

Unlocking the Power of Modern Technology: Influence of Disruptive Innovation on Sustainability of GSM Communications Industry in Nigeria

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DOI: 10.56201/wjimt.v9.no5.2025.pg261.275

Abstract

The use of conventional process and business practices, the use of orthodox business models, rigid operational structures and outdated marketing techniques experienced in global system for mobile communications industry in Nigeria are the motivations that prompted this research. Disruptive innovation is a new aged transformative landscape introduced to address these challenges especially in this contemporary time. Therefore, this study investigated the influence of disruptive innovation on sustainability of GSM communications industry in Nigeria. Specifically, the study examined disruptive market innovation, disruptive market innovation, disruptive technological innovation and disruptive business innovation and their influences on economic, social and environmental sustainability of GSM communications industry in Nigeria. Related literature was reviewed. The study was anchored on Disruptive Innovation theory and Triple Bottom Line theory. The study adopted a positivistic oncological approach and used descriptive research design using a survey method to ensure that the research procedures were duly followed. Primary source of data was used while the questionnaire was the instrument for data collection. The research instrument was duly validated and the reliability of the measuring instrument established. Data were sourced from the respondents who were the staff drawn from the population of various GSM service providers under review. Partial least square structural equation statistical technique was used to estimate all the statistical parameters and was also used to test the hypotheses on the standpoint of 5% level of significance. The study found that product disruptive innovation, market disruptive innovation, technological disruptive innovation and business disruptive innovation have significant positive influences on economic sustainability, social sustainability and environmental sustainability of GSM communications industry in Nigeria. The researchers recommended among others that GSM service providers should continue to invest on disruptive innovations through the introduction of more new products, introduction of more new markets, introduction of more unique technological and introduction of more novel business innovations for enhanced profitability, efficiency, equity, wellbeing and sustainability of GSM communications industry in Nigeria.

Key words: Disruptive Innovation, Product, Market, Technology, Sustainability, GSM.

1. INTRODUCTION

In today's growing, fast-paced and highly competitive global economy, innovation has emerged as a critical tool for business survival, growth, and long-term relevance. Among various innovation models, disruptive innovation has gained prominence for its ability to challenge established market structures and redefine industry norms. Disruptive innovation as coined by Clayton Christensen (1997) entails the process by which a product or service initially takes root in simple applications at the bottom of a market and then effortlessly moves upmarket, thereby replacing competitors. In the Telecommunications industry, the rate at which tech advancement and digital transformation has increased due to the occurrence of disruptive innovations. Importantly, disruptive innovations have changed how services are delivered, how customers are engaged, and how value is created across the industry (Akinwale, Dada & Ajiboye, 2012). From the transition of voice dominated services to data centric operations, to the adoption of mobile money, cloud services, and Internet of Things solutions, telecom firms globally are reengineering their models to remain competitive. In Nigeria, the telecommunications sector plays an important role in economic development, social connectivity, and technological advancement. With over 220 million individuals and a growing digital population, the sector is highly dynamic and deeply influential. Among the key players MTN, GLO, Airtel are the market leader and innovation drivers in Nigeria. Thus, since its entry into the Nigerian market, global system for mobile communications (GSM) has consistently introduced transformative services, such as mobile banking, 4G and 5G networks, and digital enterprise solutions, which have reshaped consumer behavior and industry standards (Ali, 2024).

However, disruptive innovation plays a very critical role in enhancing sustainability especially in the telecommunications industry in Nigeria (Adegbile, Sarpong & Meissner, 2017). Interestingly, despite widespread acknowledgment of innovation's significance in this sector, there is still paucity of empirical research in this area especially how as well as the extent disruptive innovation influences the sustainability outcomes of leading telecommunications firms such as MTN, GLO and Airtel (Okeke, Nwokerie & Ekwochi, 2019). In this study, it is pertinent and germane to ascertain how disruptive innovation could enhance economic resilience, social responsibility and environmental wellbeing especially within evolving landscape of Nigeria's telecommunications sector (Adesanya & Nwachukwu, 2019). Bridging this gap is vital for advancing both scholarly insight and strategic decision-making, as firms increasingly navigate the dual imperative of innovation and sustainable business practice (Eze & Akintola, 2023). Indisputably, the rapid pace of technological advancement and transformative change in Nigeria's telecommunications sector due to emergence of disruptive innovation has been a remarkable one. The global system mobile communication has roll out path-breaking and unique services such as mobile money platforms, cloud computing solutions and cutting-edge network technologies including 4G and 5G (Adewale & Akanbi, 2021). Specifically, there is paucity of empirical research on the extent to which disruptive innovation contributes to the sustainability of GSM sector.

Furthermore, there is a research gap in empirical research on the influence of disruptive innovation on the sustainability of GSM communications especially within the context of emerging markets like Nigeria (Adesanya, 2019). Although, extant literature has provided empirical studies on the influence of disruptive innovation on performance outcomes such as competitive advantage, cost leadership and market expansion (Fu et al., 2023; Ndubisi, Anetoh, Okeke, Ogbunju & Ewuzie, 2022; Christensen, 2018; Hopp et al., 2018; Anetoh, Ndubisi, Okeke & Obizekwem, 2022). Regrettably, most of these studies were conducted in developed countries (Hopp, Antos, Kaminski

& Salge, 2018). Pertinently, the unique dynamics of the Nigerian market characterized by high volatility, regulatory uncertainty, and socio-economic disparities demand localized studies that will examine how innovation manifests in such contexts and what factors influence its success or failure (Fu et al., 2023; Anetoh et al., 2022). Nevertheless, notwithstanding that there are empirical studies that have examined the influence of disruptive innovation on sustainability but significant gaps still exist especially in developing economies like Nigeria (Christensen, 2015; Owoye & Makinde, 2025; Poi, 2023; Oluwaseyi, 2022). Unfortunately, there is paucity of empirical studies on the extent to which disruptive innovations has led to the sustainability in the Nigerian telecommunications sector especially with respect to GSM (Karimo & Williams, 2024; Adedeji & Adelowotan, 2023). This has created a geographic and knowledge gaps.

Hence, this study seeks to bridge these gaps by focusing specifically on how the GSM introduced disruptive innovation strategies influence the overall sustainability of the sector so as to contribute to context-specific and holistic insights to extant literature and academic discourse. In addition, sustainability in this context extends beyond achieving financial performance to other areas such as long-term relevance and contribution to social and environmental goals (William et al., 2024; Akinwale, Dada & Ajiboye, 2021; Anabaraonye, 2021). Furthermore, some GSM service providers are yet to adopt the holistic sustainability that incorporates innovation as a strategic enabler. This fragmented approach undermines the ability of GSM service providers to build resilient systems capable of withstanding market disruptions or policy shocks (Okorie & Worlu, 2020). Consequently, there is need for an integrated research on how disruptive innovation strategies lead to the sustainability of GSM communications sector in Nigeria. Therefore, this research work is an attempt to bridge the gap in the literature by investigating how disruptive innovation influence the sustainability of GSM communications industry in Nigeria.

Research Objectives

The main objective of this study is to investigate the influence of disruptive innovation on the sustainability of GSM communications industry in Nigeria. The specific objectives of the study are to;

1. ascertain the nature of influence product disruptive innovation has on the sustainability of GSM communications industry in Nigeria.
2. determine the nature of influence market disruptive innovation has on the sustainability of GSM communications industry in Nigeria.
3. examine the influence of technological disruptive innovation on the sustainability of GSM communications industry in Nigeria.
4. investigate the influence of business disruptive innovation on the sustainability of GSM communications industry in Nigeria.

Research Questions

The following research questions were raised based on the objectives of the study.

1. How does product disruptive innovation influence the sustainability of GSM communications industry in Nigeria?
2. To what dimension does market disruptive innovation influence the sustainability of GSM communications industry in Nigeria?
3. To what extent does technological disruptive innovation influence the sustainability of GSM communications industry in Nigeria?

4. How does business disruptive innovation influence the sustainability of GSM communications industry in Nigeria?

Research Hypotheses

The following hypotheses were raised to guide the research work:

- H₁: Product disruptive innovation has a significant influence on the sustainability of GSM communications industry in Nigeria.
H₂: Market disruptive innovation has a significant influence on the sustainability of GSM communications industry in Nigeria.
H₃: Technological disruptive innovation has a significant influence on the sustainability of GSM communications industry in Nigeria.
H₄: Business disruptive innovation has a significant influence on the sustainability of GSM communications industry in Nigeria.

Significance of the Study

This study is relevance as it provides a focused analysis of how disruptive innovation contributes to the sustainability of GSM communications which is a dominant player in the Nigeria's telecommunications industry. As digital technologies continue to transform the way telecom firms operate, there is a growing need to understand how innovations such as mobile money platforms, 4G/5G networks, and digital service ecosystems influence long-term organizational sustainability. The findings from this study are expected to provide more insights on how product, market, business as well as technological disruptive innovations influence the three key dimensions of sustainability namely; economic, social and environmental in telecommunication industry. The study is expected to offer valuable insights on how GSM service providers align their disruptive innovation strategies with broader development goals. This research is chiefly intended to uncover the extent technological disruptive innovations like mobile financial solutions and advanced connectivity technologies such as 5G, dynamic digital platforms engineered enrich customer engagement. Additionally, the study is expected to contribute to academic literature by bridging the gap between disruptive innovation theory and practical sustainability outcomes in the context of a developing economy. It will also serve as a foundation for further research on innovation driven sustainability in other sectors and emerging markets.

2. LITERATURE REVIEW

Conceptual Review

Disruptive Innovation

Disruptive innovation is the process by which new technologies basically change or alter an industry, product, market or business by displacing the established business model or competitors (Lee & Trimi, 2018). Disruptive innovation refers to revolutionary solutions that challenge and transform existing technologies or market norms by offering simpler, more cost-effective, and efficient alternatives (Christensen, 1997). It can be seen as introducing new package of attributes that appeal to customers. In GSM communications sector, disruptive transformative initiatives include the mobile money service, the expansion of cloud technology infrastructure, digital platforms for customer engagement, intuitive digital platforms that enhance customer interaction, and the implementation of advanced network systems like 4G and 5G (Adawudi et al., 2024). These groundbreaking innovations represent transformative shifts in GSM Nigeria's from orthodox landlines to cellular network and voice over internet protocols which have enhanced the

operational approach, service delivery and customer interaction with GSM service providers in Nigeria. These technological advancements have reshaped how customers engage with services and have been instrumental in driving Nigeria's socio-economic advancement generating jobs, narrowing the digital gaps as well as fast-tracking the development of telecom infrastructure in Nigeria (Karimo et al., 2024; Williams et al., 2024). Interestingly, GSM has introduced cutting-edge technologies and service innovations that have significantly shaped the evolution of Nigeria's telecommunications industry (Okeke et al., 2019). Indisputably, the GSM service providers have consistently introduced disruptive innovations technologies in Nigeria such as mobile money, 5G network services, self-service apps, and data-driven customer solutions (Fu et al, 2023). These innovations have significantly and meaningfully improved user experiences thereby contributing to Nigerian GDP, socio-economic growth and development by enabling new employment opportunities, advancing digital access and facilitating the growth of critical telecommunications infrastructure across the country (Adegbite & Ayodele, 2021).

Product Disruptive Innovation

Product disruptive innovation involves introducing new devices, new mobile technologies as well as new service offering that challenge the existing market norms (Anetoh et al, 2022, Poi, 2023). GSM communications industry has introduced and offered many aspects of product disruptive innovation in Nigerian GSM communication sector (Poi, 2023). The introduction of smart devices which has transcended from the use of rudimentary mobile phones to smartphones designed with advanced capabilities that have transformed the pace of consumers' interactions and service consumption. Product disruptive innovation in GSM communications has played a significant role in Nigeria especially in reshaping telecommunications industry by fostering and enhancing competitiveness as well as increasing consumers' engagements (Ibidunni, Ufua & Opute, 2022). Secondly, the introduction of soft-sim technology so as to eliminate the use of physical sim cards and to encourage users' switch to networks seamlessly. Thirdly, the introduction of over the top services using Skype and WhatsApp which have disrupted the traditional voice and SMS services which have reduced over reliance on conventional telecom offerings (Poi, 2023; Adegbite & Ayodele, 2012). Fourthly, the introduction of mobile number portability which enables users to retain their phones numbers when switching to another service provider. This has helped to enhance competitiveness and improved service quality in the industry (Njeba & Li, 2024).

Market Disruptive Innovation

Market disruptive innovation in GSM communications in Nigeria is the type of innovation that has disrupted the traditional market structures through the introduction of new business models, new services and new pricing mechanisms that have challenged and changed the established market players. Global system for mobile communications industry has introduced and offered many aspects of market disruptive innovation in Nigerian GSM communication sector. The introduction of multiple service providers has paved way for intense competition as well as entry of new competitors. This has led to better service delivery, quality service and lower costs. In addition, the introduction of pay as you go plans and bundled data packages by GSM communications have transformed GSM consumers' spending habits Poi, 2023). Furthermore, the adjustment of the regulatory framework and policies to accommodate new market dynamics by global system for mobile communications has helped to enhance consumer protection and maintenance of fair competition (Karakaya, 2014). In addition, market disruptive innovation in GSM communications

has led to digital economic integration and digital transformation which has enhanced the growth and development of new emerging markets (Monye & Osio, 2024; Hossain, 2013).

Technological Disruptive Innovation

The global system for mobile communications in Nigeria has introduced many aspects of technological disruptive innovation by advancements in network infrastructure, consumer accessibility and service delivery. Interestingly, GSM service providers has witnessed great transformations due to the introduction of new technologies that have changed the conventional operational system and enhanced the efficiency and sustainability of the sector. The GSM communications industry has changed the evolution of network technology from 2G to 5G (Hopp et al., 2023; Fu et al., 2023). The transition has improved data speeds, connectivity and reliability. GSM communications sector has helped to revolutionized mobile financial services, mobile banking, payment platforms for increased financial inclusion. The use of artificial intelligence and AI driven customer service solutions and automated network management by GSM have enhanced the operational efficiency and sustainability of the sector. In addition, use of internet of Things (IoT) integration and Iot-enabled devices has helped to expand the scope of GSM services beyond conventional or traditional communication system (Adawudi et al., 2024). Furthermore, GSM has revolutionized financial transactions using platforms such as MTN mobile money or Airtel Money thereby assisting users to send or receive money without traditional banking infrastructure. GSM has made the use of digital wallets and block chain-based payment solutions possible through Fintech integration.

Business Disruptive Innovation

This type of innovation introduces new business models that change orthodox operations and create new business opportunities that will enhance sustainability (Owoeye & Makinde, 2025). Business disruptive innovation in GSM communications in Nigeria has changed the market dynamics, service delivery and competitive strategies in telecommunications industry. Telecom companies have extended their business and product offerings beyond data and voice services to digital platforms and fintech solutions (Zhou et al., 2018). Furthermore, GSM has introduced path-breaking innovative management strategies which have increased market positioning, enhanced competitive advantage and sustained growth (Chukwuemeka, 2018). Moreso, the introduction of digital identity verification, e-commerce and other digital services has helped to expand the business spectrum of global system for mobile communications. Moreso, GSM has engaged in business innovation AI-powered network management as well as cloud-based telecom solutions. These disruptive innovations have helped to enhance operational efficiency (Hopp et al., 2018). Furthermore, the introduction of data-driven workforce management and workforce analytics has helped to increase the competence, decision-making process as well as organizational efficiency.

Sustainability

Sustainability in the context of GSM communications refers to the development, deployment and operations of mobile communication networks and services so that current communication needs will be met without compromising future generations. It is the use of mobile network systems in a way to support economic viability and promotes equitable access to communication services. Sustainability as used in this study is the dependent variable which encompasses economic, social and environmental dimensions (Orjinta & Anetoh, 2025). Economic sustainability in relation to this study focuses on ensuring the long term financial viability of GSM services by reducing

operational costs as well as providing affordable services to ensure broad access (Ali et al., 2017). Social sustainability encompasses the provision of network coverage to different area and provision of information accessible to every GSM user as well as the provision of employment opportunities to the people (El-kassar & Singh, 2019). Furthermore, environmental sustainability focuses on minimizing energy consumption of base stations, network infrastructure, reduction of environmental pollution and engaging in recycling practices. Therefore, disruptive innovation is expected to boost sustainability in GSM communications industry by heightening operational effectiveness, lowering costs and increasing profitability (Karimo & Williams, 2024; Fu et al., 2023). Furthermore, disruptive innovation enhances the accessibility to digital technologies, mitigate disparities in connectivity, and foster more inclusive participation in socio-economic processes (Fu, 2023). In addition, disruptive innovation by GSM communications facilitate the integration of energy-efficient technologies, reduce carbon emissions and diminish reliance on obsolete infrastructure (Williams et al., 2024; Porter & Heppelmann, 2014). Moreso, economic sustainability entails improvements in profitability, operational efficiency, financial resilience while social sustainability focuses on increasing digital service accessibility, narrowing the digital divide, promoting community development efforts (Gunday et al., 2011; Poi, 2023). Consequently, disruptive innovation has a positive significant influence on economic, social and environmental dimensions of sustainability within the operational framework of GSM communications.

Theoretical Foundations

a. The Disruptive Innovation theory by Clayton Christensen (1997)

The theory as propounded by Christensen focused on how novel technologies or business approaches can revolutionize existing industries by offering simpler, more affordable and more accessible solutions. Initially targeting niche or underserved markets, these innovations eventually evolve to challenge established market leaders. In the context of this study, Disruptive Innovation theory helps to analyze how GSM communications utilized novel approaches to gain market footholds so as to achieve long-term sustainability. Within the context of GSM, the introduction of mobile money services, digital self-service platforms and next-generation network technologies like 5G represent clear examples of disruptive innovation. These technologies allow to reach new customer segments, streamline operations and maintain competitiveness contributing significantly to the firm's long-term sustainability. Disruptive Innovation Theory assumes not only a framework for understanding how innovation unfolds within firms but also a strategic guide for navigating competitive landscapes characterized by volatility, technological change and shifting consumer expectations. Therefore, this theory helps explain the strategic influence of disruptive innovation on the sustainability of GSM communications industry in Nigeria.

b. Triple Bottom Line Theory by John Elkington (1994)

The triple bottom line theory as coined by Elkington (1994) provides a holistic perspective on sustainability by highlighting three key pillars: economic performance, social influence and environmental responsibility. The theory assumes that organizations should evaluate success not just through financial outcomes but also by how they contribute to society and safeguard the environment. In this study, the TBL framework supports an analysis of how GSM communications use disruptive innovation initiatives to influence and enhance its profitability, community outreach and environmental practices. This theory ensures that disruptive innovation is assessed beyond profitability and market share but also through environmental stewardship, social equity and economic inclusiveness. This is important in Nigeria due to high levels of poverty, environmental

degradation and inequality. In addition, by integrating the two theories, this research therefore, establishes a strong theoretical grounding for investigating how disruptive innovation variables; product, market, technology and business influence the three dimensions of sustainability; economic, social and environmental in the GSM telecommunications industry in Nigeria.

Empirical Review

Ali, Warren and Mathiassen (2017) reported that digital platforms used by telecoms enhance service delivery and promote inclusive innovation across broader stakeholder ecosystems. Adegbile, Sarpong, and Meissner (2017) reported that MTN's investment in mobile money and digital platforms have significantly boosted customer loyalty and improved business sustainability. Zhou et al. (2018) examined innovation in Chinese telecoms and reported that investment in digital services contribute economic growth and environmental efficiency. Akinwale et al. (2021) reported that digital innovation has improved the social influence of telecom firms. Lee and Trimi (2018) explored how digital innovation contributes to sustainability and reported that technology integration significantly improves social equity and environmental accountability. Tidd and Bessant (2014) found that innovation processes are essential for long-term sustainability. Prajogo (2016) found that process innovation has a positive significant effect on firm performance and environmental compliance. Gunday et al. (2011) found that product innovations significantly influence both financial and sustainability metrics. Karakaya, Hidalgo, and Nuur (2014) examined sustainable innovation diffusion and found that firms using innovation have gained reputational advantages, improve stakeholder trust, and reduce risk exposure. Ouma and Rambo (2013) investigated mobile financial innovation in Kenya and found substantial improvements in financial inclusion and poverty reduction, aligning with social sustainability goals.

Furthermore, Govindarajan and Kopalle (2006) found that disruptive innovations allow companies to cut operational costs while expanding access to underserved markets thereby contributing significantly to economic and social sustainability. El-Kassar and Singh (2019) found a positive correlation between technological innovation and environmental performance, noting that eco-friendly technologies help firms to reduce emissions and energy consumption. Olawale and Garwe (2010) found that innovation supports operational sustainability by improving affordability and service access. Bocken et al. (2014) examined sustainable business model innovation and found that environmental and social considerations are embedded within core strategic activities that are applicable to telecom firms adapting to technological shifts. Hossain (2013) examined frugal innovation in emerging economies and also found that affordable, locally-adapted technologies promote sustainability in resource-scarce environments. Oke, Walumbwa and Myers (2012) reported that firms implementing disruptive technologies tend to experience enhanced agility, innovation capacity, and long-term competitiveness. Seelos and Mair (2007) reported that social entrepreneurship and innovative business models contributed directly to long-term sustainability.

3. METHODOLOGY

The study adopted a positivistic oncology approach and used a descriptive research design using a survey method. The use of this approach is to the researchers to systematically get, document and articulate the existing patterns and characteristics of disruptive innovation practices currently implemented in GSM communications industry. Disruptive innovation was surrogated by product, market, technological and business innovations while sustainability was proxied by its dimensions namely; economic, social and environmental dimensions. The population of this study comprised

the staff/ employees of GSM, specifically those working in departments that directly engage with innovation strategies. However, the sample size was 384 while purposive sampling strategy was adopted. Data were gathered using the structured questionnaire distributed to the staff of GSM service providers under review. A combination of physical distribution in Anambra State and online dissemination using tools such as Google forms method were employed to enhance response rates. To ensure clarity, relevance, and alignment with the study objectives, the instrument was subjected to expert review and a pilot test was conducted. The feedback obtained helped refine the structure of the measuring instrument and improve its reliability. The primary instrument for data collection in this study was the structured questionnaire designed to measure the influences of disruptive innovation; product, market, technological and business disruptive innovations on sustainability of GSM networks under investigation (MTN, GLO and Airtel). To ensure the validity of the instrument, the research instrument was validated. For reliability, a pilot study was conducted which involved the use of 20 participants (GSM staff) who were not part of the final sample. The responses from the pilot study were analyzed and correlated using Cronbach's alpha of 0.716 established the internal consistency the measuring instrument for the main survey.

Measurement Model for the Study

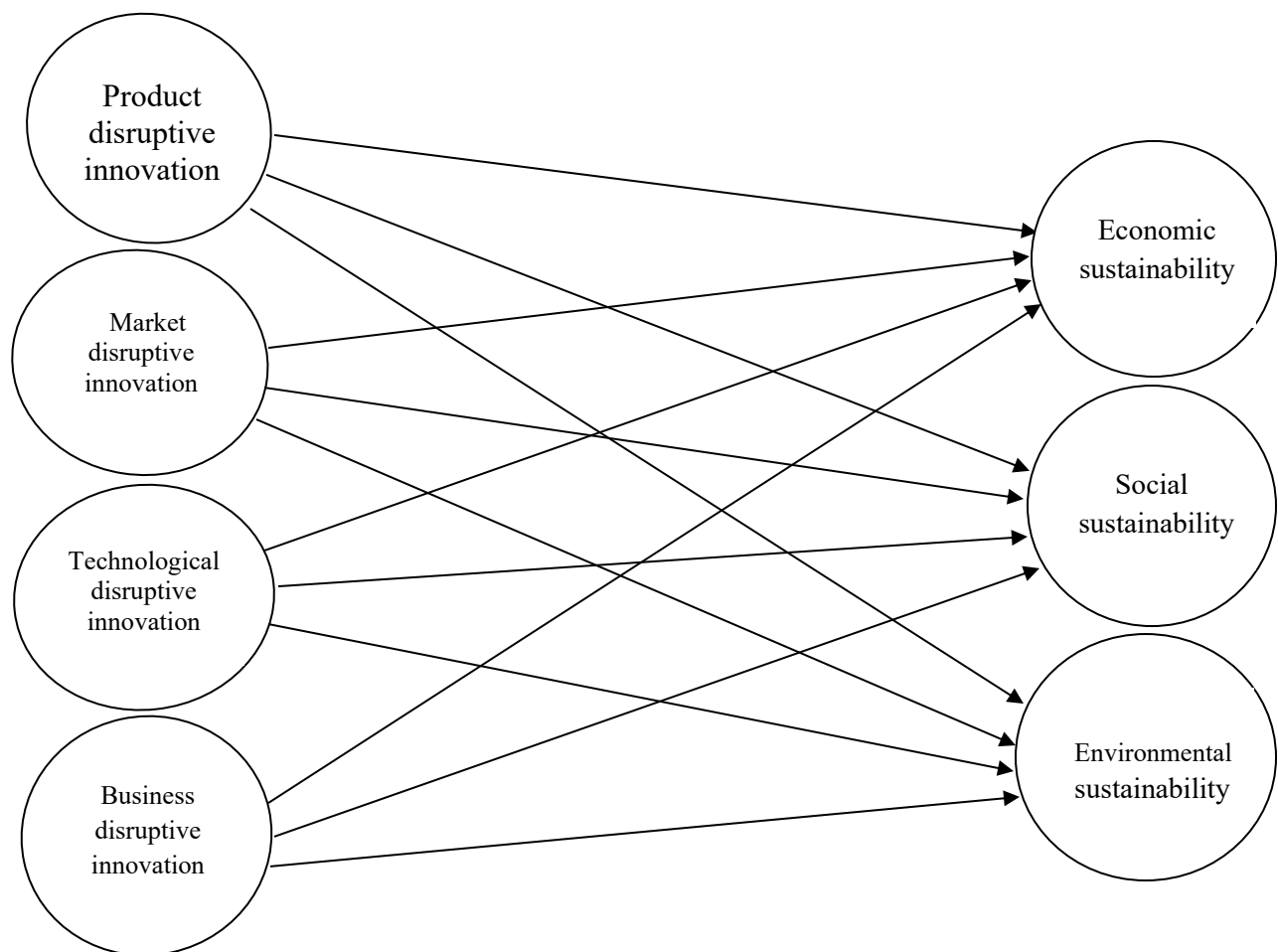


Figure 1: Measurement Model for Disruptive Innovation and Sustainability

Source: Anetoh, Otite, Okoro, Anetoh Ajakpo, Obiezekwem and Oranye (2025).

Model Specification

$$ECS = f(\beta_1PDI + \beta_2MDI + \beta_3TDI + \beta_4BDI + \varepsilon)$$

$$SOS = f(\beta_1PDI + \beta_2MDI + \beta_3TDI + \beta_4BDI + \varepsilon)$$

$$EVS = f(\beta_1PDI + \beta_2MDI + \beta_3TDI + \beta_4BDI + \varepsilon)$$

NB: PDI = product; MDI = market; TDI = technological; BDI = business disruptive innovation.
ECS = economic; SOS = social; EVS = environmental sustainability; ε = stochastic error term.

4. STRUCTURAL EQUATION MODEL RESULTS

The researchers distributed 384 copies of the research instrument but only 352 usable copies were used for the analysis of this study. The partial least square structural equation modeling statistical technique was used to test the significance of the model using bootstrapping procedure. The choice of PLS-SEM is because it is use to estimate complex model involving multiple independent variables and multiple dependent variables simultaneously. Using the tenet of a two-tailed t-test approach with 5% level of significance as the benchmark for acceptance or rejection of hypothesis. On the standpoint that the t-value should be 1.96 for it to be significant (Wong, 2013) or the p-value should be less than or equal to 0.05 for it to be significant as proposed by (Hair et al., 2014).

Table 1: The Partial Least Square Structural Equation Model Result

Hypotheses	Hypotheses paths	Coefficients	T-values	P-values	Remark
H1a	PDI -> ECS	0.829	7.605	0.000	Significant
H1b	PDI -> SOS	0.702	6.741	0.003	Significant
H1c	PDI -> EVS	0.716	6.880	0.001	Significant
H2a	MDI -> ECS	0.648	6.549	0.005	Significant
H2b	MDI -> SOS	0.623	5.346	0.016	Significant
H2c	MDI -> EVS	0.640	5.847	0.008	Significant
H3a	TDI -> ECS	0.884	8.579	0.000	Significant
H3b	TDI -> SOS	0.705	7.584	0.002	Significant
H3c	TDI -> EVS	0.834	8.561	0.000	Significant
H4a	BDI -> ECS	0.868	8.683	0.000	Significant
H4b	BDI -> SOS	0.677	6.681	0.003	Significant
H4c	BDI -> EVS	0.729	6.963	0.001	Significant

Path coeff. is significant at 5% level of significance; if the t-value is ≥ 1.96 , or p-value ≤ 0.05 .

NB: PDI = product; MDI = market; TDI = technological; BDI = business disruptive innovation; ECS = economic; SOS = social; EVS = environmental sustainability.

Source: PLS-SEM Output, 2025.

The coefficient of determination (R^2) measures the total changes determined in the dependent variable as a result of variations in the independent variables in the model. The model explained the significant and positive variance of 0.76, 0.70 and 0.73 for economic, social and environmental sustainability. The R square values generated as indicated above showed the strong power of the independent constructs to explain the dependent constructs which are clearly above the given threshold given that the R^2 values of 0.75, 0.50 and 0.25 which stand for substantial, moderate and weak respectively as proposed by (Hair, Hult, Ringle & Sarstedt, 2017). In addition, the significance of the structural model was estimated based on the values of the path coefficients, statistical t-values and the p-values of the model.

A careful look on the result on table 1, shows that product disruptive innovation has a significant positive influence on economic sustainability. Product disruptive innovation has a significant positive influence on social sustainability. Also, product disruptive innovation has a significant positive influence on environmental sustainability. Therefore, the null hypothesis one (HO_1) is rejected and alternative hypothesis one (HA_1) accepted which states that product disruptive innovation has a significant positive influence on the sustainability of GSM communications industry in Nigeria. A careful investigation of the result on table 1, shows that market disruptive innovation has a significant positive influence on economic sustainability. Market disruptive innovation has a significant positive influence on social sustainability. Similarly, market disruptive innovation has a significant positive influence on environmental sustainability. Therefore, the null hypothesis two (HO_2) is rejected and alternative hypothesis two (HA_2) accepted which states that market disruptive innovation has a significant positive influence on the sustainability of GSM communications industry in Nigeria.

In addition, a careful assessment on the result on table 1, reveals that technological disruptive innovation has a significant positive influence on economic sustainability. Also, technological disruptive innovation has a significant positive influence on social sustainability. Correspondingly, technological disruptive innovation has a strong significant positive influence on environmental sustainability. Therefore, the null hypothesis three (HO_3) is rejected and alternative hypothesis three (HA_3) accepted which states that technological disruptive innovation has a significant positive influence on the sustainability of GSM communications industry in Nigeria. A careful examination on the result on table 1, shows that business disruptive innovation has a significant positive influence on economic sustainability. In addition, business disruptive innovation has a significant positive influence on social sustainability. Also, business disruptive innovation has a significant positive influence on environmental sustainability. Therefore, the null hypothesis four (HO_4) is rejected and alternative hypothesis four (HA_{14}) accepted which states that business disruptive innovation has a significant and positive influence on the sustainability of GSM communications industry in Nigeria.

Discussion of Findings

The results of the study revealed that product, market, technological and business disruptive innovations have significant and positive influence on the sustainability of GSM communications industry in Nigeria. Technological disruptive innovation was found to be the most influential factor, indicating that the continuous adoption of emerging technologies contributes meaningfully to GSM's economic, social and environmental sustainability. Product and market disruptive innovations also showed strong positive influences thus, reflecting the effectiveness of GSM strategies in responding to products and customer needs especially in capturing new market opportunities (Adebayo & Olanrewaju, 2024). Business disruptive innovation demonstrated a very strong significantly contributed to the sustainability of GSM by enabling flexibility, efficiency, and value creation through new operational structure. The findings align with prior research. Also, Christensen (2018) reported business that disruptive innovations drive organizational adaptation and long-term competitiveness. Similarly, Ouma and Oloko (2015) found that technological advancements significantly influence and enhance firm performance. The positive link between market disruptive innovation and sustainability is supported by the work of (Hopp et al., 2018; Anetoh et al., 2025; Anetoh, Anetoh Ajakpo, Nwatu, and Eboh, 2025) and that of the findings of Fu et al. (2023) that stressed the importance of aligning market strategies with customer-centric

innovation. Business disruptive innovation, as supported by Okeke, Nwokorie and Ekwuochi (2019) enables firms to rethink value creation and delivery that supports the long-term sustainability. Furthermore, the findings strongly support the Disruptive Innovation Theory, which posits that innovation can transform existing markets by creating new value networks. GSM's success in leveraging innovation aligns with this theory, demonstrating that when a firm embraces disruption across technology, market orientation, and business operations, it strengthens its sustainability performance (Adawudi et al., 2024). In addition, the implication of the findings is that GSM are both strategic and operational. First, the company should continue to invest in advanced technologies to maintain its sustainability in telecommunication sector. Furthermore, strengthening business and market innovations by actively listening to customers' complaints and feedback and also by swiftly introducing new product, new technology and new services will enhance business and market relevance (Anetoh, Ndubisi, Ogbunuju and Ewuzie 2022). In addition, business flexibility should be reinforced to support agile responses to market disruptions.

5. CONCLUSION AND RECOMMENDATIONS

The research highlights the importance of integrating disruptive innovation into organizational strategy to ensure sustainable growth and competitiveness in a dynamic business environment. The study explored how product, technological innovation, market innovation, and business model innovation influenced the sustainability in GSM, measured across three dimensions: economic, social and environmental sustainability. Technological disruptive innovation had a significant and positive influence on economic, social and environmental aspects of sustainability. The study concludes that GSM communications should continue to investments in digital platforms, automation, and infrastructure enhancement. Product and market innovation were found to have significant influence on economic, social and social sustainability, particularly through GSM adaptation to customer needs, introduction of new market segments, and agile pricing strategies. Business disruptive innovation exhibited the strongest influence on sustainability, highlighting the importance of GSM strategic reconfiguration, partnerships, and revenue diversification in maintaining profitability. The study found that product disruptive innovation, market disruptive innovation, technological disruptive innovation and business disruptive innovation have significant positive influences on economic sustainability, social sustainability and environmental sustainability of GSM communications industry in Nigeria. The findings support the Disruptive Innovation Theory and Triple Bottom Line theory. The study concluded that product, market, technological and business disruptive innovations significantly and positively influence the sustainability of GSM communications industry in Nigeria. The researchers recommended among others that GSM service providers should continue to invest on disruptive innovations through the introduction of more new products, introduction of more new markets, introduction of more unique technological and introduction of more novel business innovations for enhanced profitability, efficiency, equity, wellbeing and sustainability of GSM communications industry in Nigeria.

6. CONFLICT OF INTEREST: the researchers have no conflicting interest to declare.

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