

# DYNAMIC CAPABILITIES AND ECONOMIC SUSTAINABILITY OF PETROLEUM TANK FARMS IN SOUTH-SOUTH, NIGERIA.

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## Abstract

The study investigated the relationship between dynamic capabilities (dimensioned by sensing capabilities, seizing capabilities and reconfiguring capabilities) and economic sustainability of petroleum tank farms in South-South, Nigeria. The theoretical foundation of this study was grounded by the Dynamic Capabilities Theory and the Moral Responsibility Theory of Corporate Sustainability, while the positivist philosophical paradigm underpinned the study. The research adopted a cross-sectional survey design with a structured questionnaire based on a Likert's five-point scale. The elements of the accessible population are 820 middle and top level managers of the 29 petroleum tank farms in South-South, Nigeria. The Krejcie and Morgan's table was utilized to determine a sample size of 262 respondents, and the simple random sampling was adopted. The partial least squares structural equation modeling was deployed to test the hypotheses at the 0.05 significance level. The findings revealed that there is a strong positive and significant relationship between sensing capabilities and economic sustainability. Moreso, there is a weak positive and statistically significant relationship between seizing capabilities and economic sustainability. Furthermore, there is a weak positive but not significant relationship between reconfiguring capabilities and economic sustainability of petroleum tank farms in South-South, Nigeria. It was concluded that the ability of petroleum tank farms to gather and interpret market information is crucial for their economic sustainability, while their ability to seize opportunities contributes to a lesser degree. However, reconfiguring capabilities, may not directly affect sustainability outcomes in the same way. It was recommended that Managers of petroleum tank farms should **enhance sensing capabilities** by investing in strengthening their market research and information-gathering processes, in order to remain competitive and ensure long-term economic sustainability. Furthermore, Management of petroleum tank farms should **leverage seizing capabilities** by improving their ability to quickly exploit new opportunities, aligning

*internal resources and focusing on innovation as a means of achieving economic sustainability.*

**Key words:** *Dynamic capabilities; Economic Sustainability; Petroleum tank farms*

## Introduction

Petroleum tank farms play a crucial role in Nigeria's oil and gas sector by ensuring the efficient storage, handling, and distribution of petroleum products, thereby stabilizing supply and preventing fuel shortages across the country (Adeniyi & Olagoke, 2020). However, these tank farms face several challenges such as: infrastructural deficit, exchange rate risk, as well as regulatory and bureaucratic hurdles (Ogunbayo & Mohammed, 2018). These challenges result to weak economic sustainability of these tank farms. The economic sustainability of petroleum tank farms in Nigeria is critical for the stability and growth of the nation's oil and gas industry. Ensuring their economic sustainability is essential for maintaining fuel supply security and avoiding disruptions that could negatively impact the Nigerian economy (Okolie & Amadi, 2021). Moreover, economic sustainability fosters long-term investments in infrastructure and technology, enhancing efficiency and safety in petroleum handling. (Adesanya & Ogbonna, 2020). **Economic sustainability** refers to the capacity of an economic system to support a defined level of economic production indefinitely. It involves the efficient use of resources to maintain production and improve living standards without depleting natural resources or causing environmental degradation for future generations (Barbier, 2019). Several suggested **predictors of economic sustainability** include: **resource efficiency** (Rao & Holt, 2020), **innovation and technology adoption** (Porter & Kramer, 2019), **strong governance and regulatory compliance**, (Okoye & Eze, 2021), **environmental stewardship** (Barbier, 2019), **social equity and corporate responsibility** (Bebbington & Unerman, 2018). However, this study adopts dynamic capabilities as the predictor of economic sustainability, where dynamic capabilities refers to an organization's

ability to build, integrate, and reconfigure internal and external resources to adapt to rapidly changing environments. This concept emphasizes the importance of a firm's ability to develop new skills, innovate, and adjust strategies in response to shifting market conditions and technological advancements, in order to remain competitive. Dynamic capabilities enable firms to remain competitive by adapting to uncertainty and change. Companies that develop strong dynamic capabilities are better positioned to sustain long-term competitive advantages in industries characterized by rapid technological change and market volatility (Eisenhardt & Martin, 2000). According to Teece (2018), dynamic capabilities involve three core processes: **sensing** opportunities and threats, **seizing** those opportunities through strategic decisions, and reconfiguring organizational resources in order to adapt to the dynamic changes in the business environment. Therefore, this study sought to establish the link between dynamic capabilities and economic sustainability of petroleum tank farms in South-South, Nigeria.

### Statement of the Problem

The problem of this study is weak economic sustainability of petroleum tank farms in South-South, Nigeria. The manifestations of the problem include frequent supply disruptions caused by poor maintenance of infrastructure, leading to leaks, accidents, and inefficiencies in resource management (Ogunleye & Fashola, 2019). Another manifestation is high operational costs due to outdated technologies and inefficient practices, which limit long-term profitability and resilience to market changes (Adebayo, 2020). Additionally, environmental degradation, stemming from oil spills and improper waste management, incurs legal penalties and cleanup costs, further straining economic sustainability (Okafor & Ezech, 2021). Weak economic sustainability of petroleum tank farms in South-South Nigeria can be attributed to several underlying causes such as: infrastructural deficit (Ogunleye & Fashola, 2019), lack of technological innovation (Adebayo, 2020), regulatory challenges (Okafor & Ezech, 2021), and poor waste management which leads to costly penalties (Adesanya & Ogbonna, 2020). Moreover, the emergence of the Dangote Refinery is expected to significantly impact the economic sustainability of petroleum tank farms in Nigeria, particularly by reshaping the supply chain and distribution of petroleum products. A possible impact of the Dangote refinery is **increased local supply of refined petroleum products**, reducing the country's reliance on imports, thus, import-

dependent tank farms may face competitive pressure. Additionally, tank farms which are not located in close proximity to the refinery may suffer from higher transportation costs and this will reduce profitability (Olawale & Akintoye, 2020). The effects of weak economic sustainability of petroleum tank farms in South-South Nigeria include fuel shortages and higher fuel prices, which negatively impact businesses and individuals (Ogunleye & Fashola, 2019), increased operational costs, reducing profitability and limiting job opportunities in the region (Adebayo, 2020), damaged local ecosystems, leading to costly cleanup efforts and legal penalties (Okafor & Ezech, 2021). Moreover, the weak economic sustainability discourages investment, as investors are reluctant to fund underperforming tank farms, hindering modernization and technological advancement (Adesanya & Ogbonna, 2020). This cycle of inefficiency and financial instability ultimately reduces the competitiveness of Nigeria's downstream oil sector.

Indeed, several strategic solutions has been suggested as predictors of economic sustainability of petroleum tank farms in Nigeria, such as: **infrastructure modernization and investment** (Adebayo, 2020), **adoption of stricter environmental and safety standards** (Ogbonna & Okoli, 2019), **resource efficiency** (Rao & Holt, 2020), **innovation and technology adoption** (Porter & Kramer, 2019), **strong governance and regulatory compliance**, (Okoye & Eze, 2021), **environmental stewardship** (Barbier, 2019), **social equity and corporate responsibility** (Bebbington & Unerman, 2018), as well as **diversification of income streams** (Adesanya & Ogbonna, 2020). Despite these suggested solutions, the problem of weak economic sustainability of petroleum tank farms is still apparent in South-South, Nigeria. Moreover, literature review indicates that studies that have deployed partial least squares-structural equations modelling to ascertain the link between dynamic capabilities and economic sustainability, especially within the domain of petroleum tank farms in South-South, Nigeria, are scant. This reveals a possible contextual and methodological gap in literature. Therefore, this study sought to fill the lacuna by critically assessing the nexus between dynamic capabilities (dimensioned by sensing capabilities, seizing capabilities and reconfiguring capabilities) and economic sustainability of petroleum tank farms in South-South, Nigeria.

In view of the foregoing, the specific objectives were to:

- i. Ascertain the relationship between sensing capabilities and economic sustainability of petroleum tank farms in South-South, Nigeria.
- ii. Determine the relationship between seizing capabilities and economic sustainability of petroleum tank farms in South-South, Nigeria.
- iii. Investigate the relationship between reconfiguring capabilities and economic sustainability of petroleum tank farms in South-South, Nigeria.

Sequel to the stated objectives, the following research questions were listed:

- I. What is the relationship between sensing capabilities and economic sustainability of petroleum tank farms in South-South, Nigeria.
- II. How does seizing capabilities relate with economic sustainability of petroleum tank farms in South-South, Nigeria.

- III. What is the relationship between reconfiguring capabilities and economic sustainability of petroleum tank farms in South-South, Nigeria.

Accordingly, the following null hypotheses were formulated to provide tentative answers for the research questions:

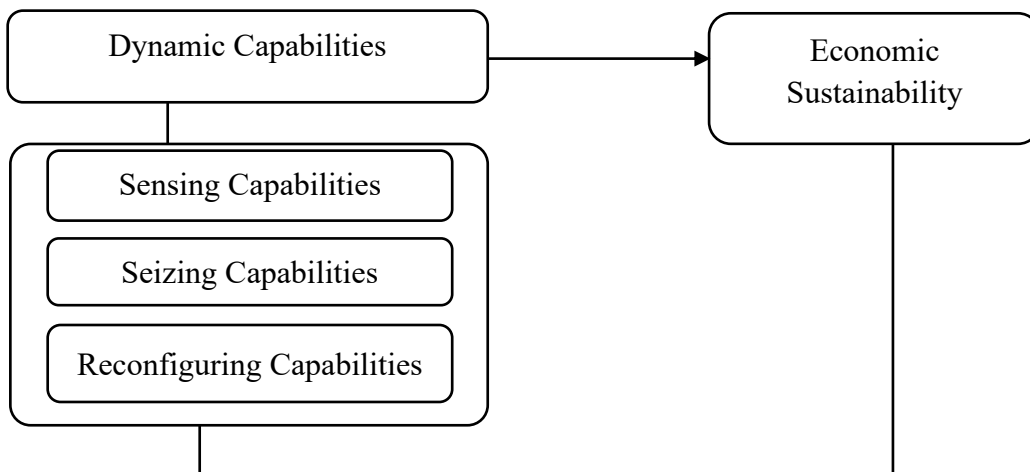
**H<sub>01</sub>:** There is no significant relationship between sensing capabilities and economic sustainability of petroleum tank farms in South-South, Nigeria.

**H<sub>02</sub>:** There is no significant relationship between seizing capabilities and economic sustainability of petroleum tank farms in South-South, Nigeria.

**H<sub>03</sub>:** There is no significant relationship between reconfiguring capabilities and economic sustainability of petroleum tank farms in South-South, Nigeria.

## 2.0 Literature Review

### 2.1 Conceptual Framework:



**Figure 1:** Conceptual Framework dynamic capabilities and economic sustainability of petroleum tank farms in South-South, Nigeria.

**Source:** Conceptualised by the Researcher. Dimensions of Dynamic Capabilities were adapted from *Kump, Engelmann, Kebler, and Schweiger (2019); Oluigbo-Moses and Nwankwo (2023); Teece (2018)*, while items used to measure Economic were adapted from *Cella-De-Oliveira (2013)*.

**Dynamic Capabilities:** Dynamic capabilities refer to an organization's ability to systematically build, integrate, and reconfigure internal and external resources to adapt to rapidly changing environments. This concept, introduced by Teece, Pisano, and Shuen (1997), emphasizes the importance of a firm's capacity to innovate, change strategies, and respond to market shifts to maintain a competitive advantage. Unlike operational capabilities, which focus on maintaining current performance levels, dynamic capabilities enable organizations to modify their resource base and processes to meet emerging

challenges and opportunities. According to Teece (2007), dynamic capabilities consist of three core processes: **sensing opportunities and threats, seizing opportunities, and transforming resources** to maintain competitiveness.

**Sensing Capabilities:** Sensing capabilities refer to an organization's ability to identify and assess opportunities and threats in its external environment. This is a core component of dynamic capabilities, as it involves gathering information about market trends, technological advancements, customer

needs, and competitor activities, and using that information to make strategic decisions (Teece, 2007). Sensing capabilities enable firms to stay ahead of their competitors by recognizing shifts in the market and emerging opportunities before they become widely apparent. According to Teece (2007), sensing involves processes such as scanning, searching, and exploring across technological, market, and competitive landscapes. Moreover, firms with well-developed sensing capabilities can anticipate disruptions, such as regulatory changes or competitor actions, and take preemptive action to mitigate risks (Augier & Teece, 2009; Mama & Onuoha, 2020).

**Seizing Capabilities:** Seizing capabilities refer to an organization's ability to take advantage of opportunities identified through its sensing capabilities. Once a firm detects a market shift, emerging technology, or new customer demand, seizing capabilities allow the organization to mobilize resources, make strategic decisions, and commit to actions that capitalize on those opportunities (Teece, 2007). Seizing involves the timely deployment of resources, investments in innovation, and reconfiguring business models to align with changing market conditions. Teece (2007) notes that seizing capabilities require firms to make decisive choices about where and how to allocate resources, including investments in new products, processes, or technologies. Moreover, seizing capabilities often require overcoming organizational inertia and resistance to change. Companies with strong seizing capabilities are able to act swiftly and decisively, ensuring that they capture value from market opportunities before competitors do (Augier & Teece, 2009).

**Reconfiguring Capabilities:** Reconfiguring capabilities refer to an organization's ability to realign, reconfigure, and transform its resources and processes to adapt to new market conditions and sustain long-term competitiveness. This is one of the core components of dynamic capabilities and involves modifying the organization's asset base, business models, and operational structures to respond to external changes effectively (Teece, 2007). Reconfiguring capabilities enable firms to remain flexible and responsive by continually reshaping their strategies, structures, and processes to address new challenges or seize emerging opportunities. According to Teece (2007), reconfiguring involves activities such as redeploying existing resources, acquiring new capabilities, or shedding outdated ones to maintain strategic alignment with market demands. This process

ensures that a firm can not only respond to current challenges but also anticipate future changes in the business environment. For example, a company might reconfigure its operations by shifting from a product-centric model to a service-oriented one, or by adopting new digital technologies to enhance efficiency and customer engagement. Eisenhardt and Martin (2000) suggest that reconfiguring capabilities are particularly critical in dynamic industries where technological advancements and market conditions change rapidly. Thus, firms with strong reconfiguring capabilities are better equipped to innovate continuously and adjust their business models to remain competitive.

**Economic Sustainability:** Economic sustainability refers to the ability of an organization to maintain stable and continuous economic growth over time while effectively managing its resources. It involves balancing present economic development with the need to ensure future prosperity without depleting natural resources, causing environmental damage, or creating long-term financial instability. Economic sustainability focuses on achieving long-term value creation by promoting practices that support financial health, environmental protection, and social well-being (Goodland, 2020). Barbier (2019) explains that economic sustainability requires optimizing the use of resources to generate wealth and improve living standards, while also considering the environmental and social costs of economic activities. This concept is crucial for businesses and economies that aim to remain competitive in the long run by investing in sustainable practices, such as resource efficiency, technological innovation, and responsible governance. Economic sustainability also emphasizes equity in resource distribution, ensuring that future generations can enjoy the same or better quality of life as the current population. From a business perspective, economic sustainability involves practices that ensure long-term profitability without compromising environmental or social responsibilities. Companies that adopt sustainable business models are more resilient to market fluctuations, regulatory changes, and resource shortages, which enhances their ability to sustain operations over time (Bebbington & Unerman, 2018).

**Theoretical Review:** The theoretical foundation of this study was grounded by the Dynamic Capabilities Theory and the Moral Responsibility Theory of Corporate Sustainability.

**Dynamic Capability Theory:** The **Dynamic Capabilities Theory** was introduced by Teece, Pisano, and Shuen (1997) and focuses on a firm's ability to integrate, build, and reconfigure internal and external resources in response to rapidly changing environments. This theory posits that organizations that develop strong dynamic capabilities—such as sensing opportunities, seizing them, and reconfiguring their resources—are better equipped to maintain competitive advantage in volatile industries. It emphasizes the importance of adaptability, innovation, and strategic flexibility, particularly in industries characterized by constant change, such as the petroleum industry. In the context of the **petroleum tank farms in South-South Nigeria**, the Dynamic Capabilities Theory is highly relevant as these firms operate in an industry that faces challenges such as fluctuating global oil prices, regulatory changes, environmental pressures, and supply chain disruptions. Developing dynamic capabilities can help petroleum tank farms enhance their **economic sustainability**, which refers to their ability to maintain long-term profitability and operational efficiency while effectively managing resources and minimizing environmental and social impacts (Goodland, 2020).

**Moral Responsibility Theory of Corporate Sustainability:** The moral responsibility theory of corporate sustainability (**MRTCS**) was developed by Ha-Brookshire (2015). The **MRTCS** posits that businesses have an ethical obligation to operate in

ways that protect and enhance environmental, social, and economic well-being. This theory extends beyond profit-making and highlights that companies must consider the impact of their operations on stakeholders, including future generations, and take responsibility for the sustainability of the planet and society (Garriga & Melé, 2004). According to this theory, corporate sustainability should not only focus on economic performance but also incorporate environmental stewardship and social equity, aiming for a balance that benefits all stakeholders. In the context of **petroleum tank farms in South-South Nigeria**, the MRTCS is highly relevant, especially as these operations are associated with significant environmental risks, such as oil spills, pollution, and ecosystem degradation. Moreover, the MRTCS aligns with the **economic sustainability** of these petroleum tank farms, as ethical and sustainable practices can lead to long-term profitability and operational resilience. Additionally, this theory is relevant to the **dynamic capabilities** of petroleum tank farms, particularly in how they **sense** and **seize opportunities** for sustainability. The MRTCS also encourages firms to develop **reconfiguring capabilities**, allowing them to continuously realign their strategies to address sustainability challenges. Thus, petroleum tank farms in South-South Nigeria can reconfigure their operations by incorporating corporate social responsibility (CSR) initiatives, enhancing stakeholder engagement, and investing in sustainable infrastructure (Bebbington & Unerman, 2018).

**Empirical Reviews:**

**Table 1: Webometrics of Empirical Reviews**

S/N	Author (Date)	Title	Scope	Methodology	Findings	Comparison with Present Study
1.	Ibarra, G. (2020)	<i>Sensing Capabilities and Organizational Sustainability in Energy Firms: A Strategic Perspective</i>	Focuses on energy firms in the Middle East, analyzing the relationship between sensing capabilities and organizational sustainability.	Quantitative approach using a survey of 150 energy firms; data analyzed using Structural Equation Modeling (SEM).	A significant positive relationship between sensing capabilities and economic sustainability, as firms with strong sensing capabilities were able to adapt to changes and achieve long-term profitability.	Similar to the present study on petroleum tank farms in South-South Nigeria, where sensing capabilities are expected to improve the tank farms' ability to anticipate and respond to market and regulatory changes.

S/N	Author (Date)	Title	Scope	Methodology	Findings	Comparison with Present Study
2.	Okoye, P., & Eze, C. (2021)	<i>Strategic Seizing Capabilities and Economic Performance of Oil and Gas Firms in Nigeria</i>	Focuses on oil and gas firms in South-South Nigeria, investigating the link between seizing capabilities and economic sustainability.	Cross-sectional survey of 200 oil and gas managers; data analyzed using Partial Least Squares-Structural Equation Modeling (PLS-SEM).	A strong positive relationship between seizing capabilities and economic sustainability, with firms that swiftly seize market opportunities improving their profitability and resource management.	Aligned with the present study's focus on petroleum tank farms in South-South Nigeria, highlighting how seizing opportunities improves economic sustainability through efficiency and investment.
3.	Abubakar, M. (2019)	<i>The Role of Reconfiguring Capabilities in Enhancing Economic Sustainability in the Petroleum Sector</i>	Investigates how reconfiguring capabilities impact the economic sustainability of petroleum firms in sub-Saharan Africa.	Mixed-method approach combining surveys and case studies of 10 petroleum firms; data analyzed using multiple regression.	Reconfiguring capabilities positively impact economic sustainability, with firms that frequently restructured resources maintaining long-term profitability and competitiveness.	Supports the present study's examination of how reconfiguring capabilities in petroleum tank farms can improve adaptability and ensure economic sustainability.
4.	Bowman, C., & Ambrosini, V. (2019)	<i>Dynamic Capabilities and Sustainable Competitive Advantage: An Empirical Study of Large Firms</i>	Examines large firms in Europe and the relationship between dynamic capabilities and economic sustainability.	Quantitative survey of 300 large firms; data analyzed using Structural Equation Modeling (SEM).	A significant positive relationship between dynamic capabilities and economic sustainability. Firms with strong dynamic capabilities achieved long-term profitability, market position, and resilience to environmental changes.	Similar to the present study on petroleum tank farms in South-South Nigeria, highlighting that dynamic capabilities (sensing, seizing, and reconfiguring) are key to sustaining profitability and competitiveness in volatile environments.
5.	Teece, D. J. (2020)	<i>Dynamic Capabilities and Firm Performance in Resource-Constrained Environments</i>	Focuses on firms in emerging markets in Asia and Africa, studying dynamic capabilities and economic sustainability.	Mixed-method approach: surveys and interviews of 200 firm managers; data analyzed through regression analysis.	Firms with strong dynamic capabilities, particularly sensing and reconfiguring, maintained economic sustainability despite resource constraints. Firms with the ability to sense opportunities and mobilize resources performed better in the long run.	Aligned with the present study's focus on how dynamic capabilities help petroleum tank farms navigate challenges in South-South Nigeria, emphasizing the importance of sensing and reconfiguring in sustaining economic sustainability.

S/N	Author (Date)	Title	Scope	Methodology	Findings	Comparison with Present Study
6.	Eisenhardt, K. M., & Martin, J. A. (2018)	<i>Dynamic Capabilities and Economic Sustainability: Evidence from High-Tech Firms</i>	Investigates high-tech firms in North America, focusing on dynamic capabilities and economic sustainability.	Quantitative research with 250 high-tech firms; Partial Least Squares (PLS) regression was applied.	Dynamic capabilities, especially seizing and reconfiguring, were found to have a strong positive impact on economic sustainability. Firms that adapted to market and technological changes maintained profitability and reduced risks from industry shifts.	Similar to the present study in highlighting the importance of seizing and reconfiguring capabilities in ensuring the economic sustainability of firms, including petroleum tank farms facing market and environmental changes in South-South Nigeria.

### Methodology:

The underlying philosophy for this study was positivism. The research adopted a cross-sectional survey design, with a structured questionnaire based on a Likert's five-point scale. The population of this study comprises all the petroleum tank farms in South-South, Nigeria. Data retrieved from the Nigerian Midstream and Downstream Petroleum Regulatory Authority (<https://www.nmdpra.gov.ng>), reveals that they are 124 petroleum tank farms in Nigeria, out of which 37 tank farms are located in South South, Nigeria, while 29 of these tank farms belong to members of the Independent Petroleum Products Importers (IPIs), while 3 tank farms and 5 tank farms belong to NNPC/PPMC and major marketers respectively. To ensure accessibility, this study focused on the 29 tank farms in South-South, Nigeria, which belong to members of the IPIs. These tank farms are located in Rivers, Akwa Ibom, Delta and Cross River States of Nigeria. Thus, the elements of the accessible population are 820 middle and top level managers (with designations such as: terminal managers, marketing managers, HSE managers, administration managers, audit managers and HR managers) of the 29 petroleum tank farms owned by members of the IPIs, in South-South, Nigeria. The Krejcie and Morgan's sample size determination formular was deployed to calculate a sample size of 262 respondents. However, Naing, Winn and Rusli (2006) noted that "it is wise to over-sample by 10%

to 20% to accommodate on-responses, attrition or outliers". Therefore, this study adjusted the sample size by adding 10% to the calculated figure. Thus, adjusted sample size ( $S_{aj}$ ) = 288 respondents. The study utilized the Bowley's proportional sample allocation formula ( $nh = nN_h/N$ ), to get the representative proportionate sample from each tank farm. The simple random sampling was adopted. The Partial least squares-structural equation modeling was deployed to test the hypotheses at 0.05 significance level via SmartPLS 4.1.0.5. 288 copies of the questionnaire were administered, however, only 248 (84.02%) copies of the research instrument were retrieved, while 202 copies were found to be adequately completed and usable, representing 70.14% questionnaire usage rate. A Cronbach's Alpha and composite reliability coefficients of 0.7 was adopted as reliability cut-off point for this study. From literature review, Hulland (1999) recommends (outer loadings)  $\beta$  threshold of 0.70. Similarly, when the factor loadings are squared the resultant statistic is indicator reliability ( $\beta^2$ ). Hulland (1999) argued that indicator reliability ( $\beta^2$ )  $\geq 0.50$  mean that the construct explains more than 50% of the indicator's variance. Moreso, an average variance extracted (AVE) above 0.5 implied convergent validity, while discriminant validity was confirmed when the square root of a construct's AVE is greater than its correlation with all other constructs (Fornell & Larcker, 1981). Also, t-values  $>1.96$  and p-values  $<0.05$  were cut-off points for significance (Hair et al., 2014).

**Table 3.1:** Petroleum tank farms owned by **IPPIs members** in South-South, Nigeria

S/N	NAME OF IPPIs Member	Address	Number of middle and top level managers	Proportional Sample Allocation
1	A&E Petrol Nig. Ltd	Ifiekporo town, Warri	25	9
2	Avidor Oil & Gas Ltd	Abonnema Warf Road, Port Harcourt	18	6
3	Othinel Brooks Oil & Gas	Oghareki, Delta State	24	8
4	Cybernetics Inter. Services	Oghareki, Delta State	35	12
5	Delmar Petroleum	Rumuolumeni Road, Iwofe, Port Harcourt	26	9
6	Dozy Oil & Gas Limited	Abonnema Warf Road, Port Harcourt	38	13
7	Liquid Bulk Oil & Gas	Aker Base, Oduoha Village, Rivers State	25	9
8	Grand Petroleum	Calabar Free Trade Zone, Cross River State	24	8
9	Hudson Petroleum	Imesco Jetty, Marina Road, Calabar	37	13
10	Hyde Tank and Terminers	Calabar Free Trade Zone, Cross River State	24	8
11	Ibafon Oil FZE	Calabar Free Trade Zone, Cross River State	36	13
12	Linc Nigeria Limited	Calabar Free Trade Zone, Cross River State	24	8
13	Lubcon Limited	Marina Road, Calabar, Cross Rivers State	34	12
14	Mainland Oil & Gas Ltd	Esuk Utan Layt (by PPMC Depot) Calabar	38	14
15	Masters Energy Oil & Gas	Aker Base, Oduoha Village, Rivers State	29	10
16	Nepal Oil and Gas Ltd	Oghareki, Delta State	28	9
17	Northwest Petroleum	Calabar Free Trade Zone, Cross River State	27	10
18	Ontario Oil & Gas	Calabar Free Trade Zone, Cross River State	22	8
19	Optima Energy Res. Ltd	Koko Town, Warri North, Delta State	18	6
20	Oryx FZE	Calabar Free Trade Zone, Cross River State	17	6
21	Petroleum Warehousing	FOT, Onne, Rivers State	19	7
22	Petrolog Nigeria Ltd	Reclamation Road, Port Harcourt	29	10
23	Petrostar Nigeria Ltd	Aker Base, Rumuolumeni, Port Harcourt	29	10
24	Rainoil Limited	Oghareki, Delta State	36	13
25	Sahara Energy Ltd	FOT, Onne, Rivers State	32	11
26	Sea Petroleum & Gas Ltd	FOT, Onne, Rivers State	29	10
27	Shorelink Oil & Gas Ltd	Abonnema Waterside, Port Harcourt	33	13
28	Tempogate Oil and Energy	Calabar Free Trade Zone, Cross River State	28	10
29	Tonimas Nigeria Ltd	FOT, Onne, Rivers State	36	13
	<b>TOTAL</b>		<b>820</b>	<b>288</b>

Source: Nigerian Midstream and Downstream Petroleum Regulatory Authority (<https://www.nmdpra.gov.ng>).

**Table 4.0: Descriptive Statistics (Univariate Analysis)**

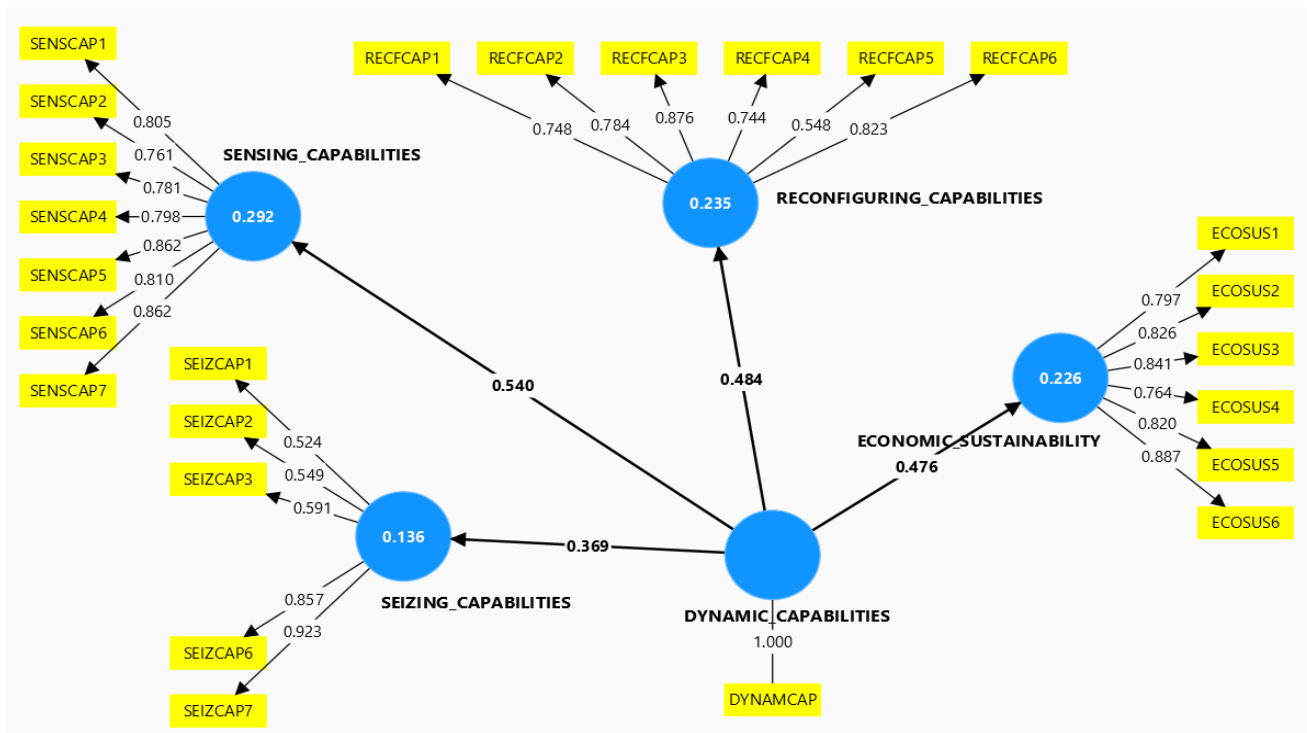
	N	Mean	Std. Deviation	Skewness		Kurtosis	
				Statistic	Std. Error	Statistic	Std. Error
<b>DYNAMIC CAPABILITIES</b>							
<b>SENSING CAPABILITIES</b>	<b>202</b>	<b>17.53</b>	<b>4.732</b>	<b>.235</b>	<b>.244</b>	<b>-.076</b>	<b>.483</b>
1) Our company knows the best practices in the market.	202	3.01	1.044	-.189	.171	-.120	.341
2) Our company is up-to-date on the current market situation.	202	2.99	.922	.183	.171	.218	.341
3) Our company systematically searches for information on the current market situation.	202	3.09	1.082	-.165	.171	-.485	.341
4) As a company, we know how to access new information.	202	3.09	1.127	-.081	.171	-.603	.341
5) Our company always has an eye on our competitors' activities.	202	2.96	1.112	.089	.171	-.678	.341
6) In our firm, we collect industry information through informal	202	2.95	1.149	-.002	.171	-.760	.341

means (lunch with industry friends, talks with trade partners).							
7) In our firm, we use market research skills to develop effective marketing programs.	202	3.05	1.031	.038	.171	-.405	.341
<b>Seizing Capabilities</b>	<b>20.21</b>	<b>4.832</b>	<b>.278</b>	<b>.244</b>	<b>-.217</b>	<b>.483</b>	<b>.426</b>
1. Our company can quickly relate to new knowledge from the outside.	202	2.93	.992	.027	.171	-.496	.341
2. We recognize what new information can be utilized in our company.	202	2.54	1.008	.334	.171	.052	.341
3. Our company is capable of turning new technological knowledge into process and product innovation.	202	3.82	1.181	-.701	.171	-.477	.341
4. Current information leads to the development of new products or services in our firm.	202	3.23	1.032	.014	.171	-.731	.341
5. Organize for innovation and integrate or allocate new resources to take advantage of a market opportunity.	202	3.50	.953	-.174	.171	-.467	.341
6. Constantly implement new marketing policies or strategies to take advantage of identified market opportunities.	202	3.05	1.031	.038	.171	-.405	.341
7. Make changes to organizational structure in order to leverage market opportunities.	202	3.09	1.127	-.081	.171	-.603	.341
<b>Reconfiguring Capabilities</b>	<b>202</b>	<b>20.21</b>	<b>4.832</b>	<b>.278</b>	<b>.244</b>	<b>-.417</b>	<b>.483</b>
1) By defining clear responsibilities, we successfully implement plans for changes in our company.	202	3.04	1.235	.122	.244	-.947	.483
2) Even when unforeseen interruptions occur, change projects are seen through consistently in our company.	202	3.24	1.167	-.017	.244	-.987	.483
3) Decisions on planned changes are pursued consistently in our company.	202	3.35	1.159	.138	.244	-1.158	.483
4) In the past, we have demonstrated our strengths in implementing changes.	202	3.12	1.115	.255	.244	-.632	.483
5) In our company, change projects can be put into practice alongside the daily business.	202	3.05	1.078	.401	.244	-.712	.483
6) In our company, plans for change can be flexibly adapted to the current situation.	202	2.91	1.194	.180	.244	-.767	.483
<b>Economic Sustainability</b>	<b>202</b>	<b>21.45</b>	<b>4.213</b>	<b>.287</b>	<b>.244</b>	<b>.367</b>	<b>.462</b>
1. My organization honours the taxes, tributes, fees, and other government contributions that enhances economic sustainability	202	2.84	1.152	.196	.171	-.588	.341

2.	My organization does not practice disloyal competition, trust, monopoly or dumping on economic sustainability issues.	202	2.91	1.025	.050	.171	-.252	.341
3.	My organization's economic sustainability decisions are taken based on a formal strategic planning that encompasses the organization as a whole, made by professionals.	202	2.54	1.008	.334	.171	.052	.341
4.	My organization focused on risk management plans and evaluations, with concern of the company's capacity to honour financial commitment with collaborators and shareholders.	202	3.02	1.090	-.119	.171	-.820	.341
5.	My company has restructuring plans in case of exceptional events (economic market crash, natural phenomena, etc.).	202	2.87	1.114	.180	.171	-.446	.341
6.	My organisation is punctual in the payment of salaries, benefits, and contracts with suppliers and other partners.	202	2.84	1.152	.196	.171	-.588	.341
	Valid N (listwise)	202						

**Source: SPSS output of Research Data (2024)**

As revealed in table 4.0, the descriptive statistics for dynamic capabilities and economic sustainability of petroleum tank farms in South-South Nigeria show moderate levels overall. Sensing capabilities have a mean of 17.53 ( $SD = 4.732$ ), with firms being somewhat aware of market best practices and competitor activities, and a slight positive skewness (0.235) indicates that most firms rated themselves just below the mean, while a kurtosis of -0.076 suggests a flatter distribution. Seizing capabilities also show moderate strength ( $M = 20.21$ ,  $SD = 4.832$ ) with a skewness of 0.278, indicating a right-skewed distribution, while the negative kurtosis (-0.217) suggests responses were spread out. Firms excel at turning new knowledge into innovation but struggle with quick utilization of information. Reconfiguring capabilities ( $M = 20.21$ ,  $SD = 4.832$ ) have similar distribution characteristics (skewness = 0.278, kurtosis = -0.417), indicating a consistent ability to implement changes, though flexibility could be enhanced. Economic sustainability ( $M = 21.45$ ,  $SD = 4.213$ ) reflects moderate performance, with a skewness of 0.287 and kurtosis of 0.367, suggesting a slight right skew and moderate peakedness, with firms being neutral on aspects like strategic planning, risk management, and payment punctuality. Overall, while the firms demonstrate reasonable dynamic capabilities and economic sustainability, the skewness and kurtosis reveal slight tendencies for more firms to rate their capabilities below the average, suggesting room for improvement in areas such as information utilization and strategic economic planning.



**Figure 4. 1:** Measurement (Outer) Models  
**Source:** SmartPLS 4.1.0.5 output of Research Data, 2024

**Table 4.1:** Result for Reflective Measurement Models of dynamic Capabilities and Economic Sustainability of Petroleum Tank Farms in South-South, Nigeria.

Constructs	Statement Items	Convergent Validity		Internal Consistency Reliability				
		Outer Loadings ( $\beta$ )	Indicator Reliability ( $\lambda^2$ )	AVE	Composite Reliability ( $\rho_{cc}$ )	Effect sizes ( $f^2$ )	Predictive Accuracy ( $R^2$ )	Cronbach's Alpha ( $\alpha$ )
<b>SENSING CAPABILITIES</b>  <i>Source: Kump, Engelmann, Kebler, and Schweiger (2019).</i>	1. Our company knows the best practices in the market.	0.805	0.648	0.659	0.931	0.413	0.292	0.914
	2. Our company is up-to-date on the current market situation.	0.761	0.579					
	3. Our company systematically searches for information on the current market situation.	0.781	0.610					
	4. As a company, we know how to access new information.	0.798	0.637					
	5. Our company always has an eye on our competitors' activities.	0.862	0.743					
	6. In our firm, we collect industry information through informal means (lunch with industry friends, talks with trade partners).	0.810	0.656					

	7. In our firm, we use market research skills to develop effective marketing programs.	0.862	0.743						
<b>SEIZING CAPABILITIES</b>  <i>Source:</i> <i>Kump, Engelmann, Kebler, and Schweiger (2019); Oluigbo-Moses and Nwankwo (2023)</i>	1. Our company can quickly relate to new knowledge from the outside.	0.524	0.275	0.502	0.827	0.157	0.136	0.811	
	2. We recognize what new information can be utilized in our company.	0.549	0.301						
	3. Our company is capable of turning new technological knowledge into process and product innovation.	0.591	0.349						
	4. Current information leads to the development of new products or services in our firm.	deleted	deleted						
	5. Organize for innovation and integrate or allocate new resources to take advantage of a market opportunity.	deleted	deleted						
	6. Constantly implement new marketing policies or strategies to take advantage of identified market opportunities.	0.857	0.734						
	7. Make changes to organizational structure in order to leverage market opportunities.	0.923	0.852						
<b>RECONFIGURING CAPABILITIES</b>  <i>Source:</i> <i>Kump, Engelmann, Kebler, and Schweiger (2019).</i>	1. By defining clear responsibilities, we successfully implement plans for changes in our company.	0.748	0.560	0.579	0.890	0.307	0.235	0.853	
	2. Even when unforeseen interruptions occur, change projects are seen through consistently in our company.	0.784	0.615						
	3. Decisions on planned changes are pursued consistently in our company.	0.876	0.767						
	4. In the past, we have demonstrated our strengths in implementing changes.	0.744	0.554						
	5. In our company, change projects can be put into practice alongside the daily business.	0.548	0.300						
	6. In our company, plans for change can be flexibly adapted to the current situation.	0.823	0.677						
<b>ECONOMIC SUSTAINABILITY</b> <i>Source:</i> <i>Cella-De-Oliveira, 2013</i>	1. My organization honours the taxes, tributes, fees, and other government contributions that enhances economic sustainability	0.797	0.635	0.678	0.927	0.293	0.226	0.905	
	2. My organization does not practice disloyal competition, trust, monopoly or dumping on economic sustainability issues.	0.826	0.682						
	3. My organization's economic sustainability decisions are taken based on a formal strategic planning that encompasses the organization as a whole, made by professionals.	0.841	0.707						
	4. My organization focused on risk management plans and evaluations, with concern of the company's capacity to honour financial commitment with collaborators and shareholders.	0.764	0.584						

	5. My company has restructuring plans in case of exceptional events (economic market crash, natural phenomena, etc.).	0.82	0.672					
	6. My organisation is punctual in the payment of salaries, benefits, and contracts with suppliers and other partners.	0.887	0.787					

Source: SmartPLS4.1.0.5 Output of Research Data, 2024

As revealed in Figure 4.1, and table 4.1, the results from the Reflective Measurement Model of dynamic capabilities and economic sustainability of petroleum tank farms in South-South, Nigeria, indicate strong reliability and validity across most constructs. Sensing capabilities exhibit strong outer loadings ( $\beta = 0.761$  to  $0.862$ ), satisfactory indicator reliability ( $\lambda^2 = 0.579$  to  $0.743$ ), and high internal consistency (Cronbach's  $\alpha = 0.914$ ) with an AVE of  $0.659$  and a composite reliability of  $0.931$ , showing strong predictive accuracy ( $R^2 = 0.292$ ) and medium to large effect size ( $f^2 = 0.413$ ). Seizing capabilities, while having some lower outer loadings ( $\beta = 0.524$  to  $0.591$ ) and weaker indicator reliability ( $\lambda^2 < 0.50$  for some items), still meets the AVE ( $0.502$ ) and composite reliability ( $0.827$ ) thresholds, with a small to medium effect size ( $f^2 = 0.157$ ) and weak predictive accuracy ( $R^2 = 0.136$ ). Reconfiguring capabilities demonstrate moderate reliability (Cronbach's  $\alpha = 0.853$ ), strong outer loadings ( $\beta = 0.548$  to  $0.876$ ), and an AVE of  $0.579$  with composite reliability of  $0.890$ , showing medium effect size ( $f^2 = 0.307$ ) and weak to moderate predictive accuracy ( $R^2 = 0.235$ ). Finally, economic sustainability has strong outer loadings ( $\beta = 0.764$  to  $0.887$ ), indicator reliability ( $\lambda^2 = 0.584$  to  $0.787$ ), and excellent internal consistency (Cronbach's  $\alpha = 0.905$ ), with an AVE of  $0.678$ , composite reliability of  $0.927$ , and medium effect size ( $f^2 = 0.293$ ), though predictive accuracy is moderate ( $R^2 = 0.226$ ). Overall, the model demonstrates strong internal consistency reliability and convergent validity, adhering to the thresholds suggested by Hulland (1999), Nunnally & Bernstein (1994), and Fornell & Larcker (1981).

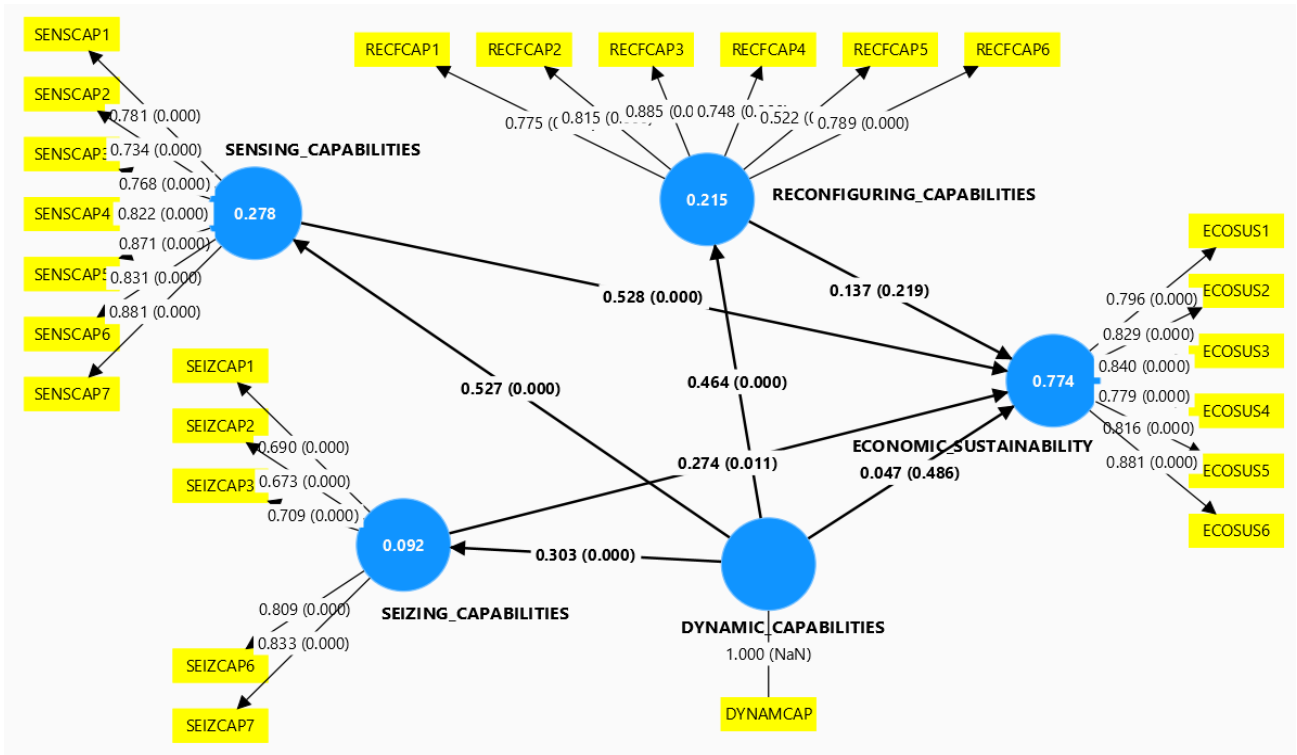
Table 4.2: Discriminant Validity of the Constructs (Fornell-Larcker Criterion)

	ECONOMIC_SUSTAINABILITY	RECONFIGURING_CAPABILITIES	SEIZING_CAPABILITIES	SENSING_CAPABILITIES
ECONOMIC_SUSTAINABILITY	<b>0.824</b>			
RECONFIGURING_CAPABILITIES	0.659	<b>0.761</b>		
SEIZING_CAPABILITIES	0.721	0.501	<b>0.789</b>	
SENSING_CAPABILITIES	0.430	0.699	0.680	<b>0.812</b>

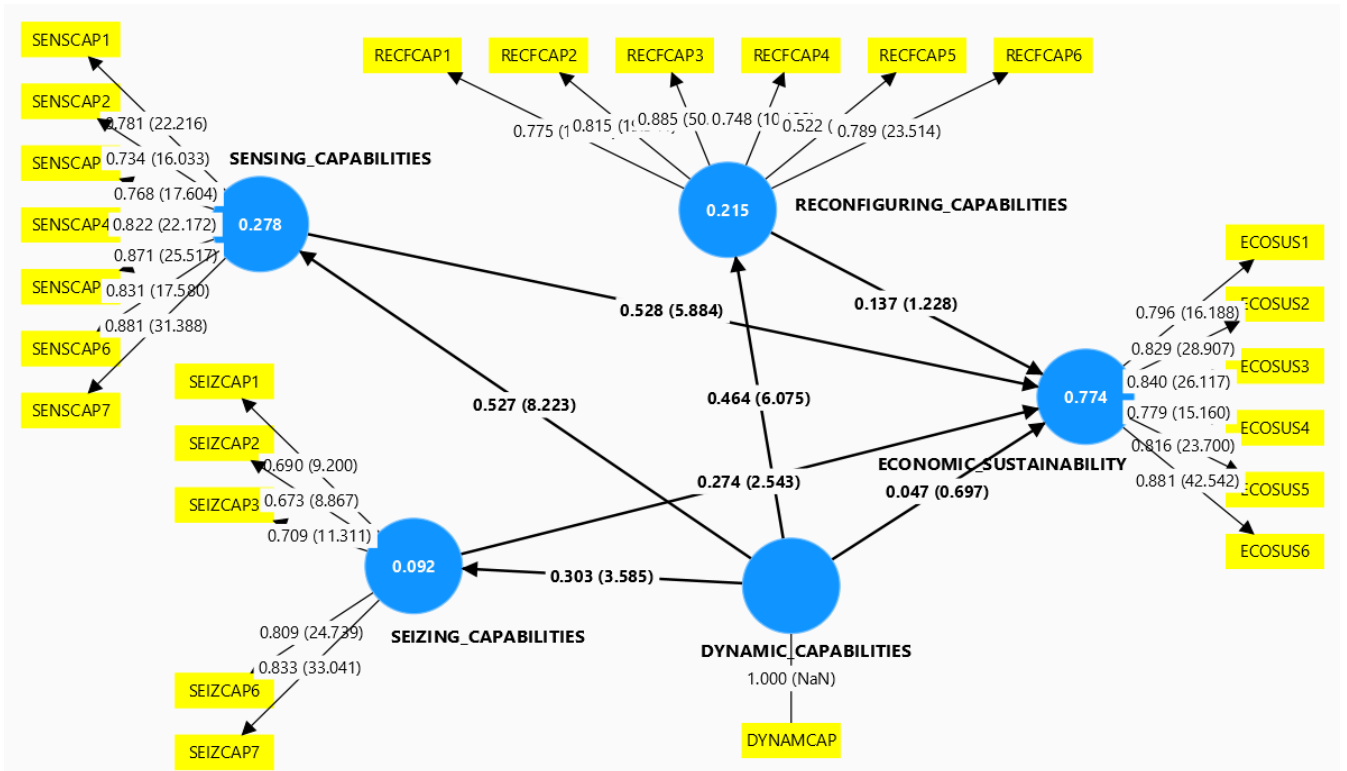
Source: SmartPLS4.1.0.5 Output of Research Data, 2024

Table 4.2 shows the discriminant validity of the constructs, assessed using the Fornell-Larcker criterion, confirms that each construct—Economic Sustainability, Reconfiguring Capabilities, Seizing Capabilities, and Sensing Capabilities—demonstrates adequate discriminant validity. The diagonal values, representing the square root of the Average Variance Extracted (AVE), are higher than the correlations between constructs, indicating that each construct explains more variance in its own indicators than in other constructs. For instance, Economic Sustainability has an AVE of  $0.824$ , Reconfiguring Capabilities has  $0.761$ , Seizing Capabilities has  $0.789$ , and Sensing Capabilities has  $0.812$ , all exceeding the correlation values with other constructs. The highest correlations are between Economic Sustainability and Seizing Capabilities ( $0.721$ ), and Reconfiguring and Sensing Capabilities ( $0.699$ ), but these are still lower than their respective AVE values, affirming that the constructs are distinct and meet the discriminant validity requirements.

Notably, each construct has a higher square root of AVE compared to the correlations with other constructs, confirming that they meet the Fornell-Larcker criterion for discriminant validity. This means that Reconfiguring Capabilities, Seizing Capabilities, Sensing Capabilities and Economic Sustainability are distinct constructs, each explaining more variance in their own indicators than in any other construct, thus supporting the model's discriminant validity.



**Figure 4. 2:** Structural Model showing the beta values and p-values  
Source: SmartPLS 4.1.0.5 Research Data, 2024



**Figure 4. 3:** Structural Model showing the beta values and t-values.  
Source: SmartPLS 4.1.0.5 Research Data, 2024

**Table 4. 3:** Results of Hypotheses Testing

Null Hypo.	Stages	Path Coefficients ( $\beta$ )	$R^2$	T Statistics ( $t \geq 1.96$ )	P Values ( $p < 0.05$ )	Decision on Null Hypotheses
H <sub>01</sub>	SENSCAP→	<b>0.528</b>	<b>0.699</b>	<b>5.588</b>	<b>0.000</b>	Not Supported
	ECOSUS	(Moderate)	Moderate	(Significant)	(Significant)	
H <sub>02</sub>	SEIZCAP→	<b>0.274</b>	<b>0.638</b>	<b>2.543</b>	<b>0.011</b>	Not Supported
	ECOSUS	(Weak)	Moderate	(Significant)	(Significant)	
H <sub>03</sub>	RECFCAP→	<b>0.137</b>	<b>0.603</b>	<b>1.228</b>	<b>0.219</b>	Supported
	ECOSUS	(Weak)	Moderate	(Not Significant)	(Not Significant)	

Source: SmartPLS 4.1.0.5 Output of Research Data, 2024

### Discussions of Findings

#### 1. Relationship between Sensing Capabilities and Economic Sustainability

As revealed in figures 4.2, 4.3 and table 4.3, the results of testing H<sub>01</sub>, which examines the relationship between sensing capabilities and economic sustainability of petroleum tank farms in South-South, Nigeria, indicate a strong positive and significant relationship ( $\beta = 0.528$ ; p-value = 0.000, and t-value of 5.588), leading to the rejection of the null hypothesis and affirming that sensing capabilities play a vital role in economic sustainability. Additionally, the R<sup>2</sup> value of 0.699 shows that sensing capabilities explain 69.9% of the variance in economic sustainability, indicating a moderate to substantial level of predictive accuracy. This finding highlights the importance of sensing capabilities in driving economic sustainability of petroleum tank farms in the region. Indeed, this is not a surprise finding as it agrees with earlier study by Ibarra (2020) who found a significant positive relationship between sensing capabilities and economic sustainability, as firms with strong sensing capabilities were able to adapt to changes and achieve long-term profitability. Furthermore, this finding agrees with Bowman and Ambrosini (2019) who found a significant positive relationship between dynamic capabilities and economic sustainability. As such, firms with strong dynamic capabilities achieved long-term profitability, market position, and resilience to environmental changes.

#### 2. Relationship between Seizing Capabilities and Economic Sustainability

As shown in figures 4.2, 4.3 and table 4.3, the results of testing H<sub>02</sub>, which examines the relationship between seizing capabilities and economic sustainability of petroleum tank farms in South-South, Nigeria, show a weak positive and statistically significant relationship ( $\beta=0.274$ ; . p-

value = 0.011, t-value = 2.543). However, the strength of the correlation is relatively low. The R<sup>2</sup> value of 0.638 indicates that seizing capabilities explain 63.8% of the variance in economic sustainability, reflecting a moderate to substantial level of predictive accuracy. These findings suggest that seizing capabilities—such as the ability to capture and leverage new opportunities—play an important role in driving economic sustainability. This is not a surprising finding, as it agrees with an earlier study by Okoye and Eze (2021) who found a strong positive relationship between seizing capabilities and economic sustainability, with firms that swiftly seize market opportunities improving their profitability and resource management. Moreso, this finding agrees with Eisenhardt and Martin (2018) who found that dynamic capabilities, especially seizing and reconfiguring, were found to have a strong positive impact on economic sustainability. As such, firms that adapted to market and technological changes maintained profitability and reduced risks from industry shifts.

#### 3. Relationship between Reconfiguring Capabilities and Economic Sustainability

As indicated in figures 4.2, 4.3 and table 4.3, the results of testing H<sub>03</sub>, revealed a weak positive but not significant relationship between reconfiguring capabilities and economic sustainability of petroleum tank farms in South-South, Nigeria ( $\beta$  value of 0.137; p-value of 0.219 and t-value of 1.228, both of which fall outside the significance thresholds). The R<sup>2</sup> value of 0.603 suggests that reconfiguring capabilities explain 60.3% of the variance in economic sustainability, indicating moderate predictive accuracy. Despite this, the weak  $\beta$  value and lack of significance imply that reconfiguring capabilities do not play a critical direct role in influencing economic sustainability in this context. The findings suggest that other factors, such as sensing or seizing capabilities, may be more

influential in driving economic sustainability outcomes for petroleum tank farms. This finding is surprising, as it disagrees with Abubarkar (2019) who found that reconfiguring capabilities positively impact economic sustainability, with firms that frequently restructured resources maintaining long-term profitability and competitiveness. Again, this finding disagrees with Tecee (2020) who found that firms with strong dynamic capabilities, particularly sensing and reconfiguring, maintained economic sustainability despite resource constraints.

### **Conclusion:**

The study on dynamic capabilities and economic sustainability of petroleum tank farms in South-South, Nigeria, reveals that sensing capabilities have the strongest and most significant positive impact on economic sustainability. Seizing capabilities also have a positive, albeit weaker, and statistically significant influence. However, reconfiguring capabilities, while positive, do not show a significant relationship with economic sustainability. These findings suggest that the ability of petroleum tank farms to gather and interpret market information (sensing capabilities) is crucial for their economic sustainability, while their ability to seize opportunities (seizing capabilities) contributes to a lesser degree. However, reconfiguring capabilities, focused on adapting resources and structures, may not directly affect sustainability outcomes in the same way.

### **Recommendations:**

1. Managers of petroleum tank farms should **enhance sensing capabilities** by investing in strengthening their market research and information-gathering processes, in order to remain competitive and ensure long-term economic sustainability.
2. Management of petroleum tank farms should **leverage seizing capabilities** by improving their ability to quickly exploit new opportunities, aligning internal resources and focusing on innovation as a means of achieving economic sustainability.
3. Although reconfiguring capabilities do not significantly influence economic sustainability in this study, Managers of petroleum tank farms should still **develop reconfiguring capabilities** by focusing on flexibility and adaptability to meet unexpected changes in the industry. This could enhance their economic sustainability in the long term.

### **Limitations of the Study**

While the study provides valuable insights, it's important to consider its limitations to accurately interpret the findings and guide future research.

- i. **Research Design:** Cross-sectional: This design cannot establish causality between dynamic capabilities and economic sustainability. Longitudinal studies are needed to understand the dynamic interplay of the relationships, over a period of time.
- ii. **Measurement:** Self-reported measures: Relying solely on self-reported data for both dynamic capabilities and economic sustainability introduces potential biases due to social desirability and recall errors.
- iii. **No moderating variable:** Some moderating factors like organizational culture and organizational structure might influence sustainability outcomes, thus, potentially confounding the observed relationships. No moderating variable was introduced in this study.
- iv. **Geographical Coverage:** This study was limited to South-South, Nigeria. Other regions like South-West, South East and North-West parts of Nigeria, were not considered in this research.

### **Contributions to Knowledge:**

This study contributes to the body of knowledge by highlighting the relative importance of different dynamic capabilities in the context of petroleum tank farms. It confirms that sensing capabilities are critical to economic sustainability, more so than seizing and reconfiguring capabilities. Additionally, the study applies the Dynamic Capabilities Theory and the Moral Responsibility Theory of Corporate Sustainability to the petroleum industry, offering new insights into how these theories can be operationalized in practice.

### **Suggestions for Further Research:**

Future research should expand the scope of the study to include different regions or other sectors to provide broader insights into the role of dynamic capabilities in ensuring sustainability across various contexts. More so, future studies could adopt a longitudinal survey design, to understand the dynamic interplay of the variables over a time period. Besides, further studies could introduce moderating factors like organizational culture and organizational structure in order to ascertain how these contextual factors might influence sustainability outcomes.

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