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Identification of Critical Factors based on Innovation at the Private Defense Enterprises for Naval Weaponry Improvement

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ABSTRACT

Private enterprises play a strategic role in the national defense industry, particularly in the development of naval armaments. The purpose of this study is to identify critical innovation-based factors in the private defense enterprises in the improvement of naval weaponry. For analysis, the theories of innovation and private enterprises as well as qualitative methods were used in the research. In addition, thematic analysis method was used which was supported by QSR NVivo 11. Twelve experts were included in supporting the research with eight domestic defense industries that have been playing an important role in the development of national armament. There are three main attributes in the defense industry's innovation-based critical factors namely Technological Innovation, Operational Innovation, and Strategic Innovation. Technological innovation consists of four subsections, namely Stealth Technology, Advanced Navigation Systems, Integration of automated Weapon Systems, and Advanced Composite Materials. Operational Innovation consists of four subs namely Operational Effectiveness, Reliability and Durability, Accuracy and Precision, and Production Capacity Enhancement. Strategical Innovation consists of four subs namely Innovation and Technology Development, Strategic Partnerships, Competitiveness Enhancement, and Local Economic Strengthening. These findings show that technological innovation conducted by private enterprises has a significant positive impact on Indonesia's maritime defense capabilities.

1. Introduction.

The main weapon system plays an important role in maintaining Indonesia's maritime sovereignty and security. As an archipelago with vast marine areas, Indonesia faces significant challenges in ensuring the security of its waters and protecting its maritime resources (Listiyono, Prakoso and Sianturi, 2019). Naval weaponry, such as warships, navigation systems, and automatic weapons, are essential elements in naval operations to secure sea borders and resolve various threats, both from within and outside the country (Yanyan, 2015). The presence of private enterprises in the defense sector helps drive the advancement of Indonesia's maritime defense industry, increase international competitiveness, and support overall national resilience (Sailenius A W, 2023). Since the early 2000s, a third model has emerged that focuses on open & interactive innovation. Based on the premise of open innovation, technological knowledge is no longer considered to be sourced only from intra-organizational networks, as external organizations along with various types of knowledge acquisition practices acquire an important role in a firm's innovation process (Brandl et al., 2021).

Private enterprises play a strategic role in the national defense industry, particularly in the development of naval weaponry. In rapid global technological advances, private enterprises in Indonesia function not only as producers, but also as innovators who are capable of absorbing and developing the latest technology (Suryokusumo, 2016). The development of naval weaponry in Indonesia faces several challenges. One of the

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main challenges is the limited human resources with specific expertise in defense technology. In addition, limited funding for research and development (R&D) often hampers sustainable innovation (Sulistijono, 2017). Complicated regulations and bureaucracy can also hinder strategic partnerships between private enterprises and government or foreign entities that are required for technology transfer. Needs for innovation and technology in the defense industry are becoming more urgent given the evolving threat dynamics.

Global advances in defense technology require Indonesia to continuously adapt and upgrade its weapon systems to remain relevant and effective in ensuring maritime security (Tarigan et al., 2024). Alvarez-Aros & Bernal-Torres (2021), revealed for future research identifying key elements of technological competitiveness and new technologies that are most widely used in developed and developing countries. Furthermore, Saunila & Ukko (2012), explain the need to evaluate the suitability of the conceptual framework in measuring innovation capabilities to be developed. Zhu et al. developed five themes including technological innovation, innovation ecology, digital transformation, business model innovation, and sustainable development, frameworks and propositions for academic research and future innovation practices of the Information Communication Technology (ICT) industry. Up to now, research on centre-private integration has mostly reflected in the process of training, and services, while little has addressed the technology spillover between centre and private enterprises and the legal restrictions of space privatisation in the process of centre-private integration (Huang et al., 2023). Therefore, the application of innovation and cutting-edge technology is crucial to ensure that Indonesia's naval weaponry can face future challenges (Kusuma, Prakoso and Sianturi, 2020).

The objective of this study is to identify critical factors based on innovation in the private defense enterprises in improving the Navy's weaponry. This study also underlines the importance of policies that support collaboration between the private sector and the government. The implementation of the recommendations from this study can assist policymakers in formulating policies that encourage innovation and increase the competitiveness of the national defense industry, which in turn will strengthen Indonesia's maritime defense. For analysis, the theories of innovation and private enterprises along with qualitative methods were used in the study. Additionally, a thematic method of analysis was used which was supported with QSR NVivo 11. Twelve experts were included in supporting the research with eight domestic defense industries that have been instrumental in the development of national defense.

This research has several contributions, theoretically this research enriches the literature on innovation and technology in the defense industry, especially in the maritime sector (Farras et al., 2024), This study also provides a framework for understanding the relationship between strategic collaboration, technology transfer, and defense capability enhancement. This research is expected to provide deep insights into the strategic role of private enterprises in the national defense industry and offer solutions to improve the quality and effectiveness of naval weaponry through innovation and technology. Moreover, through this thematic analysis process, the research is expected to provide deep insights into how private enterprises contribute to the development of naval armaments through innovation and technology, as well as the factors that influence their success in this sector. The research also contributes to defense economics by highlighting the economic factors that influence innovation in the defense industry. It can inform theories on how economic conditions, government policies and market dynamics affect the ability of private defense firms to innovate and contribute to national security.

2. Literature Review.

2.1. Innovation Theory.

Innovation is a new idea that has the potential to provide benefits and attract the user's interest. People who create something new are known as innovators or people who have an innovative attitude (Fitri, 2023). Most contemporary definitions of 'innovation', seen as the outcome of a process, rest on two defining characteristics, namely the degree of novelty of a change and the degree of usefulness or success in the application of something new. Innovation is the creation of any product, service or process, that is new to the business, most successful innovations are based on the cumulative effect of incremental changes in ideas or methods (Tushman and Nadler, 1986). The innovation in question is defined as a technology or practice implemented for the first time by members of an organization, regardless of whether the technology or practice has been used by other organizations before (McAdam et al., 2017). The concept of 'new' can mean new to the world, new to a country, new to a company, and so on (Granstrand and Holgersson, 2020). In the context of the defense industry, innovation includes not only developing new products but also improving the efficiency and effectiveness of existing weapon systems.

Since the early 20th century, three sequential models of innovation have emerged, each of which offers a common understanding of how ideas can be transformed into final products or services, where resources should be allocated and how those resources should be managed to drive the innovation process (Brandl et al., 2021). Rogers et al. (2003) in their theory of innovation diffusion explain that the successful adoption of innovations in an organization is highly dependent on the characteristics of the innovation itself, the existing social system, and the way the innovation is communicated. Innovative companies are highly agile in responding to any changes in their environment and are characterized by creative people who develop new products and services (Peters and Waterman Jr, 1982). What makes innovation challenging is the fact that it is very difficult to agree on a common definition, and also to decide which firms are the most innovative and how to measure innovation activity (Zairi, 1995).

2.2. Private Enterprises.

Private enterprises are the most active economic entities and are an important force that effectively drives the rapid development of the national economy (Xiaoyi et al., 2018). Private

enterprises are business entities whose securities are not traded on public markets. Private firms can be structured as sole proprietorships, partnerships, or corporations, and can vary in size from sole proprietors to international corporations (Huang et al., 2023). Due to market-oriented private firms taking a dominant position in exports and usually exhibiting higher resource allocation efficiency as well as innovation vitality to deal with fierce market competition, exporting firms cause less environmental damage (Wang and Chen, 2022). Although private firms cannot sell their securities without first conducting an Initial Public Offering (IPO) (Pu and Lam, 2021), they may still be able to raise capital by issuing securities through private placements (Xiaoyi et al., 2018). Fierce competition from existing competitors as well as new entrants makes private enterprises have to be more careful in complying with government regulations and advocate strong operations (Sun, Tang and Li, 2022).

3. Methodology.

This research uses a qualitative approach with a case study method. The qualitative approach was chosen as it allowed the researcher to gain an in-depth understanding of the role of private enterprises in the development of naval armaments through the application of innovation and technology. The case study method was used to explore this phenomenon in a real-world context, allowing in-depth analysis of the various factors that influence and contribute to the success of private enterprises in this sector. The subjects in this study are private enterprises in Indonesia that play a role in the development of naval armaments.

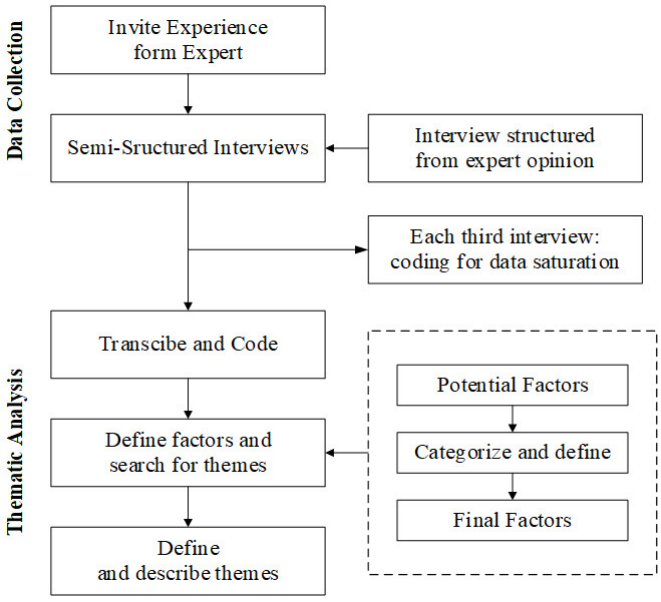
We conducted a series of semi-structured interviews with e-learning creators, after which we conducted thematic analysis to generate answers to our questions and categories of factors. The semi-structured format is a technique often used in qualitative health studies. One of its main advantages is the interaction between interviewer and participant, which allows for deeper insights into possible constructs (Leeuw et al., 2019). A purpose sampling method was used for this study. To answer the research questions, twelve academic and practitioner experts were surveyed using thematic analysis. A questionnaire containing a list of variables was sent to potential experts including defense industry experts and management from private enterprises involved in technology development and innovation in the maritime defense sector.

Table 1: Demographic information of the experts.

Expert	Field	Position
E1; E2; E3	PhD in Maritime Industries	Academic and Professional
E4; E5; E6; E7	Master in Naval	Academic and Professional
E8; E9; E10	PhD Student in Maritime Management	Academic
E11; E12	Master in Defense industries	Professional

Source: Authors.

Figure 1: Flowchart of the thematic analysis performed in this study.



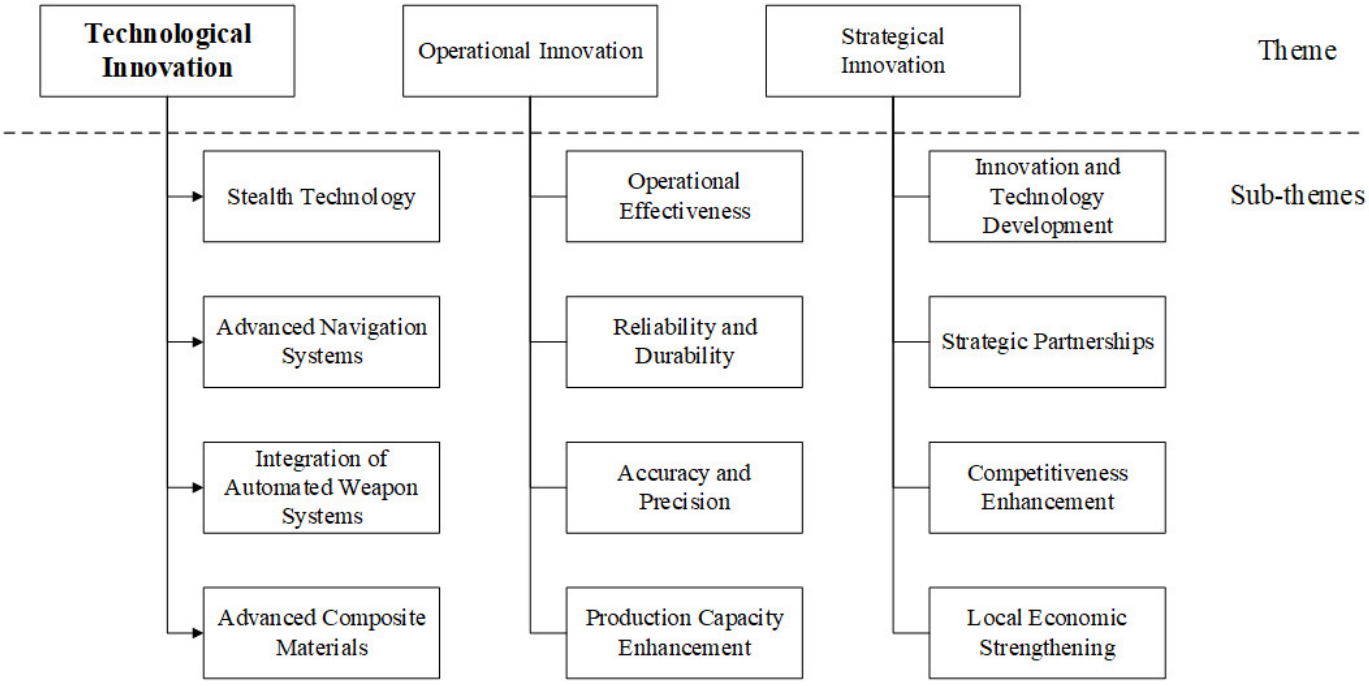
Source: Authors.

We transcribed all interviews verbatim and conducted thematic analyses according to Braun et al (2019). Interview transcriptions were conducted with RL and DL. We used Nvivo for initial coding. The reason for using thematic analysis is that it can summarise key features and generate unexpected insights, and has proven useful for generating appropriate qualitative analysis (Wipulanusat et al., 2019) to identify key factors. To conduct data analysis in a structured method, we used several steps proposed by Braun et al (2019). Firstly, transcribe the data. All interviews were recorded and transcribed to ensure that every detail was obtained and could be analyzed in depth. Second, Coding. Transcription data and other documents were broken down into smaller units of information and coded to identify key themes that emerged from the data. Third, categorization: The codes were then grouped into larger categories based on relevant themes or topics. Fourth, interpretation. The categorised data was interpreted to understand the relationship between the emerging themes and to answer the research questions. These interpretations were supported by relevant theories and findings from previous literature.

4. Results.

Some consistent patterns emerged among the speakers. From the analysis of the speaker transcripts three prominent themes emerged, namely: Technological innovation; Operational innovation, and Strategic innovation. Each theme and subtheme is discussed with theoretical explanations and supported by quotes taken from the transcripts. Figure 2 presents an overview of the themes and subthemes.

Figure 2: Themes (shaded) and subthemes from the thematic analysis.



Source: Authors.

4.1. Technological Innovation.

Private enterprises in Indonesia have successfully implemented various technological innovations in the development of naval weaponry. There is no doubt that some sustainable technological innovations in the industry will influence the future Appropriate value is often measured based on (technological) performance, as ecosystem success often relates to the development of technological innovation (Cobben, Ooms and Roijakkers, 2023). Companies can concentrate on internal capabilities, relying on product performance and technological innovation (Evi and Pramesworo, 2023). The success of a firm's technological innovation depends on whether it can match the right workforce and tap into knowledge spillovers (Zhao, Zhu and Zhu, 2022). Technological innovation consists of four subthemes, likely:

a. **Stealth Technology**.
PT PAL Indonesia has developed warships with stealth technology that can reduce radar signatures, making the ships harder to detect by enemies. The Perusak Kawal Rudal (PKR) warship is a concrete example of this innovation.

b. **Advanced Navigation Systems.**
PT PAL has also integrated advanced navigation systems into its warships, allowing for increased accuracy and efficiency in maritime navigation. This system involves the use of more accurate GPS technology and integrated navigation software.

c. **Integration of Automated Weapon Systems.**
PT Pindad has developed and integrated automated weapon systems on warships, allowing for more precise and efficient weapon operations. This system uses remote control technology and artificial intelligence to enhance responsiveness and accuracy in combat.

d. **Advanced Composite Materials.**
PT Lundin Industry Invest has developed fast missile boats (KCR) using advanced composite materials that are lighter and resistant to corrosion. This technology increases the speed and durability of the boats, making them more efficient and effective in military operations.

4.2. Operational Innovation.

Inovasi operational (OI) is defined as a breakthrough change in a small firm's manufacturing operations and processes for producing the firm's products (Oke and Kach, 2012). Operational innovation can lead to significant competitive advantages by optimizing resource use, reducing costs, improving quality, and enhancing customer satisfaction. Operational innovation is associated with process management adaptability that focuses on the skills and knowledge of employees to perform processes, processes must be measured and improved regularly (Ali, Zwetsloot and Nada, 2019). Operational innovation is achieved by matching high levels of traceability with effective and balanced transparency and flexibility and overcoming difficulties in managing complexity and cost (Shou et al., 2021). Operational innovation consists of four sub-themes, such as:

a. **Operational Effectiveness.**
Stealth technology and advanced navigation systems implemented on warships have increased the operational effectiveness of the Indonesian Navy. Ships that are harder to detect and more accurate navigation allow for more efficient and successful military operations.

b. **Reliability and Durability.**
The use of advanced composite materials on fast missile boats increases the durability and reliability of the boats in various environmental conditions. This is important to ensure the long-term readiness of the boats.

c. **Accuracy and Precision.**
The integration of automated weapon systems with remote control technology and artificial intelligence increases the accuracy and precision of weapon use. This provides significant tactical advantages in naval combat.

d. **Production Capacity Enhancement.**
Strategic partnerships and technology transfers with foreign companies have increased the production capacity of private enterprises, allowing them to better meet domestic weaponry needs.

4.3. Strategical Innovation.

Private enterprises play a strategic role in Indonesia's defense industry ecosystem with various important contributions. In the context of innovation development strategy, technology and industry are intertwined, and customized production as well as intelligent manufacturing based on digital technology will drive enterprises to achieve technological innovation, which is of great significance for expanding the development space of real industries (Tian et al., 2023). Strategic innovation that strategically and continuously acquires new knowledge to create innovation becomes a key process by which a company quickly establishes a position in the market and new technology, which is also a factor to achieving 'strategic transformation' (Kodama and Shibata, 2014). Strategic innovation ensures that organizations are not stuck in the rut of following prevailing administrative procedures and patterns, which ultimately cannot remain dominant as all its competitors are doing the same (AlQershi, 2021). Because strategic innovation provides business rethinking, industry redesign, and value proposition reinvention. Therefore, strategic innovation affects the company's competitive position directly because imitation of strategic innovation is difficult for competitors (Ozkan-Canbolat, Beraha and Bas, 2016). Strategical innovation consists of four subthemes, namely:

a. **Innovation and Technology Development.**
Private enterprises have become the driving force of innovation in the maritime defense industry. Through research and development, private enterprises can create new technologies that enhance weaponry capabilities.

b. **Strategic Partnerships.**
Private enterprises actively establish partnerships with foreign companies for technology transfer and production capacity enhancement. This not only accelerates the innovation process but also improves the quality of the produced weaponry systems.

c. **Competitiveness Enhancement.**
Innovations conducted by private enterprises enhance the competitiveness of Indonesia's defense industry in the international market. The produced weaponry systems can compete with products from other countries, opening export opportunities and strengthening Indonesia's position globally.

d. **Local Economic Strengthening.**
The activities of private enterprises in the defense industry contribute to local economic strengthening. Increased production and innovation create new jobs and drive the growth of related industrial sectors.

5. Discussion.

This study reveals that private enterprises in Indonesia play a very important role in the development of naval weapons with various technological innovations. The resulting innovations, such as stealth technology, advanced navigation systems, integration of automated weapon systems, and the use of advanced composite materials, have significantly improved the capabilities and operational effectiveness of naval weapons. From a formal point of view, technological innovation concerns process innovation, while product innovation is the result of innovation. When considering the impact of innovation, technological innovation can lead to standardization, simplification and high efficiency of production processes. Thus, technological innovation can reduce the production cost of an enterprise, improve production efficiency, generate process compensation, and ultimately affect enterprise performance (Shao et al., 2020).

These findings suggest that technological innovations made by private enterprises have a significant positive impact on Indonesia's maritime defense capabilities. For example, stealth technology and advanced navigation systems increase the effectiveness of warship operations by making them more difficult to detect by the enemy and improving navigation accuracy. The integration of automated weapon systems also provides important tactical advantages in naval combat by improving the accuracy and precision of weapon use. The innovation results and experience gained from previous innovation inputs can become the basis for later new technological breakthroughs, which can improve the efficiency of technological innovation and thus promote technological innovation and create a favourable innovation environment for enterprises to promote the sustainable development of innovation in the region (Tian et al., 2023). However, this study also found that the success of private enterprises in technological innovation is inseparable from government policy support and strategic partnerships

with foreign enterprises. This suggests that in addition to the internal capabilities of firms, external factors such as regulations and international collaboration also play an important role in successful innovation.

In addition, the use of advanced composite materials on fast missile boats increases the speed and durability of the vessels, enabling them to operate more efficiently and for a longer period under various environmental conditions. This shows that technological innovations carried out by private enterprises are not only incremental but also transformative, significantly improving the weapon capabilities of the Indonesian navy. Technological development is an important topic in new institutionalism because the exploitation of new technologies may require new institutions and existing institutions may become salient due to technological change (Kurzhals, Graf-vlachy and König, 2020). his study reinforces such findings by providing concrete examples from the Indonesian context, where private enterprises have successfully implemented significant technological innovations in the development of naval weapons.

6. Implications.

Theoretical implication. Firstly, this research helps extend innovation theory by exploring how the private defense industry contributes to military technological advancement. It identifies specific factors - such as collaboration, technological capabilities and strategic partnerships - that drive innovation in the sector. This can enhance existing theories on innovation by emphasizing the role of sector-specific factors in determining the success of the innovation process. Second, in terms of organizational behaviour, factors such as leadership style, corporate culture, team dynamics, and employee motivation play an important role in determining the capacity of firms to produce innovative outputs. Insights from this research can inform theories regarding organizational change management and strategic alignment with government objectives. Third, Public-Private Partnerships. Understanding how these partnerships function and what structures lead to successful collaboration between government entities and private enterprises can inform theoretical frameworks regarding cooperation strategies in other sectors as well.

Practical implication. Technological innovations made by private enterprises directly enhance the operational capabilities of the Indonesian Navy, strengthening Indonesia's maritime defense. Stealth technology, advanced navigation systems, and the integration of automated weapon systems enable more efficient and effective military operations. The government needs to continue to support the development of private enterprises through pro-innovation policies. The importance of strategic partnerships with foreign companies for technology transfer and increased production capacity. The government can facilitate these partnerships through policies that support international collaboration and protection of intellectual property rights. The formation of innovation clusters involving various stakeholders such as private enterprises, state companies, universities, and research institutions can accelerate the process of innovation and technology transfer. Collaboration within this ecosystem can create synergies that support the growth of the defense industry.

Conclusions.

Private enterprises play a strategic role in the national defense industry, particularly in developing naval weaponry. In rapid global technological advancements, private enterprises in Indonesia function not only as producers, but also as innovators capable of absorbing and developing cutting-edge technologies. Global advancements in defense technology require Indonesia to continuously adapt and upgrade its weapon systems to remain relevant and effective in ensuring maritime security. As such, the application of innovation and cutting-edge technology is essential to ensure that Indonesia's naval weaponry can face the challenges.

After conducting a comprehensive thematic analysis, this study has identified critical innovation-based factors in the private defense industry in the improvement of the Navy's weaponry. The implementation of the recommendations from this study can assist policymakers in formulating policies that encourage innovation and increase the competitiveness of the national defense industry, which in turn will strengthen Indonesia's maritime defense. Thematic analysis reveals that there are three main attributes in the defense industry innovation-based critical factors consisting of Technological Innovation, Operational Innovation, and Strategic Innovation. Technological innovation consists of four subs namely Stealth Technology, Advanced Navigation Systems, Integration of Automated Weapon Systems, and Advanced Composite Materials. Operational Innovation consists of four subs namely Operational Effectiveness, Reliability and Durability, Accuracy and Precision, Production Capacity Enhancement. Strategic Innovation consists of four subs namely Innovation and Technology Development, Strategic Partnerships, Competitiveness Enhancement, Local Economic Strengthening.

The findings suggest that technological innovation by private enterprises has a significant positive impact on Indonesia's maritime defense capabilities. However, this study also found that private enterprises success in technological innovation is not separate from government policy support and strategic partnerships with foreign companies. This suggests that in addition to the internal capabilities of companies, external factors such as regulations and international collaboration also play an important role in the success of innovation.

A limitation of this study lies in the absence of an analysis of the impact of technological innovation on the operational performance and cost-effectiveness of weapon systems. Future research can encourage this to be able to provide more measurable insights into the benefits of innovation with a quantitative method approach. Second, further research on the most effective government policies in supporting innovation in the defense sector, including comparative studies with other countries in the corridor of policy analysis can be the next step. By conducting further research, it is hoped that a more comprehensive understanding of the factors that support the success of technological innovation in the defense industry can be obtained, as well

as ways to overcome existing obstacles and challenges to help strengthen the role of private enterprises in the development of weapon systems and improve maritime defense capabilities.

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References.

Ali, Z., Zwetsloot, I. M. and Nada, N. (2019) 'An empirical study to explore the interplay of Managerial and Operational capabilities to infuse organizational innovation in SMEs', Procedia Computer Science, 158, pp. 260–269. doi: 10.1016/j.procs-.2019.09.050.

AlQershi, N. (2021) 'Strategic thinking, strategic planning, strategic innovation and the performance of SMEs: The mediating role of human capital', Management Science Letters, 11, pp. 1003–1012. doi: 10.5267/j.msl.2020.9.042.

Alvarez-aros, E. L. and Bernal-torres, C. A. (2021) 'Technological competitiveness and emerging technologies in industry 4 . 0 and industry 5 . 0', Annals of the Brazilian Academy of Sciences, 93(1), pp. 1–20. doi: 10.1590/0001-37652021201191-290.

Brandl, K. et al. (2021) 'The nature of innovation in global value chains Bj o', Journal of World Business journal, 56. doi: 10.1016/j.jwb.2021.101221.

Braun, V. et al. (2019) 'Thematic Analysis', in Handbook ofResearch Methods in Health Social Sciences, pp. 843–860.

Cobben, D., Ooms, W. and Roijakkers, N. (2023) 'Indicators for innovation ecosystem health : A Delphi study', Journal of Business Research, 162(April 2022), p. 113860. doi: 10.1016/j.jbusres.2023.113860.

Evi, T. and Pramesworo, S. (2023) 'Analysis Of The Balanced Scorecard Approach For Assessing The Financial And Non-Financial Performance Measurement.', Indonesian Journal of Business. Available at: https://search.ebscohost.com/login.aspx?direct=true&profile=ehost&scope=site&authtype= crawler&jrnl=24075434&AN=173165887&h=wzpdRZ%2B71-2fNSTNV4gGn6S1Xxe96Ml544hLlp6d9fKO2gn3cIZhbxK%2B3VfecLGPsvFJkEpGF6q11mcm6L71i%2Fw%3D%3D&crl=c.

Farras, A. N. et al. (2024) 'Diplomasi Pertahanan Indonesia Dan Inggris Dalam Kerjasama Pengembangan Industri Pertahanan'.

Fitri, K. A. (2023) 'Analysis of Challenges and Opportunities in Strengthening Village Development Innovation for Village Community Welfare', Journal of Islamic Economics and Business Studies, 2(1).

Granstrand, O. and Holgersson, M. (2020) 'Technovation Innovation ecosystems : A conceptual review and a new definition', Technovation journal, 91(November 2019). doi: 10.1016-/j.technovation.2019.102098.

Huang, X. et al. (2023) 'Selecting Suitable Key Supplier for Core Components During Smart Complex Equipment Central-Private Enterprises Collaborative Development Process: From Two Different Forms of Evaluation Information and Matching Perspective', Journal of Systems Engineering and Electronics, 34(4), pp. 939–954. doi: 10.23919/JSEE.2023.000099.

Kodama, M. and Shibata, T. (2014) 'Strategy transformation through strategic innovation capability - a case study of Fanuc', R and D Management, 44(1), pp. 75–103. doi: 10.1111-/radm.12041.

Kurzhals, C., Graf-vlachy, L. and König, A. (2020) 'Strategic leadership and technological innovation : A comprehensive review and research agenda', Corp Govern Int Rev., 28(October), pp. 437–464. doi: 10.1111/corg.12351.

Kusuma, A. W., Prakoso, L. Y. and Sianturi, D. (2020) 'Relevansi Strategi Pertahanan Laut Berdasarkan Doktrin Jalesveva Jayamahe Terhadap Globalisasi Dan Perkembangan Lingkungan Strategis', Jurnal Strategi Pertahanan Laut, 6(1).

Leeuw, R. A. De et al. (2019) 'Influencing factors in the implementation of postgraduate medical e-learning : a thematic analysis', BMC Medical Education, 9(300), pp. 1–11.

Listiyono, Y., Prakoso, L. Y. and Sianturi, D. (2019) 'Membangun Kekuatan Laut Indonesia dipandang dari Pengawal Laut dan Detterence Effect Indonesia', Strategi Pertahanan Laut, 5(1), pp. 73–84.

Oke, A. and Kach, A. (2012) 'Linking sourcing and collaborative strategies to financial performance: The role of operational innovation', Journal of Purchasing and Supply Management, 18(1), pp. 46–59. doi: 10.1016/j.pursup.2012.01.001.

Ozkan-Canbolat, E., Beraha, A. and Bas, A. (2016) 'Application of Evolutionary Game Theory to Strategic Innovation', Procedia - Social and Behavioral Sciences, 235(October), pp. 685–693. doi: 10.1016/j.sbspro.2016.11.069.

Peters, T. J. and Waterman Jr, R. H. (1982) 'In Search of', Of Excellence, New York: Harper and Row.

Pu, S. and Lam, J. S. L. (2021) 'Blockchain adoptions in the maritime industry: a conceptual framework', Maritime Policy and Management, 48(6), pp. 777–794. doi: 10.1080/03088839-.2020.1825855.

Rogers, E. M., Singhal, A. and Quinlan, M. M. (2003) 'Diffusion of innovations', in An integrated approach to communication theory and research. Routledge, pp. 432–448.

Sailenius A W, A. S. I. . P. J. (2023) 'Strategi Joint Development BUMN Industri Pertahanan Program Alutsista yang Efektif dan Efisien', 10(7), pp. 3228–3238.

Saunila, M. and Ukko, J. (2012) 'A conceptual framework for the measurement of innovation capability and its effects', Baltic Journal of Management, 7(4), pp. 355–375. doi: 10.1108-/17465261211272139.

Shao, S. et al. (2020) 'Environmental Regulation and Enterprise Innovation : A Review', Bussinerss Strategy and the Environment, (February 2019), pp. 1–14. doi: 10.1002/bse.2446.

Shou, Y. et al. (2021) 'Matching traceability and supply chain coordination: Achieving operational innovation for superior performance', Transportation Research Part E: Logistics and Transportation Review, 145(December 2020), p. 102181. doi: 10.1016/j.tre.2020.102181.

Sulistijono, R. K. (2017) 'Kemandirian Pt.Pal Indonesia-(Persero) Sebagai Industri Strategis Pertahanan Nasional Dalam

Pembuatan Kapal Selam Diesel Electrik Klas 209 the Independece of Pt. Pal Indonesia (Persero) As National Defence Strategic Industry in the Making of Submarine'S D', Jurnal Prodi Strategi Perang Semesta, 3(1), pp. 25–39.

Sun, X., Tang, J. and Li, S. (2022) 'Promote Green Innovation in Manufacturing Enterprises in the Aspect of Government Subsidies in China', International Journal of Environmental Research and Public Health, 19(13). doi: 10.3390/ijerph19137864.

Suryokusumo, S. (2016) Konsep sistem pertahanan nonmiliter: suatu sistem pertahanan komplemen sistem pertahanan militer dalam pertahanan rakyat semesta. Yayasan Pustaka Obor Indonesia.

Tarigan, H. et al. (2024) 'Transformasi Manajemen Pertahanan Indonesia Di Era Modernisasi Militer'. Bandung: Indonesia Emas Group.Tian, Z. et al. (2023) 'The impact of digital economy on regional technological innovation capability: An analysis based on China's provincial panel data', PLoS ONE, 18(7 July), pp. 1–17. doi: 10.1371/journal.pone.0288065.

Tushman, M. and Nadler, D. (1986) 'Organizing for innovation', California management review, 28(3), pp. 74–92.Wang, S. and Chen, H. (2022) 'Could Chinese enterprises real benefit from embedding in global value chains?', Environment, Development and Sustainability, (0123456789). doi: 10.1007/s10668-022-02348-w.

Wipulanusat, W. et al. (2019) 'Drivers and barriers to innovation in the Australian public service: A qualitative thematic analysis', Engineering Management in Production and Services, 11(1), pp. 7–22. doi: 10.2478/emj-2019-0001.

Xiaoyi, Z. et al. (2018) 'Research on the Impact of Supply Chain Finance on the Financing Constraints of Cultural Enterprises Research on the Impact of Supply Chain Finance on the Financing Constraints of Cultural Enterprises', Accounting and Corporate Management, pp. 71–80. doi: 10.5176/2251-1970_bizstrategy18.130.

Yanyan, Y. M. Y. I. M. (2015) 'Indonesia sebagai Poros Maritim Dunia: Suatu tinjauan Geopoltik', Jurnal Pertahanan, 5(2), pp. 25–47. doi: 10.47532/jic.v7i1.967.

Zairi, M. (1995) 'Top-down innovation for bottom-up results', World Class Design to Manufacture, 2(1), pp. 6–12.

Zhao, W., Zhu, C. and Zhu, Y. (2022) 'The Comparative Advantage of Cities and Innovation Value Chain: Evidence from China', Sustainability (Switzerland), 14(6), pp. 1–14. doi: 10.3390/su14063510.