The proposed design of optimization of research integrated higher education using dynamic program approach by performing strategic stages

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Abstract. Integrated research conducted by lecturers in higher education must be applied because with the Tri Dharma Perguruan Tinggi, such as: to educate the educators to the students that the theories presented can be absorbed by real students because the teaching materials delivered by the teachers to the students have been done research before and have been devoted lecturers to the community as well as to the industry industrial service industry and manufacturing industry. From research proposals conducted in an integrated and optimal can be done between higher education, industry and government agencies related and from the results of research obtained by teachers or students who do research in the industry in real so it will provide advice or input to the industry and later if any obstacles in the industry, from these obstacles can be followed up by the government concerned. This should be done in good cooperation by higher education, industry and institutions related to the hope of avoiding the occurrence or reduce the unrest of the community.

1. Introduction

Higher education is organized with the principle of scientific truth-seeking by academic and student-centered students with careful attention to the environment in harmony and balance. In general, the implementation of higher education in Indonesia aims to prepare human resources who can professionally implement and develop areas of expertise to improve the lives of people and national culture [1].

Expertise from graduates of higher education, especially can be achieved by utilizing the existing facilities in the laboratory optimally. By practicing science and theory obtained, and from library with textbook, journal, and final project result [2]. It is expected that the results of the research can be used appropriately and useful by conducting or continuing from previous research titles, or conducting integrated research [3]. Continuing the above research [4] under the title Technology Integration System Model for Research in Higher Education. The research was conducted in 2013 at Institut Teknologi Bandung (ITB), at Universitas Gadjah Mada (UGM), Universitas Muhammadiyah Surakarta (UMS) and Tri Sakti. From the results of the study found that the desired research is not in accordance with the desired and from the results of research conducted at Universitas Sebelas Maret (UNS) in 2017 that the desired research has not as expected. Then the research continued by doing integrated research and optimize with dynamic program approach to do strategic stages.
Of the two studies in Higher Education have not obtained an integrated research because it is expected if the research is done in an integrated and optimal, then the problem of a product generated from the industry will gradually be repaired and improved until the product is ENASE (Effective, Comfortable, Safe, And Efficient). Therefore, it is necessary to make a proposal of Higher Education which is optimally integrated with dynamic program approach with hope of research result and give real input to academician to add references for non-academic will get various information from some service and manufacturing industry, from the information obtained is expected to bring a positive impact of the interests of these industries.

Similarly, for government agencies concerned can set the rules in accordance with the conditions that have something to do with the industry. Input from the research result of Higher Education is a real condition of the industry, as example of problems that exist in the industry that is about the quality of a product, it is associated with the agency is the Quality Standards Agency and waste problems from industry related institutions, the responsible agency is the environment agency (KLH), if the above pattern can be applied in tri party i.e. Higher Education, Government and Industry then any problems in the industry can be quickly overcome without causing problems of unrest in the community.

According to Johan Brunell, although the literature on university-industry relations has begun to uncover the reasons, and the kind, collaboration between universities and businesses, offers little explanation of the way -how to reduce the hurdles in this collaboration [5]. This paper seeks to unravel the nature of the collaborative barriers between universities and industry, exploring the influence of different mechanisms in lowering barriers associated with university orientation and to transactions involved in working with university partners. Viewed in large-scale surveys and public records, this paper examines the impact of collaborative experience, breadth of interaction, and inter-organizational trust on differentiation of different types of barriers. The analysis shows that previous collaborative research experience lowers the barriers of linkage and a higher level of trust reduces both types of barriers being studied. It also indicates the extent of the interaction reduces the associated orientation, but increases transaction-related barriers. That the paper explores the implications of these findings for policies aimed at facilitating university-industry collaborations.

According to Kurt Larsen, the importance of cooperation with the University from an industry perspective, a four-point scale can be used to rank potential benefits, ranging from 1 (useless) to 4 (very useful). High-quality recruitment graduates in position 1, followed by gaining access to new ideas and known how, promoting new product development, and continuing education from staff. Reduced R n D costs are cited as the least important benefit [6].

According to Jose Guinon, the collaboration between the academic world and the industrial world is increasingly becoming a critical component in an efficient national innovation system. It aims to test the ability of the developing countries to better understand the differences from the type of university and industry collaboration. Motivation to shape makes agreement and boundaries of cooperation, and the role of public policy in fostering such interconnections. Developing countries face more obstacles to such alliances, calling for a divergent approach to promoting university collaboration relationships with industry [7].

Based on the exposure of some of the above mentioned journals only explain the relation of industrial relations with Universities and State. Thus the opportunity to do research proposal design optimization of integrated research in higher education using the Dynamic Program Approach by Doing Strategic Stage "has not been studied by the journals mentioned above.

1.1 Formulation of the problem
Based on the description above, then the formulation of the problem is how to optimize the proposed research design integrated in higher education by using the dynamic program approach by performing strategic stages?
1.2 Research purposes
The purpose of this research is to design research proposal integrated in higher education by using dynamic program approach by doing strategic stages, among others, used for academic community (student and lecturer) and non-academics (service industry and manufacturing industry).

1.3 Benefits of Research Results
The benefits of research for the academic community is to facilitate the title and reference research. For lecturers, in order to perform *Tri Dharma Perguruan Tinggi*, which can improve the results of research and develop the repertoire of science. While as to non-academics to improve their business as desired.

2. Research design
2.1 Type of research
This research is an explorative research that will be able to answer the hypothesis that has been made and look for correlation between latent variables and find new insights. This research is also referred to as field research, which is doing direct research to the object of research. Schematic figure of this research methodology can be seen in Figure 1.

2.2 Location and object research
The research was conducted in Higher Education in Java Island. While the object of research is the Institute for Research and Community Service (LPPM) at Institut Teknologi Bandung (ITB), Universitas Gadjah Mada (UGM), Universitas Muhammadiyah Surakarta (UMS) and Research Institute of Universitas Trisakti Jakarta.

2.3 Population and sample
The population of this study was determined to have criteria as a Research Institution contained in Higher Education of Java Island. While the research sample is the data contained in four Research Institute of Higher Education.

2.4 Design of model development

![Figure 2. Design of Model Development](image-url)

Reference

- Library *(Textbook)*
- Internet *(Digital)*

Research institutions

- Research
- Classification of Research
  - Manufacture
  - Services

Research model

Can continue the research as desired
Figure 1. Research design framework
2.5 Conceptual framework

![Conceptual Framework Diagram](image)

**Figure 3.** Conceptual framework

2.6 Dynamic Deterministic Program

Dynamic Deterministic Programs can be described with diagrams in **Figure 4**. At the nth stage, the process will be in a sn state. Policy making xn then moves the process to the state of sn + 1 at stage (n + 1). Subsequent contributions to the objective function under optimal policy have been calculated earlier with the equation fn + 1 * (Sn + 1). The policy decision xn also gives some contribution to the purpose function. The combination of these two values will give fn * (Sn), ie the contribution of the next stage n to the destination function, then the optimization of the recursive function can already be done.

![Dynamic Deterministic Program Diagram](image)

**Figure 4.** Diagrammatic image of Dynamic Deterministic Program

The stage n process will be in state Sn. At state made decision Xn, then process move to state Sn + 1 at stage (n + 1). From the point forward, the value of the objective function for its optimal decision has been first calculated, ie f * n + 1 (Sn + 1). The decision to choose Xn also contributes to the purpose function, which by combining these two magnitudes will get the value of the objective function fn (Sn, Xn) starting at stage n. minimize that value by paying attention to Xn to obtain fn * (Sn = fn (Sn, Xn *))). Once this is done for all possible Sn values, then the resolving procedure moves back to the problem with one stage.

A way to categorize the question of the determinant dynamic program is to look at the form of its objective function in the set of states on a stage, ie whether the Sn state can be represented as a discrete or continuous state variable, or a vector state may be required (more than one variable).
2.7 Characteristics of Dynamic Deterministic Programs
One way to categorize the Dynamic Programming problem is determined with the purpose function form. For example, the goal may be to minimize the amount of contribution from the individual stages or to maximize the amount, or to minimize a product and so on. Another categorization is in the form of the nature of the set of circumstances for the corresponding phase. In particular, Sn states can be expressed by discrete state variables or by continuous variables or may require a state vector (more than one variable).

Characteristics of problems that can be solved by using Dynamic Deterministic Programs are similar to simple Dynamic Programs with additional terms as follows:

a. Each stage (stage) has several states (parts or decisions) whose values are known with certainty and unchanged
b. The decision at each stage has a definite effect on status in the next stage and it has a probability of 1.
c. There is a definite and definite recursive relationship and will provide optimal decision on stage n based on optimal decision in stage (n + 1)
d. If the value of xn which is the decision variable at stage n (n = 1, 2, ... , N) has the limit r'l ≤ x i ≤ r j where i = 1, 2, ......., N, but the function value fn (S, xn) whose max value (or min) will be a fixed value

The recursive equation is always shaped fn * (S) = max {fn (S, Xn) or fn * (S) = min {fn (S, Xn)} even though the value of the decision variable is an interval or range of values or in other words the value of the decision or continuous (not discrete).

2.8 Conceptual framework
Conceptual Framework in this research is continuing from previous research which is designing of digital library system with concept of interoperability. This research was conducted by observing and collecting data directly from Research Institute. Research data are then classified into manufacturing industries such as textiles, furniture, and so on; and service industries such as transportation, healthcare, and so on.

The targets of each study are achievements in the new study. While the boundary problem is the stage of the new research target. Conceptual framework can be described as Figure 5.

![Conceptual Framework](image)

**Figure 5.** Conceptual Framework
3. Results and discussion

Of the two studies in Higher Education studied have not received an integrated research because it is expected if the research is done in an integrated and optimal, then the problem of a product produced from the industry will gradually be repaired and improved until the product is ENASE (Effective, Comfortable, Safe, And Efficient).

Therefore, it is necessary to make an proposal of Higher Education design which is optimally integrated with dynamic program approach with hope of result of research and give real input to academia to add references and for non-academics will get various information from some service and manufacturing industry, from the information obtained is expected to bring a positive impact of the interests of these industries.

Dynamic Deterministic Program is a Dynamic Program that has characteristics that the status that may occur in the next stage is wholly determined by the status of decision choices in the current stage. The full meaning is that the value of a definite decision in every stage will have a definite effect on the status of the next stage. In general, the way the problem is solved is the same as the Dynamic Program. Thus, the results of the research can be said that optimal integrated research can be produced as desired if good cooperation is done between Higher Education, Industry and Government.

4. Conclusions

From the result of the research, it can be concluded that with the optimum integrated research can be produced as desired if good cooperation is done between Higher Education, Industry and Government. The results of the research can bring a positive impact for:

a. For academics, the students and staffs of the facilities used can be tidied up among others: Laboratory and Library.

b. For non-academics can add insight and develop their business from the results of research conducted by students and teachers in High Education.

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