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**Article**

## Self-reliant in defense industries: Case study Indonesia

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## OPERATIONS MANAGEMENT | RESEARCH ARTICLE

# Self-reliant in defense industries: Case study Indonesia

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**Abstract:** Many developing countries are supporting their local defense industries to increase self-sufficiency, although they remain dependent on imports from foreign suppliers. Little is known about factors that may explain the self-reliance aspect of these industries. Therefore, this study aims to examine factors related to business performance that can explain the independence of the defense industry in developing countries. In this experiment, the implemented system covers four aspects of organizational performance, namely dynamic capabilities, high-performance work systems, technological innovation, and business model innovation. The system then investigates the mediation of



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### PUBLIC INTEREST STATEMENT

This paper discusses the business performance of the defense industry, especially in developing countries like Indonesia. In developing countries, the independence of the defense industry is very important because it provides military and commercial economic advantages. An independent defense industry can improve domestic industry and improve defense skills from a military perspective. From a fiscal perspective, developing countries can benefit from this sector to strengthen their economies and create jobs. However, difficulties such as lack of money, technology, and human resources must be overcome. Growing human capital, technology, international collaboration, and access to finance are important components of an effective plan to grow the defense sector in developing countries. It is this performance-based independence paradigm for the defense industry that makes this research new. This is important because it can serve as a model for the defense industry in developing countries.

business model innovation between the first three factors and organizational performance. Based on this analysis, Partial Least Squares-Structural Equation Modeling is used on data from 70 Indonesian defense industries. The results show that high-performance work systems and technological innovation significantly explain the variation of model innovation. By using business model innovation interventions, these two factors also explain business performance. These conditions imply the importance of prioritizing the following: human resource practices that promote employee self-improvement, motivation, and engagement, and adopting new or improved technologies into products and processes. The model built is novelty in the development of the defense industry, especially in developing countries.

**Subjects: Industrial Economics; Human Resource Management; Management of Technology & Innovation;**

**Keywords: defense business performance; dynamic capabilities; high-performance work systems; technological innovation; business model innovation; PLS-SEM; case of Indonesian defense industries**

## 1. Introduction

Defense industries are important tools for developing the strength of the national security system, as well as supporting domestic economic growth and innovation in many countries (Reis, 2021). Besides developed countries, many developing nations, including Indonesia, are also strengthening the establishment and sustainability of domestic defense industries. In this case, many of them are still positioned as users of defense products from the developed countries besides from the promising outputs (Béraud-Sudreau et al., 2022). From this context, self-reliance indicates that the country's defense industries are capable of domestically designing and producing military goods and services across the spectrum of the armed forces' needs, with small or no input from foreign technology. This leads to the following question: What are the factors inhibiting or strengthening self-reliance aspect of these industries? Although the factors influencing the business performance of defense industries have been studied from a management perspective (Fachrur et al., 2019; Montratama, 2018), less is still known about them in developing countries. This leads to the analytical performance of a case study on Indonesian defense industries.

Defense industries are also known to contain government and commercial organizations, which are involved in the research, development, production, and maintenance of weapons and military facilities. Although the establishment of these industries in most developing countries emphasizes political and national strategic motives, as well as government commitments and protections in the development blueprint (Benoit, 1978), many nations still understand their importance while applying industrial and managerial innovation (Béraud-Sudreau et al., 2022; Fachrur et al., 2019; Montratama, 2018). From this context, the change is characterized by the transformation of defense industries' globalization, which begins with research and development collaborations within developing countries and between developing-developed nations (Çağlar Kurç & Neuman, 2017). It also continues to encompass the areas of co-production/development, partnerships, mergers, and acquisitions, as well as joint ventures, regarding the increasing costs of weapon production. For developing countries, the transformation provides the opportunities to develop defense production capabilities and industrial policies, which are aimed at market niches (Çağlar Arifin et al., 2019; Kurç & Bitzinger, 2018). Moreover, the pressure on defense industries and the national budget is significantly reduced through an export-oriented security industrial policy, market liberalization, privatization, and integrative industrialization regulation from cooperative relationships.

Since 1970, the Indonesian government has pursued a policy of self-reliance by establishing its state-owned defense industries (Maharani & Matthews, 2022). This includes the following processes, namely import substitution, goods-led industrialization, and defense offsets, which are considered important mechanisms to benefit from the acquisition of military technology (Maharani & Matthews, 2022). According to Béraud-Sudreau et al. (2022), Indonesia ranked 9th and 5th from 12 countries in the Indo-Pacific region, regarding arms production, self-reliance, and exports, respectively. This ranking prioritized three indicators, namely (1) domestic and licensed production as a share of total major arms procurement in 2016–2020, (2) the size of domestic arms production and military services companies, and (3) the research and development capabilities in emerging military technologies. Despite the scarce literature on the arms production capabilities of these countries, Béraud-Sudreau et al. (2022) still showed the differences in the degree of self-reliance between Indonesia and other nations. The domestic production of Indonesia and other Southeast Asian countries, namely Malaysia (rank 10) and Thailand (rank 11), is also reported to remain limited, regarding the 100% imports of total procurement. To increase self-reliance, these countries are developing capabilities for maintenance, repair, and overhaul. This was not in line with, for example, China (rank 1), which dominated the rankings and was more than 2½ times more self-reliance than Japan. India (rank 4) and Pakistan (rank 8) also differed greatly in the size of domestic arms companies, with the level of licensed production being relatively high for both states.

The base of Indonesian defense industries is presently dominated by nine specialized state-owned companies with 105 small private organizations. These companies enable Indonesia to produce weapons domestically, own several licensed productions of foreign-designed ammunition, provide maintenance, repair, and overhaul services, as well as possess an export right for some internationally designed weaponry, with the ability to sell some of them abroad (Arifin et al., 2019; Béraud-Sudreau et al., 2022). Based on Béraud-Sudreau et al. (2022), the capabilities of these defense industries varied greatly. For example, the shipbuilding sector is Indonesian strongest industry, where private companies are most present (Bachtiar et al., 2021). Meanwhile, the other sectors rely heavily on foreign inputs for more complex systems, as well as have a domestic capacity for arms and systems production. Since 2010, several national policies have also been implemented to boost technology transfer toward supporting the development of domestic defense industries (Haripin, 2016; Maharani & Matthews, 2022). From the provision of the Indonesian Law No. 16/2012 and the 2020–24 Defense Industrial Development Plan, the government expects the Armed Forces to prioritize domestic acquisitions over imports, to align with the stronger capabilities of defense industries in producing and becoming self-reliance (Béraud-Sudreau et al., 2022; Grevatt, 2019).

To the best of our knowledge, no studies have evaluated the self-reliance aspect of defense industries in developing countries. Therefore, this study aims to examine the factors related to business performance, which can explain the self-reliance of defense industries in developing countries. The analysis emphasized the data from 70 Indonesian defense industries, with the Partial Least Square-Structural Equation Modeling (PLS-SEM) method implemented due to its ability to handle small sample-sized heterogeneous information (Hair et al., 2017).

The following section provides a literature review focusing on the factors influencing business performance and their relationship to the defense domain. This is accompanied by Section 2, where the study model derived from the literature is presented. Subsequently, Sections 3 and 5 describe the methodology and analytical results, respectively. The main outputs, practical and policy implications, as well as limitations and suggestions for future analysis, are discussed in Section 5, with Section 7 presenting the conclusion of the study.

## 2. Literature review

The possession of a sustainable business performance is the most important factor of self-reliance (strong and independent) defense industries in the era of post-modern industrialization (Tseng &

Lee, 2014), leading to organizational success in a competitive environment. To improve performance, every industry develops a set of competitive strategies, which are capable of determining the following: (1) The competitive pattern of the industry, (2) The goals to be achieved, and (3) The policies to be developed (Porter, 1997). These strategies are then translated into the objectives or activities performed by the industry's business units and processes (Hitt et al., 2019). From this context, the outcomes are accounted for regarding the change in the industry's performance.

According to Haseeb et al. (2019), each of the competitive strategies should focus on addressing emerging social and technological challenges, to achieve sustainable business performance and advantages. Meanwhile, Obradovic and Obradovic (2016) stated that any competitive advantage was unable to be separated from innovation, indicating the capability of non-innovative organizations in reducing competitiveness. This proved that the factors influencing business performance in this present study should emphasize the following: (1) Dynamic capabilities related to internal and external resources (Ambrosini & Bowman, 2009; Teece, 2018; Winter, 2003; Zahra & George, 2002; Zollo & Winter, 2002), (2) High-Performance Work Systems, which prioritizes the human resources (Ananthram et al., 2018; Evans & Davis, 2005; Kaushik & Mukherjee, 2022; Min et al., 2018; Wang et al., 2019), and (3) Technological Innovation related to the adoption of new or improved technology and research outputs (Chatterjee & Sahasranamam, 2018; Damanpour & Gopalakrishnan, 2001; Garcia & Calantone, 2002; Giuliani et al., 2016; Jemala, 2015). Based on the expectation to adjust a company in a specific direction, these factors are considered predictors for the implementation of organizational strategies, regarding Business Model Innovation (Hoch & Brad, 2020; Schneider & Spieth, 2013; Teece, 2018).

Any innovation emphasizing a new idea, concept, method, device, product, etc., is capable of impacting the patterns by which an industry develops, delivers, and captures values. These values are justified regarding various outcomes, such as internal (operational) efficiency and effectiveness, employees' knowledge, skills and capabilities, customers' satisfaction, and profit (Beamish & Hubbard, 2011; Best, 2013; Yulivan, 2013). From this context, the resulting values are related to the measure of performance when innovation is manifested based on the actions or activities of individual business units, processes, and employees. This is because the outcomes are appropriately captured by the changes in business performance. Table 1 summarizes the factors related to business performance, with each of them consisting of several underlying dimensions. In the following sections, their patterns of application in the domain of defense industries are also described.

### **2.1. Dynamic capabilities**

Many attempts have been performed to conceptualize dynamic capabilities, by identifying different dimensions to its notions (Ambrosini & Bowman, 2009; Pavlou & El Sawy, 2011; Teece, 2018; Winter, 2003; Zollo & Winter, 2002). According to Pavlou and El Sawy (2011), five dimensions were observed within dynamic capabilities, namely sensing, learning, integration, coordination, and reconfiguration. These dimensions represent the core processes enabling defense industries, to reconstruct and shape its internal and external resources in the rapidly changing environment. The innovative and effective exploitation of future opportunities is also observed as sources of consideration.

*Sensing* is responsible for implementing the periodic exploration of internal and external opportunities, as well as identifying market needs. This is performed by conducting the periodic strategic environmental analyses of dynamic potential, which emphasizes the market growth of the defense industries and periodically updates the outputs of research and development. *Learning* is also the acquisition, assimilation, and implementation of existing knowledge, to generate new understanding. This focuses on building competence on an individual, group, and organizational level. From external sources, industries are capable of learning business defense strategies while emphasizing segmentation, targeting, and positioning to develop competitive military goods and services. They

**Table 1. Factors affecting business performance**

<b>Construct/ dimension</b>	<b>Theoretical definition</b>
Dynamic Capabilities	Change-oriented routines in the managerial and organizational processes of a firm, for acquiring, releasing, integrating, and reconfiguring resources Zollo and Winter, (2002). The industry's ability to integrate, build, and reconfigure internal and external competencies to cope with a rapidly changing environment Leih et al. (2015).
Sensing	The industry's ability to identify and assess opportunities outside the industry Pavlou and El Sawy (2011).
Learning	A high-level core capability that enables an industry to acquire and use sufficient knowledge in facilitating the development and modification of its attributes and resource base Pavlou and El Sawy (2011), Zahra and George (2002), Zollo and Winter (2002).
Integration	The industry's ability to add new strategic assets within the industry Pavlou and El Sawy (2011).
Coordination	Capabilities to mobilize the resources to capture value from the opportunities Pavlou and El Sawy (2011).
Reconfiguring	The transformation and recombination of assets and resources Ambrosini and Bowman (2009)
High-Performance Work Systems	The practice of activities related to human resource management, which provide better operational performance in organizations Bhatti et al. (2020)
Staffing	The processes for selecting human resources, where job and organization fit abilities are evaluated Evans and Davis (2005).
Self-Managed Team	The chain of command grants authority to many different teams over their decision-making Evans and Davis (2005).
Training	Programs that are designed to help employees increase their knowledge, skills, and ability Evans and Davis (2005).
Flexible Work Assignments	An opportunity for individual employees to task/job rotation, toward broadening their knowledge, skills, and abilities Evans and Davis (2005). Empowering individual employees to choose what time they begin to work, where to work, and when they will stop work Leslie et al. (2012)
Technological Innovation	A set of processes, facilities, and skills with improved service products or processes are created and provided to the market and society Jemala (2015) The transformation of a new idea or scientific discovery into a standard practice Spies (2014).
Product Innovation	The mechanism and process of integrating resources and knowledge that are distributed among the industry's joint venture network, to achieve product innovation. It is also a logical result of the shorter product lifecycle complexity, the cost of expensive research and development, and the fast-changing market of product innovation Chai et al. (2012). A new or improved product or service that is significantly different from the industry's previous commodities, and has been introduced to the market OECD/Eurostat (2018).
Process Innovation	A new or improved business process for one or more business functions, which are significantly different from the previous organizational procedures and have been used by the industry OECD/Eurostat (2018).
Business Model Innovation	A change towards the implementation of new ideas, to improve or update the components of the business model and its influence on the industry environment, while impacting organizational output Amit and Zott (2012).
Value Development	The means and methods by which an industry develops new values and increases the total value, through network resources, as well as intra- and inter-organization process capabilities Teece (2018).
New Proposition	The industry's portfolio of new products and services for customers, as well as its development patterns of commodities and market relationships Amit and Zott (2012).

(Continued)

**Table 1. (Continued)**

<b>Construct/ dimension</b>	<b>Theoretical definition</b>
Capture	The patterns by which the industry innovatively builds its revenue model and cost structure, to better distribute and capture quality in the value network Teece (2018).
Business Performance	A measurement of corporate performance, which focuses on the business portfolio aspect Beamish and Hubbard (2011).
Financial Perspective	A measure that assesses the achievement of the industry goal, to earn a return on the investments made and manage the key risks involved in operating the business Kaplan and Norton (1992).
Internal Process Perspective	A measure that determines the adequate performance of the industry Kaplan and Norton (1992).
Learning and Growth Perspective	A method assessing the intangible assets of the industry, specifically the internal skills and capabilities required to support the organizational processes Kaplan and Norton (1992).
Customers' Perspective	A model monitoring the patterns by which industries are providing value to customers, while determining the level of consumers' satisfaction with their products or services Kaplan and Norton (1992).

Note: In column 1, constructs are in bold; their dimensions are written indented, in regular font.

are also capable of learning from the internal resources, to establish different and unique goods and services than the competitors.

*Integration* is responsible for allowing defense industries to combine the contribution of individuals and internal resources, to achieve organizational goals. This emphasizes the teamwork that shares similar goals and contains the routines prioritizing the following: (1) the contribution of individual knowledge to the group, (2) the representation of both individual and group knowledge, and (3) the interrelationship of all knowledge inputs as a collective system. Furthermore, defense industries are capable of implementing all resources to effectively carry out joint task performance through *Coordination*. The mechanism of this dimension includes (1) allocating appropriate resources to tasks, (2) assigning the suitable people to the appropriate tasks based on their knowledge, skills, and abilities, (3) identifying synergies between tasks, activities, and resources, and (4) organizing activities according to the business plan.

*Reconfiguration* is responsible for enabling defense industries to explore all aspects of detection, learning, integration, and coordination, as well as develop all existing resources and capabilities to maintain a competitive advantage and adopt environmental changes. This dimension is subsequently capable of impacting industries in several patterns, compared to only developing new resources and opportunities. For example, an activity within reconfiguration is found to periodically explore and refine the products and services opportunities that better match the present customers' profile. Another example emphasizes the identification and acquisition of the resources that better match those used in the production of goods and services.

## **2.2. High-performance work systems**

The theory of high-performance work systems is based on the human resources practices influencing business performance through employees' attitudes (Kaushik & Mukherjee, 2022; Rasheed et al., 2017). These practices are found to positively affect employees' satisfaction, engagement, and well-being (Ananthram et al., 2018). In this case, the higher satisfaction, engagement, and well-being levels of employees led to greater motivation, productivity, and performance (Wang et al., 2019). Some experts also suggested the best practice to be implemented for high-performance work systems, with Evans and Davis (2005) emphasizing the following dimensions



implemented for this present study, namely staffing, self-managed teams, decentralized decision-making, training, flexible work assignments, communication, and compensation.

*Staffing* is responsible for the selection and screening of employees for a specific position in defense industries, based on their knowledge, skills, and abilities. It also considers the completeness of procedures for assessing the knowledge, skills, and abilities relevant to work suitability and organization. Examples of the personnel procedures are the selective screening of employees based on their uniqueness and values, as well as performance-oriented organizational promotions (Evans & Davis, 2005). Moreover, staffing relates to *Training*, which is one of the practices ensuring the talent sufficiency of defense industries, to select suitable employees for vacant positions. Continuous training is also necessary to align the quality of human resources with the developments and challenges of industries. For example, the improvement of employees' qualities through formal or specialized training.

*Self-Managed Teams* are a redistribution of power in defense industries, by assigning authority and responsibility to the team structure. This dimension provides employees with more responsibility, access to resources, as well as great control and power in the decision-making process. Besides speeding up processing time, employees' encouragement to work autonomously is also expected, for positive outcomes and increased job motivation (Wang et al., 2019). Based on this definition, the Self-Managed Teams dimension encompasses decentralized decision-making in this study.

*Flexible Work Assignments* are often observed through job rotations within a team or with counterparts of an individual position. This dimension includes the job enrichment that allows employees to use the range of knowledge, skills, and abilities in their repertoire (Evans & Davis, 2005). From a broader perspective, the dimension is related to the workplace flexibility, which includes alternate arrangements or schedules from the traditional working day and week (Shen et al., 2012). Individual employees may arrange a different work schedule to meet personal (e.g., personal health, family needs) and professional needs (e.g., further education, customer needs).

In this study, the dimension includes two practices recommended by Evans and Davis (2005), namely communication and compensation. This proves that flexible work assignments are capable of opening communication, allowing employees to express their wishes, opinions, concerns, and suggestions. It also indicates that the organizational compensation structure satisfies employees, according to the motivation to improve their capabilities through internal promotion and job rotation. Therefore, flexible work assignments, open communication, and appropriate compensation are capable of developing a positive organizational attitude and ensuring high employees' engagement.

### **2.3. Technological innovation**

Technology is known as a driver of progress and a creator of prosperity, due to being the use of scientific and material methods to achieve commercial and industrial goals. It also plays an important role in ensuring the importance of national security and development (Lu & You, 2018). Furthermore, innovation ensures the continuous development of new and improved theories, concepts, models, and advanced products. This indicates that the transfer of technology commonly allows the acquisition of new technological advancement from research institutions, leading to organizational production, application, and promotion (Bachtiar et al., 2021; Spies, 2014; Wheelen & Hunger, 2012). According to Giuliani et al. (2016), some industries with strong technology, research, and development capabilities became market leaders and had better chances to maintain their competitive advantage. This was observed in two directions, namely technological product and process capabilities. The results were consistent with Jemala (2015), where technological innovation was used as a set of processes, facilities, and skills with improved service products. It was also identified as the processes developed and provided to the market and society. Cheung et al. (2011) subsequently defined innovation as the transformation of ideas and

knowledge into new or improved products, processes, and services for military and dual-use applications, namely civil-military science, technology, and industrial base. Based on this vision, two dimensions of technological innovation were highly emphasized in this study, namely product and process innovation.

In defense industries, *Product Innovation* is defined as changes in warfare, to enhance a military community's ability to generate power (Horowitz & Pindyck, 2022). This explains that the acquisition of a technological edge is considered an endless quest for defense industries and the protected states. This is evidenced by the increasing demand for advanced computer-based technology, such as smarter battlefield gadgets, more robust IT security, and networking solutions. Furthermore, the faster pace of technological change prioritizes the encouragement of innovation by leveraging new and imaginative concepts, unconventional methods of organizing and solving problems, as well as the audacity to perform risks. For *Process Innovation*, the adoption of new technologies is emphasized to accommodate the personnel and production lines of defense industries (Terjesen & Patel, 2017). This dimension is known as an important factor in increasing industries' production productivity while contributing to efficiency and gross domestic growth (Song et al., 2013). It also includes changes or improvements to the hardware, software, and methods used in manufacturing, supply chain, and delivery system.

#### **2.4. Business model innovation**

Since product and process innovations are essential for companies in defense industries, the appropriate business model innovation supporting the new development is expected to provide a sustainable competitive advantage (Bjorkdahl & Holmen, 2013). This is because a business model serves as a guideline for industries to cultivate or develop their profit components such as target markets, product offerings, and partners. In this case, business model innovation is expected to provide new or improved ideas into the organization (Baden Fuller & Haefliger, 2013; Holtström, 2022; Mendi et al., 2020). It also uses a range of strategic planning, which allows the companies to determine their position in the future, through the consideration of the present growth and technology developments formulating, implementing, and evaluating cross-functional decisions (Amit & Zott, 2012; Teece, 2018). Therefore, business model innovation is a fundamental part of a development strategy to open new and existing markets (Gunday et al., 2011). By applying business model innovation, industries are able to rethink customers' needs and the organizational requirements needed to accomplish the demand toward profit generation (Teece, 2018). This is in line with the practices in defense industries' domain, where the model innovation is related to the abilities of the security system to develop, propose, and provide new values, ideas, and products/services, respectively. These practices are adequately performed by industries to achieve and enhance their competitive advantage. Based on these descriptions, three dimensions of business model innovation are considered in this study, namely *Value Creation*, *New Proposition*, and *Value Capture*.

*Value Creation* and *New Proposition* are found to be interconnected, regarding the establishment of innovative qualities by an organization for customers (Bjorkdahl & Holmen, 2013). This includes innovative proposals on the patterns by which industries meet customers' needs, facilitate gains, and solve problems. Meanwhile, *Value Capture* is related to methods by which industries are able to obtain new qualities and ideas toward profit generation (Kemp et al., 2003; Teece, 2018). In this case, a practical example emphasizes organizational reliability when developing new products or services. Another example is the better communication with business partners and marketing when launching new products. From these descriptions, the three dimensions of business model innovation are defense industries' abilities that need to be supported through various components, such as internal and external resources, high competence and innovative workforce, as well as supportive infrastructure and technology. Therefore, business model innovation is a factor influenced by other performance variables, such as Dynamic capabilities, High-Performance Work Systems, and Technological Innovation.

### 2.5. Business performance

Based on previous explanations, business performance is considered a factor measuring two inputs, namely (1) the impact of the strategic management implemented by defense industries and driven by their business model innovation (Nason & Wiklund, 2018), and (2) the activity outputs at the level of individuals, groups, and business units within defense industries (Wheelen & Hunger, 2012). These activity outputs include the practices, routines, and changes to develop Dynamic Capabilities, High-Performance Work Systems, and Technological Innovation. According to the Balanced Scorecard developed by Kaplan and Norton (1992), business performance was evaluated by using four variables, namely financial, internal process, learning growth, and customers' perspectives. These variables emphasized the various influences on the performance of defense industries, beyond the traditional perceptions of profit. Fachrur et al. (2019) also stated that four key factors in defense industries were the mastery of technology, processes, production, and after-sales service, as well as marketing to industrial players, implying the competitive strategy. In this case, the four variables represent the keys to improving the competitive strategy of defense industries encountering social and technological challenges to achieve sustainable business performance.

According to the *Financial Perspective*, the increase in business performance of defense industries is indicated by its sales growth and profitability (Best, 2013). For *Internal Process Perspective*, the success of an organizational performance prioritizes the achievement levels of industries' goals and objectives. *Learning and Growth Perspective* also focuses on the increase in business performance, which is observed within highly educated and skilled employees, as well as their labor productivity and job satisfaction. Meanwhile, Montratama (2018) highlighted that the existence of defense industries should be supported with competence in serving customers. This showed that the improvement in business performance needs to be indicated by a higher level of satisfaction, regarding *Customers' Perspective*.

### 3. Methodology

In this study, Performance and Business Model Innovation were used as the dependent and mediating variables at the strategic level, respectively. This indicates that the effects of the independent variables, namely Dynamic Capabilities, High-Performance Work Systems, and Technological Innovation, on Performance are mediated by Business Model Innovation. However, Bhatti et al. (2020) showed that the creativity and innovation of employees at every level of the organizational hierarchy influenced business performance. The results argued that the innovation emphasized the ability and motivation of employees, the facilities supported, and the opportunities provided by industries. In this case, the former related to High-Performance Work Systems, while the latter prioritized Dynamic Capabilities and Technological Innovation. Therefore, this study aims to examine the intervention patterns of the indirect and direct effects of Business Model Innovation, Dynamic Capabilities, High-Performance Work Systems, and Technological Innovation on Performance. Figure 1 presents the fundamental conceptual framework underlying the factors explaining business performance of defense industries. Table 2 shows the hypotheses derived from the study model.

To identify significant influences within the relationships included in the model (Figure 1), the seven hypotheses were analyzed (Table 2). The following section presents the demographics of participants, the procedure of the experiment, the measurement instruments, and the data analysis.

#### 3.1. Participants

A total of 70 (61% out of 114) Indonesian defense industries were involved in this study as independent participants, which were pre-selected through a purposive sampling approach (non-probability sampling). Each participant held a senior position in a strategic business unit of a specific defense industry. As shown on Table 3, most participants have high education (more than 85%), are positioned as head of department (61.4%), have more than 7 years' work experience (more than 80%), and are aged older than 41 years old (more than 75%). All the involved industries were also registered with the Indonesian Ministry of Defense.

### 3.2. Sample and data

In the following paragraphs, the sample size decision, the procedure of the experiment, and the descriptive analysis of obtained data is described.

#### 3.2.1. Sample size

The initial sample size estimate was mainly determined by the purpose of this study and the number of defense industrial companies available in Indonesia. This indicated that the 70 obtained samples were above the minimum standard recommended by various PLS-SEM methods (Table 4), regarding a statistical power pursuit of .80 for detecting at least a mean effect of  $R^2 = 0.25$  with 0.05 error probability. The data obtained also met the recommendation for PLS-SEM although not for the more traditional covariance-based SEM. This was because the traditional method required a recommended minimum sample size of 200 according to Weston and Gore (2006). It was also because the method pursued different objectives than this analysis, namely testing and confirming an earlier theory. Therefore, PLS-SEM with its exploratory nature was used to investigate the relationships between the latent variables.

#### 3.2.2. Procedure

The purposive sampling approach was designed for the top management (or executives) of Indonesian defense industries. This was because the managers responsible for organizational functions and management were considered, such as the chief executive, financial, and operating officers, (vice) president director, or general manager. These executives were selected for their maximum authority in managing the organization and business operations, based on the following reasons, (1) defining the short- and long-term goals of the organization, (2) formulating an organizational plan and objectives to achieve the main goals, (3) organizing activities and tasks for middle management, (4) managing organizational resources, such as finances, assets, labor, etc., for daily activities, and (5) having responsibility for the development and progress of the organization.

The study participants were selected through an email transmission, which contained an introduction to the analysis, the purpose, the risk of participation, and an involvement invitation. After the approval of consent, each participant obtained a link to an online survey by email. In this case, all participants provided their online informed consent and filled out the digital questionnaire.

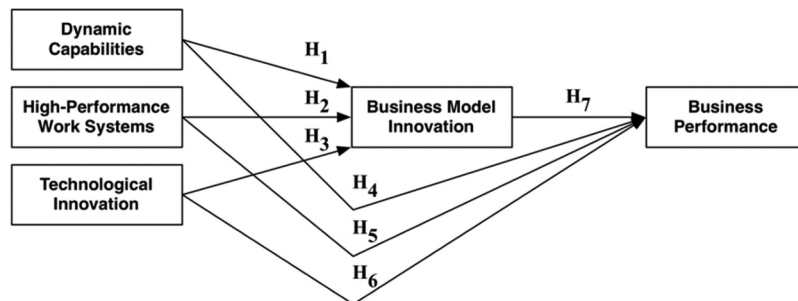
#### 3.2.3. Descriptive analysis of data

Based on the results, all latent variables were considered reflective constructs, assuming that the measures in the indicators and the dimensions represented the effects of the underlying determinants. No missing values were also found in the observed data, with an extensive description of the measurement variables ( $n = 70$ ) found in Appendix C.

### 3.3. Measurement variables

A design-made questionnaire was developed to measure the following constructs: Dynamic Capabilities, High-Performance Work Systems, Technological Innovation, Business Model Innovation, and Business Performance. Appendix A presents the list of indicators for each

Figure 1. Study model.



**Table 2. List of hypotheses tested**

H	Description
Factors affecting Business Model Innovation:	
H <sub>1</sub>	Defense industries' Dynamic Capabilities positively correlated with Business Model Innovation
H <sub>2</sub>	Defense industries' High-Performance Work Systems implementation positively correlated with Business Model Innovation
H <sub>3</sub>	Defense industries' Technological Innovation positively correlated with Business Model Innovation
Factors affecting Business Performance:	
H <sub>4</sub>	Defense industries' Dynamic Capabilities positively correlated with Business Performance
H <sub>5</sub>	Defense industries' High-Performance Work Systems implementation positively correlated with Business Performance
H <sub>6</sub>	Defense industries' Technological Innovation positively correlated with Business Performance
H <sub>7</sub>	Defense industries' Business Model Innovation implementation positively correlated with Business Performance

construct dimension, which is followed with questionnaire items emphasizing the list of English-based questions (Appendix B). Each item was also rated on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree).

### 3.4. Data analysis

In this study, a second-order PLS-SEM was performed to investigate the relationships of all involved constructs and their dimensions (Figure 1). This technique commonly supports path-analytic modeling with latent variables according to Hair et al. (2017), due to being one of the SEM approaches with no assumption about data distribution. It also focuses on the analysis of variance (Cassel et al., 1999; Hair et al., 2017), regarding the comparison between PLS-SEM and other SEM approaches.

The PLS-SEM test was conducted by using Smart PLS 3.2.9 (Hair et al., 2017) in two steps, as suggested by Henseler et al. (2009). Firstly, calculate the PLS model parameters separately by assessing the outer models, including item load, reliability, and validity tests, based on the criteria, as shown in Table 5 and through the guidelines developed by Hair et al. (2014). This assessment led to the removal of DC1.2, DC2.2, DC2.3, DC3.2, DC5.2, BMI3.5, and BP4.1 from the model (Appendix D). In this case, the removal of the last two indicators was performed because their standardized factor loading values were below .50, with the other variables subsequently eliminated to increase the AVE value of Dynamic Capabilities (Appendix E).

Secondly, estimate the path coefficients,  $\beta$ , of the inner models and the value of determination,  $R^2$ .  $\beta$  indicates the strength of a variable's effect on the endogenous determinant and was used to assess the research hypotheses. Meanwhile,  $R^2$  represents the degree of explained variance of the endogenous variables. In this case, small, medium, and large effects of 0.02, 0.13, and 0.26 were observed for the variances in the criterion variable, respectively (Cohen, 1988). Nonparametric bootstrapping was also used to generate 5000 samples, toward the estimation of  $\beta$  (Hair et al., 2017). A value of  $p < 0.05$  associated with 5% error rates of t-values was also used to determine the significance of estimates. In addition, the cross-validated redundancy measure,  $Q^2$  (Stone-Geisser test), was examined to assess the predicted validity of the endogenous constructs (Chin, 2010). From this context,  $Q^2 > 0$  proved that the observed values were adequately reconstructed, with the model having predictive relevance. To assess the influence of an independent latent variable during removal from the model, the effect size ( $f^2$ ) of the variable was also examined at the structural level. This indicated that the  $f^2$  with values of 0.02, 0.15, and 0.35 emphasized the small, medium, or large effects of a latent variable at the structural level, respectively. It was also assessed by the  $R^2$  value of the latent variable with the  $R^2$  of the full model (Cohen, 1988).

**Table 3. Demographic characteristics of participants**

Characteristics		Sample (n = 70)
<b>Age, years, n (%)</b>		
	<b>20–30</b>	<b>4 (5.7)</b>
	31–40	12 (17.1)
	41–50	25 (35.7)
	50–60	21 (30)
	> 60	8 (11.4)
<b>Work Position, n (%)</b>		
	Head of Department (Director)	43 (61.4)
	Manager	20 (28.5)
	Head of Section	4 (5.7)
	Others	3 (4.2)
<b>Educational Level, n (%)</b>		
	High School	0
	Bachelor's Degree	31 (44.2)
	Master Degree	30 (42.8)
	Doctorate Degree	1 (1.4)
	Others	8 (11.4)
<b>Work Duration, years, n (%)</b>		
	1–6	12 (17.1)
	7–12	23 (32.8)
	13–18	17 (24.2)
	19–24	9 (12.8)
	25–30	7 (10)
	> 30	(1) (2.8)

**Table 4. The recommended minimum sample size for PLS-SEM**

Method	Recommended sample size
10-times rules method (Hair et al., 2017)	40 <sup>a</sup>
Minimum R <sup>2</sup> method (Hair et al., 2017)	41 <sup>a</sup>
Gamma-exponential method (Kock & Hadaya, 2018)	18 <sup>b</sup>
Inverse square root method (Kock & Hadaya, 2018)	17 <sup>b</sup>

Note: The estimation was based on the results in Figure 2: a Four independent variables in the outer model and b the minimum significance of  $\beta = .602$ .

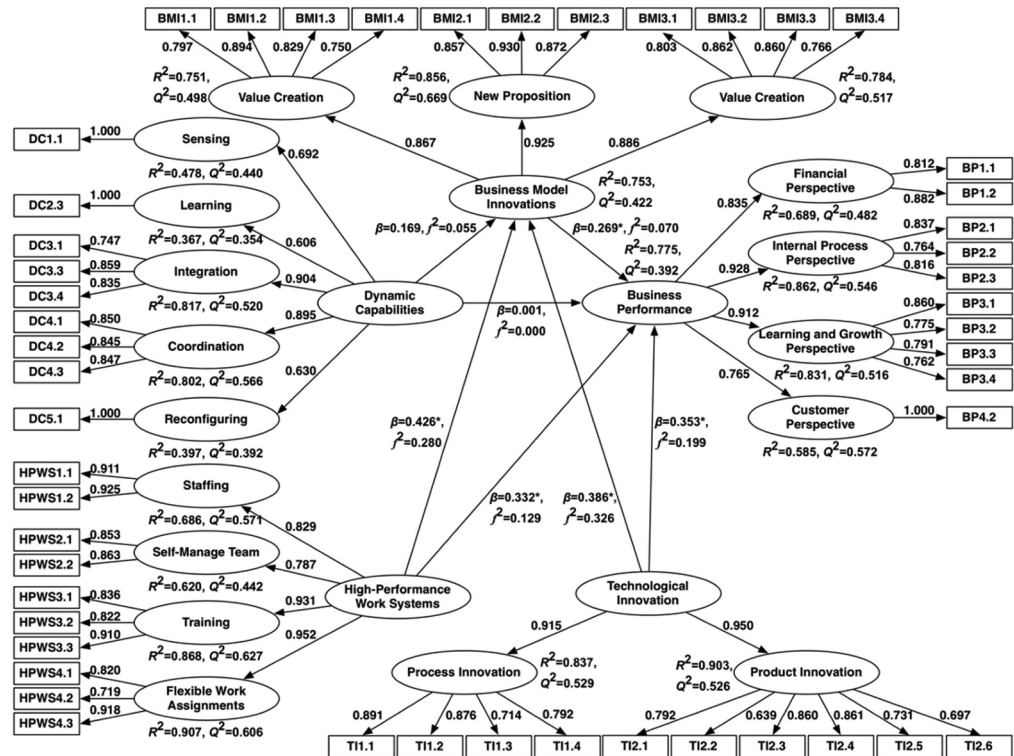
Subsequently, mediation analysis (Nitzl et al., 2016) was conducted to examine the intervention of Business Model Innovation in the relationship between significant determinants and Performance. Mediation is tested through the effect of an independent variable predicting the dependent variable, independent variable predicting the mediator, and independent variable and mediator predicting the dependent variable. Based on the hypothesis, Business Model Innovation is expected to play a mediating role between variables early and later in the causal chain. For example, Business Model Innovation concept clarifies the patterns by which the organizational strategy of a production line influences Performance.

#### 4. Results

Based on Figure 2, only High-Performance Work Systems (H<sub>2</sub>) and Technological Innovation (H<sub>3</sub>) were the appropriate predictors for Business Model Innovation. Besides this, only H<sub>5</sub>, H<sub>6</sub>, and Business

**Figure 2. The second-order bootstrapping results of the path analysis (n = 70).**

**Note:** \*Significant  $p < 0.05$



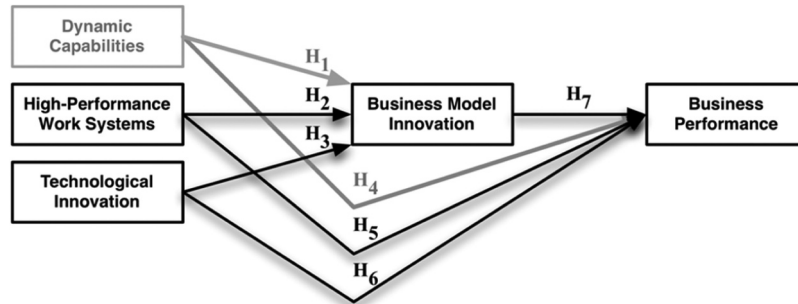
Model Innovation (H<sub>7</sub>) were the significant predictors of Business Performance. From these contexts, all dimensions of the significant determinants showed a high effect size association with their latent variable ( $f^2 > 0.35$ ). For Dynamic Capabilities, only the Integration and Coordination dimensions highly correlated with the latent variable, while the other three domains were small. At the construct level, only Technological Innovation moderately associated with Business Model Innovation ( $0.15 \leq f^2 < 0.35$ ), while the relationship with High-Performance Work Systems was small ( $f^2 < 0.15$ ). Although the relationship between Business Performance and all significant determinants were considered as small, the cross-validated redundancy values still supported the predictive relevance of the model ( $Q^2 > 0$ ). These results are subsequently presented in Appendix F.

Based on Table 6, Business Model Innovation partially mediated the relationships between High-Performance Work Systems and Technological Innovation on Business Performance. Besides the significant relationship between the mediator and the dependent variable, a relevant direct correlation was also observed amid both independent factors and the dependent determinant. This indicated that High-Performance Work Systems and Technological Innovation had some effect on Business Performance, even with the mediation ( $\theta c'$ ). From these results, the mediation of Business Model Innovation in these relationships was consistent with H<sub>5</sub> and H<sub>6</sub> (Figure Figure 2).

**5. Discussion**

Based on Figure Figure 3, the key outputs supporting model viability in assessing the factors influencing business performance of defense industries in developing countries were observed. The following sections comprehensively discuss the outputs found in the relationships between factors, their practical and policy implications, as well as the limitations and direction of future work.

Figure 3. Conceptual model of the findings (significant relationships are presented in bold).



### 5.1. Principal findings

From the results, High-Performance Work Systems ( $H_2$ ) and Technological Innovation ( $H_3$ ) were significantly associated with Business Model Innovation at 75% of defense industries' adjustment variance. This indicated that both high-performance work systems and technological innovation were important for the strategic transformation of industries. Furthermore, High-Performance Work Systems ( $H_5$ ), Technological Innovation ( $H_6$ ), and Business Model Innovation ( $H_7$ ) were capable of explaining the variation in industries' efficiency, which accounted for 78% of business performance variance between defense industries. Based on the results, a direct relationship was observed between High-Performance Work Systems and Technological Innovation with Business Performance. This relationship supported Evans and Davis (2005), where high-performance work systems were positively related to the performance of small, medium, and large industries. The work systems also provided employees with the necessary platform to increase participation in decision-making and motivation, improve knowledge, skills, and abilities, as well as enhance task efficiency to improve organizational performance (Kaushik & Mukherjee, 2022; Wang et al., 2019). Since defense industries are examples of labor and technology-intensive enterprises, the results were also in line with Guo and Liu (2021), where the adoption of technological innovation directly and positively influenced organizational business performance. This finding is within expectation, as previously shown by Bachtiar et al. (2021) in the shipbuilding sector (for civil/military) in Indonesia, technological transfer has both direct and significant on the industries' competitiveness. Further, similar to the cases of small and medium enterprises in Latifi et al. (2021), for example, Dell (the computer industry), Wal-Mart (retailing), Uber (transport), and Southwest (airline industry), a positive correlation was subsequently found between defense industries' business model innovation and performance.

The mediating role of Business Model Innovation between Technological Innovation and Performance was also consistent with Chowhan (2016) and Smajlović et al. (2019). In this case, business model innovation enabled the strategies to simulate other innovative elements, due to providing a new or significantly improved context for knowledge generation, acquisition, application, and exploitation (Mendi et al., 2020; Souto, 2015). Process innovation also iteratively developed value through new products, supply chains, and business models (Baden Fuller & Haefliger, 2013; Mostafavi et al., 2011). Based on the results, Business Model Innovation also mediated High-Performance Work Systems with Business Performance. This correlated with the effort needed to align the human resources practices with the implemented business model and the patterns by which they influenced organizational system innovation (Nielsen et al. (2012) and Malik et al. (2018)). In this context, business model innovation was related to the role of human resources in delivering value to customers and shaping organizational culture, according to industries' system and plans (Seong, 2011). From these results, organizational culture affected strategic agility during business model innovation, which subsequently became the driving force for leveraging performance (Brinkley, 2013; Özçelik et al., 2016). Since culture is a critical aspect of industries' informal



**Table 5. Assessment methods of reflective constructs**

Assessment	Description	Criteria
Indicator Reliability	Describes the relationship among indicators being consistent with its construct.	The outer loading of indicators $\beta > 0.50$ is considered acceptable Henseler et al. (2009)
Internal Consistency Reliability	Measures the inter-correlation of indicators from the same construct.	Cronbach's $\alpha > 0.60$ is considered moderate Hair et al. (2017)
Composite Reliability	Measures the inter-correlation of indicators from the same construct.	Composite Reliability $\rho > 0.70$ is considered as satisfactory Ghozali (2015)
Convergent Validity	Measures the degree to which an indicator correlates with other determinants of the same construct.	The Average Variance Extracted AVE $> .50$ indicates that more than 50% of the variance from all indicators are captured by the construct Hair et al. (2017)
Discriminant Validity	Describes the distinctiveness of a construct from others.	No indicator has factor-loading on any other construct higher than the one being measured Chin (2010)
Multicollinearity Test	Describes the correlation between constructs.	Variance Inflation Factor VIF $> 5$ indicates a potential multicollinearity problem Hair et al. (2017)

**Table 6. Effects of relationships business performance with its significant determinants with mediation (n = 70)**

Independent variable (IV)	Dependent variable (DV)	Mediator (M)	Effect	
High-Performance Work Systems	Business Performance	Business Model Innovation	$\theta_c =$	0.800*
			$\theta_a =$	0.823*
			$\theta_b =$	0.497*
			$\theta_{axb} =$	0.409*
			$\theta_{c'} =$	0.391*
Technological Innovation	Business Performance	Business Model Innovation	$\theta_c =$	0.798*
			$\theta_a =$	0.788*
			$\theta_b =$	0.507*
			$\theta_{axb} =$	0.400*
			$\theta_{c'} =$	0.398*

Note: \*significant  $p < 0.05$ ;  $\theta_a$  = effect of IV on M,  $\theta_b$  = effect of M on DV,  $\theta_c$  = direct effect of IV on DV without mediation,  $\theta_{axb}$  = indirect effect of IV on DV ( $\theta_a \times \theta_b$ ),  $\theta_{c'}$  = direct effect of IV on DV with mediation ( $\theta_c - \theta_{axb}$ ), IV = Independent Variable, M = Mediation Variable, DV = Dependent Variable.

structure, innovation was also influenced (Tellis et al., 2009). This proved that the organizational culture provided employees insight into the state of affairs in industries, leading to the norms and the shaping of individual behavior (Schein, 2010). In this case, organizational values, as the basis, shape, and reflection of business culture, was affirmed to influence strategic issues (Voss et al., 2000). Meanwhile, human resources were considered mediators of knowledge combinations in financial capital, processes, market, as well as customers' demands and expectations when their practices influenced business model innovation (Holtström, 2022). This confirmed that human resource practices were the driver of innovation in the business model.

Different from Helfat and Peteraf (2009), Teece (2018), and Lin and Huang (2012), Dynamic Capabilities neither indirectly (mediated by Business Model Innovation) nor directly predicted Business Performance significantly. Based on the variance of Dynamic Capabilities, more efforts and considerations were needed to develop these three dimensions, namely sensing, learning, and reconfiguration. From this context, a consideration showed that Indonesian defense industries were dominated by state-owned companies, with the others being small private companies acting as subcontractors (Béraud-Sudreau et al., 2022). For reasons of national security, this situation subsequently occurred in other developing countries. Moreover, state-owned enterprises are found to often exercise significant majority control or minority interest (Sturesson et al., 2015). Since industries' contribution to the economy is crucial (Robinett, 2006), many countries have adopted explicit policies to promote their internationalization (Cuervo-Cazurra et al., 2014). This is only possible when a specific degree of national self-reliance is observed based on domestic production and purchasing. Despite this, struggles are still observed in managing industries effectively (Habir, 2021). The widespread concerns of state-owned defense industries also include inefficiency, significant risks to the government budget, and conduits for corruption. This type of industries is different from private organizations due to the favouritism being commonly granted to them, such as subsidies, debt waivers, favorable loans, and protection against bankruptcy. Since some of the industries are essentially an arm of the government, they are often statutory monopolies whose products are not subject to market competition. From this context, the triple roles of the government as the asset regulator, regulation enforcer, and owner are commonly found to undermine the competitiveness and efficiency of state-owned industries (Kim & Ali, 2017; Kowalski et al., 2013). Although the situations in Kowalski et al. (2013), Kim and Ali (2017), and Habir (2021) were related to state-owned industries in other domains, they were still observed in defense industries. This indicated that the lack of competition and frequent government bailouts eroded the strength of industries' dynamic capabilities, which ultimately affected business model innovation and performance.

## **5.2. Practical and policy implication**

For practical and policymakers, these results suggested two linked strategies for improving business performance on the path to self-reliance in arms production, namely (1) innovation in human resources practices, and (2) innovation in technology. These strategies pragmatically apply to the government, the defense business actors, and the knowledge institutes. Under commercial and defense industries development, the increasing application of dual-use technologies demands higher expertise within the direct involvement of the government and the knowledge institutes, for example, in artificial intelligence, advanced sensors, machine learning, etc. Besides increasing the use of industrial technology and development information (Cheung et al., 2011; Freeman, 2008), various human resource practices should also be prioritized, including selective recruitment, extensive training, teamwork, and employees' engagement. The maintenance of positive employee-manager relationships also needs to be considered to promote a conducive work environment (Min et al., 2018). In this case, the processes by which defense industries acquire new technologies and develop them into weapon systems require in-house research and development institutes (Freitas et al., 2013). The production of scientific knowledge, various types of patents (civil, military, and mixed), and technological advancements should also be commenced by top defense industries' players (Acosta et al., 2018) and supported by the government (Lee et al., 2022). In addition, the government and local defense industries need to be able to enter regional collaboration in the field of emerging technology. This level of cooperation is only capable of contributing to regional self-reliance, which promotes interdependence between neighbors (Béraud-Sudreau et al., 2022).

Based on the results, technological innovation is expected to continuously evolve and improve business model innovation, as new technical elements require market adjustments (Chesbrough & Rosenbloom, 2002). This indicates that technology developments are capable of influencing the development and adaptation patterns of a defense industries' business model (Baden Fuller & Haefliger, 2013; Mendi et al., 2020; Mostafavi et al., 2011). The choice of business model also influences the method by which technology is monetized, developed, and capable of increasing

performance. Since no “size fits all” business model according to Holtström (2022), the innovation in business models should address the transformation of organizational conditions and strategy. From this context, changes to business model indicate the adaption to organizational environment. In defense industries under organizational and strategic transformation, the key aspects of business model innovation have been studied by others (Holtström, 2022). This phase is in line with this present study, where the criticality of dynamic capabilities is observed in defense industries (Pavlou & El Sawy, 2011). From this context, strategic transformation provides practical implications to defense business actors, to understand the following: (1) the present contextual position of industries, (2) the forecasts for future changes in industries, and (3) the impact the changes have on industries. By using in-depth knowledge of the organization’s competence and abilities to adopt the change prerequisites, the management is capable of identifying the need for transformation while comprehensively innovating the appropriate business model.

In parallel to the improvement required in the internal organization of defense industries, the capacity of the government as “owner” and “policymaker” of state-owned companies is important in management reformation (Habir, 2021; Kim & Ali, 2017). This indicated that allowing defense industries to have more autonomy in business operations is very necessary, specifically in the following, (1) strengthening their ability to sense opportunities (sensing), (2) mobilizing resources to seize the opportunities (learning), and (3) dynamically reconfiguring resources and organizational structures under the prevailing environment (reconfiguration). These reform strategies were manifested as policies, political commitments, or roadmap designs. The autonomy also improved industries’ capabilities to align and realign toward the market, adapt to dynamic change, and protect organizational assets. This indicated that defense industries were highly capable of developing dynamic capabilities.

## 6. Conclusions

This study examined the factors affecting business performance of defense industries in developing countries, regarding the exploration of self-reliance. Based on the results, business model innovation and performance were associated with both high-performance work systems and technology innovation. Besides business model innovation emphasizing industries’ strategic transformation, high-performance work systems and technological innovation also modulated innovative organizational change, with all variables directly and jointly influencing performance. From the results, dynamic capabilities did not affect both business model innovation and performance, specifically in exploring opportunities and market needs (sensing), acquiring and assimilating new knowledge (learning), and reconstructing existing resources to develop fresh resources and capabilities (reconfiguration). Industries’ assertiveness in implementing innovative human resources practices and applying new technologies was also suggested at the individual, group, and organizational levels, to ultimately provide sustainable competitive advantage. In addition, some clues were provided to the governments, as owners of the major defense industries in most developing countries. This emphasized their support and interference in the development of dynamic capabilities. Granting some degree of organizational reform was also an important policy instrument in improving the capabilities.

To fully appreciate these results, the knowledge of the observed limitations is very necessary. Although the data obtained were unique due to the sensitive nature of defense industries, the sample size was relatively very small to enable the implementation of confirmatory factor analysis and covariance-based structural equation modeling for objective estimation of the proposed model fit. Besides this, other limitations related to the data obtained also reduced the generalizability of the results and led to a lack of consensus with other studies in the same context. The information acquired through the purposive sampling method subsequently encompassed the analysis unit at the top management level only. In this case, an assumption was considered, regarding the sample encompassing the overall picture of the entire organization. Furthermore, the sample only consisted of highly educated and executive participants, with the questionnaire specifically designed and adapted to the study objectives. Another limitation emphasized the representativeness of the Indonesian sample for other developing countries. The assessment of latent variables also led to the omission of seven items

(observed indicators), as five of them correlated strongly with other elements in the same construct. Therefore, subsequent studies are recommended to reconsider these items in the future.

Based on these limitations, future analyses are recommended to obtain more samples and explore a quota sampling method that provides an accurate representation of the population. The additional sample should also include participant data from different business units and management levels. Furthermore, collaborating with other developing countries in conducting similar reports should promote more variations to the samples, or enable the comparison and validation of results. Future studies also need to provide other factors influencing business performance, for example, government support (Songling et al., 2018). The extension of the model should subsequently include the provision of new mediation variables, e.g., Dynamic Capabilities as in Thanh Nhon et al. (2020). To examine factors dampening or modulating the effect of dynamic capabilities, high-performance work systems, technology innovation, and business model innovation on business performance, a moderating factor is needed. Examples of these factors are the type of business (state-owned, commercial), age, size (assets), growth, debt, etc.

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## Appendices

### Appendix A Measurement Items

Construct/ Dimension	Indicator
<b>Dynamic Capabilities</b>	
Sensing	<ul style="list-style-type: none"> <li>- The intensity level of the observation and evaluation</li> <li>- The intensity level of new product development</li> </ul>
Learning	<ul style="list-style-type: none"> <li>- The intensity level of old product improvement</li> <li>- The intensity level of the identification, assessing, and gaining of knowledge effectively</li> <li>- The intensity level of knowledge utilization for the development of products</li> </ul>
Integration	<ul style="list-style-type: none"> <li>- The intensity level of individual contribution to the business unit</li> <li>- The intensity level of people understanding their tasks and responsibilities</li> <li>- The intensity level of individual recognition and acknowledgment</li> <li>- Having relevant skills, knowledge, and abilities</li> <li>- The intensity level of action integration between individuals, according to changes in the environment</li> </ul>
Coordination	<ul style="list-style-type: none"> <li>- The intensity level of organizational task and function integration</li> <li>- The intensity level of work results</li> <li>- The intensity level of the adequacy of resource allocation</li> </ul>
Reconfiguring	<ul style="list-style-type: none"> <li>- The intensity level of task suitability with skills, knowledge, and abilities</li> <li>- The intensity level of well-coordinated activities</li> </ul>
<b>High-Performance Work Systems</b>	
Staffing	<ul style="list-style-type: none"> <li>- Performing selective screening</li> <li>- Conducting technical skill, attitude, and personality assessments</li> <li>- Conducting performance-based promotions</li> </ul>
Self-Managed Team	<ul style="list-style-type: none"> <li>- Having programs to participate in work teams with tasks and decision-making tasks</li> <li>- Having extensive use of work teams across the organization</li> <li>- Having defined tasks</li> <li>- Having decentralized decision-making</li> <li>- The intensity level of employees' engagement</li> <li>- Having participatory management</li> </ul>
Training	<ul style="list-style-type: none"> <li>- Conducting training for present and future skills</li> <li>- Conducting cross-technical and interpersonal training</li> <li>- Conducting training for new and experienced employees</li> </ul>
Flexible Work Assignments	<ul style="list-style-type: none"> <li>- Having job and cross-team rotations</li> <li>- Having the ability to perform the job</li> <li>- Having access to all levels of operation results</li> <li>- Applying employees' suggestion system</li> <li>- Explaining business strategy</li> </ul>
<b>Technological Innovation</b>	
Product Innovation	<ul style="list-style-type: none"> <li>- Achievement of the production process effectiveness and efficiency</li> <li>- There has been a change in the way products and services are provided to customers</li> <li>- There are new techniques and tools for quality improvement</li> <li>- There is a better implementation of production methods</li> <li>- There is an increase in production and better product results</li> </ul>
Process Innovation	<ul style="list-style-type: none"> <li>- There is the acquisition and training of new skills</li> <li>- Recruiting new employees with innovative skills</li> <li>- Occurring new quality improvements and implementing technological innovation</li> <li>- There is an increase in the production of standardized products</li> </ul>

(Continued)



<b>Construct/ Dimension</b>	<b>Indicator</b>
<b>Business Model Innovation</b>	
Value Development	<ul style="list-style-type: none"> <li>- The intensity level of training in the company</li> <li>- The intensity level of sophistication and innovation in business processes</li> <li>- The importance level of partnerships in business processes</li> </ul>
New Proposition	<ul style="list-style-type: none"> <li>- The intensity level of work procedure innovation carried out to increase the benefits of industries' products</li> <li>- The intensity level of increasing the effectiveness and efficiency of distribution channels of industries' products and services</li> </ul>
Capture	<ul style="list-style-type: none"> <li>- The level intensity of innovative actions to improve customers' retention and relationships</li> <li>- The intensity degree of developing new income opportunities</li> <li>- The intensity level of production cost savings</li> <li>- The intensity level of production costs adjustment with prices and market movements</li> <li>- The intensity level of exploiting opportunities through price differentiation</li> </ul>
b	
Financial Perspective	<ul style="list-style-type: none"> <li>- Having a measure of the intensity level of increased product sales</li> <li>- The intensity level of profitable financing products.</li> </ul>
Internal Process Perspective	<ul style="list-style-type: none"> <li>- The intensity level of increasing company profits.</li> <li>- The intensity level of interest in the product</li> </ul>
Learning and Growth Perspective	<ul style="list-style-type: none"> <li>- The intensity level of customer complaints decreased</li> <li>- The intensity level of the increase in the number of buyers</li> <li>- The intensity level of product quality improvement</li> </ul>
Customer Perspective	<ul style="list-style-type: none"> <li>- The intensity level of increasing the suitability of target products and market niches</li> <li>- The intensity level of increasing the speed of the financing process</li> <li>- The intensity level of increasing employees' satisfaction</li> <li>- The intensity level of increasing the number of employees having competency grades according to the job position in industries</li> <li>- The intensity level of increasing labor productivity</li> </ul>

Note: In column 1, constructs are in bold; their dimensions are written indented, in regular font.

## Appendix B Questionnaire Items (Translated from Indonesian to English)

### Dynamic Capabilities

Sensing	DC1.1	Monitor industries' dynamic capabilities commitment to serving customer needs.
	DC1.2	Industries' business objectives are primarily geared toward customers' satisfaction.
Learning	DC2.1	Industries' business objectives are primarily guided by the creation of greater customer value.
	DC2.2	Industries' strategic competitiveness is based on understanding customer needs.
	DC2.3	Companies often measure customer satisfaction.
Integration	DC3.1	Industries pay more attention to after-sales and service.
	DC3.2	The company's marketing people regularly share information relating to competitors' activities.
	DC3.3	Industries respond quickly to the actions of competitors that threaten the industries.

(Continued)

<b>(Continued)</b>		
	DC3.4	Top managers regularly discuss competitors' strengths and actions.
Coordination	DC4.1	Industries target where the company has the opportunity for competitive advantage.
	DC4.2	The company's top managers from each function regularly visit customers and potential customers.
	DC4.3	All business functions are integrated into serving the needs of the company's target market.
Reconfiguring	DC5.1	All company managers understand how everyone in the company's business can contribute to customer value creation.
	DC5.1	Share resources with other business functions within the company.

### **High-Performance Work Systems**

Staffing	HPWS1.1	The company is trying to organize its capabilities to achieve high efficiency in employees' performance.
	HPWS1.2	The company is trying to organize its capabilities to achieve comprehensive capabilities to anticipate future demand.
Self-Managed Team	HPWS2.1	The new product development process is directed by technical personnel who have adequate capabilities.
	HPWS2.2	The company is trying to organize its capabilities to achieve better team work in the organizational structure.
Training	HPWS3.1	The company is trying to organize its capabilities to achieve a standard of a measure of service by developing skills.
	HPWS3.2	The company is trying to invest in HR skills to make its HR have high skills and knowledge in the IT field.
	HPWS3.3	The company is trying to achieve teamwork by investing in HR skills.
Flexible Work Assignments	HPWS4.1	The company is trying to maintain its HR competence by investing in HR skills.
	HPWS4.3	The company has better technological knowledge than the competitors.
	HPWS4.3	The company is trying to invest in HR skills to implement its HR technical capabilities in order to achieve good service.

### Technological Innovation

Process Innovation	TI1.1	The company emphasizes the development of new production procedures and methods.
	TI1.2	The company emphasizes the introduction of new production methods compared to the main competitors.
	TI1.3	The company emphasizes the introduction of new production methods compared to three years ago.
	TI1.4	Industries emphasize the introduction of new production methods compared to other average companies in the same sector.
Product Innovation	TI2.1	Industries have a high level of product innovation.
	TI2.2	Industries emphasize on modifying existing products.
	TI2.3	Industries' commitment in the introduction of new products is more than the main competitors.
	TI2.4	Industries' commitment to the introduction of new products is more than the other average companies in the same sector.
	TI2.5	The company's commitment to the introduction of new products is more than three years ago.
	TI2.6	With new products the company can compete with other companies.

### Business Model Innovation

Value Creation	BMI1.1	Industries are trying to organize its capabilities to keep up with competitive research and development trends.
	BMI1.2	Industries intend to develop new technologies in response to changes and customers' expectations.
	BMI1.3	Industries are very effective in the development of new products.
	BMI1.4	Industries' product development program is more ambitious than the competitors.
New Proposition	BMI2.1	Industries are trying to invest in HR skills to achieve the polarization of different skills to achieve a competitive advantage.
	BMI2.2	Industries are trying to invest in HR skills to achieve the benefits of employees' creative ideas.
	BMI2.3	Industries have the ability to identify opportunities and investments.
Capture	BMI3.1	Industries have different skill capabilities.
	BMI3.2	Industries have certain (specific) abilities that are sure to achieve superior performance.
	BMI3.3	Industries have the ability to innovate and the ability to enter new areas.
	BMI3.4	Industries have the ability to use a variety of communication channels (internally to the organization and to external stakeholders).
	BMI3.5	Industries have the ability to reduce service costs.

### Business Performance

Financial Perspective	BP1.1	Industries retain current customers and manages them to attract new customers (clients).
	BP1.2	Industries' reputation in the eyes of customers is increasing.
InternalProcess Perspective Process Perspective	BP2.1	Industries pay attention to the relationship with suppliers (suppliers) very well because the company maintains a sincere partnership with them.
	BP2.2	There is mutual trust between the company and the company's suppliers.
	BP2.3	The quality of industries' products is above the average of other companies in the same sector.
LearningandGrowth Perspective and Growth Perspective	BP3.1	Employee productivity is higher than the industry average.
	BP3.2	Employees' absenteeism in the company is very rare.
	BP3.3	Response time to complaints from customers is quite well above the industry average.
	BP3.4	The level of service is better than competitors.
Customers' Perspective	BP4.1	Industries often initiate the development of new products and technology.
	BP4.2	The products the company produces include high-tech items.

### Appendix C Data Description of Pre-processed Data

Construct	Item (n = 70)	Mean	Median	Std. Deviation	Variance	Range
Dynamic Capabilities	DC1.1	4.471	4.5	0.583	0.340	[2 . 5]
	DC1.2	4.600	5.0	0.493	0.243	[4 . 5]
	DC2.1	4.386	4.0	0.621	0.385	[3 . 5]
	DC2.2	4.414	4.0	0.625	0.391	[2 . 5]
	DC2.3	4.343	4.0	0.562	0.316	[3 . 5]
	DC3.1	4.443	4.0	0.528	0.279	[3 . 5]
	DC3.2	4.100	4.0	0.745	0.555	[2 . 5]
	DC3.3	4.186	4.0	0.748	0.559	[2 . 5]
	DC3.4	4.129	4.0	0.760	0.577	[1 . 5]
	DC4.1	4.543	5.0	0.582	0.339	[3 . 5]
	DC4.2	4.343	4.0	0.587	0.345	[3 . 5]
	DC4.3	4.314	4.0	0.753	0.566	[2 . 5]
	DC5.1	4.400	4.0	0.522	0.272	[3 . 5]
	DC5.2	4.186	4.0	0.644	0.414	[2 . 5]

(Continued)

<b>Construct</b>	<b>Item (n = 70)</b>	<b>Mean</b>	<b>Median</b>	<b>Std. Deviation</b>	<b>Variance</b>	<b>Range</b>
High Performance Work Systems	HPWS1.1	4.614	5.0	0.519	0.269	[3 . 5]
	HPWS1.2	4.543	5.0	0.557	0.310	[3 . 5]
	HPWS2.1	4.543	5.0	0.606	0.368	[3 . 5]
	HPWS2.2	4.500	5.0	0.558	0.312	[3 . 5]
	HPWS3.1	4.443	4.0	0.528	0.279	[3 . 5]
	HPWS3.2	4.343	4.0	0.679	0.460	[3 . 5]
	HPWS3.3	4.486	5.0	0.631	0.398	[3 . 5]
	HPWS4.1	4.443	4.0	0.581	0.337	[3 . 5]
	HPWS4.2	4.114	4.0	0.772	0.595	[2 . 5]
	HPWS4.3	4.414	4.0	0.602	0.362	[3 . 5]
Technological Innovation	TI1.1	4.286	4.0	0.684	0.468	[2 . 5]
	TI1.2	4.129	4.0	0.721	0.519	[2 . 5]
	TI1.3	4.071	4.0	0.688	0.473	[2 . 5]
	TI1.4	4.029	4.0	0.722	0.521	[2 . 5]
	TI2.1	4.314	4.5	0.790	0.624	[2 . 5]
	TI2.2	4.329	4.0	0.653	0.427	[2 . 5]
	TI2.3	4.129	4.0	0.779	0.606	[2 . 5]
	TI2.4	4.143	4.0	0.748	0.559	[2 . 5]
	TI2.5	4.043	4.0	0.788	0.621	[2 . 5]
	TI2.6	4.543	5.0	0.582	0.339	[3 . 5]
Business Model Innovation	BMI1.1	4.500	5.0	0.584	0.341	[3 . 5]
	BMI1.2	4.500	5.0	0.558	0.312	[3 . 5]
	BMI1.3	4.257	4.0	0.774	0.600	[2 . 5]
	BMI1.4	3.986	4.0	0.752	0.565	[3 . 5]
	BMI2.1	4.257	4.0	0.793	0.629	[1 . 5]
	BMI2.2	4.314	4.0	0.671	0.451	[3 . 5]
	BMI2.3	4.300	4.0	0.622	0.387	[3 . 5]
	BMI3.1	4.100	4.0	0.684	0.468	[2 . 5]
	BMI3.2	4.357	4.0	0.660	0.436	[2 . 5]
	BMI3.3	4.329	4.0	0.631	0.398	[3 . 5]
	BMI3.4	4.243	4.0	0.624	0.389	[3 . 5]
BMI3.5	3.814	4.0	0.666	0.443	[3 . 5]	

(Continued)

**(Continued)**

<b>Construct</b>	<b>Item (n = 70)</b>	<b>Mean</b>	<b>Median</b>	<b>Std. Deviation</b>	<b>Variance</b>	<b>Range</b>
Business Performance	BP1.1	4.414	4.0	0.577	0.333	[3 . 5]
	BP1.2	4.414	4.0	0.625	0.391	[3 . 5]
	BP2.1	4.443	4.0	0.555	0.308	[3 . 5]
	BP2.2	4.329	4.0	0.696	0.485	[2 . 5]
	BP2.3	4.214	4.0	0.679	0.461	[3 . 5]
	BP3.1	4.057	4.0	0.720	0.518	[2 . 5]
	BP3.2	4.271	4.0	0.797	0.635	[2 . 5]
	BP3.3	4.229	4.0	0.726	0.527	[2 . 5]
	BP3.4	3.914	4.0	0.812	0.659	[3 . 5]
	BP4.1	3.943	4.0	0.796	0.634	[1 . 5]
	BP4.2	4.471	5.0	0.607	0.369	[3 . 5]

**Appendix D Summary of Assessment Results (n = 70)**

<b>Construct</b>	<b>Indicators</b>	<b>Assessment Result</b>	
		<b>Included in Analysis</b>	<b>Exclusion Criteria</b>
Dynamic Capabilities	DC1.1	Yes	
	DC1.2	No	AVE < 0.50
	DC2.1	No	AVE < 0.50
	DC2.2	No	AVE < 0.50
	DC2.3	Yes	
	DC3.1	Yes	
	DC3.2	No	AVE < 0.50
	DC3.3	Yes	
	DC3.4	Yes	
	DC4.1	Yes	
	DC4.2	Yes	
	DC4.3	Yes	
	DC5.1	Yes	
	DC5.2	No	AVE < 0.50

(Continued)

Construct	Indicators	Assessment Result	
		Included in Analysis	Exclusion Criteria
High Performance Work Systems	HPWS1.1	Yes	
	HPWS1.2	Yes	
	HPWS2.1	Yes	
	HPWS2.2	Yes	
	HPWS3.1	Yes	
	HPWS3.2	Yes	
	HPWS3.3	Yes	
	HPWS4.1	Yes	
	HPWS4.2	Yes	
	HPWS4.3	Yes	
Technological Innovation	TI1.1	Yes	
	TI1.2	Yes	
	TI1.3	Yes	
	TI1.4	Yes	
	TI2.1	Yes	
	TI2.2	Yes	
	TI2.3	Yes	
	TI2.4	Yes	
	TI2.5	Yes	
	TI2.6	Yes	
Business Model Innovation	BMI1.1	Yes	
	BMI1.2	Yes	
	BMI1.3	Yes	
	BMI1.4	Yes	
	BMI2.1	Yes	
	BMI2.2	Yes	
	BMI2.3	Yes	
	BMI3.1	Yes	
	BMI3.2	Yes	
	BMI3.3	Yes	
	BMI3.4	Yes	
BMI3.5	No	$\theta < 0.50$	

(Continued)

**(Continued)**

Construct	Indicators	Assessment Result	
		Included in Analysis	Exclusion Criteria
Business Performance	BP1.1	Yes	
	BP1.2	Yes	
	BP2.1	Yes	
	BP2.2	Yes	
	BP2.3	Yes	
	BP3.1	Yes	
	BP3.2	Yes	
	BP3.3	Yes	
	BP3.4	Yes	
	BP4.1	No	$\theta < 0.50$
	BP4.2	Yes	

## Appendix E PLS Algorithm Results

### Reliability Analysis (n = 70)

Construct	Dimension	Indicator	Cronbach's $\alpha$	Composite Reliability	AVE
Dynamic Capabilities			0.878	0.903	0.509
	Sensing		1.000	1.000	1.000
	Learning		1.000	1.000	1.000
	Integration		0.745	0.848	0.650
	Reconfigure		1.000	1.000	1.000
High-Performance Work System			0.918	0.932	0.582
	Staffing		0.813	0.914	0.842
	Self-Managed Team		0.640	0.848	0.735
	Training		0.819	0.892	0.735
	Flexible Work Assignments		0.757	0.862	0.677
Technological Innovation			0.905	0.922	0.544
	Process Innovation		0.837	0.892	0.674
	Product Innovation		0.857	0.895	0.589
Business Model Innovation			0.920	0.933	0.560
	Value Creation		0.835	0.890	0.671
	New Preposition		0.864	0.917	0.787
	Value Capture		0.841	0.849	0.894
Business Performance			0.902	0.920	0.537
	Financial Perspective		0.612	0.836	0.719
	Internal Process Perspective		0.731	0.738	0.848
	Learning and Growth Perspective		0.810	0.875	0.637
	Customer Perspective		1.000	1.000	1.000



**Outer Loading and Discriminant Analysis (n = 70)**

Construct	Dimension	Indicator	$\beta$ to Dimension	$\beta$ to Construct	Discriminant Validity**	VIF < 5.0
Dynamic Capabilities						
	Sensing					
		DC1.1	1.000*	0.692*	Yes	Yes
	Learning					
		DC2.3	1.000*	0.606*	Yes	Yes
	Integration					
		DC3.1	0.747*	0.749*	Yes	Yes
		DC3.3	0.859*	0.774*	Yes	Yes
		DC3.4	0.835*	0.676*	Yes	Yes
	Coordination					
		DC4.1	0.850*	0.765*	Yes	Yes
		DC4.2	0.845*	0.724*	Yes	Yes
		DC4.3	0.847*	0.784*	Yes	Yes
	Reconfigure					
		DC5.1	1.000*	0.630*	Yes	Yes
High-Performance Work System						
	Staffing					
		HPWS1.1	0.911*	0.728*	Yes	Yes
		HPWS1.2	0.925*	0.791*	Yes	Yes
	Self-Managed Team					
		HPWS2.1	0.853*	0.664*	Yes	Yes
		HPWS2.2	0.863*	0.686*	Yes	Yes
	Training					
		HPWS3.1	0.836*	0.776*	Yes	Yes
		HPWS3.2	0.822*	0.707*	Yes	Yes
		HPWS3.3	0.910*	0.897*	Yes	Yes
	Flexible Work Assignment					
		HPWS4.1	0.820*	0.796*	Yes	Yes
		HPWS4.2	0.719*	0.665*	Yes	Yes
		HPWS4.3	0.918*	0.875*	Yes	Yes
Technological Innovation						
	Process Innovation					
		TI1.1	0.891*	0.826*	Yes	Yes
		TI1.2	0.876*	0.823*	Yes	Yes
		TI1.3	0.714*	0.577*	Yes	Yes
		TI1.4	0.792*	0.747*	Yes	Yes
	Product Innovation					
		TI2.1	0.792*	0.802*	Yes	Yes

(Continued)

<b>(Continued)</b>						
<b>Construct</b>	<b>Dimension</b>	<b>Indicator</b>	<b><math>\theta</math> to Dimension</b>	<b><math>\theta</math> to Construct</b>	<b>Discriminant Validity**</b>	<b>VIF &lt; 5.0</b>
		TI2.2	0.639*	0.642*	Yes	Yes
		TI2.3	0.860*	0.767*	Yes	Yes
		TI2.4	0.861*	0.798*	Yes	Yes
		TI2.5	0.731*	0.690*	Yes	Yes
		TI2.6	0.697*	0.655*	Yes	Yes
<b>Business Model Innovation</b>						
	<b>Value Creation</b>					
		BMI1.1	0.797*	0.678*	Yes	Yes
		BMI1.2	0.894*	0.768*	Yes	Yes
		BMI1.3	0.829*	0.752*	Yes	Yes
		BMI1.4	0.750*	0.631*	Yes	Yes
	<b>New Preposition</b>					
		BMI2.1	0.857*	0.783*	Yes	Yes
		BMI2.2	0.930*	0.870*	Yes	Yes
		BMI2.3	0.872*	0.806*	Yes	Yes
	<b>Value Capture</b>					
		BMI3.1	0.803*	0.718*	Yes	Yes
		BMI3.2	0.862*	0.713*	Yes	Yes
		BMI3.3	0.860*	0.822*	Yes	Yes
		BMI3.4	0.766*	0.648*	Yes	Yes
<b>Business Performance</b>						
	<b>Financial Perspective</b>					
		BP1.1	0.812*	0.629*	Yes	Yes
		BP1.2	0.882*	0.777*	Yes	Yes
	<b>Internal Process Perspective</b>					
		BP2.1	0.837*	0.794*	Yes	Yes
		BP2.2	0.764*	0.663*	Yes	Yes
		BP2.3	0.816*	0.780*	Yes	Yes
	<b>Learning and Growth Perspective</b>					
		BP3.1	0.860*	0.821*	Yes	Yes
		BP3.2	0.775*	0.686*	Yes	Yes
		BP3.3	0.791*	0.766*	Yes	Yes
		BP3.4	0.762*	0.612*	Yes	Yes
	<b>Customers' Perspective</b>					
		BP4.2	1.000*	0.765*	Yes	Yes

Note: \*Significant  $p < 0.05$ , \*\* see section below (Cross Loading).

**Discriminant Validity (Cross Loading)**

	<b>Business Performance</b>	<b>Dynamic Capabilities</b>	<b>High-Performance Work Systems</b>	<b>Business Model Innovation</b>	<b>Technological Innovation</b>
DC1.1	0.353	0.692	0.414	0.416	0.388
DC1.1	0.353	0.692	0.414	0.416	0.388
DC2.3	0.458	0.606	0.516	0.429	0.285
DC2.3	0.458	0.606	0.516	0.429	0.285
DC3.1	0.598	0.749	0.618	0.531	0.529
DC3.1	0.598	0.749	0.618	0.531	0.529
DC3.3	0.447	0.774	0.549	0.611	0.507
DC3.3	0.447	0.774	0.549	0.611	0.507
DC3.4	0.293	0.676	0.484	0.509	0.402
DC3.4	0.293	0.676	0.484	0.509	0.402
DC4.1	0.534	0.765	0.610	0.587	0.455
DC4.1	0.534	0.765	0.610	0.587	0.455
DC4.2	0.396	0.724	0.444	0.420	0.302
DC4.2	0.396	0.724	0.444	0.420	0.302
DC4.3	0.555	0.784	0.633	0.623	0.493
DC4.3	0.555	0.784	0.633	0.623	0.493
DC5.1	0.543	0.630	0.483	0.466	0.505
DC5.1	0.543	0.630	0.483	0.466	0.505
HPWS1.1	0.522	0.533	0.728	0.544	0.483
HPWS1.1	0.522	0.533	0.728	0.544	0.483
HPWS1.2	0.603	0.603	0.791	0.629	0.607
HPWS1.2	0.603	0.603	0.791	0.629	0.607
HPWS2.1	0.543	0.537	0.664	0.544	0.569
HPWS2.1	0.543	0.537	0.664	0.544	0.569
HPWS2.2	0.551	0.595	0.686	0.556	0.507
HPWS2.2	0.551	0.595	0.686	0.556	0.507
HPWS3.1	0.664	0.605	0.776	0.586	0.416
HPWS3.1	0.664	0.605	0.776	0.586	0.416
HPWS3.2	0.544	0.451	0.707	0.625	0.466
HPWS3.2	0.544	0.451	0.707	0.625	0.466
HPWS3.3	0.717	0.622	0.897	0.737	0.660
HPWS3.3	0.717	0.622	0.897	0.737	0.660
HPWS4.1	0.563	0.576	0.796	0.627	0.355
HPWS4.1	0.563	0.576	0.796	0.627	0.355
HPWS4.2	0.598	0.499	0.665	0.646	0.694

(Continued)

<b>(Continued)</b>					
	<b>Business Performance</b>	<b>Dynamic Capabilities</b>	<b>High-Performance Work Systems</b>	<b>Business Model Innovation</b>	<b>Technological Innovation</b>
HPWS4.2	0.598	0.499	0.665	0.646	0.694
HPWS4.3	0.759	0.638	0.875	0.743	0.584
HPWS4.3	0.759	0.638	0.875	0.743	0.584
TI1.1	0.758	0.602	0.691	0.679	0.826
TI1.1	0.758	0.602	0.691	0.679	0.826
TI1.2	0.703	0.660	0.665	0.656	0.823
TI1.2	0.703	0.660	0.665	0.656	0.823
TI1.3	0.483	0.354	0.439	0.370	0.577
TI1.3	0.483	0.354	0.439	0.370	0.577
TI1.4	0.544	0.461	0.490	0.564	0.747
TI1.4	0.544	0.461	0.490	0.564	0.747
TI2.1	0.694	0.588	0.676	0.764	0.802
TI2.1	0.694	0.588	0.676	0.764	0.802
TI2.2	0.530	0.384	0.431	0.509	0.642
TI2.2	0.530	0.384	0.431	0.509	0.642
TI2.3	0.505	0.260	0.375	0.517	0.767
TI2.3	0.505	0.260	0.375	0.517	0.767
TI2.4	0.608	0.334	0.436	0.600	0.798
TI2.4	0.608	0.334	0.436	0.600	0.798
TI2.5	0.476	0.324	0.387	0.470	0.690
TI2.5	0.476	0.324	0.387	0.470	0.690
TI2.6	0.501	0.415	0.489	0.587	0.655
TI2.6	0.501	0.415	0.489	0.587	0.655
BMI1.1	0.457	0.478	0.586	0.678	0.432
BMI1.1	0.457	0.478	0.586	0.678	0.432
BMI1.2	0.581	0.590	0.727	0.768	0.525
BMI1.2	0.581	0.590	0.727	0.768	0.525
BMI1.3	0.635	0.491	0.587	0.752	0.652
BMI1.3	0.635	0.491	0.587	0.752	0.652
BMI1.4	0.542	0.339	0.438	0.631	0.613
BMI1.4	0.542	0.339	0.438	0.631	0.613
BMI2.1	0.623	0.487	0.645	0.783	0.559
BMI2.1	0.623	0.487	0.645	0.783	0.559
BMI2.2	0.705	0.653	0.750	0.870	0.633
BMI2.2	0.705	0.653	0.750	0.870	0.633
BMI2.3	0.706	0.729	0.634	0.806	0.631

(Continued)

	<b>Business Performance</b>	<b>Dynamic Capabilities</b>	<b>High-Performance Work Systems</b>	<b>Business Model Innovation</b>	<b>Technological Innovation</b>
BMI2.3	0.706	0.729	0.634	0.806	0.631
BMI3.1	0.515	0.549	0.495	0.718	0.665
BMI3.1	0.515	0.549	0.495	0.718	0.665
BMI3.2	0.644	0.427	0.616	0.713	0.602
BMI3.2	0.644	0.427	0.616	0.713	0.602
BMI3.3	0.731	0.628	0.697	0.822	0.717
BMI3.3	0.731	0.628	0.697	0.822	0.717
BMI3.4	0.557	0.489	0.536	0.648	0.415
BMI3.4	0.557	0.489	0.536	0.648	0.415
BP1.1	0.629	0.540	0.555	0.534	0.381
BP1.1	0.629	0.540	0.555	0.534	0.381
BP1.2	0.777	0.564	0.630	0.631	0.661
BP1.2	0.777	0.564	0.630	0.631	0.661
BP2.1	0.794	0.517	0.608	0.504	0.541
BP2.1	0.794	0.517	0.608	0.504	0.541
BP2.2	0.663	0.475	0.616	0.684	0.694
BP2.2	0.663	0.475	0.616	0.684	0.694
BP2.3	0.780	0.555	0.616	0.668	0.672
BP2.3	0.780	0.555	0.616	0.668	0.672
BP3.1	0.821	0.595	0.671	0.682	0.649
BP3.1	0.821	0.595	0.671	0.682	0.649
BP3.2	0.686	0.378	0.461	0.470	0.451
BP3.2	0.686	0.378	0.461	0.470	0.451
BP3.3	0.766	0.279	0.566	0.646	0.648
BP3.3	0.766	0.279	0.566	0.646	0.648
BP3.4	0.612	0.487	0.507	0.678	0.581
BP3.4	0.612	0.487	0.507	0.678	0.581
BP4.2	0.765	0.414	0.612	0.530	0.542
BP4.2	0.765	0.414	0.612	0.530	0.542

**Appendix F The Second-Order Bootstrapping Results of the Path Analysis (n = 70)**

H	Independent Variable (IV)	Dimension	R <sup>2</sup>	Q <sup>2</sup>	β to IV	β to DV	f <sup>2</sup> to IV	f <sup>2</sup> to DV
	Business Model Innovation as a dependent variable (DV)		0.753	0.422	0.422*			
H <sub>1</sub>	Dynamic Capabilities					0.169		0.055
		Sensing	0.478	0.440	0.692*		0.917	
		Learning	0.367	0.354	0.606*		0.580	
		Integration	0.817	0.520	0.904*		4.474	
		Coordination	0.802	0.566	0.895*		4.041	
		Reconfigure	0.397	0.392	0.630*		0.660	
H <sub>2</sub>	High Performance Work Systems					0.426*		0.280
		Staffing	0.686	0.571	0.829*		2.189	
		Self-Managed Team	0.620	0.442	0.787*		1.632	
		Training	0.868	0.627	0.931*		6.550	
		Flexible Work Assignments	0.907	0.606	0.952*		9.738	
H <sub>3</sub>	Technological Innovation					0.386*		0.326
		Process Innovation	0.837	0.529	0.915*		5.143	
		Product Innovation	0.903	0.526	0.950*		9.317	
	Business Performance as a dependent variable (DV)		0.775	0.392				
		Financial Perspective	0.689	0.482	0.835*		2.311	
		Internal Process Perspective	0.862	0.546	0.928*		6.251	
		Learning and Growth Perspective	0.831	0.516	0.912*		4.929	
		Customers' Perspective	0.585	0.572	0.765*		1.409	
H <sub>4</sub>	Dynamic Capabilities					0.001		0.000
H <sub>5</sub>	High Performance Work Systems					0.332*		0.129
H <sub>6</sub>	Technological Innovation					0.353*		0.199
H <sub>4</sub>	Business Model Innovation					0.269*		0.070
		Value Creation	0.751	0.498	0.867*		3.018	
		New Proposition	0.856	0.669	0.925*		5.946	
		Value Capture	0.784	0.517	0.886*		3.635	

Note: \*Significant p < 0.05.