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Green dynamic capability for enhancing green innovations performance in a manufacturing company: a conceptual framework

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Abstract. Green innovation has become a necessity for companies in line with the demands of environmental requirements. Green innovation is the activity of developing a product or process that is carried out by considering environmental aspects (such as energy savings, pollution prevention, waste recycling, reduction of resource consumption) to reduce the impact of industrial activities on the environment. One of the factors associated with green innovation performance is the company's dynamic capabilities. This paper proposes a conceptual framework that illustrates the role of companies' dynamic green capabilities on the performance of green innovation in manufacturing companies in Indonesia.

1. Introduction

The industrialization has become a major driver of economic growth and increased the welfare of countries in the world. On the other hand, industrial activities also contribute to the reduction of natural resources, destruction of ecosystems, and the threat of climate change. Limited natural resources, global warming, waste management, and other environmental issues are challenges for industrial growth. In addition, international environmental regulations, various environmental protection conventions, and increasing environmental awareness of consumers have an impact on the pattern of business competition and how industrial companies conduct their business [1, 2]. This encourages industries throughout the world to increase attention and awareness of environmental issues. Therefore, the company's environmental management plays an important role in business today.

Environmental management and green practices are related to firm innovativeness [3]. Therefore, green innovation is one way to achieve sustainable development in the manufacturing industry that is in line with increasing environmental awareness among consumers. Green innovation is innovation that is carried out related to environmental aspects (energy-saving, pollution prevention, waste

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recycling, reduction of resource consumption) to reduce the impact of industrial activities on the environment. Green innovation is a topic that has been widely studied by researchers in recent years. If examined from various literature on innovation, research on green innovation can be broadly grouped into several groups. The first group is the literature that discusses green design, such as the influence of environmental problems in the R&D process [4]; the influence of market performance on green innovation and the development of new products [5]; influences from consumers and environmental regulations on green product innovation. This group includes those who discuss internal and external barriers [7] and challenges for green innovation [8]. Third, is a literature group that discusses the impact of green innovation on performance. Included in this group is the literature on how green innovation impacts the company's competitive advantage [1] and the influence of green innovation on company performance [9, 10, 11, 12]. The last group is the literature that discusses the performance of green innovation, which is related to dynamic capabilities [13]; absorptive capacity [14]; regulatory and customer pressure [15]; and evaluation of green innovations [16, 17].

Green innovation performance depends not only on existing capabilities but also on how to change these capabilities to build new capabilities. The dynamic capability perspective is one concept that provides a theoretical view to examine the practices of innovation management at the organizational level. Dynamic capabilities allow companies to combine and rearrange resources to respond to environmental challenges. The dynamic capability perspective also explains that dynamic capabilities help companies to sense and capture opportunities and to reconfigure important knowledge at various levels of the organization [18, 19]. In addition, a key factor for achieving sustainable innovation is knowledge [20]. Innovation is associated with high-level variation and exploration. This requires new knowledge that is different from existing knowledge and specific combinations of new knowledge [21]. When companies innovate, they not only process existing information but also create new information and knowledge to re-create a new corporate environment. The creation of company knowledge becomes important when companies are going to innovate [22]. Therefore, knowledge management becomes an important activity for companies especially to be able to innovate and adapt to environments changes. According to [23], knowledge management also has relevance to dynamic capabilities. This is supported by [24] and [25] which shows that the achievement of dynamic capabilities is influenced by knowledge-based resources. The availability of company knowledge is a prerequisite for the flow of new knowledge in the learning process to create dynamic capabilities [26].

Based on the literature, it can be seen that the dynamic capability and ability of the company to absorb knowledge are related to green innovation performance. However, none of the literature has comprehensively discussed how dynamic capabilities and knowledge play a role in green innovation performance. Therefore, this paper will explain a conceptual framework that illustrates how the relationship between a company's ability to acquire and create knowledge, green dynamic capabilities, and green innovation performance.

2. Literature review

2.1. Green Innovation

Green innovation is also known as eco-innovation or environmental innovation. Eco-innovation, in general, can be defined as innovation for reducing negative impacts on the environment. According to [27], eco-innovation activities can be analyzed based on three dimensions, namely 1) targets, are areas of focus on eco-innovation: products, processes, marketing methods, organizations, and institutions; 2) mechanism, is the way in which changes are made in the target: modification, redesign, alternatives, and creations); and 3) impacts (the impact of eco-innovation on the environment). Green innovation is generally defined as activities related to the development of new products and processes that can

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reduce negative impacts on the environment [1]. Green innovation is categorized into technology, management functions, product design, and production processes. Green innovations carried out during product life cycle assessments include the process of modifying existing product designs to produce environmentally friendly products. Whereas green innovation in the process is done by modifying production methods so as to reduce consumption of natural resources, water, and energy, and reduce waste and pollution.

2.2. Green dynamic capability

Dynamic capabilities are needed by companies to adapt to changes in the environment. Dynamic capability is different from organizational capabilities. Dynamic capabilities allow companies to innovate beyond their current routines, while organizational capabilities provide the means to configure organizational resources for company routines [18]. This capability consists of high-level organizational practices that transform organizational and member expertise into products and services. Dynamic capability is the ability of companies to reconfigure their competencies both internal and external competencies to deal with environmental changes [19]. In this definition, organizational competence shows managerial and organizational processes or "current patterns of practice and learning". In line with [18], [21] then redefining dynamic capabilities as a corporate process that uses resources to match and even make market changes. This definition describes dynamic capabilities are widely regarded as combining processes that enable organizations to maintain superior performance over time [28].

The term green dynamic capability used in this study is adapted from [29]. In this case, green dynamic capabilities are defined as the ability of companies to use existing resources and knowledge to renew and create green organizational capabilities. With this capability, the company can change its products and processes to meet the requirements of environmental conditions and adapt to dynamic environmental changes. Dynamic capability consists of sensing capability, seizing capability, and reconfiguring capability.

- Sensing capability is the company's ability to see, interpret, and pursue opportunities related to "green" aspects [13, 19, 28, 30, 31]. Sensing capability describes the intensity of company activities for scanning, search, exploration, and observing green best practices in the same industry.
- Seizing capability is the company's ability to respond to "green" opportunities through new products, processes, or services [19, 28].
- Reconfiguring capability is the ability of companies to carry out sustainable alignment, reorganize, and protect assets (tangible and intangible) to adapt to environmental changes [19, 28].

2.3. Absorptive Capacity

Based on [32], absorptive capacity is defined as the ability of a company that is indicated by a series of routines and processes in the company to acquire, assimilate, transform, and exploit knowledge. Absorptive capacity consists of potential absorptive capacity and realized absorptive capacity [32, 33].

- Potential absorptive capacity is the company's ability to acquire and assimilate knowledge from the external environment. Knowledge acquisition describes the company's ability to carry out activities to identify and obtain external knowledge that is considered important for the company. Assimilation is the company's ability to analyze, process, interpret, and understand the knowledge that has been acquired.
- Realized absorptive capacity describes the ability of companies to utilize external knowledge that has been absorbed. This capability illustrates how companies combine existing knowledge with

newly acquired and assimilated knowledge, and how companies develop and improve their competencies by incorporating modified knowledge.

3. Conceptual framework

The conceptual framework that will be discussed in this paper refers to [13], [14], [34], and [35]. Green innovation is used to improve environmental management performance in terms of meeting environmental protection requirements [1]. Green innovation performance is a company's performance derived from innovation in processes and products that pay attention to environmental aspects (energy savings, pollution prevention, waste recycling, green product design, or environmental management) so as to reduce negative impacts on the environment [1,13,14,35]. Green innovation performance consists of green product innovation performance and green process innovation performance [1, 13, 17,35].

Based on the perspective of dynamic capabilities, companies need dynamic capabilities to adapt to change. The company's dynamic capability is something that can transform resources into performance [24, 36]. Green innovation performance does not only depend on existing capabilities but also the ability to change these capabilities so that the company can build new capabilities. Dynamic capability helps companies to perceive and capture opportunities and to reconfigure important knowledge at various levels of the organization [18, 19]. Dynamic capability is an important mechanism for changing the ability to manage knowledge into performance at the company level. Dynamic capability is the company's ability to create and utilize resources in the company to achieve sustainable competitive advantage [31]. In this case, the company combines individual skills and knowledge, physical and technical resources, structure and culture to stimulate the dynamism of knowledge within the company.

Knowledge is a source of dynamic capability through various activities in the company such as technical training provided to partners, informal information exchange, identification of market information through direct communication between individuals, and systematic collection of information from central companies. The ability to recognize opportunities depends on individual abilities and existing knowledge. Various forms of knowledge, especially when transmitted through social interaction, can act as a source of dynamic capabilities. However, the relationship between organizational knowledge and dynamic capabilities is not always positive and is very dependent on the broader organizational context [23]. The ability to absorb knowledge is also needed for knowledge creation in companies which also influences the company's dynamic capabilities [34]. Referring to [32], absorptive capacity is divided into two namely potential absorptive capacity and realized absorptive capacity. Potential absorptive capacity is the ability of companies to assess and obtain knowledge originating from outside the company (acquisition and assimilation of knowledge), while the realized absorptive capacity is the ability of companies to utilize the knowledge that has been absorbed (transformation and exploitation of knowledge). Potential absorptive capacity and realized absorptive capacity both affect the company's dynamic capabilities. According to [14], the ability to absorb knowledge has a positive effect on the performance of innovation performance both green product innovation and green process innovation.

Based on the literature review described in the previous section, a conceptual framework is developed that illustrates how manufacturing companies can improve their green innovation performance through the company's green dynamic capability. The conceptual framework is illustrated in Figure 1.

4. Methodology

The conceptual framework described in this paper is part of the ongoing research on green innovation performance. The conceptual framework was built based on the literature review and preliminary observations in several manufacturing companies. The next step is to develop the conceptual framework into a conceptual model by identifying research variables and relationships between research variables. Furthermore, the conceptual model will be empirically tested. Data collection will be carried out by distributing questionnaires to manufacturing companies in Indonesia that have implemented environmental management (such as companies that have obtained ISO 14000 certificates, have followed the PROPER standard assessment). Empirical data testing will be carried out with multi-case studies to obtain a complete and in-depth analysis of how green innovation can be achieved through a green dynamic capability.



Figure 1. Conceptual framework

5. Conclusion and further study

Based on the conceptual framework, there are three important aspects that are considered related to achieving green innovation performance, namely the ability to absorb knowledge, the company's dynamic capabilities, and green innovation. This conceptual framework will be developed into a conceptual model by determining research variables and relationships between variables. Data collection with surveys will be conducted to test the model empirically. For this purpose, the development of measurement instruments, data collection and analysis will be carried out. Measuring instruments will be designed by adopting and modifying measurement items from the relevant literature that already exists.

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