

## **STRATEGIC PLANNING FOR THE DEVELOPMENT OF PREFABRICATED HOUSE CONSTRUCTION INDUSTRY IN INDONESIA**

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**Abstract:** The prefabricated house construction industry in Indonesia has enormous potential, driven by the high demand for housing, which reached 9.9 million, and supportive government policies, but it is still hit by multidimensional challenges that require comprehensive strategic planning. Thus, this study aims to map strategic planning to develop the prefabricated house construction industry in Indonesia. The research questions of this study are: (1) What are the factors that affect the development of the prefabricated house construction industry in Indonesia? (2) What strategic planning does Indonesia implement to develop this industry? This research was compiled by uncovering the growth of the prefabricated house construction industry and its situation in Indonesia, and adopting secondary data analysis to collect data. The results of the study by integrating the Diamond Porter Model and SWOT/TOWS analysis revealed that the success of industrial development depends on a synergistic multi-stakeholder approach involving integrated policy support, technology adoption, supply chain consolidation, and comprehensive market education to transform Indonesia's housing sector towards greater efficiency, scalability, and sustainability.

**Keywords:** *Prefabricated House, Strategic Planning, Diamond Porter Model, SWOT Analysis, Indonesia Construction Industry*

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### **1. Introduction**

The global construction industry is at a crucial turning point with the increasing shift to prefabricated methods as a solution to chronic challenges such as labor shortages, project delays, cost overruns, and significant environmental impacts [1, 2]. Prefabricated construction promises increased productivity, superior quality, reduced waste, and accelerated project turnaround times by manufacturing building components in a controlled factory environment before assembling them on-site. In the context of housing, this method holds great promise for efficiently addressing large-scale housing deficits.

Indonesia, as a developing archipelagic country with an increasingly urbanized population, faces a large and persistent housing backlog. Official data shows that the national backlog reaches around 9.9 million units based on ownership and increases to 12.7 million units when considering the quality of occupancy [3]. This deficit is exacerbated by rapid urban migration, which increases the demand for affordable and livable housing in urban

centers and often leads to the spread of informal settlements and slums [4]. Conventional construction methods, which are still dominant in Indonesia, struggle to keep up with this demand due to their reliance on unskilled labor, vulnerability to weather delays, and inconsistent material quality.

Realizing this, the Indonesian Government has launched ambitious programs, the most famous of which is the One Million Houses Program, to boost housing production. However, the limitations of traditional construction methods continuously constrain this program's target. In response, there has been a shift in policies to encourage Industrialized Building Systems (SBIs), including precast and prefabricated concrete technologies, to achieve scalability, efficiency, and sustainability in the housing sector [5]. The Government has spearheaded the implementation of modular systems, such as RISHA (Healthy Simple Instant Houses) and RUSPIN (Instant Panel System Houses), for certain housing projects, demonstrating a commitment to technological innovation [6].

## **2. Research Method**

The structure of the research is carried out according to the following steps: 1) The literature reviewed is related to the growth of the prefabricated house construction industry in Indonesia, the model of the factors affecting the prefabricated house construction industry in Indonesia, the Porter Diamond theory, and the SWOT/TOWS matrix analysis; 2) This research was designed based on research objectives and literature review; 3) Data analysis; and 4) Interpret data, summarize findings, and draw conclusions and suggestions.

The qualitative research method used in this study is the collection of data sources through secondary data analysis, which includes academic papers, books, websites, and research reports from research institutions. The hypothesis of this study is 1) identifying the factors that affect the development of the prefabricated house construction industry in Indonesia, which will be analyzed with the concept of the supply and demand model of prefabricated house construction, and 2) mapping out strategic planning to develop the prefabricated house construction industry in Indonesia, which will be analyzed with an integrated diamond model and SWOT analysis [7].

Furthermore, the analytical steps of this study are 1) identifying the factors influencing the development of the prefabricated house construction industry from the data obtained, which investigates the comparison of the prefabricated house demand model and its situation in Indonesia; 2) identifying the comparative advantages of countries' analyses of the industry; 3) investigating the SWOT analysis of the industry; and 4) mapping out strategic planning to develop industries in Indonesia by formulating TOWS correlation and matching, and the results are linked and integrated between the Diamond and SWOT models.

## **3. Results and Discussion**

### **3.1. Results**

#### **Factors Influencing the Analysis**

In analyzing the development of the prefabricated house construction industry in Indonesia, the demand model is an important framework for understanding the dynamics of demand and market acceptance of modern building technology [8]. This model focuses attention on the interaction between consumer behavior, market conditions, socio-cultural factors, and government policies that act as drivers and inhibitors of the adoption of prefabricated systems in the national housing sector.

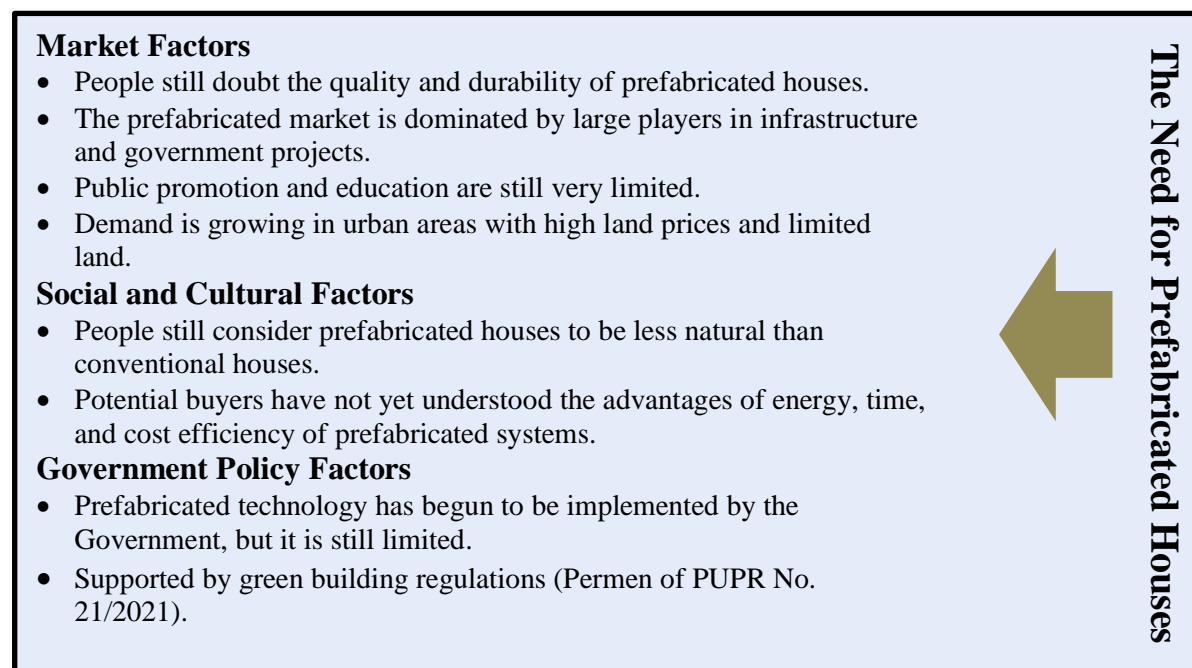
In general, the level of demand for prefabricated houses in Indonesia is still in the early stages of growth. This is due to limited public literacy, negative perception of the quality of manufacturers' buildings, and the Government's promotion strategy and affirmative policies. Nonetheless, the increasing need for rapid and efficient housing in densely populated urban areas presents significant opportunities for the expansion of this industry.

The following analysis is divided into three main groups of factors, namely: (1) market factors, which include consumer acceptance, industry structure and competition, marketing strategies, and actual market demand; (2) social and cultural factors related to public perception and the level of public knowledge about new construction technologies; and (3) government policy factors (institutional demand), which include public procurement programs, pilot projects, and environmental and sustainability policies.

Through these three groups of factors, the prefabricated industry demand model is expected to provide a comprehensive picture of the mechanism of shaping the need for prefabricated houses in Indonesia, as well as identify structural barriers and strategic opportunities for accelerating the adoption of sustainable construction technology.

**Table 1. Comparison of Prefabricated House Construction Industry Demand Model and Prefabricated House Situation in Indonesia**

Prefabricated House Construction Industry Demand Model	Situation of Prefabricated Houses in Indonesia
<b>Prefabricated House Needs</b>	
Market Factors	
<ul style="list-style-type: none"> <li>• Customer acceptance of prefabricated houses</li> <li>• Market structure (level of competition and concentration of players)</li> <li>• Marketing strategies to increase interest</li> <li>• Market demand for prefabricated houses</li> </ul>	<ul style="list-style-type: none"> <li>• Most Indonesian people are still skeptical about the quality and durability of prefabricated houses.</li> <li>• The prefabricated industry is still dominated by several major players in the infrastructure sector and government projects.</li> <li>• The promotion of prefabricated houses has not been carried out massively.</li> <li>• Demand is increasing in areas with high land prices and limited space</li> </ul>
<b>Social and Cultural Factors</b>	
<ul style="list-style-type: none"> <li>• Public Perception: Factory buildings are still negative, especially regarding comfort and beauty.</li> <li>• Education and Information: Lack of public literacy about the benefits of prefabricated decreases buying interest.</li> </ul>	<ul style="list-style-type: none"> <li>• Some people still consider prefabricated houses "less natural" than conventional red brick houses.</li> <li>• Many potential buyers are not yet aware of the energy, time, and cost efficiency advantages of prefabricated systems.</li> </ul>
<b>Government Policy Factors (Institutional Demand)</b>	
<ul style="list-style-type: none"> <li>• Procurement and Demonstration Programme (Public Procurement &amp; Pilot Projects)</li> <li>• Environmental and Sustainability Policy.</li> </ul>	<ul style="list-style-type: none"> <li>• The Government has begun to apply precast technology to rusunawa projects, ASN/TNI-Polri flats, and subsidized housing. However, the scale of implementation is still limited.</li> <li>• Regulatory support began to emerge through <i>the Regulation of the Minister of PUPR No. 21/2021</i> concerning green buildings. Prefabricated technology is in line with the principles of material efficiency and construction waste reduction.</li> </ul>



**Figure 1.** Factors Influencing the Development of Home Construction Prefabricated in Indonesia

Based on the description of these factors, it can be concluded that the demand for prefabricated houses in Indonesia is shaped by a combination of structural impulses and social perceptions of the public. On the one hand, government policies and the needs of the urban market provide great opportunities for the development of the prefabricated industry. But on the other hand, low public literacy, limited marketing innovation, and negative perception of the quality of manufacturers' buildings are still the main obstacles.

Thus, the analysis of this demand model indicates that the increase in the adoption of prefabricated houses depends not only on technical aspects and production costs but also on socialization strategies, consumer education, and the sustainability of government policies. Understanding these three groups of factors is an important basis for formulating a prefabricated industry development strategy that is adaptive to domestic market conditions and supports the sustainable national housing development agenda.

### **Competitive Advantages of Nation Analysis**

The Competitive Advantages of Nation (CAoN) analysis was used to assess the strengths and weaknesses of the prefabricated house construction industry in Indonesia by adapting Porter's Diamond Model approach. This analysis aims to identify the extent to which national factors support the competitiveness and sustainable development of the precast construction industry [9].

The analysis was conducted to understand the balance between the potential and structural challenges of the prefabricated house industry. On the one hand, Indonesia has enormous opportunities through regulatory support, high market needs, and potential energy and material efficiency. However, there are still obstacles to the quality of human resources, logistics infrastructure, and public perception of precast products.

Table 2 outlines five main dimensions that affect the competitiveness of the industry, namely: 1) Productive Factors; 2) Demand Conditions; 3) Related and Supporting Industries; 4) Firm Strategy, Structure, and Rivalry; and 5) Government. Each dimension highlights advantages and *disadvantages* that collectively describe Indonesia's competitive position in the development of prefabricated technology.

**Table 2. The Nation's Competitive Advantage in Prefabricated House Construction in Indonesia**

CAoN	Advantages	Disadvantages
<b>Productive factor</b>	<ul style="list-style-type: none"> <li>• Potential energy and material savings through controlled production in factories.</li> <li>• May reduce reliance on excessive manual labor.</li> <li>• Potential for reducing construction waste.</li> <li>• Abundant labor availability, although training is needed for prefabricated technology.</li> <li>• Regulatory support and incentives, such as exemption from Building Licensing and Land and Building Rights Ownership Duties.</li> <li>• The potential development of prefabricated construction technology is supported by government policies.</li> <li>• Development of modular technologies such as</li> <li>• R&amp;D support from the Ministry of PUPR and universities.</li> </ul>	<ul style="list-style-type: none"> <li>• Limited strategic land at affordable prices.</li> <li>• Basic infrastructure (electricity, water, roads) is inadequate in many locations.</li> <li>• The quality of human resources is still low in the application of precast technology.</li> <li>• The logistics and transportation costs of prefabricated modules are still high.</li> <li>• Educational curriculum that does not yet accommodate specialized training for precast construction.</li> </ul>
<b>Demand condition</b>	<ul style="list-style-type: none"> <li>• The high backlog of housing nationally (9.9 million units) and in South Sulawesi (400 thousand units) creates a large market.</li> <li>• The Government's 3 million Houses program is a significant driver of demand. Included in the national strategic program.</li> <li>• Population growth and urbanization increase the need for livable housing.</li> <li>• Demand for earthquake-resistant and quick-wake homes.</li> <li>• There is a clear segmentation: Low-Income Communities, commercial, self-reliant, and renovation.</li> </ul>	<ul style="list-style-type: none"> <li>• Negative public perception of the quality, aesthetics, and safety of precast houses.</li> <li>• High customization demands from consumers make it difficult to meet the standard precast system.</li> <li>• People's purchasing power is still limited, especially for MBR.</li> <li>• Economic uncertainty and interest rate fluctuations affect credit ability.</li> <li>• The demand for prefabricated houses is still low due to the lack of socialization and public trust.</li> </ul>
<b>Related and supporting industries</b>	<ul style="list-style-type: none"> <li>• Strong property industry support through associations such as REI, which has been established since 1972 and has a national</li> </ul>	<ul style="list-style-type: none"> <li>• The supporting infrastructure is not evenly distributed, especially in</li> </ul>

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	<p>network.</p> <ul style="list-style-type: none"><li>• The domestic industry supports the availability of local raw materials for construction (cement, steel, building materials).</li><li>• There are financing institutions such as FLPP (housing financing liquidity facility), Tapera (people's housing savings), and subsidized KPR (People's Housing Loan) that support housing demand.</li><li>• Support technology and information systems such as SIMBG for the acceleration of licensing.</li><li>• Supporting industries such as precast concrete, steel, GRC panels, and modular materials are already growing.</li><li>• The existence of a government e-catalog for the procurement of flats and modular components facilitates access and transparency.</li><li>• Support from associations (REI) and construction research institutes.</li><li>• Potential integration with BIM (Building Information Modeling), IoT (Internet of Things), and RFID (Radio Frequency Identification) technologies to improve efficiency.</li></ul>	<p>areas outside Java.</p> <ul style="list-style-type: none"><li>• Dependence on the import of certain materials for prefabricated technology is still high.</li><li>• Supporting industries, such as logistics and transportation of prefabricated modules, are still limited.</li><li>• High dependence on manufacturers of modular components.</li><li>• There are still limited suppliers of precast components in areas outside Java.</li><li>• Uneven logistics and transportation infrastructure.</li></ul>
<b>Firm strategy, structure, and rivalry</b>	<ul style="list-style-type: none"><li>• There is collaboration between developers, the Government, and the community through cooperation and CSR programs.</li><li>• The emergence of developers who focus on modular and precast houses.</li><li>• Collaboration between governments, developers, and associations (REIs).</li><li>• There is a transparent e-purchasing scheme.</li><li>• The potential for product differentiation through faster and higher-quality prefabricated technology.</li><li>• Long-term time and cost efficiency initiatives through standardization</li><li>• More collaboration with international parties for technology transfer</li></ul>	<ul style="list-style-type: none"><li>• Organizational culture that is resistant to change and innovation.</li><li>• Competition with conventional developers is still dominant.</li><li>• Limited capital and access to construction credit.</li><li>• Low innovation in small-medium developers.</li></ul>
<b>Government</b>	<ul style="list-style-type: none"><li>• Supporting regulations such as Law No. 1/2011 on Housing and Settlements</li><li>• Fiscal incentives and subsidies for MBR houses</li><li>• Development acceleration programmes such as 3 million Houses</li><li>• Support in research and development through universities and research</li></ul>	<ul style="list-style-type: none"><li>• Bureaucracy is still complicated and uneven throughout the region.</li><li>• There is uncertainty regarding different regional regulations (Perda).</li><li>• There is no national standardization for precast</li></ul>

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| <p>institutions</p> <ul style="list-style-type: none"> <li>• The policy of accelerating licensing (maximum 10 days) for MBR houses.</li> <li>• E-catalog for the procurement of flats and modular houses.</li> </ul> | <p>components yet.</p> <ul style="list-style-type: none"> <li>• Special policies do not support the logistics and transportation costs of precast components.</li> <li>• Overlapping regulations between the central and regional governments.</li> </ul> |
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### SWOT Analysis

The SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis is used to evaluate the strategic position of the prefabricated house construction industry in Indonesia in facing market challenges and the transformation of modern construction technology. Through this approach, it is possible to identify internal strengths that are the main capital for industrial development, weaknesses that need to be addressed, external opportunities that can be exploited, and threats that have the potential to hinder growth.

This analysis provides a comprehensive overview of the adaptability and competitiveness of the prefabricated sector, especially in the context of efficient, fast, and sustainable national housing development. By understanding these four SWOT aspects, industry players, governments, and investors can formulate more effective strategies to strengthen competitiveness, expand market share, and accelerate the adoption of prefabricated construction technology in Indonesia.

**Table 3. SWOT Analysis of Prefabricated House Construction Business in Indonesia**

	<b>Internal factors</b>	<b>External factors</b>
<b>Favorable factors</b>	<p><b>Strengths (S)</b></p> <p><b>S1:</b> Potential energy, material, and waste reduction.</p> <p><b>S2:</b> Labor availability.</p> <p><b>S3:</b> R&amp;D support from the Government and universities.</p> <p><b>S4:</b> Development of modular technology</p> <p><b>S5:</b> Very large market (housing backlog)</p> <p><b>S6:</b> Driven by government programs (3 Million Houses)</p> <p><b>S7:</b> Strong local raw material industry (cement, steel).</p> <p><b>S8:</b> Accelerating the approval of financing support (Subsidized Mortgage).</p> <p><b>S9:</b> There is a government e-catalog for transparency.</p> <p><b>S10:</b> Established association (Real Estate Indonesia) support.</p> <p><b>S11:</b> The rise of developers</p>	<p><b>Opportunities (O)</b></p> <p><b>O1:</b> Reduced reliance on manual labor</p> <p><b>O2:</b> Regulatory support (exemption of Building Permits/Building Rights Ownership Duties) can be utilized.</p> <p><b>O3:</b> Development of a special training curriculum</p> <p><b>O4:</b> Population growth and urbanization increase the need for housing.</p> <p><b>O5:</b> Clear market segmentation (Low-Income Society, commercial, self-help).</p> <p><b>O6:</b> The potential of socialization to change public perception</p> <p><b>O7:</b> Product differentiation through construction speed and quality.</p> <p><b>O8:</b> Long-term cost efficiency</p>

	<p>who focus on modular.</p> <p><b>S12:</b> Potential for international collaboration and technology transfer.</p> <p><b>S13:</b> Supportive fiscal regulations and incentives.</p> <p><b>S14:</b> Licensing acceleration policy.</p>	<p>initiatives through standardization.</p> <p><b>O9:</b> Kebijakan pemerintah yang mendukung riset dan pengembangan.</p>
<b>Unfavorable factors</b>	<p><b>Weaknesses (W)</b></p> <p><b>W1:</b> The quality of human resources is still low for precast technology.</p> <p><b>W2:</b> High module logistics and transportation costs.</p> <p><b>W3:</b> Strategic land limitations.</p> <p><b>W4:</b> Negative public perception of the quality and aesthetics of precast houses.</p> <p><b>W5:</b> Limited public purchasing power (MBR).</p> <p><b>W6:</b> The demand for customization is high.</p> <p><b>W7:</b> Dependence on the import of certain materials.</p> <p><b>W8:</b> The logistics and transportation industry of modules is still limited.</p> <p><b>W9:</b> Precast component providers outside Java are still few.</p> <p><b>W10:</b> An organizational culture that is resistant to innovation.</p> <p><b>W11:</b> Competition with the dominant conventional developer.</p> <p><b>W12:</b> Limited capital and access to credit.</p> <p><b>W13:</b> There is no national standardization for precast components yet.</p>	<p><b>Threats (T)</b></p> <p><b>T1:</b> High logistics costs can erode cost advantage.</p> <p><b>T2:</b> Inadequate infrastructure hinders distribution and implementation.</p> <p><b>T3:</b> Economic uncertainty and interest rate fluctuations affecting credit.</p> <p><b>T4:</b> Demand is still low due to a lack of trust.</p> <p><b>T5:</b> Dependence on material imports makes costs susceptible to fluctuations.</p> <p><b>T6:</b> Uneven logistics infrastructure, especially outside Java.</p> <p><b>T7:</b> Fierce competition with established conventional methods.</p> <p><b>T8:</b> Complicated and uneven bureaucracy in the regions.</p> <p><b>T9:</b> Uncertainty and overlap of regulations between the central and regional governments.</p> <p><b>T10:</b> There is no special policy to support the logistics cost of precast components.</p>

### **TOWS Correspondence and Matrix Analysis**

This correspondence analysis was applied to investigate the systematic correlation between the SWOT dimension and the formulation of the concept of Guobin Wu (2019). The goal is to transform the list of isolated factors into the basis for integrated and evidence-based strategy formulation, as reflected in the TOWS Matrix. There are four types of matching strategies using the TOWS matrix, namely SO, WO, ST, and WT. Internal factors (S and W) related to the aspect of the competitive advantage of the same nation are then formed into a group of factors, such as (S1 to S6) or (W1 to W6). Internal factors are actively correlated

with external factors (O and T), so they show many highly correlated factors. Forming a group of factors can help reduce complexity in correspondence analysis and facilitate the formulation of further integrated strategies. By using the TOWS matrix as shown in Table 4, finally, the 38 results are correlated between SWOT factors and form the competitive advantages of the nation.

**Table 4. Correspondence analysis using the TOWS matrix**

SWOT		Strengths (S)														Weaknesses (W)															
		SW	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	
Opportunities (O)	OT	P	P	P	P	P	R	F	P	P	R	F	D	G	G	P	P	P	P	P	P	R	R	G	G	F	F	D	G		
	O1	▲	0	▲	▲	▲	▲	0	▲	0	▲	0	▲	0	0	0	▲	▲	▲	0	0	▲	▲	0	▲	0	0	0	▲		
	O2	0	0	▲	▲	0	0	▲	0	0	▲	0	▲	▲	0	0	0	0	0	▲	▲	▲	0	0	▲	0	0	▲	0		
	O3	▲	▲	0	▲	▲	0	▲	0	▲	0	▲	0	0	0	0	▲	0	0	0	0	▲	0	▲	0	0	0	0	▲	0	
	O4	▲	▲	0	▲	▲	0	▲	0	▲	0	▲	0	0	0	0	▲	▲	0	0	0	▲	0	▲	0	0	0	▲	▲	▲	
	O5	▲	0	0	0	▲	▲	0	0	0	▲	0	0	0	0	▲	0	0	0	▲	0	0	0	▲	0	▲	▲	0	0	0	
	O6	0	0	▲	0	0	▲	▲	0	0	▲	0	0	▲	▲	▲	▲	▲	0	0	0	0	0	0	0	▲	0	0	▲	0	
	O7	▲	▲	▲	0	▲	▲	▲	▲	0	▲	0	0	▲	▲	▲	0	▲	▲	▲	▲	0	▲	0	0	0	0	▲	0	▲	
	O8	▲	0	▲	0	▲	0	▲	0	▲	0	0	▲	0	0	▲	0	0	0	0	0	0	0	▲	▲	▲	0	0	▲	▲	▲
	O9	0	▲	0	0	▲	0	0	▲	0	0	▲	0	0	0	0	0	0	▲	0	0	0	0	▲	0	0	▲	0	▲	0	0
Threats (T)	T1	▲	0	▲	0	0	▲	▲	0	0	0	▲	0	▲	0	0	0	▲	0	0	0	0	▲	0	0	0	0	▲	▲	▲	
	T2	0	▲	0	▲	0	0	▲	0	▲	0	▲	0	▲	0	0	▲	▲	0	0	▲	0	▲	▲	0	0	0	▲	0	0	
	T3	▲	0	0	▲	▲	0	▲	0	▲	0	0	▲	▲	0	0	0	0	0	▲	▲	▲	0	0	0	▲	▲	▲	0	▲	
	T4	0	0	0	▲	0	0	▲	0	▲	0	0	0	0	0	0	▲	0	▲	0	▲	0	▲	0	▲	0	0	0	▲	0	
	T5	0	▲	▲	0	0	▲	0	0	▲	0	0	▲	0	0	0	0	0	0	0	▲	0	0	0	0	0	0	0	0	▲	▲
	T6	▲	▲	0	0	0	0	▲	0	0	▲	▲	0	▲	0	0	▲	0	▲	0	0	0	0	▲	0	0	0	▲	▲	0	0
	T7	▲	▲	0	▲	0	0	▲	▲	0	▲	▲	0	0	0	0	0	0	0	▲	0	0	▲	0	0	▲	▲	0	0	0	0
	T8	0	0	0	0	0	0	0	0	▲	0	▲	0	0	0	0	▲	0	▲	0	▲	0	▲	0	0	▲	▲	0	0	0	0
	T9	0	0	0	0	0	0	▲	▲	0	▲	0	0	▲	0	0	▲	▲	0	0	0	0	▲	▲	0	0	▲	▲	0	0	0
	T10	▲	0	▲	0	▲	0	0	0	0	▲	0	0	▲	0	0	0	▲	0	0	▲	▲	▲	0	▲	0	▲	0	0	0	0

Note:  
1. P= Production factor, R= Related and supporting industries, F= Firm strategy, structure and rivalry, D= Demand factor, G= Government  
2. '▲' denotes high correlation and '0' denotes no/low correlation

**Table 5. Correlation between SWOT factors and the formation of competitive advantages of a nation**

	Strengths (S)	Weaknesses (W)
<b>Opportunities (O)</b>	<b>SO1:</b> (S1, S3, S4, S5, S7, S10, S12, O1) <b>Demand Conditions</b> <b>SO2:</b> (S3, S4, S5, S11, S12, S13, O2) <b>Government</b> <b>SO3:</b> (S1, S2, S4, S5, S7, S11, S13, O3) <b>Firm Strategy, Structure, and Rivalry</b> <b>SO4:</b> (S1, S2, S4, S5, S7, S8, S10, S13, O4) <b>Productive Factors</b> <b>SO5:</b> (S5, S6, S10, S11, O5) <b>Related &amp; Supporting Industries</b> <b>SO6:</b> (S3, S6, S10, S12, S13, S14, O6) <b>Government</b> <b>SO7:</b> (S1, S2, S3, S5, S6, S7, S8, S10, S13, S14, O7) <b>Productive Factors</b> <b>SO8:</b> (S1, S3, S5, S7, S9, S11, S13, S14, O8) <b>Firm Strategy, Structure, and Rivalry</b> <b>SO9:</b> (S2, S5, S8, S12, S13, O9) <b>Demand</b>	<b>WO1:</b> (W1, W3, W6, O1) <b>Productive Factors</b> <b>WO2:</b> (W4, W5, W6, O2) <b>Related &amp; Supporting Industries</b> <b>WO3:</b> (W1, W5, O3) <b>Productive Factors</b> <b>WO4:</b> (W1, W2, W6, O4) <b>Productive Factors</b> <b>WO5:</b> (W4, O5) <b>Related &amp; Supporting Industries</b> <b>WO6:</b> (W3, W6, O6) <b>Productive Factors</b> <b>WO7:</b> (W1, W2, W3, W4, W5, W7, W8, O7) <b>Productive Factors</b> <b>WO8:</b> (W9, W10, O8) <b>Government</b> <b>WO9:</b> (W2, W5, W10, W12, O9) <b>Firm Strategy, Structure, and Rivalry</b>

	<b>Conditions</b>	
<b>Threats (T)</b>	<b>ST1:</b> (S1, S3, S4, S6, S7, S10, S13, T1) Demand Conditions	<b>WT1:</b> (W1, W4, T1) Productive Factors
	<b>ST2:</b> (S2, S4, S5, S6, S7, S13, S14, T2) Government	<b>WT2:</b> (W1, W2, T2) Productive Factors
	<b>ST3:</b> (S1, S4, S5, S7, S9, S13, S14, T3) <b>Firm Strategy, Structure, and Rivalry</b>	<b>WT3:</b> (W4, W5, W6, T3) Related & Supporting Industries
	<b>ST4:</b> (S4, S6, S7, S9, S11, S13, T4) Related & Supporting Industries	<b>WT4:</b> (W2, W4, W5, T4) Productive Factors
	<b>ST5:</b> (S2, S3, S5, S6, S9, S14, T5) <b>Firm Strategy, Structure, and Rivalry</b>	<b>WT5:</b> (W5, W6, W10, T5) <b>Firm Strategy, Structure, and Rivalry</b>
	<b>ST6:</b> (S1, S6, S7, S10, S11, T6) Related & Supporting Industries	<b>WT6:</b> (W1, W3, W6, T6) Productive Factors
	<b>ST7:</b> (S1, S2, S4, S7, S8, S10, S11, T7) Productive Factors	<b>WT7:</b> (W4, W7, W8, T7) Related & Supporting Industries
	<b>ST8:</b> (S6, S9, S11, S14, T8) <b>Firm Strategy, Structure, and Rivalry</b>	<b>WT8:</b> (W2, W4, W9, W10, T8) Government
	<b>ST9:</b> (S6, S7, S8, S10, S12, S14, T9) Government	<b>WT9:</b> (W1, W9, W10, W12, T9) Government
	<b>ST10:</b> (S1, S3, S5, S10, S13, T10) Demand Conditions	<b>WT10:</b> (W4, W6, W10, W11, T10) <b>Firm Strategy, Structure, and Rivalry</b>

### **Strategic Planning of the Prefabricated House Construction Industry in Indonesia**

Comprehensive strategic planning designed to accelerate the development of the prefabricated house construction industry in Indonesia. This framework was constructed by adopting and modifying the analysis lens of Porter's Diamond Model, which is traditionally used to analyze a nation's competitive advantage [10]. Through this approach, key strategies are grouped into four main determinants that interact with each other: (1) Firm Strategy, Structure, and Rivalry, which focuses on the internal dynamics of the company and market competition; (2) Factor Conditions, which discuss essential inputs such as technology, human resources, and demand; (3) Related and Supporting Industries, which highlight the importance of the supporting industry ecosystem; and (4) the central role of the Government as a catalyst and facilitator. The synergy of these four pillars is expected to create a robust, innovative, and sustainable industrial ecosystem, to be able to overcome the structural challenges that have been hindering the mass adoption of prefabricated construction in Indonesia.



**Figure 2.** Strategic planning to develop the prefabricated house construction industry in Indonesia

**A. Related and Supporting Industries**

*(Driven by SO5; related to ST4, ST6)*

*(Driven by WO2, WO5; related to WT3, WT7, WT10)*

**1. Development of Strategic Industrial Clusters**

Based on Porter's (1998) industrial cluster theory, the development of integrated industrial estates in strategic locations near raw material sources and distribution centers creates agglomerations that facilitate collective efficiency and innovation through spillover knowledge. Its implementation requires multi-stakeholder coordination to provide integrated supporting infrastructure and fiscal incentives.

**2. Local Supplier Database Mapping**

The development of an integrated database system is an implementation of a resource-based view in building domestic supply chain resilience. Digital platforms connected to the national construction information system facilitate an efficient sourcing process while ensuring the quality of local materials through standardized verification and certification mechanisms.

**3. Long-Term Manufacturer-Supplier Partnership**

Long-term partnership strategies are based on a relational view that emphasizes the creation of shared value through collaborative relationships. Futures contracts with a transparent price adjustment mechanism are able to mitigate the risk of price volatility while facilitating knowledge transfer and innovation between supply chain players.

4. Integrated Supply Chain Digital Platform

The implementation of digital platforms represents the application of the Supply Chain 4.0 concept, which increases transparency, efficiency, and responsiveness through information system integration. Real-time tracking and predictive analytics features optimize material flow while reducing the bullwhip effect in the construction supply chain.

5. Building Information Modeling Adoption (BIM)

Using BIM in the prefabricated construction industry creates a digital twin that serves as a reliable source of information, helping to enhance accuracy and teamwork among different fields. Combining BIM with computer-aided manufacturing systems makes the module fabrication process more efficient and reduces material waste.

6. Triple Helix Research Consortium

The formation of a research consortium applies the triple helix model of Etzkowitz and Leydesdorff (1995) in the innovation ecosystem of the construction industry. Industry-university-government collaboration accelerates applied research and commercialization of technology through co-funding and resource-sharing schemes.

7. Standardization of Labor Competency

The development of competency standards based on Indonesia's national qualification framework is an investment in human capital that increases productivity and the quality of industrial output. The implementation necessitates the creation of a training curriculum and certification system that seamlessly integrates with the job market.

8. Compatible Complementary Components Industry

The development of the supporting component industry creates a complete industrial ecosystem through harmonious interface standardization and technical specifications. Support for MSME capacity development as component suppliers ensures product quality and compatibility.

9. International Technology Transfer

Systematic technology transfer programs accelerate the improvement of technological capabilities through explicit and tacit knowledge transfer. The joint venture and licensing agreement mechanism is designed to ensure the learning process and technology adaptation according to the local context.

10. Large Module Logistics Regulation

The formulation of special regulations based on institutional economics overcomes infrastructure constraints through adjustments to dimensions, maximum weights, and distribution routes. Coordination between ministries creates regulatory coherence that supports efficient distribution.

11. Development of Optimal Logistics Routes

Identify the optimal route by applying network optimization theory and considering infrastructure capacity and regional demand patterns. The use of multimodal transport optimizes the cost efficiency and distribution time of prefabricated modules.

**B. Firm Strategy, Structure, and Rivalry**

*(Driven by SO3, SO8; related to ST3, ST5, ST8)*

*(Driven by WO9; related to WT5, WT10)*

1. **Small-Medium Developer Consolidation**  
Consolidation through mergers and acquisitions represents a resource-based growth strategy to achieve economies of scale and increase the competitiveness of business entities in the prefabricated construction industry.
2. **Market Segment Specialization**  
Market segment specialization uses Porter's positioning theory and product differentiation to avoid direct price competition and build a long-term competitive edge by developing niche markets.
3. **Adoption of end-to-end business models.**  
The implementation of the end-to-end business model adopts value chain integration to increase the added value of the company through integrated control from upstream to downstream of the construction process.
4. **Utilization of E-Catalog and Digital Platform**  
The utilization of government e-catalogs and digital platforms represents a digital transformation in a marketing strategy that expands market reach through integrated digital distribution channels.
5. **Integrated Branding**  
The development of integrated branding based on Aaker's brand equity theory emphasizes product differentiation through the consistent communication of value propositions regarding the competitive advantage of prefabricated houses.
6. **Joint Venture and Technology Transfer**  
The joint venture partnership implements strategic alliance theory to accelerate technology transfer and enhance technical capabilities through collaboration with international players.
7. **Partnerships with Traditional Developers**  
Partnership strategies with traditional developers exemplify a co-opetition model that expedites technology adoption by leveraging both technical proficiency and supplementary market experience.
8. **IoT and AI-Based SCM Deployment**  
The implementation of supply chain management based on IoT and AI adopts Industry 4.0 concepts to optimize logistics efficiency through real-time monitoring and predictive analytics.
9. **Modular Project Management Software Investment**  
The investment in custom software represents technology adoption for the optimization of modular construction processes through workflow digitization and improved team collaboration.
10. **Formation of a Dedicated R&D Team**  
The formation of a dedicated R&D team applies innovation management theory to the development of continuous improvements in construction designs and methods through structured research.
11. **Preparation of a Business Code of Ethics**  
The preparation of a business code of ethics implements a self-regulation mechanism to maintain industrial sustainability through the prevention of unfair competition practices and price dumping.
12. **Focus on Quality and After-Sales Service**

The quality-based differentiation strategy and after-sales service represent a service excellence approach in building a sustainable competitive advantage compared to conventional methods.

C. Productive and Demand Factors

*(Driven by SO4, SO7, SO9; related to ST1, ST7, ST10)*

*(Driven by WO1, WO3, WO4, WO6, WO7; related to WT1, WT2, WT4, WT6)*

1. Investment in State-of-the-Art Production Technology

Investments in cutting-edge production technologies and the implementation of lean manufacturing represent strategic alignment with operating theory to achieve cost optimization through waste elimination and increased productivity.

2. Adoption of green materials and renewable energy.

Research and adoption of green materials implement the principles of green manufacturing and circular economy to create sustainable construction practices that are in line with environmental regulations.

3. Vocational Curriculum Development and Certification

The preparation of the vocational training curriculum applies human capital development theory through the standardization of the competencies of skilled workers to ensure the quality and productivity of industrial human resources.

4. Public Education and Perception Change

Massive public socialization and education adopt the theory of planned behavior to change negative perceptions through the formation of positive attitudes, subjective norms, and perceived behavioral control.

5. Integration with Government Programs

Integration with government programs through special quotas represents a public-private partnership model that creates sustainable demand through structured financing schemes.

6. Adaptive Modular Design Development

The development of customizable modular designs applies the principle of mass customization to achieve design flexibility to suit local needs and tropical climatic conditions.

7. Expansion of New Market Segments

Expansion into new market segments implements a resource-based diversification strategy to create sustainable growth through the utilization of core capabilities.

8. Research on Disaster-Resistant and Energy-Efficient Modules

The research and development of earthquake- and flood-resistant modules represents technological innovation in responding to Indonesia's geographical conditions while meeting building sustainability standards.

9. Long-Term Value-Based Pricing

Competitive pricing by highlighting the long-term advantages of implementing a value-based pricing strategy through communication of life cycle costs that are superior to conventional methods.

10. Partnerships with Banks for Special Loans

Cooperation with banks for mortgage products specifically implements a financial inclusion strategy through the provision of accessible financing schemes to expand the consumer base.

#### D. Government

*(Didorong oleh SO2, SO6; terkait dengan ST2, ST9)*

*(Didorong oleh WO8; terkait dengan WT8, WT9)*

##### 1 Harmonization of Building Regulations

Harmonization of building regulations and permits implements regulatory reform theory to accommodate the characteristics of prefabricated systems through adjustments to national standards and licensing procedures.

##### 2 Implementation Regulation Sandbox

The implementation of the regulatory sandbox represents an adaptive governance approach that facilitates the testing of innovations in a controlled environment prior to full-scale implementation.

##### 3 Provision of Fiscal and Non-Fiscal Incentives

Fiscal and non-fiscal incentive policies adopt industrial policy theory to stimulate investment through reducing tax burdens and accelerating the licensing process.

##### 4 Green Material Subsidy and SNI Acceleration

The implementation of green industrial policies, through the provision of green material subsidies and the acceleration of SNI, supports sustainable production by providing positive incentives and ensuring timely standardization.

##### 5 Independent Inspection and Certification Authority

The establishment of an independent inspection body represents a quality assurance mechanism that ensures compliance with standards through third-party verification and certification.

##### 6 Cooperation between Banking and Guarantee Institutions

Partnerships with banks implement a financial facilitation model through special credit schemes and guarantee schemes to improve access to financing.

##### 7 Prefabricated Requirements in Government Procurement

With the integration of prefabricated requirements in procurement, the Government implements a public procurement innovation strategy to create definite demand through a domestic product preference scheme.

##### 8 Large-Scale Pilot Projects

The implementation of large-scale pilot projects represents a demonstration effect theory to accelerate the adoption of technology through measurable and visible proof of concept.

##### 9 Inter-Agency Coordination Task Force

The establishment of a special task force implements a whole-of-government approach to ensure policy coherence through structured cross-ministerial coordination.

#### 4. Conclusion

The development of the prefabricated house construction industry in Indonesia is a strategic solution to overcome the massive housing backlog while transforming the national construction sector towards efficiency, productivity, and sustainability. The large market potential, supported by government policies and the availability of local raw materials, is the foundation of the industry's strength. However, significant challenges still hinder it, such as limited skilled human resources, high logistics costs, inadequate supporting infrastructure, and entrenched negative perceptions of the community. Therefore, the development of this industry requires a holistic approach that focuses not only on the technological aspect but also

on strengthening the entire ecosystem, including regulation, supply chain, human resources, and market acceptance.

Accelerating industrial development, strategic synergy from all stakeholders is needed. The Government needs to prioritize national regulatory harmonization and standardization, provide targeted fiscal incentives, and act as a demand leader through the procurement of large-scale prefabricated housing projects. On the other hand, industry players must actively consolidate and collaborate to achieve economies of scale, invest in technology and human resource development, and intensively conduct education and branding to change market perception. Meanwhile, educational and research institutions are required to contribute through applied research and the preparation of vocational curricula that are in line with industry needs. This quadruple helix collaboration between the Government, industry, academia, and the community is key to building a mature, competitive, and sustainable prefabricated house industry ecosystem in Indonesia.

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