

# An Integrated Strategic Policy-Based Approach to Circular Economy, Corporate Risk Management, and Innovation Capability for Enhancing Sustainable Firm Performance at PT PLN (Persero)

Willy Novananda Siregar<sup>1\*</sup>, Willy Arafah<sup>2</sup>

<sup>1,2</sup>Doctoral Program in Economics, Concentration in Strategic Management, Faculty of Economics and Business, Universitas Trisakti, Indonesia

Email: <sup>1)</sup> [willywiganti@gmail.com](mailto:willywiganti@gmail.com), <sup>2)</sup> [willy.arafah@trisakti.ac.id](mailto:willy.arafah@trisakti.ac.id)

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## Abstract

The development of electric vehicles (EV) in Indonesia presents economic opportunities as well as environmental challenges, particularly regarding the management of used electric vehicle battery waste. In this context, the implementation of circular economy becomes an important strategy for creating sustainable value through waste reduction, material recovery, and battery life cycle extension. However, the success of this approach is also influenced by the effectiveness of corporate risk management in anticipating regulatory, technological, and environmental risks arising from energy transformation. On the other hand, innovation capability is needed to drive efficiency and develop new business models capable of improving the competitiveness and profitability of companies. This study aims to integrate these three concepts with strategic policy as a mediating variable that ensures strategic alignment in achieving corporate performance objectives. The method used is an integrative literature review that examines literature from various disciplines to develop a conceptual model regarding the relationship between circular economy, corporate risk management, innovation capability, strategic policy, and sustainable firm performance. The results of the review indicate that circular economy, corporate risk management, and innovation capability have strong potential in driving improvements in firm performance, but their maximum contribution can only be realized through the support of adaptive and visionary strategic policies, particularly in large-scale organizations such as the state-owned enterprise PT PLN (Persero). Thus, this study provides a theoretical contribution in the development of a new conceptual framework as well as a strategic approach for strengthening the electric vehicle ecosystem and circular economy in Indonesia.

**Keywords:** Circular Economy, Corporate Risk Management, Firm Performance, Innovation Capability, Strategic Policy.

## 1. Introduction

The development of electric vehicles (EV) is currently one of the important steps in supporting the global energy transition and participating in efforts to reduce the impact of climate change. According to a report from the International Energy Agency (IEA, 2023), the number of electric vehicles worldwide is estimated to reach more than 230 million units by 2030. These figure indicates that electric vehicles are not only becoming a trend, but are also becoming an important part of the solution in creating a cleaner and healthier world. The sales trend of electric cars in the world over the last five years from 2020 to 2024 totaled 35,943 units.



Electric car sales in Indonesia have continued to increase, where in 2020 the number of electric car sales was 120 units. In 2021 it increased by 685 units or rose by 57%, in 2022 the sales figure increased again to 10,327 units or increased by 15%, and by 2023 electric car sales continued to increase to 17,062 units or increased by 16.5% (Kompas, 2025). This increase in sales shows that interest in electric cars among Indonesian consumers continues to grow. However, electric car sales in 2024 declined to 7,749, or decreased by 44% from 2023. Only when comparing the sales rate from the previous years, namely 2020 to 2023, the very significant growth has indeed become a trend that needs attention, as interest in electric cars will certainly continue to improve. The growth in electric car sales figures year after year serves as a good record for increasing interest in electric cars in the future.

This rapid growth is supported by the commitment of countries around the world to reduce carbon emissions and the increasing efficiency of lithium-ion battery technology used. Indonesia itself, with its large population and aspirations to realize a greener future, has also set targets and strategies to support the widespread use of electric vehicles. A key player in this national strategy is PT PLN (Persero), the state-owned electricity company, which bears the primary responsibility for developing the electric vehicle charging infrastructure and ensuring the availability of a reliable, low-carbon electricity supply to power the growing fleet of electric cars. PLN's role is critical in overcoming one of the main challenges to EV adoption: the availability and accessibility of charging stations. Indonesia is committed to participating in this major agenda for a cleaner and more sustainable future. The following is an overview of the development of electric car sales in Indonesia.

Electric Car Sales in Indonesia in 2025. However, behind this great potential, important challenges also arise that must be addressed together immediately. One of them is the management of used electric vehicle battery waste. When batteries are no longer capable of storing energy optimally, this waste can become a threat to the environment and public health if not managed properly. Therefore, proper, safe, and sustainable battery waste management is a necessity for all stakeholders, especially PT PLN (Persero), as a national energy company that has a major role in welcoming the future of Indonesia's energy.

As the national Electricity Infrastructure Provider, the state-owned energy company is tasked with ensuring a power system that is reliable, affordable, and sustainable. Its responsibilities encompass constructing renewable energy power plants, integrating them into the grid, and developing smart grid technology to facilitate greater clean energy usage. Furthermore, in advancing the Electric Vehicle Ecosystem, this enterprise plays a pivotal role by deploying essential charging infrastructure, including Public Electric Vehicle Charging Stations (SPKLU) and Battery Exchange Stations (SPBKL). This initiative is vital for encouraging EV adoption and simultaneously cultivates new markets aligned with the principles of a circular economy.

The phenomenon in this study shows part of a case study that reflects the interaction between corporate risk management strategies, the implementation of circular economy, and the support of national policies in supporting firm performance. The energy company is an important representation because it has a strategic mandate in supporting national energy transformation, pioneering the development of the electric vehicle ecosystem and battery waste management. The state-owned enterprise, in this case the national energy-focused Perusahaan Listrik Negara, has the potential to become a catalyst for implementing circular economy in the management of electric vehicle batteries. By cooperating with the recycling industry, electric vehicle manufacturers, and the private sector, it has a role in building a sustainable used battery supply chain, whether through reuse programs, repurposing (reuse

of batteries for stationary applications), or recycling (recovery of critical materials such as lithium, nickel, and cobalt).

The research gaps found include the fact that PT PLN (Persero) faces various corporate risk management challenges directly related to the successful implementation of circular economy based on strategic policy. The role of the energy company is not limited to the provision of electrical energy, but also as a strategic actor in accelerating the transition toward sustainable energy and in ensuring that the energy transformation process can provide balanced economic, social, and environmental benefits. Based on the research gap, there is a need for empirical evidence for regulators to formulate policies related to the management of used electric vehicle battery waste that are aligned with circular economy principles.

The novelty of this study is the analysis of circular economy and corporate risk management on the firm performance of PT PLN (Persero) mediated by strategic policy. The general objective of this study is to serve as a strategic guide that not only enriches knowledge, but also provides real benefits, especially in preserving the environment, improving energy sustainability, and supporting the realization of a circular economy in Indonesia. In practical terms, it aims to produce good circular economy and firm performance to support the success of State-Owned Enterprises and PT PLN (Persero) in particular.

The identification of research problems discussed in this study concerns how the role and contingency factors of circular economy, corporate risk management, innovation capability, and strategic policy can consolidate and formulate policies, and whether the interaction between contingency factors and critical factors will be able to improve firm performance. All these factors are relevant to the prior research presented in the research background section. Understanding the role of circular economy, corporate risk management, innovation capability, and strategic policy in the process of consolidating and improving the organization to enhance firm performance makes it impossible to understand the micro-mechanisms linking circular economy, corporate risk management, and innovation capability with the mediation of strategic policy. This understanding is what theory and practice in organizational theory seek in the effort to improve firm performance.

## 2. Literature Review

### 2.1. Circular Economy

The concept of the circular economy has gained significant attention as a sustainable alternative to the traditional linear economic model. According to Banihashemi et al. (2024), the circular economy is defined as a restorative economic system designed to transcend the traditional 'end-of-life' concept. It achieves this by systematically reducing, reusing, and recovering materials at every stage of the value chain, from production and distribution to final consumption. This definition states that the circular economy focuses on replacing the linear model that generates waste with a sustainable material cycle system, so as to minimize the occurrence of corporate risk in addressing sustainable strategic policy. In the context of the electric vehicle industry, circular economy principles are particularly relevant for managing battery waste and ensuring that the environmental benefits of electrification are not offset by new forms of pollution.

### 2.2. Corporate Risk Management

Corporate risk management provides the systematic framework necessary for organizations to navigate uncertainty and address potential threats. According to (Kalina et al., 2022), corporate risk management is defined as the set of processes and techniques

employed to identify, assess, monitor, and mitigate risks arising from an organization's operations. At a strategic level, this discipline embodies the prudential principle that many organizations follow. In essence, corporate risk management offers a systematic framework for addressing uncertainty and managing potential threats (Berzon et al., 2022).

### **2.2.1. Corporate Risk Management in Energy Transition**

The energy transition presents unique challenges for organizations operating in the power sector. The transformation toward cleaner energy sources brings uncertainty in terms of regulation, finance, and technology. Therefore, state-owned enterprises such as PT PLN (Persero) are required to implement Enterprise Risk Management (ERM) in order to anticipate emerging risks while capturing new business opportunities. Specific risks in this context include primary energy price fluctuations, stranded asset risks from fossil power plants, and environmental risks arising from electric vehicle battery waste (Lebedev et al., 2022). Effective monitoring of these risks provides opportunities for organizations to enhance their understanding of innovation capability, thereby generating benefits in managing electric vehicle battery waste.

### **2.3. Innovation Capability**

Innovation capability plays a crucial role in enabling organizations to address the challenges and opportunities presented by the energy transition. According to Malodia et al (2025), innovation capability encourages organizations to obtain economically valuable products or services. Gama and Magistrett (2025) argue that when innovation capability is embedded within an organization, the resulting products achieve higher selling value and stronger competitiveness. This advantage extends to the broader market, benefiting business actors in their competitive efforts. The researchers conceptualize innovation capability as the latent potential to execute practices guided by an innovation orientation. Furthermore, a firm performance-based lens positions organizational learning as an essential tool for gaining the specific knowledge required to attain competitive advantage and foster rule-based or policy-driven innovation.

### **2.4. Strategic Policy and Firm Performance**

Strategic policy serves as the bridge between organizational goals and actionable programs. Strategic policy is the deliberate translation of strategic goals into actionable programs aligned with work unit functions (Putera et al., 2022). Petersen (2023) applies this concept to PT PLN (Persero), defining it as the foundational concepts and principles guiding work, leadership, and organizational conduct. Regarding firm performance, Nguyen and Nguyen (2020) highlight the critical role of knowledge and human capital in value creation, viewing it as a superior resource. Fernández-Temprano and Tejerina-Gaite (2020) reinforce this perspective, arguing that firm performance depends on leveraging intellectual capital, with human capital being uniquely strategic because it is the sole source of knowledge creation. These insights underscore the importance of integrating circular economy principles, risk management, and innovation capability into coherent strategic policies that enhance organizational performance and sustainability outcomes.

### 3. Methods

#### 3.1. Research Approach and Type of Literature Review

A qualitative methodology is adopted for this study, operationalized through the Integrative Literature Review method. The choice of this method is deliberate, as it facilitates the integration of theoretical and empirical evidence from diverse fields, providing a robust foundation for developing a novel and comprehensive conceptual framework (Torraco, 2016). This approach is relevant for research that aims to develop conceptual models and theoretical propositions, particularly on multidisciplinary topics such as circular economy, corporate risk management, innovation capability, strategic policy, and firm performance. Unlike systematic literature reviews that focus on empirical synthesis based on strict protocols, integrative literature reviews place greater emphasis on critical analysis, conceptual comparison, and theoretical synthesis in order to identify patterns of relationships between variables and research gaps. Therefore, this method is considered the most appropriate for achieving the objectives of this research.

#### 3.2. Literature Search Strategy

Literature searches were conducted systematically through internationally reputable academic databases, namely Scopus, Web of Science, ScienceDirect, Emerald Insight, and Google Scholar as a supplement. The search was focused on scientific publications relevant to the research topic and having significant theoretical contributions. The main keywords used include (1) *circular economy*, (2) *corporate risk management*, (3) *enterprise risk management*, (4) *innovation capability*, (5) *strategic policy*, (6) *firm performance*. These keywords were combined with Boolean operators (AND, OR) to broaden and narrow search results according to research needs.

#### 3.3. Literature Inclusion and Exclusion Criteria

To maintain the quality and relevance of the review, the literature analyzed was selected based on the following criteria.

- 1) Inclusion criteria
  - a. Reputable international journal articles (indexed in Scopus or Web of Science).
  - b. Academic books and conference proceedings relevant to strategic management, risk management, innovation, circular economy, and public policy.
  - c. Publications from 2010 to 2025, with priority given to the most recent literature (2020–2025)
  - d. Studies that discuss the relationship between research variables directly or indirectly.
- 2) Exclusion criteria
  - a. Non-academic publications without a peer review process.
  - b. Articles that do not have conceptual relevance to the research objectives.
  - c. Literature with weak or unclear methodological quality.

#### 3.4. Literature Selection and Classification Process

Literature obtained through the initial search process was selected in stages. The first stage was carried out by reviewing titles and abstracts to ensure topic suitability. The second stage was conducted through full-text review to assess theoretical contributions and relevance to the research variables. Selected literature was then classified into several main themes, namely:

- 1) Circular economy and its implications for firm performance.
- 2) Corporate risk management and enterprise risk management.
- 3) Innovation capability as a source of competitive advantage.

- 4) Strategic policy in the context of organizations and public policy.
- 5) Firm performance and its determining factors.

These thematic classification aims to facilitate the analysis of relationships between variables and to identify patterns and differences of opinion in the literature.

### **3.5. Literature Analysis Techniques**

Literature analysis was carried out using content analysis and thematic analysis. Each piece of literature was analyzed to identify key concepts and operational definitions of variables, theoretical assumptions used, key findings and managerial implications, research limitations acknowledged by the authors. This analysis is not only descriptive, but also critical, comparing various theoretical perspectives and identifying inconsistencies and existing research gaps.

### **3.6. Theoretical Synthesis and Conceptual Model Development**

The results of the literature analysis were then synthesized in an integrative manner to build the research conceptual framework. This synthesis emphasizes the causal relationship between circular economy, corporate risk management, and innovation capability; the role of strategic policy as a mediating variable; and the overall impact on sustainable firm performance. This synthesis process produces research propositions and a conceptual model that constitute the main theoretical contribution of this dissertation research.

### **3.7. Validity and Reliability of the Literature Review**

To ensure the validity and reliability of the review results, this study uses literature from trusted academic sources and applies a consistent and iterative analysis process. Concept triangulation is carried out by comparing findings from various disciplines and research contexts. Thus, the results of the literature review are expected to have adequate theoretical strength and be relevant for the development of strategic policies and improvement of organizational performance.

## **4. Results and Discussion**

### **4.1. Circular Economy as a Sustainable Business Strategy**

The concept of circular economy has developed significantly in academic discourse and is no longer understood merely as a technical approach to waste management. Contemporary understanding positions circular economy as an economic system oriented toward the preservation of resource value through material efficiency, product life cycle extension, and the integration of innovation in production and consumption processes (Hartley & Kirchherr, 2023; Morsetto 2020). This approach represents a paradigm shift from the linear economic model toward one that emphasizes long-term sustainability and continuous value creation.

Most studies emphasize that circular economy operates through the principles of reducing resource use, reuse, recycling, and material recovery, with the aim of minimizing waste and reducing environmental impact (Morsetto, 2020; Neligan et al., 2023). Although there is agreement on these basic principles, the literature shows differences in conceptual orientation. A number of studies position circular economy primarily as an environmental policy instrument and public governance tool focused on controlling environmental externalities (Corvellec et al., 2022; Reike et al., 2023). Conversely, other approaches position circular economy as a business strategy integrated with improvements in operational

efficiency, innovation development, and the strengthening of corporate competitiveness (Agyapong et al., 2024; Banihashemi et al., 2024).

In the context of firm performance, the implementation of circular economy is generally associated with improved resource use efficiency and strengthened organizational legitimacy, which in turn has a positive impact on operational and financial performance (Oliveira Rosa & de Oliveira Paula, 2023; Sarfraz et al., 2023). In addition, circular economy acts as a driver of innovation, particularly through the development of new business models and sustainable product design that support long-term value creation (Neligan et al., 2023; Saari et al., 2024).

However, the relationship between circular economy and firm performance is not always direct and linear. A number of studies highlight that the effectiveness of circular economy implementation is greatly influenced by the internal capabilities of the organization, governance structures, and the existence of strategic policies that support cross-functional implementation (Corvellec et al., 2022; Lin & Chang, 2024). In conditions where circular economy is implemented partially or symbolically, its contribution to improving firm performance tends to be limited (Reike et al., 2023; Yalçın et al., 2024)

Most previous studies still position circular economy as a single determinant of firm performance, with relatively limited attention to its interaction with other organizational mechanisms. The integration of circular economy with corporate risk management, innovation capability, and strategic policy is still rarely discussed comprehensively within a single conceptual framework, even though the transition toward a circular economic model inherently involves strategic uncertainty, operational risks, and demands for continuous innovation (Banihashemi et al., 2024; Saari et al., 2024).

This condition indicates that understanding the role of circular economy in improving firm performance requires a more integrated approach, particularly in the context of large-scale organizations and state-owned enterprises operating in complex regulatory and risk environments. Such an approach becomes crucial in explaining how circular economy can function as part of a sustainable corporate strategy, rather than merely as an environmental initiative separate from corporate performance objectives.

#### **4.2. Concepts and Processes of Corporate Risk Management**

Effective corporate risk management equips leadership to proactively address uncertainty, balancing associated risks with potential opportunities, and ultimately strengthening the organization's ability to generate value. According to Kalina et al. (2022), enterprise risk management is built upon a series of interrelated components. The foundational component is the internal environment which is the setting within which the company functions. This environment is shaped by several factors: the prevailing risk-management philosophy (reflecting management's cultural attitude toward risk), organizational integrity, risk perspective, risk appetite, ethical values, structural design, and the framework for delegating authority.

Second, objective setting requires management to define the organization's goals as a prerequisite for identifying, assessing, and managing risks. These objectives can be categorized as either strategic or activity-based. In this context, strategic objectives in a company are related to the achievement and improvement of institutional performance in the medium and long term, and represent the implementation of the institution's vision and mission. Meanwhile, activity objectives can be broken down into three categories, namely operations objectives, reporting objectives, and compliance objectives. Third, through event identification, an organization seeks to pinpoint potential happenings, both inside and outside its walls, that could affect its strategy or its capacity to meet its objectives. These identified

events can be either beneficial, opening up opportunities, or detrimental, introducing risks that need to be managed.

Fourth, risk assessment evaluates the extent to which the impact of events (occurrences or conditions) can disrupt the achievement of objectives. The magnitude of the impact can be determined from inherent and residual risk and can be analyzed from two perspectives, namely likelihood (tendency or probability) and impact or consequence (the magnitude of the realized risk). Thus, the magnitude of risk for each organizational activity is the product of likelihood and consequence. Two distinct approaches are available for risk assessment. The first, qualitative techniques, utilizes instruments such as self-assessment (categorizing risk as low, medium, or high), questionnaires, and internal audit reviews. The second, quantitative techniques, draws upon numerical data generated by probability-based models, non-probabilistic models (which optimize only for consequence assumptions), and benchmarking exercises (Kalina et al., 2022).

Fifth, risk response requires the organization to determine its stance on the results of the risk assessment. The organization's risk response can take several forms. First, avoidance refers to the cessation of activities or services that cause risk. Second, reduction involves taking steps to reduce the likelihood or impact of risk. Third, sharing means transferring or jointly bearing the risk or part of the risk with another party. Finally, acceptance means accepting the risk that occurs (usually small risks), with no special measures taken. In selecting a response, factors such as the influence of each response on risk likelihood and impact, the optimal response that synergizes with the fulfillment of risk appetite and tolerances, cost versus benefit analysis, and possible opportunities that may arise from each risk response need to be considered.

Subsequently, control activities play a role in the preparation of policies and procedures to ensure that risk responses are implemented effectively. Control activities require a control environment that includes integrity and ethical values, competence, human resource policies and practices, organizational culture, management's philosophy and leadership style, organizational structure, and authority and responsibility. Furthermore, information and communication focus on conveying relevant information to the relevant parties through appropriate communication media. Factors that need to be considered in delivering information and communication are information quality, direction of communication, and communication tools.

Finally, monitoring can be carried out either on an ongoing basis or through separate evaluations. Ongoing monitoring activities are reflected in supervision activities, reconciliation, and other routine activities. In the monitoring process, obstacles such as reporting deficiencies namely incomplete or even excessive (irrelevant) reporting need to be observed. These obstacles, in turn, arise from various factors such as information sources, reporting material, parties to whom the report is submitted, and reporting directives (Adams et al., 2024).

Risk is an inherent element in a company's business activities and is included in business activities (Borisova, 2020). Referring to Baloyi & Ozumba (2020), there are various types of risks faced by companies, including financial risk, operational risk, strategic risk, external risk, and other risks that may arise in carrying out company activities. To face existing conditions, companies need to provide management tools that can manage risk (Andersen et al., 2022). Linking Enterprise Risk Management (ERM) with firm value, it was found that the implementation of Enterprise Risk Management (ERM) has a significant positive impact on firm value. Empirical results support that Enterprise Risk Management (ERM) will increase firm value by 3.6%-17% higher than companies that do not implement Enterprise Risk

Management (ERM) (Carmine, 2022). From a legal standpoint, risk management constitutes the operationalization of the prudential principle, a concept commonly embraced within the banking industry. Furthermore, it may be characterized as a systematic framework for managing the uncertainties associated with various threats.

Effective corporate risk management will produce good levels of performance and soundness for the party concerned. Meanwhile, risk management in banking is a continuous process of how banks manage the risks they face (Naibaho & Mayayogini, 2023). It minimizes the impact caused by various unwanted risks. On the other hand, it accepts and operates with those risks. Even at a higher level, if possible, it can convert risks into profitable business opportunities. In another definition, risk management is about how to actively choose the type and level of risk that is appropriate to the relevant business activities (Altaf et al., 2022).

Corporate risk management according to Lebedev et al. (2022) can be defined as a set of procedures and methodologies used to identify, measure, monitor, and control risks arising from business activities. Kulinich et al. (2023) provide a definition of risk, namely: describing a condition in which there is an exposure to loss or the possibility of loss occurring. Conversely, chance in statistics is a condition in which the probability of a certain situation occurring is defined. Risk is the possibility of loss. The term possibility is the probability of a condition being between zero and one.

Based on Ghofar et al. (2022), the definition of risk here is almost the same as the everyday definition of risk. Risk is uncertainty. Risk according to this definition is the existence of uncertainty. The existence of uncertainty in decision-making leads to loss. Risk is the dispersion of actual from expected results. This definition as the deviation of actual results from expected results is another version of risk uncertainty, where relative deviation is a statement of uncertainty in statistical terms (Musiello-Neto et al., 2022).

### **4.3. Concepts and Role of Innovation Capability**

The development of innovation capability is very important because innovation plays a key role in the survival and growth of organizational performance. According to Sudolska & Łapińska (2020) innovation capability is the most important determinant of organizational performance. Innovation capability is the ability to apply creativity in order to solve problems and opportunities to enrich and improve life (AlTaweel & Al-Hawary, 2021). Innovation capability according to Iranmanesh et al. (2021) is the ability to apply creativity in order to solve problems and opportunities to improve performance.

The participation and implementation of innovation capability to change or renew the stock of tangible and intangible assets can be considered to a certain extent as an ability or competence acquired through a learning process, and is a key element of innovation capability (Mendoza-Silva, 2021). Citing from Sudolska & Łapińska (2020), innovation capability has the consequence of renewal/use/development by creating something new that is different from before. Innovation can also be summarized as a new discovery in technology or the capability of introducing new findings that are different from those that already exist. Innovation capability is the discovery of a new capability that is different from what already exists or has been known before. Entrepreneurs who always innovate can be said to be innovative entrepreneurs.

A defining characteristic of innovation capability is its inherent novelty—it must generate outputs, whether tangible work or conceptual thought, that possess originality. Furthermore, initiatives to foster innovation capability are executed through structured, well-planned programs. This ensures that innovation emerges from a considered process rather than haste, ultimately maximizing its usefulness (Freije et al., 2022; Leo et al., 2022). The cultivation of innovation capability requires thorough preparation and well-defined programs

established in advance. When such an initiative is launched, it must be guided by specific objectives, meaning the program must have a clear sense of purpose, including both the strategic direction and the methods for attaining its goals (Iranmanesh et al., 2021).

#### 4.4. Concepts of Strategic Policy and Its Role in Organizations

In successful organizations, a comprehensive policy strategy serves as the foundation that guides all other strategies. Both organizational strategy and information strategy are derived from and depend upon this policy strategy. These three elements must be carefully balanced, as changes in any one will inevitably impact the others (Lazarevic et al., 2022). Business Strategy is a vision articulated in terms of where the business is headed, how to get there, and why. The competitive advantage model serves as a framework for organizations to articulate and comprehend their strategic choices. Business strategy, in this context, represents a synthesis of competition, market positioning, and organizational capabilities. Its formulation demands insight into customer desires as well as competitor actions. Positioning specifies the means by which the organization aims to execute its objectives, and the resulting strategy becomes a critical tool for assessing the organization's existing capabilities.

Organizational strategy relates to how the business is organized to implement the business strategy. The commonly used organizational strategy model in business is the Leavitt Business Diamond, which determines the important components of the organization for structure, people tasks, information, and control. All elements are interrelated. The impact can be detrimental with respect to failure to understand the relationship between the three. This model can be used for organizational design or for diagnosing problems within an organization. Another, more complex model, the Managerial Levers model, states that the successful implementation of organizational strategy covers all organizational variables, control, and culture. Essentially, organizational design can either hinder or support the organization's business strategy.

Strategic policy needs to complement the policy strategy in relation to supporting business objectives. As outlined previously, information systems strategy is influenced by and can influence business and organizational strategy. The scope of information strategy includes policies and strategies in the management of information technology and human resources in the field of information technology. It can thus be defined as an information systems and services plan (Beckett-Camarata, 2020).

According to Messina et al. (2020), strategic policy is a set of interrelated components for collecting, processing, storing, and distributing information to support decision-making and control within an organization. The interdependence between organizations and information systems: the interdependent relationship between organizations and information systems allows a business to implement the business strategy of the organization. In addition, information systems also help companies measure their existing capabilities. The four key components of information systems infrastructure that are key to an information systems strategy are hardware, software, networking, and data. These key components can be used by managers to assess critical issues occurring in the information systems used in the organizations they lead (González, 2023).

In the preparation of strategic policy guidelines for Information Systems Governance, they must be in accordance with the background that Intelligence Technology is positioned as a parameter to ensure the alignment of Defense Information Technology. Information technology governance policies are divided into 2, namely Strategic Policies and Operational Policies (Haryana, 2022).

Strategic Policy for Information Technology Governance covers eight important points, namely: Determination of the organization's information technology role, Information

technology planning, Information technology process and organizational framework, Information Technology Investment Management, Information Technology Resource Management, Information Technology Risk Management, Project Management, and Handling of Requirements, Identification of Solutions (Identify Automated Solution).

Strategic policy according to Dühr (2024) in determining the role of Information Technology is a policy statement established to determine the role of information technology in the company. This aims to place the Information Technology function in accordance with the determined role and is directly related to the duties, authority, and responsibilities of the Company's Information Technology.

Strategic Policy based on Lazarevic et al. (2022) can regulate the governance of the company's information technology processes and the needs of its supporting organization, which aims to ensure that the company's main information technology processes can be carried out and aligned with the company's Information Technology role, as well as the availability of the supporting organization for these processes. The information technology process framework must be defined to include process structure, ownership, performance measurement, and compliance. This functional organization should ideally be structured based on the principle of segregation of duties according to function or segregation of duty (SoD). This policy can result in a structured company information technology management process complete with its duties and responsibilities, as well as the form of the information technology organization (including ad hoc organizations) supporting the finalized information technology processes (El-Dessouki & Mansour, 2023).

#### **4.5. Concepts and Measurement of Firm Performance**

Firm performance represents the level of achievement of organizational objectives produced through the implementation of managerial and operational corporate functions. Firm performance is generally understood as the result of a coordinated resource management process, which is reflected in financial, operational, and strategic achievements within a certain period (Jung & Shegai, 2023; Ayinaddis, 2023) Measuring firm performance has been carried out with the aim of determining the effectiveness of company operations. This can be done using methods or approaches.

Measuring firm performance is generally carried out through financial and non-financial approaches. Financial indicators reflect the effectiveness of resource utilization and the economic sustainability of the company, while non-financial indicators capture operational aspects, process quality, stakeholder satisfaction, and the achievement of the organization's strategic objectives (La Rocca et al., 2024). This multidimensional approach reflects the view that firm performance is not solely determined by financial results, but also by the organization's ability to effectively manage internal processes and resources (Bhaskaran, 2023).

From a managerial perspective, firm performance is closely related to the implementation of the formulated strategy. The success of this implementation is greatly influenced by the quality of human resources, including competence, motivation, and the alignment of individual interests with organizational objectives. The organization's treatment of its human resources has direct implications for the attitudes, behaviors, and contributions of employees in achieving the company's performance targets (Noone et al., 2024).

The process of achieving firm performance also requires continuous control and evaluation mechanisms. Periodic monitoring, measurement, and review of performance allow organizations to ensure alignment between strategic plans and operational realization. An effective performance management system functions as a feedback tool for managerial

decision-making as well as a foundation for strategy adjustments in the face of changes in the business environment (Wang & Xia, 2024)

In addition, firm performance reflects the level of productivity and contribution of human resources to the achievement of organizational results. Performance is viewed as the result of the work of individuals and groups directly related to their responsibilities and authority, and is linked to the organization's strategic objectives and stakeholder satisfaction (Ahmad et al., 2023; Fu et al., 2024). Thus, firm performance does not only represent the final results of organizational activities, but also the quality of the processes underlying the achievement of those results.

Conceptually, firm performance can be understood as a multidimensional construct that reflects the quality and quantity of organizational achievements, influenced by strategy, policies, internal capabilities, and the company's ability to manage uncertainty and the dynamics of the business environment. This understanding positions firm performance as a strategic outcome that is relevant to analyze in relation to circular economy, corporate risk management, innovation capability, and strategic policy.

#### **4.6. An Integrated Approach Model for Achieving Sustainable Firm Performance**

The concepts of circular economy, corporate risk management, and innovation capability are important pillars in creating sustainable corporate performance. These three aspects require a deep understanding of the company's resource readiness in facing change, both in terms of competence, infrastructure, and agile policies in responding to technological challenges (Gun et al., 2024). Therefore, improving firm performance needs to be viewed as a sustainable strategy that prioritizes the use of knowledge over mere information as the basis for corporate decision-making (Peña et al., 2024). However, if an organization fails to integrate innovation capability into its structure and policies, gaps will arise in the achievement of strategic objectives, thus requiring the support of appropriate strategic policy (Dühr, 2024; Putera et al., 2022).

Circular economy has been proven to have a positive effect on firm performance. Several studies state that the implementation of circular economy improves internal efficiency and financial performance through resource optimization and the transformation of more environmentally friendly business models (Agyapong et al., 2024; Banihashemi et al., 2024). Circular economy also strengthens corporate competitiveness through innovation in waste management and the reuse of raw materials, which directly impacts improvements in operational performance (Neligan et al., 2023; Yalçın et al., 2024). Thus, circular economy becomes a strategic factor in supporting the sustainability of firm performance.

In addition, innovation capability plays a significant role in improving firm performance. Organizations that are able to harness creativity as a solution to changes and business opportunities will have better competitive advantages (Hurtado-Palomino et al., 2022; Saari et al., 2024). Innovation capability not only drives the creation of new products, but also improves processes and increases overall firm value (AlTaweel & Al-Hawary, 2021; Iranmanesh et al., 2021). The high role of innovation at both the individual and organizational levels also contributes to increased technological adaptability and strengthens the resilience of companies in global market competition (Leo et al., 2022; Vu, 2020).

Strategic policy functions as the director of the organization's operational implementation in driving maximum firm performance objectives. Policies that are organized and aligned with business strategy will create efficient management and strengthen the company's competitive advantage (González, 2023; Purwanto et al., 2022). With good strategic policy, organizations can more easily adapt to external changes and focus resources

on achieving optimal performance results (Arias Gómez & Antosová, 2025; Zulqarnain et al., 2024).

Circular economy has also been proven to have a positive influence on the formation of strategic policy. The integration of circular economy principles into business policies improves corporate effectiveness through technological support and waste reduction throughout the entire production cycle (Banihashemi et al., 2024; Lin & Chang, 2024). This approach is in line with the company's need to formulate sustainable policies that are able to adapt to market and environmental demands (Chang et al., 2024; Peng et al., 2023).

From the perspective of risk management, corporate risk management contributes positively to the formulation of strategic policy because companies need to ensure readiness to face change and anticipate risks through flexible and adaptive policies (Ajeigbe & Ganda, 2023; Husaini et al., 2023). Strengthening risk management enhances proactive organizational behavior, allowing organizations to maintain stability while driving the successful implementation of strategy (Borisova, 2020; Kulinich et al., 2023).

Innovation capability has also been proven to have a positive influence on strategic policy because innovative organizations are able to design strategic policies that support value creation and business sustainability (Chatterjee et al., 2023; Saari et al., 2024). Innovative capabilities enable companies to effectively utilize resources and encourage the adoption of adaptive policies oriented toward performance improvement (Battistella et al., 2023; Kroh et al., 2024; Somwethee et al., 2023).

Furthermore, strategic policy serves as a mediator in the relationship of circular economy toward firm performance. Policies aligned with circular economy principles enable more effective coordination in optimizing resources, thereby having a greater impact on firm performance (Oliveira Rosa & de Oliveira Paula, 2023; Peng et al., 2023; Sarfraz et al., 2023). In other words, the implementation of circular economy will produce more maximum output when supported by a clear policy structure.

In the aspect of corporate risk management, strategic policy forms the pathway for strengthening its influence on firm performance. Good risk management supported by directed strategic policies is able to maximize the company's efforts in improving performance and minimizing the potential for operational disruptions (Ajeigbe & Ganda, 2023; Lu et al., 2023; Naibaho & Mayayogini, 2023). This demonstrates the importance of alignment between risk management and business strategy.

The relationship between innovation capability and firm performance is also strengthened through strategic policy. Policies that support innovation increase organizational commitment to creating change and enhancing firm value, which ultimately impacts the achievement of sustainable firm performance (Fu et al., 2024; Kroh et al., 2024; Park, 2023; Saari et al., 2024). This confirms that the mediating role of strategic policy is the key to optimizing innovation strategies in modern companies.

## 5. Conclusion

This study affirms that circular economy plays an important role in improving resource efficiency, reducing waste, and creating sustainable economic value. Corporate risk management becomes a strategic element in dealing with various uncertainties in the energy transition process and electric vehicle battery waste management. Meanwhile, innovation capability functions as the main driver for producing more competitive new business solutions. However, the contribution of these three elements to firm performance is not direct. Strategic policy mediates these elements by aligning organizational direction, fostering

cross-functional collaboration, and enabling the successful implementation of sustainability programs. Thus, an integrated approach between circular economy, corporate risk management, innovation capability, and strategic policy is an important foundation in improving sustainable firm performance for national energy state-owned enterprises.

Energy state-owned enterprises such as PT PLN (Persero) need to develop long-term strategic policies that ensure the adoption of circular economy is not partial, but rather becomes a core part of corporate strategy. Further research is needed to test the resulting conceptual model through empirical approaches across various sectors related to the electric vehicle ecosystem, such as battery manufacturers, recycling companies, and the automotive industry. In addition, the government needs to strengthen incentives and regulations related to investment in battery recycling technology and triple helix collaboration in order to accelerate the realization of a sustainable circular battery supply chain in Indonesia.

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