Implementation Analysis of Army Polytechnic Research Management for The Armament Development of The Indonesian Army

Arief Cahyo Widodo[1], Agus Heruanto Hadna[2], and Umi Listyaningsih[3]

[1]Graduate School of Leadership and Policy Innovation, Universitas Gadjah Mada, Yogyakarta, [2]Faculty of Social and Political Sciences, Universitas Gadjah Mada, Yogyakarta, [3]Faculty of Geography, Universitas Gadjah Mada, Yogyakarta, Indonesia

Corresponding Author: Umi Listyaningsih (email: umilis@ugm.ac.id)

Abstract

Implementing Vocational Higher Education in The Army Polytechnic (Poltekad) has used the Triple Helix approach: universities, the private sector, and the government. In its development, Poltekad contributes to the direction of the development of the Army's technological innovation field. Based on observations of the results of Poltekad research, it has yet to be utilized optimally in fulfilling Army equipment and weapons. In the last three years, 2020–2022, 163 final research assignments were recorded by Poltekad students, and 40 research by Poltekad lecturers. However, only eight lecturers' research has become research models with the potential for defense and development in the Army. This study uses a qualitative research method, specifically a case study. The study results show that Poltekad has not been able to play a role as a research university, but is still limited to its function as a vocational education institution in the technology field. The allocation of research funds for Poltekad is still relatively small compared to the benefits of research to support the development of Army Armaments. The research themes of lecturers and students are not entirely following the needs of the development of Indonesian Army weaponry technology. The absence of a Poltekad external monitoring and evaluation team for research programs, limited educational laboratory facilities, and qualified lecturers as researchers in the Poltekad environment are several reasons for optimizing the utilization of Poltekad research results which cannot be carried out downstream in the implementation of production activities carried out by the Defense Industry in Indonesia as is stated in the Poltekad vision. Poltekad, as a Research University, needs to pay attention to elements, such as 1) budgeting, 2) Research Programs, 3) monitoring, and evaluation, 4) researcher competence, 5) facilitation facilities, 6) information and communication systems, and 7) scientific publications. Downstreaming the themes to utilize research results is carried out according to needs and developments.

Keywords: research; The Army Polytechnic; downstream; science publication

Introduction

Research in higher education seems to stand alone without contributing to development (Laurie, et.al., 2016). The initiation of the triple helix concept is as if it were just a slogan without effective implementation (Fonseca & Nieth, 2021). Therefore, questioning how the management of research in tertiary institutions meets the urgency.

The role of higher education has its essence in the scientific field. Higher education is always considered considering its fundamental contribution to society's social, cultural, and intellectual life, which is carried out by increasing human resources (Chankseliani, Qoraboyev, & Gimranova, 2021; Qasemi & Behzadi, 2021; de Gayardon, 2022). In recent years, competition between countries to increase their role in the global economic space has forced governments to think more strategically about the economic value of knowledge production and dissemination.

In the context of university strategy implementation, research projects are concrete actions taken by educational organizations to carry out their strategic plans aimed at achieving research and academic excellence in a highly competitive global environment (Filho, 2011; Suzigan & Albuquerque, 2011; Sedlacek, 2013; Bousquet, 2017; Ardito et al., 2019). Therefore, research management in tertiary institutions needs attention.

Research management is undertaken at the intersection of science and the public interest (Cravens, et.al., 2022; Beck, et.al., 2022). Indeed, the organization of a research project is a high time-consuming activity. This is due to the need for extensive resources and the complexity of the structure of scientific institutions. Under such conditions, the research structure must regulate the relationship between science and society. With the help of such a structure, it is much easier to mobilize the resources needed to carry out research.

Research management includes processes related to scientific (knowledge production) and social (introduction of scientific knowledge into practice) dynamics (Hicks, 2012; Saghafian, Austin, & Traub, 2015; Uwizeye, et.al., 2022). Thus, the boundaries between administrative and scientific fields are blurred. The ultimate goal of management research is to generate selective relationships between specific organizational elements. The question of the mechanism for establishing such a connection remains open. Today, we can observe various management mechanisms as research contexts become more diverse than others. A distributed concentration of multiple management tasks in a specialized management position can contribute to developing a new professional role.

This research management challenge also applies to the Army Polytechnic (Poltekad), a vocational education institution in the Army, as one of the institutions implementing educational activities under the control of the Indonesian Army's Education and Training Doctrine Guidance Command. The very rapid development of science and technology is currently a challenge for the Poltekad and must be adequately addressed and responded to by the Poltekad. In answering this challenge, of course, the various studies produced by the Poltekad are expected to be one of the technological benchmarks owned by the Army, which is conceptually following the Triple Helix model, where the Poltekad research results are an answer to the needs of the Army in improving the quality of its weapons. The research results of the Poltekad were followed up with mass production by utilizing the existing defense industry in Indonesia to meet the weapons and technology needs of the Army.

In its implementation, the Poltekad is still in a position as an internal higher education provider within the Army, which specifically educates Army soldiers in terms of technology. The results of research carried out by students and lecturers of the Poltekad with educational costs provided by the Army have not been realized and used for mass production in the defense industry in Indonesia to meet the needs for the development of weapons technology and technology that supports the main tasks of the Army. From the perspective of researchers, the need for more utilization of technological research produced by the Poltekad in

carrying out the main tasks of the Army is a phenomenon which is inversely proportional to the vision and mission of forming a Polytechnic as a higher education institution in the Army. In addition, these conditions are not following the Triple Helix theory in the opinion of various experts (Etzkowitz, 2003; Coletti, 2019; Segatto, et.al., 2022; Baeta, et.al., 2022).

The above is a problem because the context of the Poltekad as a tertiary institution must be supported and take on a role as one of the elements of the Triple Helix. The limited allocation of the education budget which has been allocated, the limited number of lecturers with researcher qualifications, the absence of a monitoring and evaluation team for research programs, and the limited educational facilities indicate that efforts to realize Poltekad as a higher education institution with a research function or a research university are downstream. Research produced by Poltekad students and lecturers who are Army soldiers selected to study and serve in the field of education at the Poltekad who have contributed their knowledge as a form of realization of the Tri Dharma of Higher Education (Istambul, 2019; Kemal & Rosyidi, 2019; Yusup, et.al., 2021; Sugiarti, 2022), have not been utilized optimally and have not been able to provide benefits for the progress and development of Army weapons technology. In other words, implementing the research results has yet to be realized in mass production in the defense industry in Indonesia.

The research results of the Poltekad students and lecturers were only in the form of weapons technology prototypes and prototypes of Army weapons-supporting technology which had yet to gain the trust to proceed to the mass production stage. Even though the research results of the Poltekad students and lecturers positively contributed to the Army institution, they cannot be implemented now. This condition shows that the attachment and dependence of these three elements, that is the Poltekad, the Army, and the Defense Industry are not visible. This condition is not following the theory of the Triple Helix model. This gap encourages researchers to describe conceptual problems as problems at the operational level that cause phenomena in the Poltekad case study.

The role of the Poltekad is very significant in the Army environment because it not only increases the ability of personnel who can study at the Poltekad, but also encourages soldiers to produce research which varies in the field of technology according to the study program at the Poltekad which is very useful in enriching scientific treasury in the field of technology. The question then is how to implement the management of the research which took place at the Poltekad for the development of the Armed Forces of the Indonesian Armed Forces. Therefore, this research aims to analyse the implementation of research management at the Poltekad for developing Army armaments.

Research Method

This study uses a qualitative approach. The research occurred at the Poltekad in Batu, Malang, East Java. The reason for selecting Poltekad as the research subject is because researchers see that the Poltekad has a vast opportunity to develop weapons as the primary weapon system tool in the Army. However, its implementation still needs to be realized optimally with existing technology in the primary weapon system tool in the Army. Therefore, this study uses a phenomenology paradigm with a case study approach. In this case, the phenomenon seen by researchers is a phenomenon resulting from Poltekad research which only stops at prototype models where until now, there have been no research results used for the advanced stage, specifically mass production of research results conducted by Poltekad.

Data collection techniques are used to obtain primary and secondary data. In this study, primary data was collected through interviews and observation. Interviews were conducted with Poltekad Commanders, Heads of Departments or Study Programs, Poltekad Lecturers, several Section Heads, and officers in the research laboratory. Observations were made at the Poltekad unit. The secondary data was collected through library research and documentation collection from documents relevant to the research theme, organizational documents, books, journals, internet sites, and other supporting sources. Important documents which form the basis of education in Poltekad are also used as supporting documents by researchers.

This research performs data validation so that the results of the research argue on valid data. This study uses a triangulation technique to validate the data. This technique is carried out to see whether the data is valid or not by comparing similar data from different sources. Triangulation was also carried out to compare information obtained from various research informants. The aim is that, this research is objective and thorough.

This study applies qualitative data analysis techniques in the form of data analysis techniques using the Miles and Huberman model. This model has three stages of data analysis: data reduction, data display, and conclusion drawing/verification. After collecting the data, this study analyzed both primary and secondary data. At the data reduction stage, this study simplifies the raw data through specific patterns, which can be easily analyzed. Then, at the data display stage, this research presents the data so that it is easy to read and understand from what was previously simplified and systematized. The data in this second stage has become a source of interpretation to be analyzed in the discussion chapter. In the next stage, to be specifically conclusion drawing/verification, this research makes generalizations based on interpretations of empirical findings.

Result and Discussion

The implementation of research management at Poltekad describes eight aspects, specifically research programs, funding, monitoring and evaluation, researcher competence, research support facilities, information and communication systems, scientific publications, and utilization of research results. The analysis on each of these aspects is as follows.

Research Program in Poltekad

Policies developed at the Poltekad regarding the science and practice of providing education by improving education quality assurance according to Higher Education standards and army regulations, developing educational facilities by building a Vocational Laboratory, cooperation to take part in capacity training at BBPPMPV BOE (Center for Development of Vocational Education Quality Assurance in the Automotive Sector) and Electronics) Malang. The research policy at the Poltekad is carried out by continuing to be active in participating in the Army Defense Research and Development program, participating in competitions for the creation of technology and scientific papers at the level of the Indonesian National Armed Forces, participating in competitions held by state and private universities in Indonesia. The Poltekad is always active in fostering and developing research for Lecturers and Diploma 4 students of the Poltekad under the internal supervision of the Poltekad which is carried out by the Director of Research, Study, and Development of the Poltekad by playing an active role in presenting research results organized by the Directorate General of Higher Education.

Research conducted at the Poltekad consists of 2 types: research conducted by Poltekad students in the context of completing their final assignment and research conducted by Poltekad lecturers

in the context of realizing the Tri Dharma of Higher Education, in this case, the Army. From 2020 to 2022, 163 research students and 40 researchers by lecturers were produced in Poltekad. Of the 163 research results from Poltekad students and 40 from Poltekad lecturers, 8 were research results from Poltekad lecturers, which continued at the advanced research level at the Army Research Service level. At the same time, there were no research results from Poltekad students, which continued at the research level in the Army.

From the description above, research is an important activity which must be carried out and realized to find a technological solution to be used to realize Poltekad's vision, that is achieving technological independence in the Army. This is carried out through the utilization of research by the entire Poltekad academic community, both students and lecturers, who actively carry out the research process following research norms and principles which apply in the higher education environment.

Poltekad lecturers and students propose research themes as desired, or in other words, research themes need clear objectives. Research for students is limited to completing studies at the Poltekad, while for teaching staff, it is a form of carrying out the functions of the Tri Dharma of Higher Education. This condition became not ideal when students and lecturers conducted Army-funded research. Combined funded research means that the donor, in this case, does not benefit from the research being conducted. The advantage gained is only in the form of increasing the quality of the number of military personnel who can study at the Poltekad to have additional knowledge in the technology field. However, the outcome in the form of research results has yet to be able to have an impact which has implications for advances in weapons technology in the Army.

Research results from the Poltekad have yet to be socialized optimally by the Poltekad and comprehensively recorded by the Army Research and Development Service as one of the driving elements for downstream research results within the Army. This condition is because Poltekad, as the research manager, needs a research concept which must be carried out by lecturers and students in line with the achievement of Poltekad's vision. Various studies conducted by all existing civitas will support a clear research field mission. Another thing whichneeds to be done to improve the non-optimal research activities is disseminating research results to private parties or users.

There needs to be an agreement and joint commitment between all parties involved in downstream the results of the Poltekad research, where the ending and outcome are as a mainstay product with Army technology produced by the Defense Industry in Indonesia and utilized and used by the Army. The agreement and joint commitment of all parties need to be done because the utilization of quality Poltekad research results begins with the availability of a sustainable budget, as well as the internal readiness of the Poltekad itself, which the government must fully support, both internally bureaucratic and externally which have specificities while still meeting the criteria and norms of bureaucratic provisions that apply within the Army.

Based on the discussion of the Poltekad research program, it can be concluded as follows.
1. The communication mechanism between Poltekad Managers and the Army has yet to run optimally. As an institution which provides funds for organizing the Poltekad, the Army also needs a specified program or theme of research studies which Poltekad lecturers and students must carry out. The research program is carried out based on the wishes and abilities of lecturers and students.

2. Not optimal communication between the Poltekad and the Army has caused the results of research conducted by lecturers and students not to answer the needs and difficulties of the Army in the need to procure the primary technology-based weapons system as a result of Poltekad's internal research.

3. The Army utilized only some of the Poltekad research results even though the products produced were of very high quality. There are no downstream quality research results from the Poltekad in collaboration with partners, third parties, or the defense industry in Indonesia.

4. Poltekad managers need to have a database for the needs of the Army in the field of technology needed both for the leading equipment of the Army's weapons system and to support other main tasks of the Army, both for technological needs in Military Operations and Military Operations Other Than War. The database can be arranged systematically in the form of manual data or databases which can be connected to the internet. Access to the database is connected directly to all units and sections involved in providing input in stages, from operational level units to policy level units (bottom-up) and vice versa (top-down). The results of the evaluation of activities have been carried out, which include the unit's difficulties in optimally achieving basic tasks, can be used as material for internal Poltekad discussions in order to obtain input formulations regarding technological needs which are expected to facilitate the implementation of the main tasks of the Army.

Research Funding in Poltekad

Funding for research conducted by Poltekad students has generally been allocated to the operational budget of each student's education. However, it is limited and adjusted to the availability of the existing state budget. However, faced with different types of research among these students, the budget requirements for research conducted by students also vary. Not to mention the relatively different types of research students conduct between study programs, so the research budget needs also differ from student to student. This condition encourages students to take the initiative to make the most of existing resources in the learning environment to complement the limited budgetary support for their research needs. One of the consequences of research is the availability of the budget needed to ensure the success of achieving the research target so that the research produced can follow the demands of the series of achievement of the expected results in a research product. It requires the availability of a budget for research activities to produce technology which supports the primary tasks of the Army following research needs. The students innovate optimally to complete the final project so that promising research results are obtained.

Meanwhile, the research conducted by Poltekad research lecturers was sourced from the Poltekad Operational budget within the framework of the Three Pillars of Education. The amount of the research budget at the Poltekad is determined one year before the current year, meaning that research will be carried out in the current year. The budget submission or Budget Work Plan has been carried out one year before the implementation of research activities. Budget calculations are carried out based on the results of research activity needs which have been decided and carefully planned by Poltekad's research lecturers. Furthermore, planning officials in charge of Poltekad budget submissions compile details of research budget requirements. Details of the budget requirements are then reviewed following the appropriate budget

items so that budget account items can be grouped and submitted in stages to the Army Education Supervisory Staff. Furthermore, the research budget needs of the Poltekad are supported following the availability of the existing budget in the Army through a budget implementation checklist system.

There are two types of research conducted at Poltekad. The first is research conducted by Poltekad students to complete their final project. The second is research conducted by Poltekad research lecturers who are part of the Tri Dharma of Higher Education, where the research results are intended to produce a research product which benefits the community and the Army institution.

Funding for research carried out by students in completing their final assignments has yet to be included in the educational and operational funds which have been prepared. Students use funds independently to finance their research. However, the Poltekad also provides funding assistance to several students whose research can be continued in defense technology research and development conducted by the Poltekad.

Research conducted at the Poltekad takes work. It is related to efforts to find solutions to various problems in Army units related to technology applied to equipment and weapons in all army units. In addition to the relatively large need for research funding, the researchers' morale also needs to be considered, one of which is the existence of research funding incentives provided by the Poltekad, although they are minimal. Research lecturers at the Poltekad receive financial incentive support for research results according to their level, rank group, and title. This incredibly motivated and increased the morale of the research lecturers to carry out research activities and seek solutions and technological breakthroughs from the research activities. Incentive support for Poltekad lecturers is an effort to increase the morale of Poltekad research lecturers;

financial incentive support has been allocated and provided by Poltekad as a form of respect and full support for the Poltekad institution for the active participation of lecturers in realizing research results that can later be used in the Army.

Regarding research permits, Poltekad strongly supports research activities carried out by researchers. However, before carrying out research activities, research material from researchers must pass a council meeting to determine research activities at the Poltekad. Some prospective researchers with research plans within the framework of the Poltekad Defense Research and Development activities must go through a selection process determined at the research determination hearing.

Poltekad provides general supervision and licensing to all Poltekad lecturers who will research to increase institutional capacity in the role and realize technological independence within the Army. This freedom, of course, still holds the principle of achieving the main tasks as the top priority. The licensing flexibility in question also does not mean that lecturers can research everything, but it is still adjusted to the researcher's competence and knowledge of the research lecturer. The submitted research still goes through several procedures and stages of the research council meeting at the Poltekad.

The series of research activities carried out at the Poltekad cannot be separated from the role of research consultants at the Poltekad itself. The consultant is a teaching lecturer in charge of a study program related to the material under study. Research consultation activities are carried out according to the needs of researchers and during research activities. In addition, Poltekad also works with universities in Malang and surrounding areas, sharing opinions and joint workshop activities between universities and Polytechnics in Malang, which can add inspiration and insight to Poltekad researchers in conducting their

research so that the research results can be done with better quality.

In terms of financing the salaries of the lecturers, Poltekad is always on time to distribute the salaries of the personnel who serve as lecturers. The salary distribution is always on time because the lecturers at the Poltekad are Army personnel actively serving in the Poltekad circle. They have the qualifications and competencies as teaching lecturers at the Poltekad with salaries and performance allowances following their rank and expertise based on the provisions for financing personnel expenditures within the Army. This distinguishes the system for paying lecturer salaries from military personnel to lecturers from higher education institutions other than the Poltekad.

From the description above, the proposition is drawn that the availability and support of the budget play an essential role in conducting research. With an adequate budget, research results can achieve optimal results and potentially not follow the objectives of research activities. Research at the Poltekad requires the availability of a budget sourced from the Army. A research budget for the Poltekad will impact not carrying out the mission in realizing the Poltekad's vision.

Based on the description above, data collection and research funding at the Poltekad are adequate when appropriately managed. Limited funds per capita can be reduced when done in groups. Lecturers and students or between students can collaborate on research in the context of completing students' final assignments and research in the context of realizing the Three Pillars of Higher Education. Each student, for the needs of the final project, can do one part of the scheduled significant research umbrella. The Poltekad has planned for budget support in stages through the budget planning system which applies to the Army, specifically bottom-up planning, which is compiled systematically to obtain the nominal budget requirements. Top-down budget realization is adjusted to

the availability of existing budget allocations through the Budget Execution Checklist system, directly addressed to Poltekad as an education provider.

Poltekad management and the Army identified research guidelines which several research students or lecturers could support. The research guidelines only consider the possibility of being completed quickly with several people involved. The research guideline scheme is more feasible with limited per capita funding.

Monitoring and Evaluation of Research Implementation in Poltekad

Research culture conducted by Poltekad students (the habits of Poltekad students in researching). The discussion about implementing research activities at the Poltekad concerns the culture of research conducted at the Poltekad. The facts obtained in the field that until now, there has been no determination in the form of a Term of Reference or guidelines set by the Army regarding what types of research should be carried out by Poltekad students so that the research results can later become an initial idea for sources of intellectual property which can be followed up as a prototype of weapons to be used in the Army after the results of the student research went through an approval process within the Poltekad internal environment as one of the studies determined as further research in the context of realizing the Tri Dharma form of the Poltekad institutional tertiary institution to the Army.

The student research is a starting point for the emergence of further research needed by the Army in advancing the development of weapons technology carried out by Poltekad researchers. Research conducted by Poltekad students purely came from the students' ideas based on the results of student observations of the problems in the unit or student ideas resulting from the

direction of the lecturers to complete the final educational assignment.

The research process carried out at the Poltekad, both research conducted by Poltekad students in completing their final assignments and research conducted by Poltekad lecturers in the context of Defense Research and Development, is still being monitored by an independent team formed by the Poltekad, which also serves as a research Quality Assurance within the Poltekad. The team works based on the working relationship mechanism at the Poltekad as a regular procedure in the education unit. Monitoring activities on the implementation of research by Poltekad students were also carried out by supervisors who also updated data on the development of research achievements carried out by Poltekad students so that research results could be completed according to the set time target. The monitoring process by lecturers also carries out a counseling phase directly to students conducting research activities. Monitoring is not only carried out by supervising lecturers, but also by teaching lecturers following the study program of each student. The atmosphere of work is built in a conducive and dynamic manner, in which student research is carried out flexibly by utilizing all research facilities and infrastructure, both within and outside educational institutions. This is held with the intention that students can also develop in assessing all the potential around them which can be utilized to support the completion of research carried out optimally with maximum results following their research plans.

As is the case with student research, research lecturers also monitor their research by providing updates on the progress of their research which has been carried out so that they can meet the specified quality targets. The lecturers who conducted the research were those involved in carrying out research activities within the framework of Research and Development of the Poltekad, where the research results would later become input for the Army. A supervision team from the Army Research and Development Service, in which supervision was carried out to monitor research developments and collect data on research constraints faced by Poltekad researchers, monitored research conducted by Poltekad lecturers.

Evaluation activities were carried out on several research results of students who had succeeded in becoming Poltekad inventories. The results of this research are research products from a former student of Poltekad students. From the results of this study, data was obtained that there was research potential which could be carried out at a later opportunity and various kinds of research opportunities for the next generation of Poltekad students to carry out. From some previous research results, data were obtained related to research opportunities which could be carried out by further students and research which could provide benefits and support the implementation of learning and teaching activities at the Poltekad. This is due to the limited number of supporting facilities for learning activities, such as trainer models for each study program. The resulting trainer module can be helpful for the laboratory with the research done.

Evaluation activities for the research of Poltekad lecturers are carried out by conducting counseling and discussing the progress of research developments which have been achieved. This achievement was done so that the research would be accurate due to the limited research budget.

Internal evaluators are a combination of personnel from the Army Planning Staff in charge of budgeting and research, Army Personnel Staff in charge of Education, and research and development personnel from all ranks of the Arms Center within the Army. The joint evaluator team is expected to be able to provide input on the implementation of the research activities which have been carried out, which is correlated with the

technological resume needed by units in the ranks of the Army, as input for the research implementation plan to be carried out. Evaluators can provide recommendations for implementing other research programs, including the theme and size of the budget.

Researcher Competency in Poltekad

Based on the research results at the Poltekad which were collected, based on research variables related to research mechanisms in tertiary institutions, related data were obtained regarding the competence of researchers, to be specific the first related to individual demographic characteristics. The results of field research on Poltekad students for the 2022 academic year who are currently carrying out their education, gender does not make it a problem in conducting research and does not affect the success or failure of the research conducted. The gender factor, both male and female, does not influence the research activities carried out by students in completing their final assignments. All students have the same opportunity to do their research. Likewise, with the variable age of students, Poltekad students aged between 26 and 30 years do not influence research activities carried out at Poltekad. Related to the social status of researchers, students do not have differences. All Poltekad students are active military personnel who have passed the selection and entrance exams to become Poltekad students and have the same opportunity to study. Regarding the proficiency which is the choice or interest of students, all Poltekad students take part in study programs which are taught following the results of psychological tests and related academic test results at the Poltekad, which include the Academic Potential Test, TOEFL Test and Calculus Test, including physical aptitude tests which is the selection standard for Army soldiers who will pursue an education within the Army environment.

Second, Poltekad Entrance Selection. Army personnel who can study at the Poltekad have undergone a selection process carried out by the Poltekad which the Army Education Development Staff supervises. Selection activities to become Poltekad students consist of an Academy Potential Test, a Psychological Test, a Physical Competency Test, an Interview Test, and a Health Test. This series of selection activities is a series of standards which must be carried out to get students who will become students at Poltekad. Some of the series mentioned above are requirements which must be met by all Poltekad student candidates in order to pass and be accepted by Poltekad students. The requirement shows that quality Poltekad students are military personnel in the Army environment who have been screened and meet the criteria for Poltekad students who suit their needs and are ready to pursue vocational higher education at Poltekad.

Third, Researcher's Psychological Factors. Researchers, in this case, are Poltekad students, and it is their responsibility as students to complete their final project. *Researching* is a process that all Poltekad students must carry out. It takes motivation, interest, intelligence, attitude, talent, and a high enthusiasm for learning which supports completing a final project. Of course, it is not easy for these students to conduct research, especially as part of completing their final study assignment. Not a few Poltekad students whose research proposal products were repeated because they needed intensive guidance.

Nevertheless, psychologically, Poltekad students are ready to take part in education. When starting the research, students experience worries and difficulties. However, with continuous guidance from the lecturers, these students can follow the stages of research following the research theme taken.

The students and lecturers of the Poltekad in conducting research require a relatively high quality of research motivation

due to the demand for research results in the technology field aimed at advancing Army technology. The level of difficulty faced by these researchers is very high. The difficulty requires the attention of all education providers at the Poltekad so that the motivation of students and research lecturers can be maintained. The students have high enthusiasm and motivation to study at Poltekad.

Some research results from Poltekad students are very effective and help learning and teaching activities at Poltekad. Their final project research can be used to add instructional tools to help students practice activities in the next batch.

The description above shows that the quality of psychology is also one of the main factors determining the research results at the Poltekad. Psychological elements, including the motivation and enthusiasm of the students, are one of the supporting factors for the smooth completion of a final quality project.

Fourth, Individual Competence. In terms of competence as a researcher at Poltekad students, information was obtained that, in general, Poltekad students had never conducted research before becoming students at Poltekad. Poltekad students, while studying at the Poltekad, have only acquired knowledge and skills in research activities that are an obligation and a must for all students in completing their studies at the Poltekad. The Poltekad students received guidance and direction from Poltekad lecturers in carrying out research activities.

The individual competence of students and lecturers when conducting their research requires encouragement and assistance from all education providers so that research related to study programs studied by students and researchers within the Tri Dharma of Higher Education framework can run optimally. Research activities were discovered when the soldier was a Poltekad student. Facts in the field found that these students had

never had experience conducting research or research related to the study program or other research. In addition, the lecturers at the Poltekad could be more constrained regarding the availability of research budgets at the Poltekad.

In contrast to research in the context of realizing the Tri Dharma of Higher Education conducted by the Poltekad, the lecturers and Poltekad researchers who already have competence as researchers carried out the research. The research was carried out in collaboration and mutual consultation with the Army Research Service. The research material carried out by the Poltekad lecturers has undergone a selection process, and the Poltekad Commander has made a tough decision.

Research conducted by Poltekad students started with the students' independent ideas, based on encouragement and direction from teaching lecturers, and derived from facts that there were many limitations in educational facilities, especially laboratory equipment which supports learning activities. These conditions encourage students to find solutions through their research. The results of this study are beneficial to support the smooth running of learning activities.

The Poltekad students did not own the research qualifications and training possessed by the students as researchers. The limited number of teaching lecturers who guide Poltekad students greatly influences Poltekad students in achieving their abilities as researchers at Poltekad. The fact is that military personnel who qualify as Poltekad lecturers are bound by regulations in the Army environment, where the lecturer is forced to rotate the position of Middle Officer in the Army environment for a maximum of 3 years so that the morale of this person can be maintained and at the same time part of a career development pattern in the Army environment.

From the description above, the proposition is that Poltekad students are

relatively competent researchers at Poltekad. Their willingness, tenacity, and enthusiasm show this competency for research. With the limited resources available, Poltekad students can produce research results which they can be proud of and help enrich the scientific treasury in the technology to be utilized for the Army. Nonetheless, the limited number of research lecturers within the Poltekad is one of the obstacles faced so that the Poltekad can carry out its research function. Likewise, with research lecturers their competence as research lecturers needs to be improved so that they can produce more technology-themed research to support the main tasks of the Army.

Research Support Facilities in Poltekad

Research support facilities for the existing study program, such as laboratories, other supporting facilities, and other supporting infrastructure facilities, are available at Poltekad. However, the laboratory conditions at the Poltekad need to increase the number of laboratories and upgrade and update laboratory equipment to facilitate teaching and learning activities at the Poltekad. Most of the laboratory equipment in the Poltekad is relatively old equipment and equipment whose operations sometimes experience problems and obstacles. Not all equipment can function optimally and adequately when used, so it influences when giving an overview of students in practical activities.

In addition, it is related to the support capacity and cooperative relationships which exist. The research activities carried out by the Poltekad students had several limitations which affected the research results of the Poltekad students. Research with limited educational facilities at the Poltekad and supporting laboratories for the Poltekad study program is minimal. It is necessary to repair and upgrade the supporting laboratory facilities according to the needs of each vocational

study program at the Poltekad. Even though the Poltekad has collaborated with several other universities to network and conduct research collaborations, the readiness of research facilities and infrastructure, including study programs supporting laboratories, must also be prepared appropriately. Renewal, as needed, is a top priority. The conditions in the field are that laboratory facilities and infrastructure still need to be improved, and supporting equipment needs to be renewed and procured. Research infrastructure support still needs to be improved. The condition of educational facilities at the Poltekad, especially the laboratories at the Poltekad, needs improvement and still needs improvement. Facilities and infrastructure to support research activities need to be completed.

According to each study program in student practice activities, laboratory support equipment, such as Panel Trainer Equipment in the laboratory, still needs to be improved. The Panel Trainer is one of the student learning support tools which provide an overview of processes or system explanations and an explanation of specific mechanisms of a mechanical system, both machines and other processes related to the engineering field.

The implementation of research activities by Poltekad students utilizes the equipment available in the Poltekad laboratory. The limited supporting equipment in the laboratory is supplemented by self-procurement from the students themselves and through joint research activities with students from other Polytechnics who have more adequate research facilities following their individual research needs.

Information and Communication System in Poltekad

The condition of the internet network at Poltekad is adequate. This condition is

beneficial for students and research lecturers in finding reference sources to support their research activities. The Poltekad also has a Data Based Server, which is very useful for storing all journals in the Poltekad. Internet connection and internet network in Poltekad are relatively stable. Good internet quality is because there is exceptional support for budget allocations for Internet facilities at the Poltekad. The condition of the internet and computer networks at the Poltekad supports student learning activities in finding references and practical activities although they need improvement.

Scientific Publication in Poltekad

Poltekad, one of the vocational higher education institutions with educational standards following the provisions of Higher Education, is also responsible for publication activities which all tertiary institutions in Indonesia must carry out. Poltekad lecturers are active in making and publishing scientific journals and actively participating in competitions for technological inventions and scientific and technological works at the tertiary and Army institutions.

In addition, publication by the Poltekad is carried out through information facilities and systems integrated with academic needs throughout Indonesia. In 2021, 32 accredited National Journals and 12 International Journals were published. There are 40 Poltekad's scientific works have been cited in the period up to 2022.

At present, the Poltekad already has supporting facilities for publication activities, which must be carried out as one of the requirements of higher education institutions in maintaining and increasing the accreditation of their educational institutions. Poltekad scientific journals are stored on the Poltekad library server, where the Poltekad Library has collaborated with the National Library and has also been connected to international and national journals. Poltekad Library has the accreditation qualification with the result of "B" by the National Library.

In supporting scientific publication activities, the Poltekad has five personnel as the administrative apparatus of the Poltekad Library, which can be classified as Poltekad librarians who have professional librarian certification apart from being teaching lecturers at the Poltekad. The Poltekad Library has also received certification from the State University Library Cooperation Forum.

The Poltekad Library is currently collaborating with the National Library and libraries of several universities in Malang and its surroundings, including Brawijaya University, Malang State University, Ten November Institute of Technology, Malang National Institute of Technology, Malang Asian Institute of Technology and Business, Widya Karya Catholic University, Unisma Polytechnic Malang and Ahmad Dahlan University in Yogyakarta. In addition, the Poltekad has also collaborated with the Batu City Government library. The collaboration which has been established is not limited to the use of knowledge resources owned by each educational institution, but also scientific publication collaborative activities carried out in carrying out tertiary service.

From the description above, it can be taken the proposition which scientific publications carried out by the Poltekad have received recognition from the National Library, where the Poltekad Library has received B accreditation at the national level.

Utilization of Poltekad Research Results

Research results produced by Poltekad students and lecturers, and teaching staff at the Poltekad become intellectual property that belongs to the institution. However, this intellectual property is only in the form of technology prototypes. It has yet to be

continued in the mass production process that utilizes the defense industry in Indonesia to support the Army's primary task. Unfortunately, the Army has allocated many budgets to implement vocational education activities at the Poltekad.

Up to 2022, eight research products are recommended to be used to support the main tasks of the Army, both Military Operations for War and Military Operations Other Than War. Currently, several research results aimed at supporting unit training activities within the Army are still in the certification process at the Army level. Mass production is expected to increase the professionalism of soldiers in combat and non-combat tasks. In addition, several examples of research results at the Poltekad which still need further research are constructive for training activities within the Army environment, including training mortar grenades, rockets, airless vehicle tires, and drones with rocket launchers.

Until now, there have been no research results from Poltekad research lecturers which have been mass-produced in one of the Indonesian defense industries to be used in units within the Army. This is due to constraints with the bureaucratic system of work partners or third parties. The third party in Poltekad is a third-party provider of goods and spare parts for research needs. Third parties conducting mass production must be certified to carry out mass production.

The research results which have been made (output) cannot be utilized because they differ from the priority needs determining by each party at the Army Technical Authority Environment level. In addition, the results of the Poltekad research experienced bureaucratic constraints, where the determination of product requirements for mass production rests with the Institute of Technical Authority within the Army. This condition encouraged the Poltekad to obtain specific bureaucratic provisions and regulations by making suggestions and studying the leadership of the Army so that

the research capabilities carried out by the Poltekad could be utilized optimally.

In addition to research conducted by Poltekad lecturers, Poltekad students must complete their final assignment by producing research products according to their respective study programs. Only now, there are research results from Poltekad students which can be continued in mass production because they are still included in the classification of models or prototypes. Apart from that, there has never been a request from the Army Headquarters to the Poltekad to conduct specific research on technological needs that will be realized on a large scale for developing weapons within the Army.

Conclusion

The research mechanism was carried out at the Poltekad by prioritizing the quality of the competence of individual research implementers and selecting research programs needed by the Army through the results of analyzing and evaluating the difficulties and constraints faced by units of the Army's ranks. The research was carried out by referring to the research mechanism following research standards set applicable in Indonesia, prioritizing conducive research nuances and teamwork in the process of achieving optimal research results, optimizing available educational facilities, planning research types and themes, including planning research budget requirements, playing an essential role in realizing the technological independence of the Army following the vision of the Poltekad.

The current research mechanism at the Poltekad needs to be improved through breakthroughs in implementing the internal bureaucratic activities of the Poltekad to carry out Poltekad missions so that research results are obtained that are in line with the needs of the Army.

This research provides significance in the form of being able to increase the role and capacity of its organization to create technology which supports the development of weapons technology in the Army so that technological research conducted by the Poltekad can benefit the Army. However, in order for this significance to materialize, several things are recommended to the Indonesian Army and Poltekad.

First, several recommendations to the Army are listed as follows. (a) In order to improve the quality of accreditation of the Poltekad institution, which can directly provide an increase in the performance appraisal of the Army, a particular regulation is needed regarding the granting of the special delegation from the Army Leader to the Poltekad Commander in carrying out Work Agreement activities It is in the same in order to establish cooperative relations with universities in all regions of Indonesia which are needed in increasing the accreditation and progress of the Poltekad. The implementation of the results of the Cooperation Agreement with Universities in Indonesia in charge of the Technology sector carried out by the Danpoltekad will still be reported in stages to the Army. This can elevate and make the Army proud in its participation in increasing its active role in advancing the quality of education in Indonesia. (b) Budget Support for improving educational facilities and budget support for defense technology research activities at Poltekad is suggested to be one of the priorities for the realization of technological independence in environment of the Army. (c) Optimum utilization of the Poltekad is carrying out in the initial concept of design and development of the research and development of the central weaponry system in the army environment, especially at each Armament Center in the army environment so that the transfer of technology to the Army's primary weaponry system can be an additional a source of intellectual property which is only wholly owned by the Army. (d)

There is a need for additional regulations governing changes in structural positions within the educational development staff, by adding the position of class V middle officer/ Lt Col (Mantap II) or IV/Colonel in charge of bridging and monitoring the quality of the implementation of research activities within educational institutions. Thus, the credibility and predicate, as well as the quality of the accreditation assessment of Poltekad, can increase and achieve the highest standard of assessment in the Higher Education assessment.

Second, several recommendations are recommended to the Army Polytechnic which the priority of research on the results of the Poltekad as a prototype for developing the needs of the Army's equipment needs to be adjusted in advance to the needs of technology development in the Technical Authority Institutions, in this case, the ranks of the Arms Center within the Indonesian Army.

In the future, this research provides more complex opportunities for studies related to the implementation of technological research in supporting the modernization and utilization of the latest technology. Thus, policy innovations can emerge which can encourage the development of a better and more modern organization.

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