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Toward Sustainable Operations Strategy: A Qualitative Approach to Theory Building and Testing Using a Single Case Study in an Emerging Country

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Abstract: The increasing global consciousness and collective recognition of the importance of sustainability, coupled with initiatives focused on sustainable development, have resulted in a heightened commitment and transformation among organizations and corporations in their endeavors to contribute to the achievement of sustainable development goals through their corporate sustainability initiatives. Prior studies have underscored the effects of corporate sustainability on various strategic levels, such as corporate, business, and operations, paving the way for further investigation. This paper seeks to establish a theoretical framework for sustainable operations strategy through six propositions and subsequently validate this framework via a qualitative case study analysis of a production and processing special economic zone in an emerging nation, specifically Indonesia. The findings from the empirical testing indicate that the proposed theoretical framework has been validated with minor adjustments, through the inclusion of good corporate governance and the adoption of local core values. The paper also presents theoretical and managerial implications, along with suggestions for future research avenues.

Keywords: operations strategy; sustainability; theory building; qualitative approach; case study; special economic zone; emerging country; Indonesia

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1. Introduction

The field of operations strategy has been a well-established area of research and practice within the realms of business and management for an extended period. It is frequently addressed as a distinct chapter in numerous operations management textbooks, including works by [1–5] among others. Furthermore, operations strategy has been the focus of dedicated textbooks, such as those authored by [2,6–11]. Given its strategic implications, operations strategy necessitates the formulation of operational decisions with a long-term planning perspective. The growing emphasis on sustainable development goals [12] is anticipated to influence the evolution of sustainable operations strategies.

The United Nations Report 2023, titled "Towards a Rescue Plan for People and Planet", highlights the global commitment and advancements made toward achieving sustainable development goals [13]. The report emphasizes that the Sustainable Development Goals (SDGs) serve as a universally accepted framework aimed at bridging economic and geopolitical divides, fostering trust, and rebuilding solidarity. A lack of progress in these areas could exacerbate inequalities, leading to a divided world characterized by a disparity between developed and developing nations. The report further asserts that both governments and the private sector in developing countries must realign their economies to promote low-carbon and resilient growth patterns. Indonesia, as an emerging nation, is also grappling with similar challenges. Furthermore, Indonesia has encountered competition from neighboring nations in its efforts to attract foreign investors dedicated to achieving sustainable development goals. In their research [14], Sachs provided a ranking of 167 countries based

on their overall performance regarding sustainable development goal indicators, highlighting the positions of Southeast Asian countries: Thailand (45), Vietnam (54), Singapore (65), Indonesia (78), Malaysia (79), and the Philippines (92). This information underscores the critical need for both government and private sector commitment to sustainability in developing countries.

The growing global consciousness and collective recognition of the importance of sustainability, coupled with initiatives focused on sustainable development, have resulted in heightened dedication and transformation within organizations and companies as they strive to achieve the sustainable development goals established in the UN 2030 agenda [15]. This movement has been known in the academic community as business sustainability or corporate sustainability [16].

The concept of corporate sustainability refers to the incorporation of sustainable practices within business operations [17]. From an academic perspective, there has been a significant increase in research dedicated to corporate sustainability, establishing it as a key subject in academic discourse [17–23].

A commonly emphasized element of corporate sustainability is the imperative for organizations to incorporate sustainability into their corporate, business, or competitive strategies, as well as their operational frameworks [24]. Nevertheless, numerous researchers have indicated that substantial gaps in research persist in this domain [17], particularly concerning sustainable strategies [15]. Given that strategies can encompass corporate, business, and operational levels, there exists a significant opportunity for further investigation into the integration of sustainability across various tiers of strategies.

As a developing nation, Indonesia has undertaken various initiatives to enhance economic growth and its equitable distribution across the country's islands, one of which includes the establishment of diverse special economic zones (SEZs). The management of each SEZ bears significant responsibility for advancing their business to meet the expectations of multiple stakeholders. While economic objectives are typically the foremost concern, there is an increasing emphasis on sustainability, which has become a global imperative. With the government encouraging foreign investment in SEZs, the management is now tasked with aligning their business planning and operations with sustainable development goals, often referred to as the triple bottom line. In this context, research focused on revealing the strategic decisions made at the top levels and their translation into operational practices will enhance the existing knowledge base regarding sustainable strategies across corporate, business, and functional dimensions. Research on corporate sustainability is extensive, as is the study of operations strategy; however, there exists a notable gap in the literature that connects corporate sustainability with operations strategy, especially within the context of an emerging country. To fill in this gap, the development of a sustainable operations strategy, in particular, by referring to corporate sustainability commitment is proposed as a novelty of this research.

Although research has been conducted in the area of sustainable operations management [25], which emphasizes operational practices and performance, there remains a deficiency in studies addressing sustainable operations strategy that includes the strategic decisions required to create a sustainable operational framework [26–34]. Any research in this area will complement or extend previous research on sustainable operations strategy [24,35,36]. This research aims to establish a theoretical framework for sustainable operations strategy. Acknowledging that the integration of corporate sustainability into operations strategy can differ across various contexts [23], this study will focus on a case study from an emerging nation, namely, Indonesia. By examining this case, a theoretical framework that addresses the specific circumstances of emerging countries will be developed.

This study aims to address two distinct research deficiencies: the theoretical deficiency and the empirical deficiency. The theoretical deficiency refers to the limited comprehension present in the current literature concerning sustainable operations strategy, while the empirical deficiency underscores the absence of practical implementation within a specific

context [17,21,23]. To contribute to these domains, this research intends to develop a theoretical framework for sustainable operations strategy [37] and to validate the proposed conceptual framework through a case study conducted in an emerging country.

This paper is structured into seven sections. Section 2 presents a literature review focusing on corporate sustainability and operations strategy. Section 3 conveys the development of theory. Section 4 details the methodology employed. Section 5 outlines the testing of the proposed sustainable operations strategy theory through a case study, utilizing a qualitative case study allows for the identification of any discrepancies within the proposed theory [15]. Section 6 discusses major findings and their relationships with literature review. Finally, the paper concludes with recommendations for future research.

2. Theoretical Foundations

Over the past several decades, there has been a strong push for the incorporation of Sustainable Development principles into the operations of business organizations [15,24]. Companies are often held responsible for contributing to environmental degradation and social issues due to their unsustainable practices [22–24]. In recent decades, a growing number of global initiatives have been established to guide businesses in their transition toward sustainability [24]. The United Nations Agenda 2030 has highlighted the importance of businesses in contributing to sustainable development and the necessity of incorporating this concept into their operational frameworks [17]. As time has progressed, the significance of sustainability and sustainable development has increased, as societies have generally become more cognizant of their effects on environmental conditions [38]. The business community is progressively asserting the importance of integrating the concept of sustainability into their operations and advantages. The business community is progressively asserting the importance of integrating the concept of sustainability into their operations and the advantages it brings [18].

Corporate sustainability can be characterized as the integration of economic, environmental, and social considerations into firms' corporate decision-making [17,21]. A few influencing factors of corporate sustainability include environmental-oriented sustainability, sustainable strategic management, sustainable dynamic capabilities, a stakeholder-centric strategic approach, sustainable supply chain management, operational excellence, sustainable research and development, and a sustainability-oriented global business strategy [39]. The dedication of organizations to corporate sustainability has been a topic of extensive discussion in both theoretical and practical contexts. This dedication necessitates a strategic framework to guarantee that corporate sustainability is seamlessly incorporated into the overall business strategy and operational processes [35]. Companies adopt corporate sustainability by incorporating sustainability into their strategic frameworks, resulting in a sustainable corporate strategy, sustainable business strategy, and sustainable operations strategy, all aimed at enhancing performance and gaining a competitive edge [39].

The commitment of the organization and its leadership to adopt corporate sustainability fosters governance that aligns with the vision of a sustainable corporation [23,40]. A sustainable corporation envisions a future that actively promotes the attainment of sustainable development goals. Sustainable companies, defined as those that align their operations with environmental, social, and governance criteria and assess their impact through ESG metrics, tend to be more profitable than their counterparts that neglect environmental considerations [20]. Furthermore, investors evaluate companies by taking into account the sustainable practices they implement [19]. A sustainable corporation adopts corporate governance as a framework for managing a corporation, and it addresses critical issues, such as the purpose of a business, the interests of stakeholders, and the appropriate methods for managing a company [20]. The mission and objectives of a sustainable corporation recognize the necessity of involving all stakeholders, and the manner in which environmental issues are addressed.

A significant influence on operations strategy is attributed to [41]. In their groundbreaking work, "Restoring Our Competitive Edge: Competing through Manufacturing",

they emphasized the importance for companies to leverage their manufacturing strategy as a means of gaining a competitive advantage. Within this publication, ref. [41] delineated the decisions involved in manufacturing strategy, which encompass both structural and infrastructural elements. Structural decisions pertain to aspects such as capacity, facilities, technology, and vertical integration, whereas infrastructural decisions relate to workforce management, quality assurance, production planning, material control, and organizational structure. As the focus of economic growth has transitioned from the manufacturing sector to the service sector, the concept of manufacturing strategy has evolved into operations strategy, which now encompasses both the production of goods and the provision of services [9]. The distinctions between structural and infrastructural decisions have remained relevant, as they continue to be utilized by numerous scholars.

According to [41], manufacturing strategy is defined as "a series of decisions that, over time, allow a business unit to establish a desired manufacturing structure, infrastructure, and specific capabilities". In the four decades following their work, numerous definitions of operations strategy have emerged. Despite the diversity of these definitions, as illustrated in Table 1, there is a consensus among scholars that operations play a strategic role, encapsulated by several key concepts, including competitive advantage, unique competencies, sustainable benefits, mission fulfillment and/or redefinition, alignment with higher-level business and corporate strategies, long-term objectives, the connection between operational decision-making and business strategy, contributions to overall strategy, and the maximization of net present value.

Table 1. Definitions of operations strategy.

Reference	Definition
[1]	"...is concerned with setting broad policies and plans for using the resources of a firm and must be integrated with corporate strategy".
[2]	"...the total pattern of decisions which shape the long-term capabilities of any type of operation and their contribution to overall strategy, through reconciliation of market requirements and operations resources".
[3]	"...a strategy that establishes the link between operations decision making and business strategy".
[6]	"A consistent pattern of structural and infrastructural decisions, determining the resource and process of a manufacturing system to achieve a set of manufacturing competencies alignment with business strategy".
[7]	"...connecting operations goals with customer concerns".
[8]	"...consists of all the long-term goals, plans, policies, culture, resources, decisions and actions that relate to its operations".
[9]	"...a set of goals, policies, and self-imposed restrictions that together describe how the organization proposes to direct and develop all the resources invested in operations so as to best fulfill (and possibly redefine) its mission".
[41]	"...the set of decisions across the value chain that supports the implementation of a higher-level business strategies".

Operations strategy is classified as a type of strategy, and there is a prevalent consensus among scholars concerning its hierarchical structure [2,3,7–10]. Viewed from a top-down approach, corporate strategy shapes business strategy, which in turn influences operations strategy. Conversely, from a bottom-up viewpoint, operations strategy underpins business strategy, while business strategy reinforces corporate strategy.

In the realm of strategic management research [42–44], operations strategy is similarly categorized into two primary research dimensions: content and process [2,3,7,9,10,41]. As noted by [2], the content of operations strategy pertains to the strategic choices that influence and guide the long-term trajectory of operations. There is a consensus on the

classification of strategic decisions within operations strategy, which can be categorized into structural and infrastructural decisions. Structural decisions impact the physical layout of operations, whereas infrastructural decisions encompass the systems and policies necessary for the effective functioning of the structural elements. According to [3,9], structural decisions include aspects such as capacity, sourcing, facilities, and information and process technology. In contrast, infrastructural decisions involve resource allocation, capital budgeting systems, human resource systems, work planning and control systems (including purchasing, aggregate planning, scheduling, inventory control, and waiting time), quality systems, measurement and reward systems, product and process development systems, and organizational structure.

3. Development of Propositions and a Theoretical Framework

Similar to the field of science [45], applied disciplines such as business and management evolve through a combination of theoretical frameworks and practical applications [46,47]. Consequently, robust theoretical foundations are essential as they elucidate the reasons and mechanisms behind specific business challenges or managerial dilemmas. Effective theories must not only present coherent constructs but also endure empirical validation. Thus, both scholars and practitioners are instrumental in the progression of theory and practice within the realms of business and management [46,47]. The ongoing process of developing sound theories in applied disciplines typically encompasses five key stages: conceptualization, operationalization, confirmation, application, and refinement [48].

Various interpretations of theory exist, such as "a distinct area of knowledge that clarifies its operation" [46], "a structured description of observations related to a specific aspect of reality" [45], "a set of propositions concerning the connections between two or more concepts or constructs" [48], and "a statement regarding the relationships among units that are either observed or estimated in the empirical domain" [49].

This study utilizes a deductive approach for the development of theory, informed by the results of the literature review. In the field of operations, the development of theory follows the guidelines set forth by Wacker [49], who identified four critical components of a theory in operations: (1) definitions (what? who?), (2) domain (where? when?), (3) relationships (why? how?), and (4) predictions (could? should? would?). These components correspond closely with the fundamental aspects of theoretical contribution as outlined by [50].

The definitional aspect (what?) has been strongly promoted by Dubin and others [46,50–54]. Definitions relate to the interpretations assigned to concepts, constructs, or variables that are essential to the theory. The domain specifies the context in which the theory can be applied. Relationships outline the nature of the links among these concepts, constructs, or variables. Prediction evaluates the extent to which the theory is supported by empirical evidence.

To begin with, the definition aspect indicates that a sustainable operations strategy is characterized by the strategic alignment of a company's internal capabilities with its external demands, which pertains to its overarching business and corporate strategies. The primary objective of this alignment is to facilitate the attainment of sustainable development goals [7]. Given its strategic nature, key participants in the formulation of a sustainable operations strategy typically include senior management and chief executive officers, who possess the authority to make these critical strategic decisions.

The sustainable operations strategy is characterized by a series of strategic decisions made by a firm to effectively design and manage its operating system. This involves making choices regarding structural elements such as capacity, facility location, technology, and supply chain, which collectively shape the firm's physical configuration. Additionally, it encompasses the establishment of policies and systems related to resource allocation, human resources, work planning and control, quality management, product and service development, performance metrics, and organizational structure [45]. The primary objective of this strategy is to enable the firm to meet the needs of its customers and the expectations of its stakeholders while maintaining a competitive edge. Furthermore, it aims to assist the

firm in achieving its key objectives, which include economic, social, and environmental goals. The responsibility for formulating the sustainable operations strategy lies primarily with the management of the operating firm, particularly the top management team.

Additionally, concerning the domain aspect, the timing for the development of a sustainable operations strategy may align with the established standards or practices of a company in relation to its long-term strategic planning, which encompasses corporate, business, and functional levels. Companies can implement sustainable operations strategies in various locations, provided that such actions are practical. In response to the timing aspect, the formulation of a sustainable operations strategy is undertaken by any organization to bolster its long-term corporate and business objectives. Simultaneously, addressing the location aspect, any firm can devise and execute a sustainable operations strategy at any site.

The third aspect concerning the relationship component highlights that a primary motivation for any organization to implement a sustainable operations strategy is to develop unique competencies or capabilities that align with external demands, particularly those focused on achieving the triple bottom line, which encompasses economic, social, and environmental goals. This alignment can be realized through making contextually appropriate and practical decisions related to the firm's structure and infrastructure [7,45].

The inquiry into the rationale behind a company's adoption and implementation of a sustainable operations strategy fundamentally revolves around the pursuit of competitive advantage and the attainment of sustainable development goals. In addressing the operational aspects, a company aiming to embrace a sustainable operations strategy allocates its resources or capital, which encompasses financial assets, human resources, information systems, organizational structures, networks, and governmental support. These resources are strategically utilized through structural and infrastructural decision-making processes to establish an operational framework that meets customer demands while developing and maintaining capabilities that confer a competitive edge. This enhanced capability is anticipated to align the operational firm with its business strategy, facilitating both competition and collaboration with various business partners, particularly suppliers and complementors [7].

In conclusion, the predictive aspect indicates that any organization that embraces and executes a sustainable operations strategy has the potential to enhance its operational and overall performance. However, the successful adoption and implementation of such a strategy largely hinges on the commitment of the organization's top decision-makers. Regarding the potential outcomes, firms intending to adopt and implement a sustainable operations strategy anticipate that targeted initiatives will lead to improved performance in relation to achieving sustainable development goals. From a normative standpoint, the decision to adopt and implement a sustainable operations strategy is likely to channel efforts toward enhanced performance, particularly in securing a competitive advantage and fulfilling sustainable development objectives. Furthermore, organizations that recognize the advantages of adopting and implementing a sustainable operations strategy are expected to actively pursue this approach [49].

The process of developing theory via a case study approach can be initiated with theoretical propositions, as noted by [55–57]. By focusing on the key elements of corporate sustainability and operations strategy, a number of significant propositions regarding sustainable operations strategy are articulated, with their corresponding references detailed in Table 2. A theoretical framework of sustainable operations strategy is presented in Figure 1.

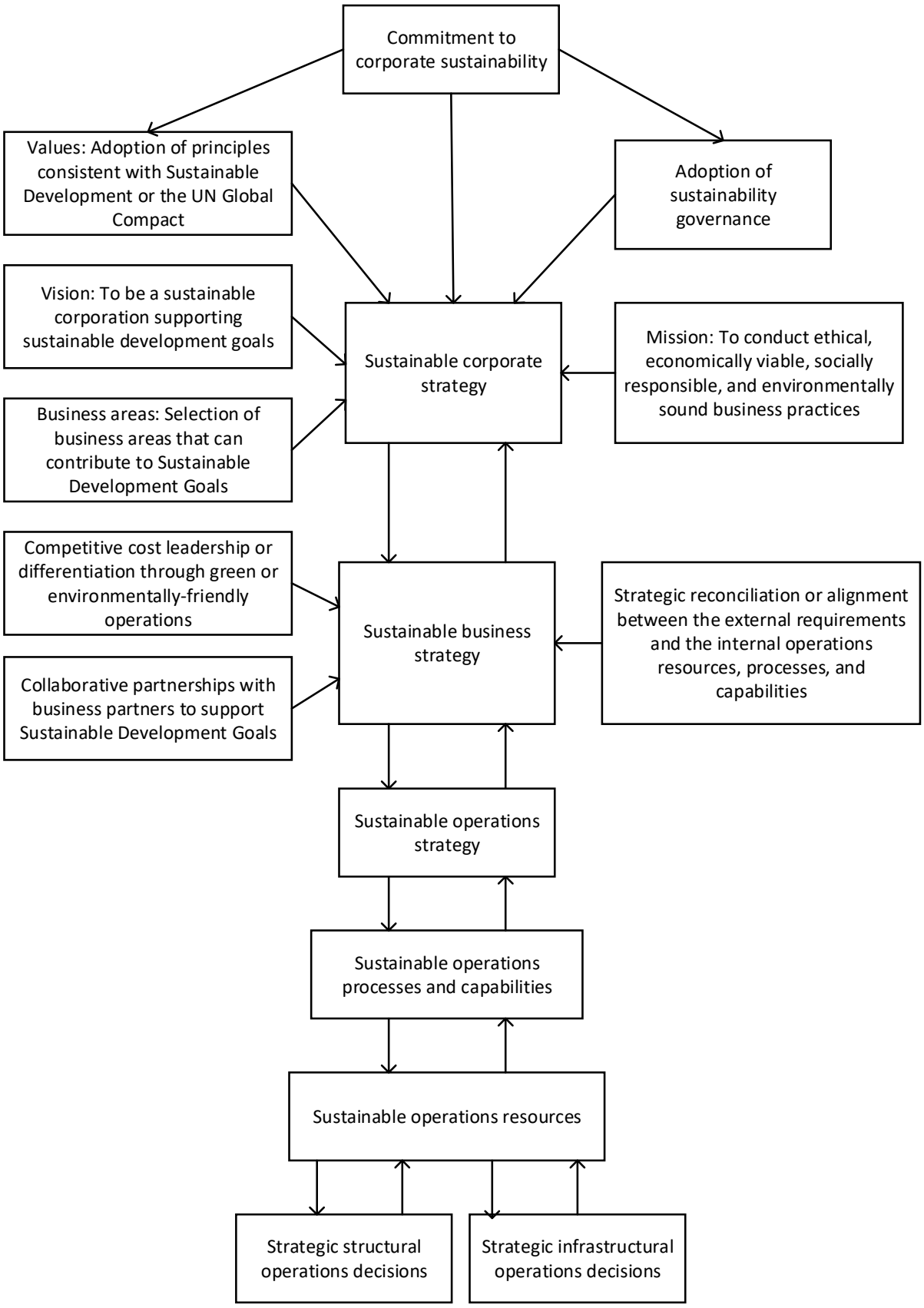


Figure 1. Theoretical framework of sustainable operations strategy.

The dedication of organizations to corporate sustainability has been a topic of considerable discussion in both theoretical and practical contexts. This dedication necessitates a strategic framework to ensure that corporate sustainability is seamlessly woven into the overall business strategy and operational processes [16,24,35]. It is essential to identify clear sustainability strategies and issues that can be incorporated across all pertinent corporate levels and systems [58]. The United Nations Agenda 2030 has underscored the significant role that businesses must play in realizing sustainable development goals and the importance of integrating this concept into their operations [12]. Consequently, a commitment to corporate sustainability is anticipated to enhance the achievement of triple-bottom-line performance, encompassing economic, social, and environmental dimensions [59–61]. These foundational premises establish the groundwork for Proposition 1.

Proposition 1. *In response to the global imperative, companies are dedicated to integrating corporate sustainability into their strategic frameworks at all levels, including corporate, business, and functional strategies. Consequently, the framework of sustainable corporate strategy, business strategy, and operational strategy focuses on achieving and contributing to sustainable development goals, which encompass economic, social, and environmental objectives, reflecting the triple-bottom-line approach of profit, people, and planet.*

Research concerning strategy content focuses on the strategic choices made by organizations, encompassing their mission, vision, values, and the selection of business sectors [40]. Furthermore, governance frameworks are essential, as companies must address sustainability challenges to thrive in competitive markets while meeting stakeholder expectations. By prioritizing sustainability, an organization can refine its mission to commit to ethical, economically viable, socially responsible, and environmentally sustainable business practices [61–63]. The vision of a firm may be to transform into a sustainable entity that actively contributes to the realization of sustainable development goals [40]. As companies position themselves as global corporate citizens, they may integrate the principles outlined in the United Nations Global Compact into their corporate values [12]. Organizations will pursue business sectors where they can generate value in alignment with sustainable development objectives [64]. These considerations support Proposition 2.

Proposition 2. *A sustainable corporate strategy encompasses the mission, vision, values, selection of business sectors, and governance structures. The company's mission is to engage in ethical, economically viable, socially responsible, and environmentally sustainable business practices. Its vision is to evolve into a sustainable corporation that actively supports the achievement of sustainable development goals. The mission further emphasizes the company's commitment to conducting business activities that contribute to the realization of these goals. The core value of the organization is to embrace principles and standards aligned with sustainable development, such as those outlined in the United Nations Global Compact and its ten principles. The company aims to explore business sectors where it can produce and offer a range of products and/or services that advance sustainable development objectives.*

The core principle of a sustainable business strategy lies in harmonizing external demands with the internal resources and capabilities that facilitate competitive advantage and sustainability [2,18,42,64–66]. On one side, external factors encompass the expectations of diverse stakeholders, such as customers, suppliers, business partners, competitors, and government entities, which guide a company in positioning its products and services within the marketplace. Conversely, the internal operational resources and processes are anticipated to develop capabilities that allow a company to conduct its business in a manner that promotes sustainability performance [2,62,67,68]. These premises support Proposition 3.

Proposition 3. *A sustainable business strategy involves harmonizing external demands with the internal operational capabilities that support sustainability. The external demands from various stakeholders, such as customers, suppliers, competitors, business partners, and government entities,*

inform the organization on how to position its products and services within targeted market segments. Meanwhile, the internal operational capabilities that promote sustainability are cultivated and enhanced through the organization's resources and business processes, forming a crucial aspect of its sustainable operations strategy.

The evolving characteristics of various strategic levels have been acknowledged by academics who advocate that the upper tiers of strategy establish guidance and priorities for the lower tiers, while the lower tiers are anticipated to aid in realizing the objectives of the upper tiers [2,3,6,7,42]. This interaction is particularly evident between corporate and business strategies. Consequently, a sustainable corporate strategy serves as a benchmark for a sustainable business strategy, and conversely, the outcomes derived from a sustainable business strategy bolster the attainment of a sustainable corporate strategy [69–71]. This reasoning serves as the foundation for Proposition 4.

Proposition 4. *A dynamic interplay exists between top-down directives and bottom-up contributions within strategies, where the sustainable corporate strategy establishes guidance and priorities for the sustainable business strategy. In turn, the performance derived from implementing the sustainable business strategy is anticipated to bolster and aid in realizing the performance objectives set forth in the sustainable corporate strategy.*

There is a consensus among academics that operations strategy encompasses both structural and infrastructural decisions [2,7,9–11]. Structural decisions pertain to aspects such as capacity, location, facilities, process technology, and sourcing and supply chain management, all of which significantly impact the physical layout of the operations system. In contrast, infrastructural decisions involve policies, systems, and standards that complement structural choices within a firm's operational activities. These infrastructural considerations may include product and/or service development, quality management, production planning, inventory control, and organizational structure. The interplay between structural and infrastructural decisions is essential for enhancing operational performance, which in turn supports the attainment of sustainability objectives [72,73]. These premises provide support for Proposition 5.

Proposition 5. *A sustainable operations strategy encompasses a series of decisions made by organizations to lay the groundwork for their operational resources, processes, and capabilities. These decisions are categorized into structural and infrastructural components. Structural decisions pertain to aspects such as capacity, location, facilities, process technology, and sourcing and supply chains. In contrast, infrastructural decisions involve the establishment of policies, systems, and standards that govern product and service development, quality assurance, production planning, inventory management, and organizational structure. Collectively, these strategic choices aim to enhance the effectiveness of sustainable operations, ultimately contributing to sustainable performance.*

Strategic decisions regarding sustainable operational strategies play a crucial role in enhancing a firm's operational resources [2,7,33,74,75]. These resources serve as the foundation for operational processes aimed at producing goods and/or services for customers while meeting external requirements that align with the objectives of the triple bottom line [36,38,72]. Furthermore, the implementation of sustainable operational processes is designed to develop a firm's capabilities, ultimately fostering the establishment of sustainable competitive advantages [76–78]. This rationale serves as the foundation for Proposition 6.

Proposition 6. *Strategic operational strategy decisions involving both structural and infrastructural shape the resources of a company, which are utilized to meet customer demands and other external obligations. These resources are further employed through various processes to enhance the firm's capabilities, thereby strengthening its competitive position within the industry. It is anticipated that sustainable operational strategies will play a significant role in achieving sustainable operational performance to support sustainable business strategy objectives.*

Table 2. Theoretical propositions and references.

Proposition	References
Proposition 1	[16,24,35,58–60]
Proposition 2	[12,40,42,60–64]
Proposition 3	[2,12,18,42,62,64–66,74,75]
Proposition 4	[2,3,6,7,42,67–69]
Proposition 5	[2,7,9–11,42,70,71]
Proposition 6	[2,7,33,36,39,72–78]

4. Materials and Methods

This paper encompasses the development and evaluation of theoretical frameworks [79–82]. The establishment of a sustainable operations strategy is grounded in positivist philosophy, which is defined by a deductive reasoning approach [49,83]. The theoretical assessment is performed through a case study [56,84] that centers on the Sei Mangkei Special Economic Zone (SEZ) in Indonesia. A case study is designed to shed light on decision-making patterns, focusing on the inquiries of how and why specific events transpire in a unique contemporary context, particularly when intervention was not feasible for the subject of the study. Research conducted through case studies relies on previously established theoretical propositions to direct the processes of data collection and analysis [56]. A single case study is employed when the case is regarded as unique or exceptional. This particular case is often referred to as an exemplar [55]. Data analysis is a systematic process that entails pattern matching and encompasses multiple stages [56,84,85]. These stages involve recognizing the fundamental ideas of the proposed theoretical frameworks, gathering important empirical data from various sources, comparing these core ideas with the main findings, and determining whether the empirical evidence aligns with or contradicts the core concepts. A range of data sources is utilized for triangulation, facilitating cross-verification to uncover similarities or logical consistency. Furthermore, the primary empirical findings may give rise to new concepts that were not originally considered in the propositions, resulting in the enhancement of the initial theoretical propositions and the overall theoretical framework [13,55,56,84,85].

This research utilizes a qualitative methodology for the purpose of developing and evaluating theories, aiming to illuminate significant decisions or actions regarding the rationale behind the strategic choices made by the management of Sei Mangkei SEZ. These choices reflect a transition from a commitment to corporate sustainability toward the implementation of a sustainable operations strategy.

The choice of this case study is influenced by several factors. Primarily, from an empirical perspective, the Sei Mangkei SEZ is significant, focusing on the processing industries of palm oil and rubber, which are particularly vulnerable to environmental impacts resulting from their operational practices. Secondly, Sei Mangkei Special Economic Zone (SEZ) is acknowledged as one of the first SEZs established in Indonesia. Additionally, the author of this paper was involved in a collaborative research project organized by the Ministry of Transportation of the Republic of Indonesia in 2015, which included various stakeholders during the initial phases of Sei Mangkei SEZ's development, and the author visited the site on two separate occasions. Furthermore, there are accessible published reports concerning Sei Mangkei from multiple sources, including the Secretariat General of the National Council for Special Economic Zones, the national agricultural holding PT Perkebunan Nusantara III (Persero), and The Global Green Growth Institute (GGGI). These data sources provide adequate information for evaluating the proposed theoretical framework of sustainable operations strategy.

5. Results

This Section is divided into two components: the findings related to the Sei Mangkei Special Economic Zone, which serve as the context for the case study, and the outcomes of the theory testing aimed at determining the degree to which the proposed theory of sustainable operations strategy is corroborated by the empirical evidence.

5.1. The Context of the Case Study: Sei Mangkei SEZ

The National Council of Special Economic Zones in Indonesia has reported that the Indonesian Government has implemented down-streaming as a means to increase the value derived from the country's natural resources. This strategy entails the domestic processing and refinement of mineral raw materials and other natural resources before they are exported, rather than simply exporting them in their unprocessed state. As a result, the aim of down-streaming is to encourage the growth of local processing industries, create job opportunities, and enhance state revenues from exports. It is expected that this initiative will strengthen Indonesia's economic framework, rendering it more diverse and less dependent on the export of raw materials.

Special Economic Zones (SEZs) play a vital role in promoting the down-streaming process and strengthening economic resilience, especially in Indonesia. These zones are designed to function as new centers of economic growth by providing a range of incentives, facilities, and conveniences for investors and business operators. The main aim is to draw in both domestic and international investments, thus accelerating the down-streaming process. Presently, there are twenty Special Economic Zones distributed across Indonesia from west to east, categorized into sectors such as production and processing; logistics and distribution; research, digital economy, and technology development; tourism; energy development; education; health; sports; financial services; and creative industries.

Sei Mangkei Special Economic Zone (SEZ) is classified as a production and processing SEZ and is situated in North Sumatera Province, Indonesia. It is located approximately 115 km from Kuala Namu International Airport, which translates to a travel time of about three hours by car. Additionally, Sei Mangkei SEZ is linked to the North Sumatera Railway Network, providing access to Kuala Tanjung Port, a key global hub within the Economic Corridor I of North Sumatera [86].

The chronological development of the Sei Mangkei Special Economic Zone (SEZ) can be traced through its regulatory framework. It commenced with the enactment of the Government of Indonesia's national constitution No. 39 in 2009, which pertains to the establishment of special economic zones within the country. This legislation serves as the foundational legal framework for all subsequent SEZs in Indonesia. Following this, a presidential decree was issued to establish the National Council of SEZ under the Government of Indonesia. In 2012, the Regency of Simalungun in Northern Sumatera Province enacted two local regulations that outlined the Regional Spatial Plan for the construction of Sei Mangkei SEZ, designating the state-owned enterprise PTPN III as the developer for this project.

In 2016, a presidential decree aimed at accelerating the implementation of the National Strategic Project (PSN) enabled the development of the Sei Mangkei Special Economic Zone (SEZ) along with its associated infrastructure. In 2021, the Government of Indonesia introduced a new regulation governing the management of SEZs. The Special Economic Zone, co-managed by PT Perkebunan Nusantara III (Persero) and PT KINRA, is primarily centered on the palm oil processing sector and the rubber processing industry.

5.2. Empirical Findings for Theory Testing

The outcomes of the theoretical examination present the empirical evidence that supports the degree to which the management of Sei Mangkei SEZ has been applying the principles of sustainable operations strategy. This analytical approach is based on the concept of pattern matching [56,84].

5.2.1. Empirical Findings for Proposition 1

The primary ideas presented in Proposition 1 encompass the international landscape encountered by companies and their dedication to corporate sustainability. A summary of the empirical evidence pertaining to this proposition is provided below.

a. The production activities of palm oil and rubber are aimed at both export and domestic markets. The international market is governed by strict environmental regulations. Consequently, adherence to these standards is essential for the sustainability of enterprises functioning within the Sei Mangkei Special Economic Zone (Secretary of the National Council for Special Economic Zone [85–87].
b. The commitment to corporate sustainability entails a policy established by the parent company mandating that all subsidiary entities, including Sei Mangkei SEZ, embrace sustainability principles. Consequently, the management of Sei Mangkei SEZ is obligated to implement business practices and industrial development strategies that foster green economic growth. This initiative encompasses five primary objectives: the reduction in greenhouse gas (CO_2) emissions; the promotion of sustainable economic growth; the facilitation of inclusive and equitable growth; the enhancement of social, economic, and environmental resilience; and the establishment of a healthy and productive ecosystem for service providers [88,89].

5.2.2. Empirical Findings for Proposition 2

Proposition 2 emphasizes the importance of a sustainable corporate strategy, which encompasses the organization's mission, vision, values, choice of business sectors, and governance structure. The empirical evidence related to these concepts is presented in the following sections.

a. Vision of the company is "Creating a modern industrial city that is highly competitive and environmentally friendly through the development of optimal processing of local natural resources". [86].
b. The firm's mission is to develop contemporary urban environments utilizing oil palm, rubber, and other local natural resources, with a focus on enhancing value addition. It aims to deliver superior integrated infrastructure that is environmentally sustainable, actively attract potential national and multinational investors to the region, collaborate with governmental bodies and key strategic partners to foster regional development, and ensure exceptional service for all tenants within the area. [86].
c. Corporate values include Knowledgeable, Integrity, Networking, Responsiveness, and Ambitious. [88,89].
d. The company's operational sectors encompass a specialized division for industrial centers centered around oil palm and rubber. These sectors are primarily concentrated on the development, management, and marketing of the Sei Mangkei Special Economic Zone. [86].
e. The governance structure of Sei Mangkei is aligned with the policies established by its parent company. According to the 2023 Annual Report and the 2022 Sustainability Report published by PT Perkebunan III, the parent company emphasizes the importance of both effective corporate governance and sustainability governance as essential components of its business operations. The principles of good corporate governance are encapsulated in five key tenets: transparency, accountability, responsibility, independence, and fairness. In terms of sustainability governance, the focus is placed on three critical performance indicators: obtaining RSPO certification, engaging in purchasing from smallholder farmers, and executing decarbonization initiatives. [88,89].

5.2.3. Empirical Findings for Proposition 3

The fundamental ideas associated with Sustainable business strategy in Proposition 3 involve the synchronization of external demands with the internal operational sustainable

capabilities, the strategic positioning of a firm, and its inherent capabilities. External demands pertain to the needs of customers and stakeholders. A summary of empirical evidence is presented as follows:

a. External requirements encompass adherence to all pertinent policies established by the parent company, specifically the state-owned agricultural enterprise, as well as compliance with governmental regulations. Tenants seek adequate supporting facilities and services to facilitate their business operations [85–89].
b. Internal capabilities encompass the ability to respond, adapt, and innovate. The capacity for responding and adapting addresses the ongoing impacts of COVID-19 and aligns with the pursuit of operational excellence, commercial success, asset optimization, and strategic alliances. As mentioned previously in Proposition 1, the organization is anticipated to play a role in promoting green growth across five key performance dimensions. The capability for innovation is cultivated to unlock new business opportunities, with a strong emphasis placed on the company's role in this process [85,86].
c. The strategic location of the firm establishes it as an appealing eco-industrial park that prioritizes environmental sustainability and is in proximity to the international hub port of Kuala Tanjung, thereby facilitating international exports via the Malacca Strait. This is the positioning of Sei Mangkei SEZ [85,86].
d. The alignment process has been carried out across multiple functions within the company, encompassing business support, finance, accounting, and management systems, as well as operations, engineering and maintenance, water treatment, wastewater treatment, and human resources, general affairs, and procurement. This coordination has been implemented to ensure the quality and timely delivery of services that fulfill the needs of their tenants [85,86].

5.2.4. Empirical Findings for Proposition 4

This proposal addresses the alignment between top-down directives and bottom-up contributions. Top-down directives pertain to the guidance provided by higher-level strategies to their lower-level counterparts, while bottom-up contributions refer to the input from lower-level strategies to their higher-level frameworks. The empirical findings are summarized below.

a. Directives originating from higher-level institutions, including the National Planning Agency, the National Council of SEZ, the Ministry of State-owned Enterprises, and the parent company, significantly influence the operations of Sei Mangkei SEZ. According to a report by the Global Green Growth Institute [90], the National Planning Agency of Indonesia has acknowledged the necessity of embracing and executing the principles of green economic growth within the SEZ framework in Indonesia, and this approach has been duly integrated into the development of Sei Mangkei SEZ.
b. The National Council of Special Economic Zones (SEZ) anticipates that the SEZs in Indonesia will play a significant role in advancing the relevant sustainable development goals [87]. The Ministry of State-Owned Enterprises (SOE) has mandated that all SOEs in Indonesia embrace the fundamental values of AKHLAK, which include Trust, Competence, Harmony, Loyalty, Adaptability, and Collaboration. Furthermore, the parent company, PT Perkebunan III, has instructed its subsidiary companies to actively support the sustainable development goals and the principles of sustainability governance as outlined by PT Perkebunan Nusantara III [87–89].
c. The bottom-up contribution pertains to the responses and effectiveness of the management at Sei Mangkei Special Economic Zone (SEZ) in aligning with the expectations of higher-level institutions regarding the attainment of sustainable development goals or the triple-bottom-line performance. According to the 2023 Annual Report from the National Council of SEZ, by the end of 2023, the total investment had approached nearly 14 trillion rupiahs (equivalent to USD 933.3 million at an exchange rate of 15,000 rupiahs per USD), resulting in the employment of 2427 individuals [87].

5.2.5. Empirical Findings for Proposition 5

This proposition addresses the strategy of sustainable operations, which encompasses the decision-making patterns employed by companies to build a solid foundation for their operational resources, processes, and capabilities. These decisions include both structural and infrastructural elements. The empirical findings are summarized as follows:

a. Structural decisions encompass land use, facilities, and infrastructure. The Sei Mangkei Special Economic Zone spans a total area of 1993.8 hectares, which is categorized into three primary sectors: the palm oil industry, the rubber industry, and various supporting industries. The infrastructure includes a power house with a capacity of 150 KV and 60 MVA, a biomass power plant generating 3.5 megawatts, toll road access, and a railway line leading to Kuala Tanjung port. Additionally, there is a gas supply system with a capacity of 75 MMSCFD, a water treatment facility capable of processing 250 m^3 per hour, a crude palm kernel oil storage tank with a capacity of 6000 tons, a crude palm oil storage tank with a capacity of 25,000 tons, a dry port with a capacity of 2300 TEUs, and a fiber optic network. According to the company's management, the number of tenants and their operational activities are significantly influenced by the available land and, in particular, the capacity of the waste treatment facility [85,86].
b. Infrastructural decisions encompass policies, systems, and standards. The parent company, PT Perkebunan Nusantara III (Persero), has established a policy for the development and management of the Sei Mangkei Special Economic Zone (SEZ) that embraces the Eco-Industrial Park philosophy. This approach focuses on utilizing natural resources derived from plantations in Northern Sumatra, specifically in the palm and rubber sectors. The transformation of these natural resources into high-quality upstream products must adhere to principles of sustainability and environmental friendliness. In terms of product management, the implementation of traceability aligns with quality system standards and certifications recognized both nationally and internationally, such as RSPO and ISPO. Additionally, Sei Mangkei SEZ has achieved various ISO certifications, including ISO 9001 for Quality Management, ISO 37001 for Anti-Bribery Management Systems, and ISO 45001 for Occupational Health and Safety Management [88,89].

5.2.6. Empirical Findings for Proposition 6

This proposal encompasses several key concepts, including resources, processes, capabilities, and leverage. The empirical findings are summarized as follows:

a. Resources can be categorized into tangible and intangible types. Tangible resources arise from the structural decisions made by the organization and the backing provided by governmental entities. As previously noted, elements such as land and its geographical positioning, along with facilities and infrastructure, constitute the company's resources. On the other hand, intangible resources encompass various ISO standards that the organization has successfully attained [88,89].
b. The processes encompass product management, supply chain management, distribution management, and waste management. In the realm of product management, Sei Mangke SEZ adheres to the parent company's dedication to responsible sustainable development, acknowledging the environmental implications of fresh fruit bunches (FFB) suppliers. This is achieved by harmonizing local economic advancement with environmental conservation. By instituting traceability in FFB procurement, the company can mitigate environmental risks, which includes tracking the origin of the FFB at the plantation level and the processing factory for crude palm oil (CPO). In terms of supply chain management, the commitment to sustainability extends beyond the company's immediate operations to encompass all suppliers, including smallholder farmers and independent cooperatives, for the procurement of additional raw materials necessary for processing across all factories within the SEZ. Furthermore, the company is responsible for educating suppliers and intermediaries

about the traceability and sustainability standards that must be adhered to. Regarding distribution management, products or commodities from Sei Mangkei SEZ to external destinations will be transported via trains or trucks. Initially, trains were prioritized due to considerations of economic efficiency and safety [85,86].

c. The operational capabilities of the management at Sei Mangkei Special Economic Zone are centered on delivering services to their tenants through the implementation of ISO standards, specifically ISO 9001 [91], ISO 37001 [92], and ISO 45001 [93], along with wastewater treatment initiatives. Tenants engaged in palm oil production are mandated to obtain certifications from the Roundtable on Sustainable Palm Oil (RSPO) and the Indonesia Sustainable Palm Oil (ISPO) to align with Indonesia's sustainable triple-bottom-line goals. These objectives encompass the safeguarding of workers' rights, enhancement of productivity, reduction in workplace accidents, inclusion of smallholders, mitigation of greenhouse gas emissions, improved waste management practices, adherence to regulatory requirements, and bolstering market confidence.

d. In order to capitalize on its strengths and locational advantages, the organization has utilized its facilities and supporting infrastructure to cater to its current tenants while also seeking to draw in additional foreign investors. According to the 2023 Annual Report from the National Council of Special Economic Zones (2024), the company has been in discussions with foreign investors from Türkiye, India, and Malaysia regarding palm oil-based products [87].

The key empirical findings associated with all propositions yield significant outcomes in the context of theory testing. The primary concepts outlined in Proposition 1 are substantiated by empirical evidence pertaining to the global business environment and the commitment to corporate sustainability. Additionally, the empirical findings regarding sustainable corporate strategy lend support to Proposition 2, particularly as the company's vision and mission are aligned with the principles of an eco-industrial city. Proposition 3, which focuses on sustainable business strategy, is reinforced by empirical evidence indicating the company's intention to establish itself as an eco-industrial park.

The top-down approach of the National Planning Agency's policy promoting green economic growth for Special Economic Zones (SEZs) in Indonesia aligns with Proposition 4. Furthermore, the contributions regarding the level of investment and the workforce by the conclusion of 2023 have bolstered this assertion. Empirical evidence related to structural and infrastructural choices indicates a certain level of endorsement for Proposition 5, which pertains to sustainable operational strategies. Structural decisions encompass land allocation, site selection, facilities, and the necessary infrastructure for the palm oil and rubber industries. Additionally, the capacity for wastewater treatment is utilized to substantiate business operations in the region. Infrastructural decisions, which involve policies, systems, and standards, also lend support to Proposition 5, with the observation that the management of the Special Economic Zone must prepare for ISO 14000 certification.

Proposition 6 encompasses operational resources, processes, capabilities, and the application of these capabilities within markets. The resources stem from both structural and infrastructural decisions previously discussed in Proposition 5. The processes are specifically tailored to meet the needs of tenants, particularly those engaged in the palm oil and rubber industries. Capabilities have been cultivated to ensure performance is aligned with the triple bottom line. From a leverage standpoint, these capabilities have been strategically utilized to attract foreign direct investment, encouraging businesses to set up operations in this Special Economic Zone (SEZ). In conclusion, these observations substantiate Proposition 6.

In light of the results of theory testing of sustainable operations strategy theory, a visual representation or diagram [13] may serve as an enhancement to the theoretical framework. This is shown in Figure 2. It has been noted that Figure 2 acts as an improvement over Figure 1 by introducing two additional concepts. In particular, local core values have been

incorporated into the "Values" concept, and Good Corporate Governance has been added as a facet of the "Adoption of sustainability governance" concept.

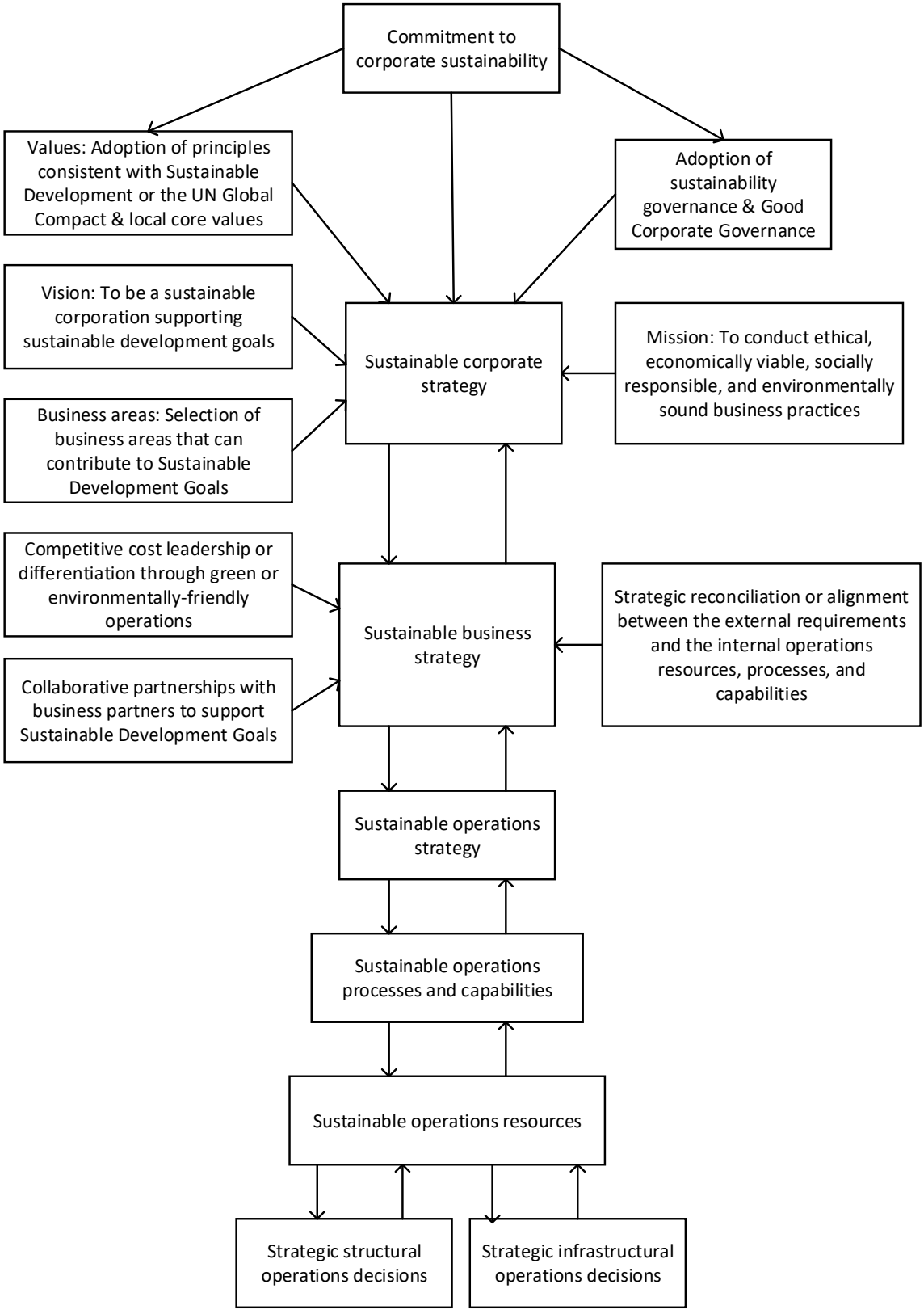


Figure 2. Refined theoretical framework of sustainable operations strategy theory.

6. Discussion

To facilitate the equitable distribution of economic development throughout Indonesia, the government has embarked on a significant initiative with the establishment of Special Economic Zones (SEZs), which began in 2014. The government acknowledges the importance of boosting investment by developing regions that offer both economic advantages and geostrategic significance. This approach has been previously implemented in various nations, as highlighted by numerous scholars [94–104]. This supports the notion that the Government of Indonesia's initiative aligns with practices observed in other countries.

The aspiration to create an eco-industrial city and establish an eco-industrial park aimed at bolstering the global business profile of the Sei Mangkei Special Economic Zone (SEZ) is consistent with similar initiatives observed in various nations [105–113]. This finding underscores the Indonesian government's dedication to establishing Sei Mangkei SEZ as an environmentally sustainable project on par with international standards.

The theoretical background indicates that the field of operations strategy has been extensively studied and has reached a level of maturity. However, the global agreement on sustainable development has introduced a new dimension to this field, specifically sustainable operations strategy. While there is a wealth of literature on sustainable operations management, there remains a notable scarcity of published research focused on sustainable operations strategy. Consequently, further investigation into sustainable operations strategy, particularly in terms of theoretical advancements, has the potential to enhance the current knowledge base in this domain. Additionally, incorporating specific contexts, such as developing nations or emerging economies, will further enrich this field from a practical standpoint. Furthermore, employing Special Economic Zones (SEZ) as an additional unit of analysis can enhance the generalizability of the sustainable operations strategy theory. The findings from theory testing have illuminated the practical applications of the proposed theory, suggesting that it may evolve from a localized and context-specific framework into a middle-range theory applicable to a diverse array of units of analysis.

The progression of scientific advancement is characterized by both top-down and bottom-up dynamics [45]. From a top-down perspective, the proposed theoretical framework for sustainable strategy has undergone empirical validation within a Special Economic Zone (SEZ) in an emerging nation, with all hypotheses receiving support. Conversely, from a bottom-up perspective, some evidence suggests the need for minor adjustments to the proposed theoretical framework concerning values and governance. In addition to the global values articulated in [12], the context of the Sei Mangkei SEZ emphasizes local, contextual core values as dictated by the primary stakeholder, the Ministry of State-owned Enterprises. The widely recognized principles of sustainability governance, as discussed by various scholars, do not necessarily diminish the significance of effective corporate governance, which has also been embraced by the management of the Sei Mangkei SEZ.

A robust theory necessitates coherence between its theoretical framework and empirical validation. From an empirical standpoint, this study enhances the existing literature by introducing a new case: the special economic zone (SEZ) within the emerging economy of Indonesia. The results of this research, in conjunction with findings from similar contexts, particularly those related to special economic zones, will facilitate the advancement of both knowledge and practices relevant to this field, benefiting SEZ operators and their governing bodies. Furthermore, the inclusion of empirical evidence from diverse cases will contribute to a more comprehensive understanding of operations strategy.

7. Conclusions

The results of this research, which is grounded in a single case study and employs a qualitative methodology, hold considerable implications for both theoretical frameworks and practical applications as outlined below.

- This research enhances the current body of knowledge regarding sustainable operations strategy by emphasizing the vital importance of corporate sustainability commitment in the setting of an emerging economy, illustrated through a qualitative

case study of a special economic zone (SEZ). The findings of this case study reveal both top-down and bottom-up viewpoints related to significant strategic decisions undertaken by the management of the SEZ. These decisions pertain to the adoption of and adherence to external expectations established by its parent holding company, local authorities, and institutions of the Indonesian central government.

- The proposed theoretical framework for sustainable operations strategy offers avenues for future research and development. This can be accomplished by expanding the fundamental concepts related to corporate sustainability, corporate strategy, business strategy, and operations strategy.
- This research is based on an individual case study utilizing a qualitative approach, which naturally limits its ability to be generalized [15,55,56]. To improve its theoretical relevance, future investigations should prioritize both the advancement of theory and empirical testing [79]. This could be achieved, for example, through the implementation of multiple case studies that allow for comparisons among various cases, thus revealing shared elements in essential concepts or notable themes that may aid in the development of a robust middle-range theory [55,56].
- From a practical perspective, various implications emerge regarding the management of the Special Economic Zone (SEZ). Empirical studies have identified four significant future challenges that must be addressed to foster the growth of the Sei Mangkei SEZ. These challenges encompass the establishment of operational efficiency, the pursuit of commercial success, the optimization of resources, and the formation of strategic alliances.
- The management of Sei Mangkei SEZ should undertake several essential initiatives, including the establishment of strategic alliances with both domestic and international business partners to facilitate corporate expansion. Additionally, there should be ongoing efforts to achieve ISO 14001 certification [114], alongside the advancement of technology-driven value-added processing of local raw materials. These actions aim at bolstering local processing industries, creating job opportunities, and increasing government revenues from the export sector.

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