce research that can be commercialized. The research method used is the analysis of systems of thinking and close loop diagrams (CLD), from the results of this analysis the leverage of the Lecturer Research Roadmap is produced. All Lecturers are obliged to make their own Lecturer Research Roadmap that will be monitored on SISDATA. The result from these Lecturer research roadmaps will produce researches that are more directed, controllable and can be commercialized through the Research Management System at the University.**

Keywords—research management, research innovation, lecturer roadmap, SISDATA, and research commercialization

I. INTRODUCTION

Innovation is a process of creating and introducing new things to the market as a product, a process or service [1-3] and innovation process is by means of systematic development and new idea practices [1]. Innovative as defined in Innovativeness, is the rate of which an individual adopting innovation. By another source, innovative is defined as the intensity of innovative usage that can be differentiated in-between or compared according to each such individuals [4,5]. One that can be mainly observed in scientific researches is Research Innovation. As implied in Minister of Birocracy Reform and National Apparatuses Regulation, the publications of scientific researches, be that national or international, must be an indivisible need from Tri Dharma (written rule which exists in most Indonesian Universities).

Publications in Scientific Journals is one of the outputs from researches done by academics or researchers. Periodic scientific journal or scientific magazine which later defined as journal is a form of publication which functions to register intelligent activities, certificate activities result that adhere to minimum scientific requirements, widely disseminate to public, and documented every founding of such intelligent scientific activity results [6]. Currently, there's a dire need of scientific publications which has become a norm. As bachelor/ bachelorettes (S1), Master (S2) and Doctors need to fulfill at least one publication on their thesis in national, accredited national, and international [7].

Research Group Roadmap in the year of 2019 needs to be adapted into Presidential Decree no.38 of 2018 regarding National Research Main Plan (RIRN in Indonesia) 2017-2045 and Permeristekdikti (Minister of Higher Education and Technological Research Regulation) no. 38 of 2019 regarding National Research Priority (PRN) 2020-2024. Research Group Roadmap plays an important part to provide direction to the national research policy, more importantly, also to include a steady stream of research funding [8,9].

Lecturer Roadmap is an important part of Research Group Roadmap in Universities, Lecturer roadmap will be very instrumental for determining the expertise and competence of lecturers while the output expected in the field of research and community dedication are indexed publications in both national

and international scope on which later will support the accreditation and clustering of universities in Indonesia. This Lecturer roadmap is a novelty which haven't existed until now, before there is only research roadmap that existed. By having a lecturer roadmap, there's a possibility of 4 or more research roadmaps depending on the expertise and specialist of each lecturer.

The aim of this lecturer roadmap development is a more directional approach of researches, becoming more professional, and national-approved research products so to produce commercial producs. Be that individual, department and university's roadmap suitability could be observed, but also producing specialists or experts in certain field, producing patents and copyrights also indexed scientific journals both in national and international level.

II. RESEARCH METHODS

In order to achieve the goal of Lecturer Roadmap Development we will be using Close Loop Diagram (CLD) with system thinking. The purpose of the causal loop diagrams is to demonstrate which element in the dynamic system causes a change in the other. Causal loop diagrams are used to map the system structure in order to try to understand system behavior [10]. These diagrams are also referred to as influence diagrams [11].

Initial system dynamics studies did not utilize causal loop diagrams. Loops were expressed by accumulation-flow diagrams and equations. Such representations are natural for engineers. Use of causal loop diagrams increasingly expanded and became popular to open the system dynamics approach to a wider population [11]. Causal loop diagrams are a visual tool for feedback system designers [7]. Causal loop diagrams are used to understand the model in general, not in detail. Thus, they preserve their simple appearance [12].

System Thinking Methodology is very essential to observe the complex relationship between Lecturer Roadmap, Research Funding, Research Institutes and its connection inside and outside universities.

Barry Richmond, the originator of the systems thinking term, defines systems thinking as the art and science of making reliable inferences about behavior by developing an increasingly deep understanding of underlying structure, that people embracing Systems Thinking position themselves such that they can see both the forest and the trees; one eye on each [13].

Defines systems thinking as a discipline for seeing wholes and a framework for seeing interrelationships rather than things, for seeing patterns of change rather than static snapshots. And that people who succeed in handling complexity are working in an intuitive domain [14] we don't even consider in our educational theories, underscoring an intuitive property of systems thinking.

III. ANALISYS AND DISCUSSION

According to Article 20 law no. 20 of 2003 concerning the national education system, universities is obligated to organize researches and community services besides implementing education [15]. In line with these obligations, Article 45 law no. 12 of 2012 concerning higher education emphasizes that researches in universities should be directed to improve knowledge and technology also public welfare and national competitiveness [16].

Based on that concern, we can see how important research products are, community service in the form of publications, mainly national and international indexed scientific journals. Productivity in general is defined as comparative ratio between output and input (sources) [17]. The area of productivity is divided by four that is national, industrial, organizational and individual [18]. There are 3 variables related to productivity which are labor, capital and management where management plays a bigger part on the increase in productivity itself whereas partial productivity only compare output to only one input factor [18].

To produce Productivity Publication Results that can produce indexed international publications, the analysis is selected based on the variable Research and Community Service Environment where the University is located, then one of the important Variables is the Lecturer Roadmap, Lecturer human resources, research funding, research institutes, facilities and infrastructures, research cooperation, and research culture, institutes relationship with universities. Based on the key variables mentioned can be drawn as a table in figure 2.

Fig. 1. Relationship Between Research and Community Service.

In total, there are 14 highly influential variables, based on the figure 1 above it can be further analyzed using CLD (closed loop diagram) as shown in the figure 2.
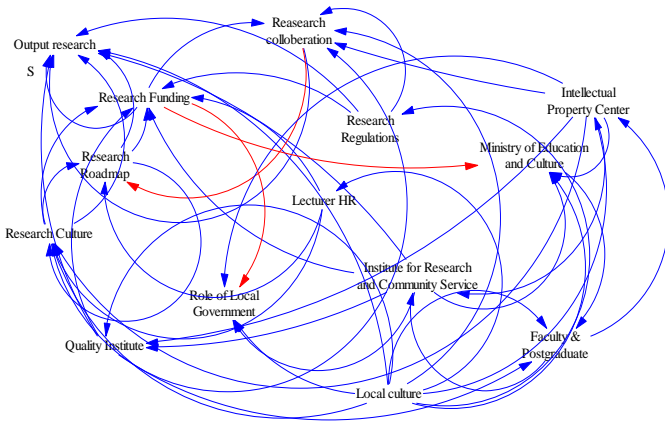
Fig. 2. Research and Community Service Variables with Closed Loop Diagram Analysis.

This CLD analysis is very important to get a leverage picture on the research and community services variable in universities as demonstrated in Pakuan University as an example.

Based on the analysis using Vensim software, 3 leverage outputs could be obtained that is Research Cost, Research Culture and Lecturer Roadmap as seen in table 1, in order to reach a specific result, roadmap is a detailed work plan which integrates all plans, program implementation and activities into one single package within a certain time span [19].

TABLE I. RESEARCH AND COMMUNITY SERVICE LEVERAGE VARIABLES

No	Variable	Loop Balikan	Ranking
1	Output Research	0	
2	Research Funding	6	1
3	Research Roadmap	3	3
4	Research Culture	4	2
5	Research Collaboration	0	
6	Research Regulations	1	5
7	Lecturer HR	1	
8	Intellectual Property Center	0	
9	Ministry of Education and Culture	0	
10	Role of Local Government	0	
11	Institute for Research and Community Service	2	4
12	Faculty & Postgraduate	0	
13	Quality Institute	3	3
14	Local Culture	0	

According to the CLD analysis using Key Variables, Main Leverages can be obtained which are the Research Budget, Research Culture and Lecturer's Roadmap, as a Recommendation to advance universities. The three recommendations that are much related and interconnected to the lecturer research roadmap can be a success given there are research budget support. Community Service Budget can also be fulfilled considering research cluster and community service entered main cluster in ministry of research technology and ministry of education and culture. In the other hand, there's a steady budget support from internal so it will never become a problem. To develop a culture of doing researches and community services, organizing journal writing training, research incentives, and community services are sufficient as motivation to carrying out research activities.

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Research Roadmap and Community Service studies are new in Pakuan University that are currently ongoing but not optimized just yet. The Lecturer Roadmap itself requires intense training and is designed based on the courses taught by each lecturer. For basic course, it won't become a problem but if it's an expert course, there is a need to form collaboration between lecturers to make group research roadmap field of expertise (KBK in Indonesian).

Meanwhile, lecturer roadmap must be adjusted according to a lecturer's expertise and research priority that is:

1) Area of expertise

a) If the roadmap itself is a lecturer research roadmap then it should be adapted to the lecturer's expertise.

b) If the roadmap itself is an expert group research roadmap (KBK) then it should be adapted with the field of expertise of each member of KBK.

2) Research Priority

a) Research is an activity that needs funding and can only be done given there is a support from donators/funders. Examples of such donator like Ministry of Research Technology, Ministry of Education and Culture, including other funding agencies be that national or international, always prioritize a specific research or featured areas.

b) Researches included in the Lecturer Roadmap must always comply with the research priority determined by donators/funders in order to obtain the funding.

Lecturer Roadmap could change each three years following research trends. Researches which follows trend often easier to be publicized in scientific journals. To know these so-called research trends, research lecturer must have a vast knowledge in the field of his/her expertise.

Benefits that comes from Lecturer Roadmap are the ability to observe the key performance, monitoring, and evaluation of Lecturer, Group Research, and Expert Group Research (KBK).

Therefore, universities specifically departments, need to draw up a map and target how much research financed with grant stipends can be published in international journals. Every research lecturer, group researchers, and department has to design such research roadmap. With this roadmap, the productivity could also be observed. The roadmap itself could develop from being an individual roadmap into a full fledge featured research that becomes the pillar of that university as shown in the figure 3.

TARGET ROADMAP RESEARCH UNIVERSITY PAKUAN

Fig. 3. Research and Community Service Roadmap in University.

In the context of efforts to achieve the results of an activity, the road map is a detailed work plan document that integrates the entire plan and implementation of programs and activities within a certain time span. (*Source: Ministerial of Utilization of State Apparatus and Bureaucratic Reform, no. 9/2011*)

IV. CONCLUSION AND RECOMMENDATION

There are three important Variable Leverages resulting from CLD analysis, namely Research Budget, Research Culture and Roadmap of lecturers who are very influential in the Field of Research and Community Service, which is expected to increase Indexed Publications at the National and International Level

Research and Community Service Journal products should be designed to follow research trends, so Research Products will tend to be easier to publish in scientific journals. To know the trend of research, each researcher must have a broad and deep insight in the field he researched.

The road map is organized based on the field of expertise of lecturers. And research priorities set by funders. This is to facilitate the Lecturer's Roadmap to more easily get research funding and more awareness for the Community and industrial needs.

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