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Innovation of Utilization of Materials Research and Development Results in the Framework of Fulfilling the Defense Equipment of the Indonesian Army (Case Study of Battlefield Management System)

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Abstract

This study aims to map policy innovations downstream of material R&D results, especially the Battlefield Management System (BMS) in fulfilling the independent and modern defense equipment of the Indonesian Army. This research was conducted using a qualitative method and a case study strategy. The determination of the research location is based on the existence of phenomena in research and development activities carried out within the Indonesian Army. This study used qualitative research methods to explain the research problem in-depth. Determination of informants/resource persons based on purposive sampling resulted in six people consisting of officials who formulate the R&D policies of the Indonesian Army, officials from elements of R&D activities implementing the Battlefield Management System, elements from domestic defense industry actors in the R&D activities of the Battlefield Management System, as well as elements from researchers/teachers and military observers from non-governmental organizations. Furthermore, the data analysis was carried out based on the theories and concepts of public policy and then the data interpretation process was carried out. The result of this study is the public policy innovations in realizing downstream policies. BMS is the result of innovation which is proven to meet the 13 determinants of innovation. Downstream policies play a role in realizing BMS products in the fulfillment of the defense equipment of the Indonesian Army. BMS is a modern defense equipment of the Indonesian Army, fulfilling aspects of complexity, technological progress and speed. Although not-yet fully realized due to the not-yet optimal of the triple helix policy, BMS products based on independence still face problems that there are still conflict of interests, research funding, production costs and indications of weak political will of the Indonesian Army to use domestic products. Recommendations from this research are the need for prioritization, continuous and consistent budgeting and procurement (mass production) and budgeting for superior material R&D results as a form of reward. In addition, there is a need for policies and regulations that can protect the products of material R&D against the competitiveness of similar products from abroad.

Keywords: policy innovations; downstreaming; defense equiptment; modernization and independence

Background

The independence of the Defense Equipment of the Indonesian Army is one of the national agendas being realized by Indonesia. Several products created by Indonesia in the form of superior defense equipment have been exported to Malaysia and South Korea, including the SS1 V2 Weapon, the Anoa 6x6 Personnel Transport Vehicle and the CN-235 Aircraft (Putra, 2018). There are Defense Equipment products used by the Indonesian Army which are the result of research and development (R&D) of the Indonesian Army materials. In the period 2010 to 2021, 343 material R&D activities have been produced, of which, amid budget constraints and unbiased regulations, 9 types of materials have been selected and mass-produced innovations. The Battlefield Management System (BMS) is one of the R&D innovation best practices. BMS R & D innovation is expected to contribute to the fulfillment of the Defense Equipment of the Indonesian Army based on independence and modernization. In addition to policy innovation, in order to fulfill this, a downstream policy is required in which mass production is part of the downstream process.

Problems related to the independence of the Defense Equipment of the Indonesian Army also occur in the process of R&D activities, including the not-yet-optimal implementation of the triple helix policy. The parties with an interest in realizing the synergy of R&D activities on the triple helix are the Government (the Indonesian Army), universities (academics), and industry. This was also stated by Wibowo (2016), that the problem is in applying the triple helix concept to the defense industry. Furthermore, there is still a conflict of interest, that there is still a push towards the fulfillment of the Defense Equipment which were classified as imported products, even though there are already similar products that can be produced domestically. There is also inconsistency in budgeting for research activities and procurement of R&D products. The production costs can burden the defense industry so that it is able to produce competitive products when compared to foreign products. In addition, there is still a weak political will of the Indonesian Army to utilize domestic products.

According to Wibowo (2016), Defence and Security Equipment is needed in order to pursue the achievement of the planned basic strengths. The fulfillment of the defense industry's needs is carried out by the domestic defense industry, but there are still problems to be solved, namely the application of the triple helix concept of the defense industry, the problem of the defense industry cluster concept and trade balance issues, local content problems and offsets for the defense and security equipment procurement.

Annisa (2021) mentioned that the state had tried to modernize the defense equipment system, but it was still not optimal. There are six challenges in the effort to modernize the Main Tool of the Indonesian Armed Forces' Weapon System (*Alutsista*), namely budget, procurement transparency, achievement of EF fulfillment targets, low quantity and quality of human resources, the defense industry is not-yet independent, and the welfare of soldiers is still in question. Therefore the process of fulfilling EF requires a strong commitment and systematic planning as well as strengthening synergies between ministries and agencies in meeting EF's needs for foreign defense equipment procurement.

Ependi (2019) explained that the P 100 Live bomb has been mass-produced, but the production still encounters a number of problems as follows. First, PT Dahana acts as a lead integrator. Second, there are six aspects that stand out, namely aspects of technology/machinery, regulatory aspects, capital aspects, HR aspects, management aspects, and material aspects. Among these six aspects, the inhibiting factors are material,

human resources, and capital aspects, while the driving factors are aspects of technology/ machinery, regulation, and management.

In Grahadi's opinion (2018), PT DI is expected to be able to produce defense equipment components, and aircraft of various sizes according to the specifications required by the Indonesian Air Force. The inhibiting factors for the empowerment of the defense industry for the independence of the modernize Main Tool of the Indonesian Armed Forces' Weapon System are the lack of common understanding between parties in viewing the development of national defense, various policies issued which are not in line with the development of the defense industry and modernization of the machinery/production facilities of the defense industry, there is still a weak political will and the commitment of the government and the Indonesian Army to use domestic production and technological capabilities still depend on the principal state.

In accordance with the concept presented by Susdarwono (2020), the state can take advantage of its defense industry R&D activities. In addition to strengthening war machines, the research results are used to support commercial activities (non-military industry). The symbiotic pattern of mutualism of military technology for use in the general public (commercial) is known as the concept of dual-use technologies. The concept of dual-use technologies is then applied in the form of a tiered tree which describes the roots of R&D for a product or technology in general which must be developed and then grows like branches to specific military or commercial specifications.

Based on the description above, this study aims to see the extent to which policy innovation and downstream material R&D results in the fulfillment of the army Defense Equipment of the Indonesian Army case study Battlefield Management System (BMS) and the determinants of innovation in creating modernization and independence.

Research Methods

This research was conducted with a qualitative method and utilized a case study strategy. The technique used by the researcher is the study of academic literature in the field of public policy in order to obtain concepts relevant to the study of public policy innovation. Determination of research locations is based on the existence of phenomena in research and development activities carried out within the Indonesian Army, including elements of policymakers and implementers of R&D activities in the Indonesian Army, elements of the domestic defense industry, and elements of academics from universities or R&D bodies as well as elements of non-governmental organizations (Non-Government Organizations). This study uses qualitative research methods to explain the research problem in-depth. Six people are determined as the informants/ resource persons based on purposive sampling, consisting of officials who formulate the R&D policies of the Indonesian Army, officials from elements of the material R&D activities of the Battlefield Management System, elements from domestic defense industry players in the R&D activities of the Battlefield Management System, as well as elements from researchers/teachers and military observers from non-governmental organizations. The stages of data analysis were carried out through three main stages, namely data reduction, data presentation, and conclusion drawing.

Results and Discussion

Innovation of the Research and Development Results of the Battlefield Management System (BMS) Material

According to Nasution and Kartajaya (2018), innovation is a continuation of the invention. The discovery of an idea and the idea is the result of the thought called innovation.

Likewise, BMS material R&D is one form of Defense Equipment innovation obtained from the results of the Indonesian Army's digital transformation. The change from the conventional combat era to a digital war based on modernization and independence can be realized by the Indonesian Army through innovation in the field of research and material development. The results obtained from the innovation of BMS R&D results in supporting the development of national defense are the realization of the Indonesian Army's Defense Equipment which is accurate, precise, safe, effective, and efficient. The ease of a defense equipment tool it is easy to operate by the soldiers in supporting the main tasks of the Indonesian Army shows that the innovation of R&D results applied in BMS material R&D activities can be realized.

According to Hoetman (2014), increasing added value and able to increase product competitiveness are the main supporting factors for the driving force of the industry. Research and development are a form of innovative research according to Putra (2011). Innovations that occur in R&D activities for BMS materials are the discovery of domestically made BMS materials that are able to answer user problems and needs. In the period 2010 to 2021, there are at least 343 material R&D results, but not all of them have been allocated a budget to support mass production. In the period 2016 until now, the results of R&D BMS have been mass-produced counted to 555 units.

This shows that BMS is an innovation that is beneficial for the Indonesian Army units. Innovation in the implementation of R&D activities also contributes to the success of R&D activities. Starting from planning activities, the preparation of planning documents in the form of a framework of reference (*Kerangka Acuan Kerja*/KAK) and a budget plan (*Rencana Anggaran Biaya*/ RAB). The selection of KAK and RAB for material R&D activities is carried out strictly and thoroughly so that the selected R&D activity proposals are the result of verification and review of the R&D activity proposal. Reduction of bureaucracy or stages of activities that are less effective and efficient can reduce the need for costs for activities. The addition of the R&D assessment mechanism aims to determine the readiness of Balakpus and its partners to work and the ability to complete their work. At each stage of R&D activities, regulations must be guided and implemented so as to reduce potential findings from the internal and external audit teams. There is an adjustment to the regulation of material R&D activities so that it can cut the bureaucracy which is too long, and change it to become more effective and efficient. This bureaucratic change is one of the policy innovations in the field of software or policy deregulation through the revision of implementation guidelines regulated through regulations and decisions of the Head of the Indonesian Army.

The innovation of the R&D material policy of the Battlefield Management System will be influenced by several factors which encourage the creation of an innovation. There are at least 13 factors driving innovation (Elijah, 2010) as follows.

a. Improvement of customer experience
   Product improvement as a result of BMS R&D in the form of increased convenience in operating the UI (user interface) of the BMS software. BMS R&D products are integrated with other communication equipment, making it easier for users to control electronic equipment in the armored fighting vehicle (*Ranpur*), such as radio equipment, intercoms, fire control systems, and others.

b. Demand of customer
   The features which users can benefit from our navigation, recognition of the position of an ally (blue force tracking), recognition of enemy positions both from

intelligence data and sensors deployed, and command features that are displayed in various forms of text, images, lines. as well as videos.

c. Cost reduction
Products resulting from BMS R&D have a competitive advantage in cost reduction because foreign BMS products offer prices 2 to 3 times or even more than the value of products produced from BMS R&D.

d. Organization culture
The organizational culture of the company with a vision and mission is to always make products that are useful for users and will continuously encourage the creation of sustainable innovation. Through the sustainability of these activities, it will continue to trigger the development of products that are more strategic and in accordance with user needs.

e. Need to change or reduce raw material
Changes in raw materials in product development will always be carried out to obtain product reliability goals. It is to obtain reliability requires iteration which occurs continuously.

f. Regulatory requirement
In general, regulations to support BMS R&D products are Law No. 16/2012 concerning the Defense Industry. Although there are already regulations that encourage the independence of the Indonesian Army's Defense Equipment, it is the contrary in their implementation.

g. Competitive positioning
The results of R&D BMS have a competitive advantage, in which currently BMS holds a key position in the integration of military electronic equipment so that military equipment containing electronic systems can no longer be imported without being integrated with the BMS.

h. Minimization of environmental impact
BMS R&D products have standardized IS0 9001:2008 and OHSAS 18001:2007 so that standardization in development and production is carried out with better quality management to avoid impacts on the environment.

i. Gap in the market
BMS is a gap in the Indonesian market in fulfilling the Defense Equipment, in which the defense industry must be able to realize products that suit user needs.

j. Improving quality
Improvements in product quality as a result of BMS R&D are continuously carried out, both hardware and software in order to meet user needs.

k. Reducing of energy expenditure
The product resulting from the BMS R&D is a Dense Equipment which has been designed to be efficient, both in operation and during the production process.

l. Differentiation
The R&D product of BMS is a product that has been adapted to the needs of the Indonesian Army, namely in accordance with the doctrine and tactics of combat. This differentiates it from similar products because the average foreign product refers to the standard NATO doctrine.

m. Enhancing flexibility
BMS R&D products have flexibility in their use and future development because they are capable of producing derivative products, such as weapons control systems, electronic optical systems, surveillance systems, artificial intelligence, big data, and others.

Downstream Policies in Fulfilling the Defense Equipment of the Indonesian Army based on Modernization and Independence

Downstream of R&D results from the Battlefield Management System is the best practice and can be used as a role model in other material R&D activities. The current condition of the Indonesian Army's material R&D has shown positive developments, such as the encouragement to utilize the results of material R&D in the fulfillment of the Defence Equipment of the Indonesian Army. There is an additional budget for defense research and higher education programs to support material R&D activities. The emergence of several new regulations which can stimulate the use of R&D products, including the Circular Letter of the Minister of Defense of the Republic of Indonesia No. SE/59/III/2022 dated March 15, 2022, concerning Commitment to the Use of Domestic Products for the Procurement of Goods and Services within the Ministry of Defense and the Indonesian Army, Decree of Head of Indonesian Army No. Kep. /159/III/2022 dated March 17, 2022, regarding the Team to Increase the Use of Domestic Products for the Indonesian Army and Head of Indonesian Army Letter No. B/1010/III/2022 dated March 18, 2022, regarding the Delivery of a Statement of Commitment to Spending on Domestic Products for the Indonesian Army's Operator Unit.

The implementation of planning activities carried out by the supervisor of R&D activities is in the form of a strict selection of proposals for material R&D activities. The selection is based on the aspect of benefit value and use value. Proposals for material R&D activities that only have low value and use value will not be followed up for inclusion in the Work Plan and Budget. So that the proposed material R&D activities which are really needed and can answer the problems will be followed up in the Work Plan and Budget to be further programmed in material R&D activities.

Regulations are applied in detail at the planning stage because they determine the budget allocation which will be given in financing material R&D activities. The review/assessment of the Budget and Cost Plan (RAB) is carried out in detail, assessed based on the aspect of benefits, Standard Cost of Output (*Standar Biaya Keluaran*/SBK), and the norm index in the Indonesian Army's environment. So that the implementation of the Budget and Cost Plan can be prepared more effectively, efficiently, and accountably. All regulatory mechanisms are implemented in detail with the aim of avoiding errors. Supervisors of R&D activities also seek to encourage the sustainability of R&D activities, among others, through prototype certification activities and programming R&D activities in accordance with the Roadmap and national priorities. The expected regulations are regulations that are able to not only encourage, but require the use of R&D products produced by the domestic defense industry. Improvements in the procedures and mechanisms of R&D activities from the planning stage to the end have received a response from the market as feedback, namely encouraging the increase of mass-produced material R&D results.

The factors which support downstream according to Hoetman (2014) are implementing import product substitution, increasing added value, and increasing product competitiveness. Based on these three factors, the products resulting from BMS R&D will be studied further, so that it can be seen how far the downstream process is applied to these products and the extent to which these innovations can realize the results in the form of mass products.

This downstream policy will function as a filter for the material of R&D activities. Only material R&D activities which meet the determinants of downstream can finally be continued for the fulfillment of the Defense Equipment of the Indonesian Army. BMS as a product of material R&D is the result of

innovation and has fulfilled the determinants of downstream, namely as a substitute for imported products, increasing added value and increasing competitiveness.

Determination Factors of Innovation based on Modernization and Independence

Several innovation determinants based on modernization and independence encourage the realization of material R&D results in innovations to fulfill the Defense Equipment. Modern Defense Equipment is not necessarily independent, therefore it will be seen to what extent modernization and independence can be realized in the material R&D activities of the Battlefield Management System.

The driving factors state that the Defense Equipment is categorized as modern or has undergone modernization when the factors have complexity, technological progress, and speed (Sari, 2021). The Battlefield Management System as a result of the Indonesian Army's material of R&D can be categorized as a modern product because when viewed from the aspect of complexity, aspects of technological progress, and aspects of speed, all of these aspects have been fulfilled. This shows that the BMS product is a modern product. It is due to the fact that apart from having fulfilled the determinants of BMS modernization, it is also a form of digital transformation in the Indonesian Army's environment. Previously the business processes were carried out manually and conventionally, but now these activities can be carried out using digital technology and automation which reflects the modernization of the Defense Equipment in the Indonesian Army's environment.

There are nine factors that influence the independence of the Indonesian Army's Defense Equipment Battlefield Management System, namely the quality of R&D, stakeholder policies (triple helix), R&D financing and the defense industry, upstream to downstream industry synergies, the industry as a political tool (pull of interest), production costs (tax, monetary, fiscal policies), mastery of technology, the readiness of machines/production facilities, the weak political will of the government and the commitment of the Indonesian Army to use domestic products (Grahadi, 2018).

The quality of R&D, mastery of technology, synergy of upstream to downstream industries, and readiness of machines/production facilities can contribute positively to the realization of an independent Battlefield Management System. Meanwhile, there are still notes and obstacles in several aspects which should if implemented properly can encourage the realization of the independence of the Battlefield Management System faster and better. These aspects include stakeholder policies (triple helix), R&D financing and the defense industry, industry as a political tool (attraction of interest), the burden of production costs (tax, monetary, fiscal policies), the weak political will of the government and the Indonesian Army's commitment to using domestic products.

Conclusions

The results of this study are as follow. 1) BMS material R&D is one of the innovative products which is proven to meet 13 determinants of innovation, namely, among others, improvement of customer experience, demand/user of the customer, cost reduction, organization culture, need to change or reduce raw material, regulatory requirements, competitive positioning, minimization of environmental impact, the gap in the market, improving quality, reducing energy expenditure, differentiation, enhancing flexibility. Downstream policies play a role in realizing BMS products in the fulfillment of the Defense Equipment of the Indonesian Army. 2) BMS is an innovative product that prioritizes modernization and independence. BMS fulfills all the determinants of modernization-based innovation and fulfills

some of the determinants of independence. This is realized for two reasons. First, BMS is a modern Army Defense Forces, fulfilling aspects of complexity, aspects of technological progress, and aspects of speed. Second, BMS is a product that is produced based on independence, the determinants of independence that are fulfilled, namely the quality of R&D, mastery of technology, synergy of upstream to downstream industries, and readiness of machines/production facilities. Meanwhile, the factors which have not been fully realized in independence are the not-yet optimal triple helix policy, the conflict of interests, research funding, production costs, and indications of weak political will of the Indonesian Army to use domestic products.

Recommendations

1. There is a need for prioritization, continuous and consistent budgeting and procurement (mass production), and budgeting for superior material R&D results as a form of reward.
2. There is a need for policies and regulations which can protect the products of material R&D against the competitiveness of similar products originating from abroad.
3. There is a need for a formulation to provide cost relief in the form of tax incentives for the purchase of raw materials as well as the sale and purchase of R&D products from the defense industry.
4. There is a need for working capital financing support through bank loans to obtain a special lower interest rate facility for the Defense Equipment products produced by the defense industry.
5. There is a need for structuring and mapping the supply needs of basic components for the defense and commercial product market.
6. It is necessary to hold a forum between users and the domestic defense industry to comprehensively discuss the products of the domestic defense industry.
7. Universities need to respond to the implementation of the involvement of researchers from universities in R&D activities by jointly helping the private sector and industry compete in creating innovations in the field of basic science and applied science to support the realization of quality and highly competitive Defense Equipment.
8. In order to realize the implementation of R&D activities that are efficient and have high use value and avoid state losses, although R&D activities are allowed to fail, it is necessary to carry out good planning activities, considering the value of benefits, effectiveness, efficiency and reflecting real work and eye-catching at the level of supervisor of R&D activities. as well as implementing R&D activities.

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