


Analysis of dynamic capabilities and company performance antecedent variables in PT PLN (persero) power plant sub-holding

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Article Info	ABSTRACT
Keywords: Dynamic Capabilities, Power Generation, Company Performance, PT PLN (Persero)	This study investigates the variables of resources, knowledge management and learning, alliances, entrepreneurial orientation with dynamic capabilities and performance at the Generation Company PT PLN (Persero). Dynamic capabilities are also examined as mediation variables. The approach uses survey methods and hypotheses tested using PLS-SEM. The analysis results show that showing resources do not affect dynamic capabilities and dynamic capabilities cannot mediate the relationship to company performance. Other variable antecedents, namely knowledge and learning management, strategic alliances, entrepreneurial orientation, and environmental dynamism positively affect dynamic capabilities and dynamic capabilities can mediate relationships with company performance.
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INTRODUCTION

Energy in today's modern world is becoming a necessity for life. Almost every human activity depends on the energy used by power sources for technology around us, such as electrical energy for lighting, refined petroleum for transportation, and natural gas for cooking. Energy needs are also increasing with the increasing human population and technological development. However, the increase in energy use that can encourage the progress of human civilization also has a negative impact that must be a concern, namely climate change, and the world's concern is the increase in greenhouse gases (GHG) in the atmosphere. Based on the GHG Inventory in 2019, it was dominated by the forestry and *peat fire* sectors, followed by the energy, waste, agriculture, and IPPU sectors. However, looking at the emission trend every year, the energy sector tends to be stable and increases yearly, where power *generation*, fuel burning, and transportation. High dependence on fossil fuel energy (coal, petroleum, natural gas) is a problem in Indonesia and contributes significantly to the increase in GHG.

One of the *game changers* that became the beginning of changes *for net-zero emissions* was the ratification of the General Plan for Electricity Supply 2021-2030, which was ratified through the Decree of the Minister of Energy and Mineral Resource Number

188.K/HK.02/MEM. L/2021 on September 28, 2021. The regulation leads to restrictions on the construction of fossil plants and gives more portion to renewable energy plants. In Indonesia's implementation context, energy security and energy transition are led by PT PLN (Persero) for the electricity sector and PT Pertamina (Persero) for the development of supporting technology and fuel. RUPTL 2021-2030 as a *game changer* for the fundamentals of energy transition in Indonesia needs to be rechallenged so that it can find the right solution.

The demand for PT PLN (Persero) to transition energy from fossil-fueled energy to new renewable energy can be explained by *dynamic capabilities* to analyze the dynamics within PT PLN (Persero). *Dynamic Capabilities* are defined as a company's ability to integrate, build, and reconfigure internal and external competencies to cope with rapidly changing environments (Teece et al., 1997). The energy transition will fundamentally change the resources of PT PLN (Persero) to provide electricity for the community, which is currently the majority sourced from PLTU. Energy transition is also PLN's effort to continue to exist and maintain its competitive advantage as a leader in the electricity sector in terms of generation, transmission, distribution, sale of electrical energy and efforts to utilize other electricity assets. The encouragement of energy transition that challenges the utilization of PT PLN (Persero) resources has driving factors, for example: Bitencourt et al. (2020) Explain that there are variables outside of resources that make companies evaluate the use of resources such as *knowledge management and learning, alliances, entrepreneurial orientation, and environmental dynamism*. In the 2021-2030 RUPTL, plant development which generally focuses on the affordability and security of supply *pillars will add acceptability aspects* in plant construction considerations. The concept of developing electricity infrastructure in the energy transition is how to produce energy that meets the criteria of energy security, namely *availability, accessibility, affordability, and acceptability*.

PT PLN (Persero) officially disclosed the public disclosure regarding the *legal end state holding sub-holding* of PLN Group on January 1, 2023. In summary, there is a corporate transformation agenda to adjust corporate and business strategies so that the company continues to exist and be sustainable in the midst of rapidly changing environmental conditions. PT PLN (Persero) needs to *build dynamic capabilities*, namely the company's ability to integrate, build, and reconfigure internal and external competencies to cope with a rapidly changing environment (Teece et al., 1997). The capability of Generation Company PT PLN (Persero) to answer future demands and challenges in order to provide electricity that is always available, easy to access, affordable, and accepted by the community. With structural organizational changes and still within the body of PT PLN (Persero) that adapts to the rapidly changing environment. Therefore, efforts are needed to assess and evaluate the ability of PT PLN (Persero) Generation Company to integrate, build, and reorganize its internal and external competencies.

Dynamic capabilities are used to analyze changes in the body of PT PLN (Persero), especially the sub-holding Generation Company to readjust its company resources in accordance with the company's strategy. Other possible factors affect *dynamic capabilities*

as previous research conducted by Bitencourt et al. (2020) there are five variables that influence dynamic capabilities, namely resources, knowledge management and learning, alliances, entrepreneurial orientation, environmental dynamism, and dynamic capabilities.

Literature Review

Enterprise Resources

Resource variables or constructs are company-specific assets that are difficult if not impossible to replicate (Teece et al., 1997). Resource constructs include *tangible* and *intangible resources* a company uses to gain competitive advantage (Arend, 2014). Organizational resources can be classified into various basic types, namely human; finance; infrastructure and technology; information systems, knowledge and organization; and networks and relationships (Sunder M et al., 2019). Resource measurement is based on constructions that assess the abundance of a company's resources (Arend, 2014) it is capital, material inventory, business plan, protected technology or other core knowledge, legitimacy, adequate financing for medium-term plans, supply chain relationships, financial capital, and reputation.

Knowledge Management and Learning

The definition of knowledge management and learning in the context of *dynamic capabilities* is a strategy that focuses on learning, knowledge generation *and* its dissemination and how companies respond to market demand (Morgan et al., 2009). The definition has the context of *dynamic capabilities* from the point of view of the marketing process to achieve company performance. In research Takahashi et al., (2017) demonstrate that *dynamic capabilities* influence organizational performance only when mediated by marketing capabilities.

Basic research on the relationship between knowledge management and organizational learning and *dynamic capabilities* is explained by (Zollo & Winter, 2002). *Dynamic capabilities* are expressed as the result of organizational learning and establish ways of collective activity, in which an organization systematically generates and modifies its operating routines based on the shared evolution of *tacit knowledge accumulation, knowledge articulation, and knowledge codification*. Learning activities, which are the source for the dynamic capabilities development process, *provide a basis for selecting the optimal set of dynamic capabilities at a later stage*. Cyfert et al., (2021) describe the linkage of *dynamic capabilities with knowledge management and learning* including (a) knowledge acquisition, which is the basis for transformation activities in the field of dynamic capabilities; (b) knowledge transfer within the organization, ensuring the proper supply of information to the units participating in the organizational change process; (c) the allocation and storage of knowledge within an organization, enabling the proper inculcation of knowledge within organizational units and ensuring synergistic potential as a result of knowledge accumulation; (d) intellectual property management, ensuring an adequate level of protection for the property rights of the organization; (e) the encouragement of employees to experiment, which is the basis for the emergence of new breakthrough ideas.

Strategic Alliances

Alliances are defined as a company's ability to form strategic partnerships (Bitencourt et al., 2020; Kale & Singh, 2007). Furthermore, the company develops *alliance capability* by developing a continuous learning process. The alliance learning process involves articulating, codifying, sharing, and internalizing alliance management and is positively related to the overall success of the alliance. The alliance learning process is similar to the high-level dynamic capabilities relevant in the context of alliances (Kale & Singh, 2007; Mamédio et al., 2019). The Company forms strategic alliances with its entities or partners with the aim of operational efficiency, market improvement and the search for information regarding competencies or resources beyond its capabilities (Ferreira et al., 2020; Rice et al., 2012). The company can configure its alliance to increase access to external resources and gain new skills possessed by partners (Hoffmann, 2007). The separation between *alliance capability management* and *dynamic capabilities* can be done as Ferreira et al., (2020) revealing that alliance management is a critical strategic domain that allows an organization to transform its resource base. A strategic alliance is a kind of dynamic capability, which is defined as a company's superior ability to manage alliances. Empirically, *strategic alliances* have a positive influence on *exploration*, *exploitation*, innovation, and new product development (Ferreira et al., 2020).

The conceptual *alliance capability management* as a dimensional construction of *dynamic capabilities* has been defined into five divisions, namely *interorganizational coordination*, *alliance portfolio coordination*, *interorganizational learning*, *alliance proactiveness* and *alliance transformation*. (Ferreira et al., 2020; Mamédio et al., 2019; Schilke & Goerzen, 2010). The definition of *interorganizational coordination* is the level of routine for coordinating activities and resources with alliance partners. *Alliance portfolio coordination* relates to routines associated with the integration of all research and development alliances within a business unit. The third dimension, *interorganizational learning*, is defined as the level of routines designed to facilitate knowledge transfer from alliance partners. *Alliance proactiveness* as the fourth dimension of *alliance capability management* is defined as the extent to which routines identify potentially valuable partnership opportunities, and alliance transformation refers to the extent to which routines to modify alliances during the alliance process.

Green Entrepreneurship Orientation

Entrepreneurial orientation consists of implementing new products or strategies to reach new markets, where this construct tends to provide a positive relationship to *dynamic capabilities* because it promotes an understanding of market complexity and stimulates the process of developing new things. Research specialization on entrepreneurial orientation becomes more specific such as *green entrepreneurial orientation* which emphasizes orientation towards environmentally friendly development. *Green entrepreneurial orientation* is also like the concept of entrepreneurial orientation in general which gains a competitive advantage by using corporate data to create new knowledge and provide a basis for innovation (Jiang et al., 2018). Thus *green entrepreneurial orientation* can bring

environmental knowledge and inspiration to business and green knowledge gathered from markets and technologies through transformation and collaboration can inspire new ideas, concepts and solutions, enabling the production of green products and technologies (Shehzad et al., 2023).

Empirical research that measures and links *entrepreneurial orientation* has been conducted, for example, with a company's environmental and financial performance (Jiang et al., (2018) and *green innovation* (Shehzad et al., 2023). *Green entrepreneurial orientation* is operationalized with five indicators that generally measure how the company's attitude in facing business problems and its tendency to choose more environmentally friendly development. Measurement of *green entrepreneurial orientation* with five indicators as follows: (Jiang et al., 2018; Shehzad et al., 2023) as follows (a) In the face of uncertainty, we take an aggressive stance towards green projects; (b) We attach great importance to environmentally friendly research and development and eco-friendly technology innovation; (c) Our company has a tendency to be a market leader and always takes the lead in introducing environmentally friendly products, services or technologies; (d) We usually initiate eco-friendly initiatives before our competitors; (e) Our company has an attitude to "beat its competitors".

Environmental Dynamics

Environmental *dynamism* is a driving construct in *dynamic capabilities* which is often seen as a mediator. *Environmental dynamism* is defined as the unpredictable frequency of changes in the external environment (Yu et al., 2022). This variable explains how the company's attitude towards changes in its environment, for example, the company will compete with its competitors or how the company will respond to changing customer needs, as well as its development process in the industry. As the concept of original *dynamic capabilities* by Teece et al., (1997) To integrate, build, and reconfigure competencies to cope with rapidly changing environments, *environmental dynamism* is an inseparable variable from its core concept.

An increasingly dynamic environment with rapidly changing demands and frequent shifts in technology, *the competitive advantage* that companies currently have can be an obstacle, requiring strategic considerations, timely decision making, and dynamic implementation to reshape that advantage (Li & Liu, 2014). However, theoretically, *environmental dynamism*, with regard to *dynamic capabilities*, has inconsistent results because different effects are shown on high and low environmental dynamics (Endres, 2018). Empirical studies show *that environmental dynamism* is a driving factor for *dynamic capabilities* and has a significant positive effect on *competitive advantage* (Li & Liu, 2014), contrary to studies Yu et al., (2022) however, environmental dynamism shows insignificant results in mediating *dynamic capabilities* with innovation. Furthermore, looking at the object of study that is different from previous research, it can be assumed that the higher *the environmental dynamism*, the stronger the influence of dynamic capabilities. The operationalization of the concept of *environmental dynamism* becomes a measurable indicator based on Li & Liu (2014) and Yu et al. (2022) yaitu *the effects of industrial*

environment, competitive behaviors, technological progress, customer demands, dan government regulation.

Dynamic Capabilities

The introduction of the concept of *dynamic capabilities* was first put forward by Teece et al., (1997) the company can integrate, build, and reconfigure internal and external competencies to cope with a rapidly changing environment. Conceptual *dynamic capabilities* is a development of the *Resources Based View* (RBV) paradigm, where RBV discusses how a company's resources and capabilities are utilized to achieve its goals and maintain competitive advantage in a relatively slow-changing environment. But today it is not easy to analyze how companies in rapidly changing high-tech industries in competitive environments, such as the information and digital technology sectors, create new competitive advantages (Kodama, 2023). Furthermore, the application of RBV concepts in dynamic or rapidly changing environments is defined as *dynamic capabilities* (Madhani, 2009).

The discourse on *dynamic capabilities* to date shows diversity with their respective study focuses. *Dynamic capabilities* require that organizations establish processes that allow them to change routines, services, products, and even markets over time. The essence of the theoretical development of *dynamic capabilities* is how companies maintain their existence in phenomena that old companies are regularly replaced by new competitors who can offer lower prices, better quality, or desired substitutes for existing products (Teece, 2023). In this perspective, *dynamic capabilities* look to the future that the company today must decide what the company must do in the future, ensure access to the resources the company needs, and implement the most appropriate organizational design. Dynamic capabilities are constructed into three dimensions: *sensing, seizing, and transforming* (Teece, 2007). The indicators that measure each of these dimensions also vary in their research applications. Despite vastly different contexts, as well as different company sizes, industries, and cultural environments, there are many similarities among dynamic capabilities (Leemann & Kanbach, 2022).

Company Performance

Performance is defined as the achievement of *the company's tangible and intangible goals (measurable and unmeasurable)*. Economic logic underlies the most commonly used conceptual measures of firm performance: value creation, competitive advantage (relative value creation), and sustainable competitive advantage (Helfat, 2007). However, company performance is also often devoted to operational performance, financial performance, environmental performance, etc. The criteria for electricity infrastructure development in the energy transition are performance indicators in this study as in the energy *trilemma* (Gunningham, 2013) namely availability, accessibility, affordability, and acceptability.

Research Hypothesis

Based on the description above, the following research framework can be built:

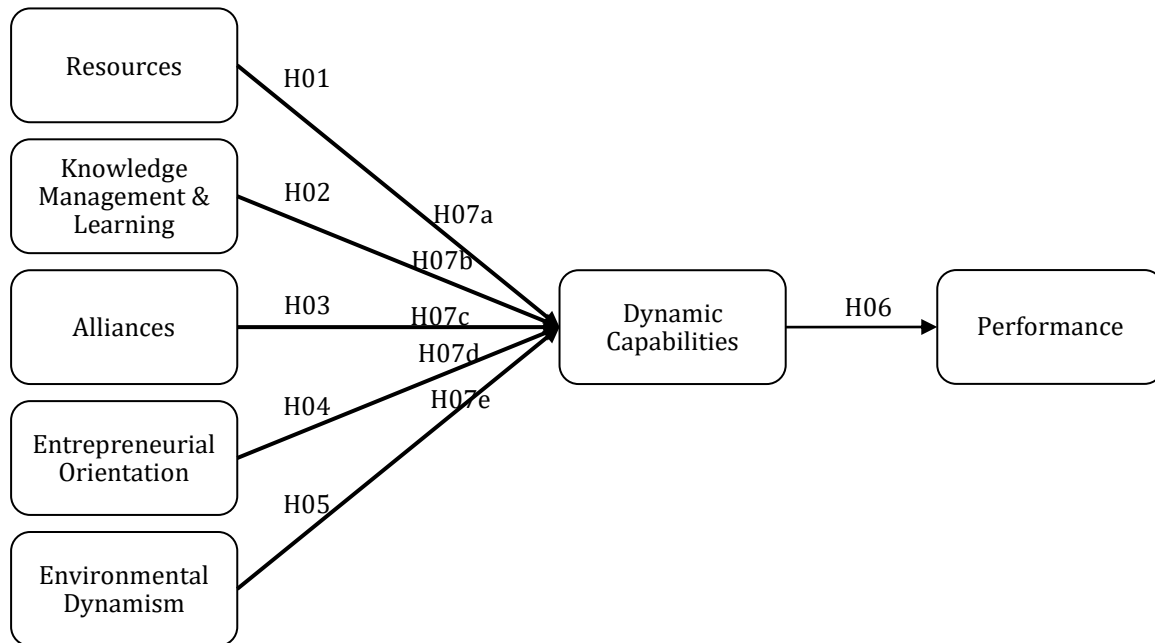


Figure 1. Research Model

Based on the formulation of the problem and conceptual framework above, the research hypothesis proposed by the researcher is as follows:

- H01 : *Resources* positively affect dynamic capabilities
- H02 : *Knowledge management & learning* berpengaruh positif terhadap *dynamic capabilities*.
- H03 : *Alliance* positively affects *dynamic capabilities*
- H04 : *Entrepreneurial orientation* has a positive effect on *dynamic capabilities*.
- H05 : *Environmental dynamism* berpengaruh positif terhadap *dynamic capabilities*.
- H06 : *Dynamic capabilities* positively affect the Company's performance
- H07A : *Dynamic capabilities* mediate the relationship between *resource variables* and company performance
- H07b : *Dynamic capabilities* mediate the relationship between *knowledge management & learning variables* and company performance
- H07c : *Dynamic capabilities* mediate the relationship between *alliance variables* and Enterprise performance
- H07d : *Dynamic capabilities* mediate the relationship between *entrepreneurial orientation variables* and company performance
- H07e : *Dynamic capabilities* mediate the relationship between *environmental dynamism variables* and company performance

METHOD

This study uses a quantitative or *positivist approach* to test objective theories by examining the relationship between variables (Creswell & David Creswell, 2018). This study will examine the relationship between *antecedent variables* (availability of resources, knowledge and learning management, *strategic alliance, entrepreneurial orientation, and environmental dynamism*) to dynamic capabilities and their relationship with company performance. Dynamic *capabilities variables* are also tested as mediating variables between *antecedent variables* and company performance. The population in this study is employees of *Generation Company PT PLN (Persero)*. Data collection is carried out by survey method using *closed ended questionnaire*. The sampling technique used is non-probabilita, *convenience sampling* with data collection using *mail and self-administered questionnaires*. The research sample was collected by 247 respondents.

The operational definition in this study translates the conceptual relationship of *dynamic capabilities* with their independent variables (*antecedent variables*) and sees them as mediating variables to performance. In this study, it can be categorized into independent variables, namely *resources, knowledge management and learning, alliances, entrepreneurial orientation, environmental dynamism, and dynamic capabilities*. The mediation variable is *dynamic capabilities*, and the dependent variable is company performance. The measurement scale uses Likert with a range of values between a minimum of 1 and a maximum of 7.

Table 1. Indicators Variable

Variable	Definisi	Number of Indicators	Reference
Resources	Resource constructs include tangible and intangible resources a company uses to gain competitive advantage	10	(Arend (2014)
Knowledge Management and Learning	Strategies that focus on learning, <i>knowledge generation and dissemination</i> and how companies respond to market demand	5	(Cyfert et al., 2021)
Alliance	The company's ability to form strategic partnerships	5	(Ferreira et al., 2020; Schilke & Goerzen, 2010)
Green Entrepreneurship Orientation	Environmental knowledge and inspiration to business and green knowledge gathered from markets and technologies through transformation and collaboration can inspire new ideas, concepts and	5	(Shehzad et al., 2023)

Variable	Definisi	Number of Indicators	Reference
Environmental Dynamics	solutions, enabling the production of green products and technologies Unpredictable frequency of changes in the external environment	5	(Yu et al., 2022)
Dynamic Capabilities	The company's ability to integrate, build, and reconfigure internal and external competencies to cope with rapidly changing environments.	19	(Leemann & Kanbach, 2022)
Company Performance	Economic logic underlies the most commonly used conceptual measures of firm performance: value creation, competitive advantage (relative value creation), and sustainable competitive advantage	5	(Gunningham, 2013)

Data analysis techniques used for quantitative data processing using univariate & multivariate analysis. Univariate analysis uses measures of concentration (mean, median, mode) and measures of spread (variety and standard deviation). Multivariate analysis using *Structural Equation Model-Partial Least Square (SEM-PLS)* using IBM SPSS and Smart PLS analysis tools. Hypothesis testing using a significant level of 0.05.

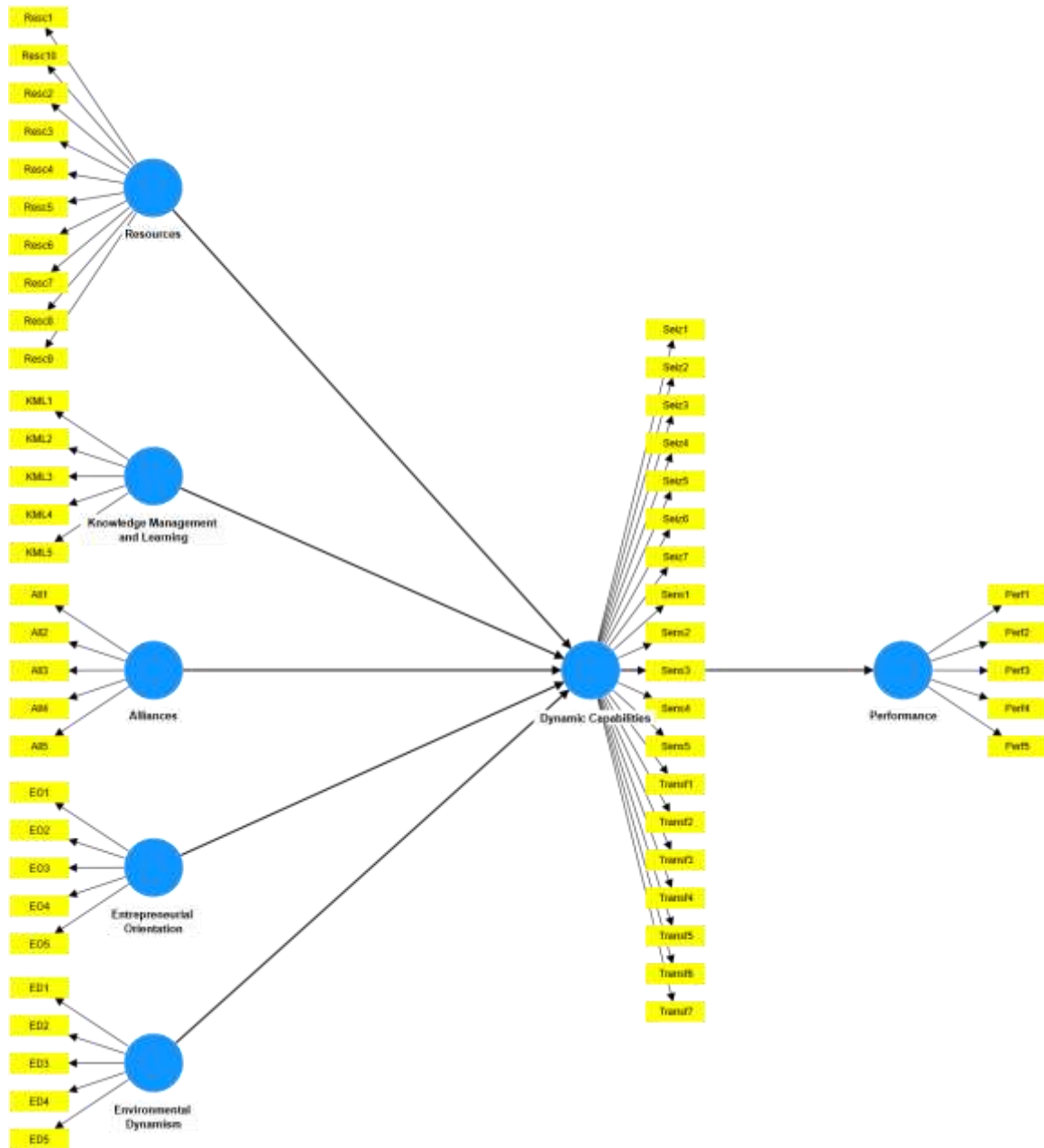


Figure 2. Research Model

RESULT AND DISCUSSION

Table 2 shows the characteristics/demographics of research respondents divided by gender category, age range, education level, rank group, and job category. Of the 247 respondents, the majority were male (83.4%). The majority of respondents were in the age category of 25-34 years (40.5%), with the majority having a bachelor's level education (53.4%). The rank group of respondents was dominated by Top Supervisors (25.1%), Basic Management

(22.7%) and Top Supervisors (21.1%). The majority of respondents' jobs included engineering (57.5%) and non-technical (42.5%) categories.

Table 2. Characteristics Responden

		Frequency	Percentage
Gender	Man	206	83,4
	Woman	41	16,6
Age Range	18 – 24 Years	6	2,4
	25 – 34 Years	100	40,5
	35 – 44 Years	66	26,7
	45 – 54 Years	65	26,3
	> 55 Years	10	4,0
Education Level	S3	2	0,8
	S2	26	10,5
	S1	132	53,4
	Diploma	39	15,8
	High School/Equivalent	48	19,4
Rank Group	Middle Management	8	3,2
	Basic Management	56	22,7
	Supervisor Minutes	62	25,1
	Supervisor/supervis or	52	21,1
	Executive Staff	18	7,3
		51	20,6
Job Category	Technical	142	57,5
	Non-Technical	105	42,5

The hypothesis test results were evaluated by comparing the values between the T-value > 1.96 and the P-value < 0.05. Table 4.2 shows that *resources* do not positively affect *dynamic capabilities* ($t=1,240$ $\beta=0.107$), while knowledge management and learning ($t=1,240$ $\beta=0.013$), strategic alliance ($t=3,993$ $\beta=0,000$), entrepreneurial orientation ($t=3,082$ $\beta=0.001$), and environmental dynamism ($t=3,937$ $\beta=0,000$) Effect on Dynamic Capabilities. The hypothesis test also shows that *dynamic capabilities* significantly affect company performance ($t = 23,301$ $\beta = 0,000$).

Dynamic capabilities as a mediating variable also showed consistent results with direct hypothesis tests, namely *dynamic capabilities* cannot mediate the relationship between *resources* and company performance ($t = 1.236$ $\beta = 0.108$). In other variables, *dynamic capabilities* can mediate the relationship between variable antecedents and

company performance with each result including *Knowledge management and learning* ($t = 2.221 \beta = 0.013$), *alliances* ($t = 3.960 \beta = 0.000$), *entrepreneurial orientation* ($t = 3.017 \beta = 0.001$), and *environmental dynamism* ($t = 3.829 \beta = 0.000$).

Table 3. Summary of Hypothesis Testing Results

No.	Hipotesis	Standard deviation (STDEV)	T statistics (O/STDEV)	P values	Information
H01	RESC -> DC	0,064	1,240	0,107	Rejected
H02	KML -> DC	0,062	2,237	0,013	Accepted
H03	ALL -> DC	0,077	3,993	0,000	Accepted
H04	EO -> DC	0,077	3,082	0,001	Accepted
H05	ED -> DC	0,060	3,937	0,000	Accepted
H06	DC -> PERF	0,033	23,301	0,000	Accepted
H07A	RESC -> DC -> PERF	0,050	1,236	0,108	Rejected
H07b	KML -> DC -> PERF	0,048	2,221	0,013	Accepted
H07c	ALL -> DC -> PERF	0,059	3,960	0,000	Accepted
H07d	EO -> DC -> PERF	0,060	3,017	0,001	Accepted
H07e	ED -> DC -> PERF	0,047	3,829	0,000	Accepted

CONCLUSION

This study aims to examine the relationship between variable antecedents and *dynamic capabilities*, following the study Bitencourt et al. (2020) and tested it on Genco PT PLN (Persero). Based on the results of analysis and hypothesis tests, this study provides empirical evidence investigating the effect of resource availability, knowledge and learning management, *strategic alliance*, *entrepreneurial orientation*, and *environmental dynamism* on company performance in the context of power generation in Indonesia. The analysis results show that *resources* do not affect dynamic capabilities and dynamic capabilities cannot mediate their relationship to company performance. Other variable antecedents, namely knowledge and learning management, *strategic alliances*, *entrepreneurial orientation*, and environmental dynamism *positively affect dynamic capabilities* and dynamic capabilities can mediate relationships with company performance. The results of the analysis also show that *dynamic capabilities* affect company performance.

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