

# Influence of Sustainable Shipping on Organizational Effectiveness of Shipping Companies in Port Harcourt, Nigeria

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**Abstract:** The study examined the relationship between sustainable shipping and organizational effectiveness of shipping companies in Port Harcourt, Nigeria. The independent variable is sustainable shipping. Also, the dependent variable - organizational effectiveness was measured with customer orientation and operational efficiency. The population of the study consisted of forty-five (45) shipping companies in Port Harcourt. The study selected ten (10) staff from each of the 41 shipping companies and that resulted to the sampling of four hundred and ten (410) staff and 374 copies of questionnaire were retrieved from them. After editing them, 354 copies of questionnaire representing 86.34% response rate were validly used for the study. The study used descriptive and inferential statistical tools to analyse the data. Specifically, Pearson Products Moment Correlation Coefficient (r) was used to test the hypotheses with the aid of SPSS 25.0. The study found that shipping companies have a formal Management Information System Department and employ managers whose main duties include the management of information technology to achieve organizational effectiveness. The study concluded that: Sustainable shipping has positive and significant relationship with customer orientation and operational efficiency of shipping companies. Technology moderates the relationship between maritime transport and organisational effectiveness of shipping companies. The study, therefore, recommends that: Government should create and encourage conducive maritime transport environment so that shipping companies can benefit from the economic and social gains arising from sustainable shipping practices. Shipping firms in Nigeria should adapt technology in various forms so that their maritime transport activities could be effectively and efficiently operated for optimal performance

**Keywords:** Sustainable Shipping, Organisational Effectiveness, Customer Orientation, Operational Efficiency, Technology

## I. INTRODUCTION

Over the last decades, sustainable shipping management has been studied broadly and its significance to practitioners and academics has been acknowledged with a high degree of popularity. However, notwithstanding major inputs in sustainable shipping management and sustainable shipping integration recent surveys demonstrates that firms are struggling to gain competitive advantage as a result of sustainable shipping integration silos. The aim of this study is to determine the relationship between sustainable shipping

and organisational effectiveness of shipping companies in Port Harcourt. A sustainable shipping system requires a platform for the facilitation of innovation, showcasing new technology and its applications (Shu, Wei & Peng, 2019). This will also entail partnerships between Governments, ship builders, classification societies, manufacturers, research and Development establishments and academic institutions. The sustainable shipping industry should take advantage of new technology in order to maximize its environmental performance as well as to enhance safety be prepared for new cargo types and new trades. Governments should provide incentives to advance new technology and innovation for the sustainable shipping system (UNCTAD,2020)

Some prior studies have examined sustainable shipping integration and organisational effectiveness. For example, Martin (2019), investigated information technology integration, operations flexibility and organisational effectiveness in shipping companies. Teece (2018) examined sustainable shipping integration scales validation and benchmark value, based the HDM Project database (2005-2007) across ten countries: Austria, Finland, Germany, Italy, Japan, Spain, Sweden, and the USA. Bagoulla and Guillotreau (2020) studied sustainable shipping in the French economy and its impact on air pollution as an input-output analysis. UNCTAD (2020) examined decarbonizing sustainable shipping: Estimating fleet renewal trends based on ship scrapping patterns. Organisational effectiveness is critical to success in any organisation. In present competitive era, without effectiveness, existence itself is impossible for organisations. Organisation's survival depends on the ability of the manager to analyze, interpret and cater for the environmental needs (Song & Mi, 2016).

Organizational effectiveness in the context of this study, looks at ways managers/firm owners make critical decisions regarding overall organizational systems based on assessment of subunit performance and general program delivery. The relationship between sustainable shipping and organizational effectiveness has been historically viewed through a narrow lens of human capital theory or cost-based analysis (UNCTAD, 2020). When engaging in new technology adaptation, the firms do have a strategic management plan,

full of objectives to achieve in order to succeed with the mission of the firm. Today, sustainable shipping management planning is an area of responsibility in which many organizations are not clearly aware of its effect on achieving organisational effectiveness. An organization's main objective is not to achieve a single sale from consumers but to build a long relationship between its suppliers and customers (Wishart, 2018). This much fund is being committed to sustainable shipping integration with the hope of establishing organisational effectiveness which is only rewarded when sustainable shipping attracts suppliers and customers.

Despite the significant role of external organisational effectiveness in enhancing firms' competitive advantage, many shipping companies are still faced with bad customer orientation and operational inefficiency (Lane & Pretes, 2020; Bagoulla & Guillotreau, 2020; Foroudi et al., 2021). There is need to examine the link between sustainable shipping and organisational effectiveness in terms of customer orientation and operational efficiency in the shipping industry with emphasis on shipping companies in Port Harcourt. It is the considered view of the researcher that a study of this nature is extremely needed.

#### Objective of the Study

- i. examine the relationship between sustainable shipping and organizational effectiveness of shipping companies in Port Harcourt.
- ii. examine the influence of technology on the relationship between sustainable shipping and organisational effectiveness of shipping companies in Port Harcourt.

#### Research Questions

In order to achieve the above objectives, the following research questions were posed:

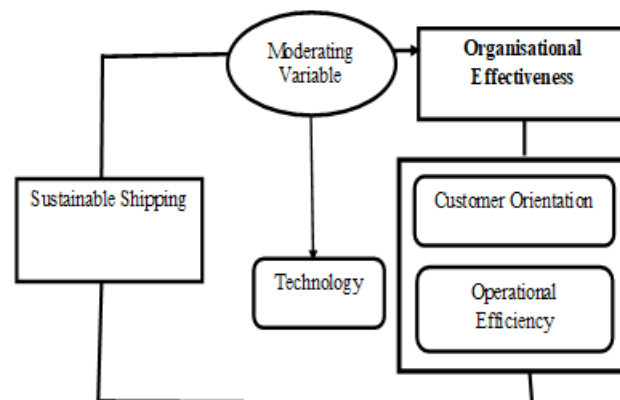
- i. To what extent does sustainable shipping relate with organizational effectiveness of shipping companies in Port Harcourt?
- ii. To what extent does technology affect the relationship between sustainable shipping and organisational effectiveness of shipping companies in Port Harcourt?

#### Study Variables and Conceptual Framework

A conceptual framework outlines possible courses of action or a preferred approach to an idea or thought, (Psarftis, 2021). The study examined the relationship between sustainable shipping and organisational effectiveness of shipping companies in Port Harcourt, Nigeria. To carry out the study, the independent or predictor variable – sustainable shipping) has been used as a dimension and the dependent variable (organisational effectiveness) was measured with customer orientation and operational efficiency. These dimension and the measures have been adopted in line with the works of Psarftis and Kontovas (2021); Özer; Canbay and Kirca (2020); Shu, Wei and Peng (2019). The imperative of the need to use these elements to measure organisational

effectiveness has become obvious as could be seen from the proposed conceptual framework of sustainable shipping and organisational effectiveness of shipping companies in Port Harcourt (see figure 1)

Figure 1: Conceptual Framework of the Relationship between Sustainable Shipping and Organisational Effectiveness of Shipping Companies in Port Harcourt, Nigeria



Source: Researcher's Conceptualization (2022). As Adapted from (Psarftis & Kontovas, 2021; Özer; Canbay & Kirca, 2020; Shu, Wei & Peng, 2019)

#### Research Hypotheses

The following null hypotheses were tested in this study:

- H<sub>01</sub>:** There is no significant relationship between sustainable shipping and customer orientation of shipping companies in Port Harcourt
- H<sub>02</sub>:** There is no significant relationship between sustainable shipping and operational efficiency of shipping companies in Port Harcourt.
- H<sub>03</sub>:** Technology has no significant influence on the relationship between sustainable shipping and organisational effectiveness of shipping companies in Port Harcourt.

## II. LITERATURE REVIEW

### Theoretical Foundation Stakeholder's Theory

In his work - extending the stakeholder theory, Jensen (2001) recognizes the multiplicity of stakeholders. He concurs with John and Senbet that certain actions of management might have conflicting effects on various classes of stakeholders. This implies that the managers have a multiplicity of objective functions to optimize, something that Jensen sees as an important weakness of the stakeholder theory "because it violates the proposition that a single-valued objective is a prerequisite for purposeful or rational behaviour by any organisation" (Jensen, 2001. p. 10). In search of a single valued objective function that conforms with rationality, Jensen suggests a refinement of the stakeholder theory – the enlightened stakeholder theory. For him, the enlightened stakeholder theory offers at least two advantages. First, unlike the earlier version with multiple objectives, the modified form of the theory proposes only one objective that managers

should pursue: the maximization of the long-run value of the firm. If the interest of any major stakeholder was not protected, the objective of long-run value maximization would not be achieved.

A second, related, appeal of the enlightened stakeholder theory is that it offers a simple criterion to enable managers to decide whether they are protecting the interests of all stakeholders: invest the firm's resources as long as that will increase by at least one dollar the long-term value of the firm. There is an important caveat, however. Jensen himself cautions that the criterion may be weakened by the presence of a monopoly situation or externalities. Despite its appeal, the stakeholder theory of the variety proposed by Jensen has not been subjected to much empirical evaluation. At least two factors might have contributed to the gap between theory and evidence. The first, already alluded to, concerns the prevalence of externalities and monopoly situation. The second is the problem of measurement, especially in view of the problems associated with getting an accurate measure of the long-term value of the firm (Ukwuoma, Oke & Nimfel, 2020).

The literature suggests that both market and non-market mechanisms could be used to promote the alignment of interest of managers and stakeholders. The managerial labour market and the market for corporate takeover tend to exert pressures both within and outside the firm in order to achieve such an alignment of interest. Fama (1980) asserts that a firm can be viewed as a team, whose members realize that in order for the team to survive, they must compete with other teams, and that the productivity of each member has a direct effect on the team and its members. Thus, within the firm, each manager has the incentive to monitor the behaviour of other managers, whether subordinates or superiors. Secondly, Fama (1980) argues that the firm is in the market for new managers and the reward system must be based on performance in order for it to attract good managers or even to retain existing ones. Demsetz and Lehn (1985) provide an explanation for the weakness of the market induced mechanisms as a means of protecting stakeholder interests. They observe that the free rider problem tends to prevent any of the numerous owners of equity from bearing the cost of monitoring the managers. Empirical works abound on the mechanisms aimed to help reduce the agency problem. Abstracting from other dimensions of corporate governance (such as incentive schemes) we focus on five mechanisms – insider shareholding, board composition, board size, ownership concentration and debt.

Consequently, the highly competitive environment of the shipping industry dictates an ongoing process of keeping up with updating and improving the implemented methods, in accordance with what the leaders of the industry are conducting (Dwarakish, & Salim 2015; Song & Mi, 2016). The causal relationship between the implemented methods, their development and expansions are viewed through the scope of competitive advantage and serve as differentiating

factors for the enhancement of the business performance. Hence, the leading companies of the shipping industry turn into a more collaborative spirit for the relationship with the regulators for uncovering better and viable solutions.

The results of the collaborative relationship with the regulators are further exploited and induced in the relationships with suppliers and customers who become the focal point that affects business performance. In the context of including actors across the supply chain the shipowners showed a normative approach (Zayyad & Toycan, 2018) when it comes to sustainability and decarbonization in extension. The development of the normative behaviour in the inner/competitive environment of the firm is the one that will aid in the formation of an appropriate green supply chain management. The importance of such an implication lies on the fact that shipowners bear the responsibility of ownership of the vessel, thus sustain the responsibility of being the central actor that will affect the market mostly in the maritime industry.

#### *Planned Behaviour Theory*

Theory of planned behaviour poses that the adoption or the performance of sustainable shipping practices is correlated with the company's attitude, where attitude is the reflection of the firm's beliefs on the outcome of the selection (Yuan et al., 2017). The notion firms have towards sustainability is aligned to what academia poses and is reflected around the triple bottom line of people-planet-profit (Golebiowski, 2016). In this context the people aspect is reflected with the provision of safety, while the planet aspect is connected with the environmental integrity and resource preservation. Lastly the profit aspect is an operational derivative under the two previous lenses through a dynamic relationship among them, along with the reciprocal relationships coming from the outer environment of the firm.

The proactive approach that was showed by the shipping firms, along with the perception that there will be no field for conducting business unless it is secured, preserved and sustainable is aligned with Hong, Chu and Wang (2011) and Yuan et al. (2017). Authors posed managerial philosophy towards sustainability and the viewpoint of incorporating sustainability into the values, goals, and objectives of the firm as suitable solutions, rather than a must-do trade-off. Examined shipping firms supported such a statement since they positioned themselves in the center of the responsibility and perceive the conduction of business and operations as an outcome with respect to the first two aspects of the triple bottom line (people and planet).

Gholami & Salimi, (2014) posed that the norms an entity is encountering are influenced by the approval or disapproval of specific behaviors by the outer environment. Yuan et al. (2017) extended it to the shipping context by posing stakeholders as the outer environment that approved or reject a certain behavior. The position as a central actor showed by shipping firms, combined with the proactive strategy

towards regulation compliance and the development of normative behavior when referring to the outer environment contradicts the notion of approval or disapproval. Though the solutions offered and suggested from various stakeholders in the shipping industry are operational, technical and market-based, the approval or disapproval derives from the central actor, in this instance the shipowner. The evaluation of each proposed choice is filtered and as posed in the results, the already developed normative and proactive approach endorses straightforward and real-life applicable solutions. Such a behavior is also supported by the fact that the expansion and further development of the implemented measures is correlated with ensuring actual results in terms of emission reduction and resource preservation. Hence, the market-based mechanisms were not supported and were instead disregarded.

### *Sustainable Shipping*

In order to provide a seamless and reliable service in the most efficient manner, the sustainable shipping system must deliver safe, secure, efficient and reliable transport of goods across the world, while minimizing pollution, maximizing energy efficiency and ensuring resource conservation. To achieve this, the complexity of the interrelation among actors in the sustainable shipping system should be recognized and taken into account when addressing specific actions (Covin & Wales, 2018).

The term sustainability, or as initially referred to consumer consciousness for services and products that are economically-environmentally-societal friendly, was introduced 20 years ago to illustrate the level of reflection of an organization regarding its responsibility to its customers and upscaling it to society level in a holistic perspective (Iheanachor, David-West & Umukoro, 2021). An alternative approach is the one of the triple bottom lines posed by Ellingsen & Aasland (2019), which comprises the aspects of people-planet-profit.

In the shipping context, the term sustainability comprises the fulfilment of present needs without jeopardising the needs of future generations, through balancing performance in three dimensions, namely economic, societal and environmental, as posed by Castellano et al. (2019). Buta (2016) depicted environment, diversity, safety, sustainable shipping and philanthropy as the underlying dimensions of the concept. Hence, Yuen et al. (2016) provided a perspective for sustainability, from a stakeholder theory lens, by integrating the satisfaction of needs of social and environmental actors along with shareholders to reach and achieve sustainability.

As stated by Martin (2019), maritime sustainability research has flourished in the last decade, revealing a trend that has awoken mostly due to the petition of exploring sustainable shipping practises. This can be supported by the fact that there is a plethora of literature regarding international regulations, namely EEDI (Energy Efficiency Design Index), SEEMP (Ship Energy Efficiency Management Plan), BWMS (Ballast Water Management System), that are developed to reduce the

environmental impact of shipping activities (Amavilah 2016; Teece 2018). Alternative fuels come to complement by aiming to ensure differentiation of the provided service and high business performance on one the hand, and on the other minimize the environmental impact (Balan, C. 2018; Onifade 2020; World Maritime News 2020).

World Commission of Environment World Ports Sustainability Programme (2020) referred to sustainability, from a cost perspective, defining it as the process where costs are internalised in order for actions to be truthfully valued as viewed through an intergenerational approach. On the other hand, Wang (2020) criticises the practices followed by shipping companies in an international scale. Specifically, they argue that the system of open registries prohibited the internalization of true costs associated with the shipping activity, namely environmental, social and labour, by the international community. Thus, giving the opportunity of offering a discounted internalized cost of maritime shipping, authors claimed to be artificial seeing from the lens of a holistic perspective of sustainability and questioned the general sustainable concept in a maritime context. Nonetheless, the rising concern of the public opinion regarding environmental issues, namely the depletion of resources and pollution that is caused due to shipping activities deriving from the globalization of operations and business activities, are discussed in a wide basis by political leaders as well (Covin & Wales, 2018).

### *Organisational Effectiveness*

The concept of organisational effectiveness is multidimensional, and leadership realises that organisational effectiveness extends beyond the traditional predictors for success. Variables such as sustainability, reputation and organisational well-being are relatively complex to define and hard to measure. Few empirical studies have introduced different kinds of OE models that describe the concept clearly (Mikelsone & Leila, 2016). Beyond tangible financial (profit) performance, the principle of the triple bottom line now includes value created from societal (people), environmental (planet), technological (innovation) and cultural (well-being) indicators. The new indicators are deemed critical in monitoring organisational effectiveness (Jacobson & Anderson, 2015; Mikelsone & Leila, 2016; Warren, 2016). Organisational effectiveness is fundamentally influenced by the context and timeframe in which the study is conducted. In 1992, Kaplan and Norton created the balance score card and grouped some of the non-financial measures of organisational effectiveness (Udayaadithya & Gurtoo, 2014) into specific categories, namely, customer, learning and growth, and internal business processes. The authors emphasise that the customer measure drives future financial performance. Researchers such as Lane & Pretes (2020), Mikelsone and Leila (2016) and Warren (2016) confirmed that financial viability, new technology, societal and environmental changes maintain a competitive edge and must be measured to demonstrate organisational effectiveness.

Organisational effectiveness has been studied in relation to approaches, assumptions, methods, models and perspectives in various contexts (Mikelson & Leila, 2016; Özer, Canbay & Kirca, 2020). Leadership of the organization develops the business strategy that stimulates performance in others (Martin 2019). Therefore, the assumption that leadership is the reason for organisational effectiveness is relevant (Covin & Wales, 2018). When stakeholders work together with leadership taking the lead, the purpose of the organisation can be realised, harnessing people assets (Alghaffari, Nguyen & Chen, 2018).

Stakeholders are driven by moral sentiment that explains who they are, what they stand for and how they relate to others (Teece 2018). Achieving organisational effectiveness requires an organisation to reflect on their goals and what they would like to be evaluated on by internal and external stakeholders (Raelin, 2018; Buta, 2016). The impact of differences means attributes emerging are different, and often classified as integrated or fragmented. According to Alghaffari, Nguyen and Chen (2018), new insights and development in organisational effectiveness empower leadership to establish a culture of sustainability through sustainable initiatives from an organisational, functional and individual level.

To date, most organisations assess their achievement of organisational effectiveness by looking at: financial performance and shareholder return as considered by economists, human factors and relational dynamics, as considered by strategists emerging behavioural factors such as trust or corporate governance, primarily considered by social scientists (Buta, 2016; Martin, 2019); Alghaffari, Nguyen & Chen, 2018; Warren, 2016). Through trust, stakeholders are enabled to function and provide the organisation with a competitive edge (Warren, 2016).

Organisational effectiveness challenges have been experienced as a result of organisations not shifting their mindsets for inclusivity of new models available (Warren, 2016). With increased globalisation, traditional organisational effectiveness definitions are falling short. The ambiguity of language caused by misinterpretation increases stakeholder confusion. For instance, one study asserted that organisations are effective when they reach consensus on the set of goals, where others interpret the goal-based model as the ability of employees to achieve goals (Udayaadithya & Gurtoo, 2014).

#### *Customer Orientation*

Customer orientation refers to the extent to which organizations and their employees are committed to meeting customer needs and improving customer well-being (Foroudi et al. 2021). Since the first conceptualization by Saxe and Weitz (1982), customer orientation has become a widespread topic in the fields of marketing, organizational behavior, and psychology, and regarded as a key determinant of business success (Covin & Wales, 2018; Iheanachor David-West & Umukoro, 2021). In practice, organizations have constantly

improved their customer-centric beliefs of front-line employees, encouraged them to provide customer-oriented services, and made unremitting efforts to become a customer-oriented organization.

From a research point of view, a large volume of studies has devoted to understanding the performance implications of customer orientation. For instance, the positive effects of customer orientation on individual, team, and business performance are largely undisputed with empirically evidence supporting such effects (Psarftis & Kontovas, 2021). Meanwhile, another stream of studies investigated how customer orientation has potential significant influences on employee attitudes and behaviors, such as employee job satisfaction (Zang et al. 2020), commitment, selling behavior, organizational citizenship behavior, intention to leave, and exhaustion. As customer is at the core of an organization's customer orientation, studies have explored its impact on customer outcomes, such as customers' attitude to product and salesperson (Zang et al. 2020), customer satisfaction and loyalty (Shu, Wei & Peng, 2019), customer repurchase intention and customer perceived service quality (Psarftis, 2021).

Although existing review papers or meta-analysis studies have summarized customer orientation or its correlated terminology, market orientation (Enyinda et al. 2021; Foroudi et al. 2021), these articles neither cover the multifaceted findings of customer orientation, nor include papers published in the past decade. Further, the emergence of many new customer-oriented research questions makes accurate positioning of customer-oriented future research directions as an important topic for scholars in this field to promote customer-oriented academic research. For instance, the global economic situation has been unpredictable, and business competition and the living environment have undergone subversive changes. Consequently, consumers' consumption patterns have changed, which force organizations to adjust or change their business models. In this case, many new customer-oriented problems have been triggered. For example, to better adapt to new competitive environments and improve corporate performance, more and more companies organize their business activities in a team mode (Domi, Capelleras & Musabelliu, 2020). Compared with the individual work model, the customer-oriented activities in the team model are more complicated. For example, in a multi-member team, achieving a high-level customer-oriented team climate with highly consistent employees within the team is a very tough question. For now, very limited research has focused on the customer orientation research in the team context, such as the research of Iheanachor, David-West and Umukoro (2021). While these team customer-oriented findings are far from satisfying the practical needs of more than 75% of companies currently switching from the traditional individual work model to the team model. The mechanism of team-level customer orientation is still unclear (Zang et al. 2020). For another example, in the era of rapid development of e-commerce and self-media platforms,

efficiently achieving customer-oriented activities under the virtual network environment arouses increasing research questions. For another example, in the post-pandemic era, how companies can effectively implement customer-oriented strategies remains to be studied. Thus, the massive amount and complexity of the existing customer orientation literature along with the ever-evolving business and market environments has led to an increasing need for a thorough literature review.

### *Operational efficiency*

Suppose that a company manages to instill aggregate fiscal discipline and to enhance operational efficiency (Foroudi et al. 2021). Operational efficiency is the tendency of operating rightly and strictly within the budgets and spending stipulations of the firm in order to achieve target objectives (Akbulaev & Bayramli, 2020). The organization that is operating at efficiency level has to confront the challenge of providing services at an acceptable level of quality and at reasonable cost. In this case, there are two problems. The first is the inevitability of the company being the monopoly supplier of some, in fact many services. A monopolist has little incentive to keep costs down and provide good service. The company as monopolist is no exception. In the case of obtaining a driver's license, for instance, because a citizen has no choice but to get it from the driver's license bureau, the service is usually grossly inefficient (and invariably corrupted). The second is a typical management problem. How can top management monitor the performance of the company staff? Top management has a set of preferences and priorities which it seeks to satisfy. Staff may not necessarily have the same preferences nor share the same priorities. When such misalignment occurs then there will be a tendency for some staff to try and "shirk", i.e. do other than what management wants them to do. This is what economists refer to as the principal agent problem (Shu, Wei & Peng, 2019). It is particularly severe in government because the likelihood of misalignment is much higher.

Iheanachor, David-West and Umukoro (2021) submit that the more severe the misalignment, the higher will be the cost of monitoring the performance of staff. The higher the cost of monitoring, the less monitoring there will be. Consequently, inefficiencies will creep in. It is no wonder for instance that, in many developing countries, considerable corruption occurs in the public procurement of goods and services. While such problems occur in private firms, competition and the profit motives tend to limit it. Unfortunately, in the public sector, monopoly is the more general rule and there is no "bottom line" profit to contend with (Zang et al. 2020).

The principal agent problem is another one of those issues which economists have beaten to death. For instance, a considerable literature exists on the appropriate contractual arrangements between a landlord (the principal) and a tenant farmer (the agent). In the context of operational efficiency, the oversight agencies (including primarily the budget agency) are the "principal" and each line agency an "agent". Moreover,

within a line agency, the minister is the principal and his management staff the agents. Within a division in the ministry, the manager of the division is the principal, and the staff are the agents. In short, there are several layers of principal-agent relationships. Is it no wonder then why many governments tend to be (operationally) inefficient? In the private sector, this problem is also endemic (Shu, Wei & Peng, 2019). The linking framework which allows expenditures to be driven by policy priorities and disciplined by budget realities is provided by the medium-term expenditure framework (World Ports Sustainability Programme 2020).

### *Concept of Technology*

Technology is the set of technical knowledge, scientifically, ordered that allows one to design and create goods and services that facilitate the adaptation to the environment and meet both their essential needs as people's wishes (Olaniyan, Halkias & Neubert, 2020). It is a word of Greek origin, *τεχνολογία*, formed by *technē* (τέχνη, art, technique or ex officio, which can be translated as skill) and *logia* (λογία, the study of something) (Agrifoglio et al. 2017). Although there are many very different technologies among themselves, it is common to use the term in the singular to refer to one of them or to the set of all. Amavilah (2016) argues that technology, may refer both to the theoretical discipline that studies the knowledge common to all technologies as educational technology, school discipline devoted to familiarization with foremost technologies.

Technological activity influences the social and economic progress, but its overwhelmingly commercial character makes sure it is more oriented to satisfy the wishes of the more prosperous (consumerism) than the essential needs of the neediest, which also tends to make a non-sustainable use of the environment friendly (Ezenwa et al., 2020). However, the technology can also be used to protect the environment and avoid growing needs causing a depletion or degradation of the planet's energy and material resources or increase social inequalities. As it makes intensive use, direct or indirect, of the environment (Biosphere), is the main cause of the increasing depletion and degradation of natural resources of the planet (Balan, 2018).

When one speaks about the relationships between technology and sustainable shipping and organisational effectiveness, it is evident that the study has to deal with the interrelations between some very complex phenomena: technology, science, society or systems of societies, and systems of performance of a universal nature. Ezenwa et al. (2020) submit that archaeologists have used the occurrence of characteristic technologies as the basis for the classification of prehistorical societies. These classifications are largely based on artefacts left behind by the peoples who once used them. In view of the task in hand, however, we have no use for a general definition of technology which includes only artefacts or the material products of inventions. Gausdal, Czachorowski and Solesvik (2018) insist that the definition of technology must enable the

study to distinguish between the use of technology in pre-industrial and industrial societies and between industrial societies and post-industrial ones in terms of such factors as flexibility, rigidity, or its pervasiveness in social life.

Ellingsen and Aasland (2019) conceptualise technology as a term which refers to human activities in connection with the utilization of artefacts. Moreover, technology implies the knowledge requisite to use these technical things. Ezenwa et al. (2020) maintain that technological 'things' are meaningless without the 'know-how' to use them, repair them, design them, and make them. As such this know-how can, partly at least, ... be systematized and taught, as in the various disciplines of engineering.

Nze et al. (2020) argued that administrative bottlenecks and corrupt practices contribute to the seaports' inefficiency, noting that the private operators are making investments in port cargo handling equipment to augment the port's outdated equipment. Technological infrastructures can increase the industry performance by dredging the seaports and channels to accommodate large vessels that will facilitate economies of scale and construction of port access roads or rail lines to eliminate traffic grids at the ports, thereby reducing congestion and reducing the current diversion of goods to neighboring countries to beat the traffic at Nigerian ports (Onifade, 2020).

#### *Relationship between Sustainable Shipping and Organisational Effectiveness*

Martin (2019). studied sustainable coastal shipping in Australia and found that mode of transport to be much more energy-efficient than other modes and, consequently, to produce less CO<sub>2</sub> per passenger carried. Furthermore, according to the European Transport Safety Council, coastal shipping is relatively safer than other modes of transport, such as road and rail transport. Lane and Pretes (2020). argued that using coastal shipping increases corporate social responsibility from which various benefits for transportation in the U.S. are derived, such as reduced air pollution and highway noise, mitigated highway congestion, and improved road safety. Furthermore, coastal shipping is an economical transport mode due to its efficient energy consumption and lower infrastructure expenditures.

By applying factor analysis, Shu, Wei and Peng (2019) investigated specific logistical strategies to integrate sustainable shipping into multimodal transport chains. World Maritime News (2020) proposed a theoretical intermodal competition model to compare sustainable and road transport and concluded that the EU needs to concentrate on port and transport system efficiency to promote sustainable shipping. Poulsen, Ponte and Sornn-Friese (2018). focused on the possibility of development of coastal shipping services within the complex transport networks around England. Psaraftis and Kontovas (2021), argued that the development of sustainable shipping needed to be put into

practice in the logistics sector and that there was a need for continued care and maintenance by logistics personnel.

Özer, Canbay and Kirca (2020) conducted a study of shippers' needs in sustainable shipping; they claimed that trucking achieved greater frequency than did coastal shipping. However, coastal shipping could be an alternative solution for complicated land transportation to cut down on environmental pollution. Similarity, sustainable shipping is promoted as an alternative to road freight transport in Greece by comparing the private and social costs, such as road accidents, environmental impacts, and other undesirable externalities (UNCTAD, 2020a). By adopting cost-benefit analysis, Wishart (2018) visualized the competitiveness of SSS against road haulage using the case of Northern Europe.

Sustainable shipping is a transport mode that is of paramount importance to coastal communities (Akbulaev & Bayramli, 2020). Due to the element of human error, issues concerning safety in shipping (Akbulaev & Bayramli, 2020), and related consequences (such as ferry disasters) have gained significant attention (Covin & Wales, 2018). A few empirical studies have examined the particular effects of ferry disasters on mental health (Bagoulla & Guillotreau, 2020). Notwithstanding the fact that coastal shipping is of critical importance for the transport of people and goods, lack of safety precautions leading to ferry disasters can be economically devastating (Xie et al. 2021). In addition, coastal shipping requires high efficiency if it is to contribute to a sustainable transport mode (Shu, Wei & Peng, 2019). Hence, it is important to understand the impact of ferry disasters on the efficiency of sustainable shipping operations. The study therefore hypothesizes that: H<sub>01</sub>: There is no significant relationship between sustainable shipping and customer orientation of shipping companies in Port Harcourt; H<sub>02</sub>: There is no significant relationship between sustainable shipping and operational efficiency of shipping companies in Port Harcourt.

#### *Influence of Technology on Sustainable Shipping and organisational effectiveness*

Balan (2018) in his study found that technology greatly improves the efficiency of maritime operations. Currently, shipping goods from a manufacturer to a consumer involves many stakeholders: transporters, ports, customs, etc. Much of the physical paperwork is handed over from one party to the next. This results in situations where goods may have arrived, but the paperwork has not caught up. Integrated digital platforms such as Port Community Systems connect the systems of multiple organizations that make up a seaport community, including shipping lines and terminals. Unfortunately, less than a third of IMO members are currently equipped with these platforms.

Ezenwa et al. (2020) in their study factors influencing information and communication technology diffusion in Nigeria's transport logistics industry: An exploratory study found that besides efficiency gains, digitization has the added

benefit of minimizing the need for physical interactions—an important consideration in the context of COVID-19. The rise of e-documents, for instance, allows workers to complete formalities quickly without having to sign or hand over papers in person. Wong et al. (2017) examined the influence of learners’ openness to IT experience on the attitude and perceived learning effectiveness with virtual reality technologies. They used correlational tools and revealed that governments lead in the way of deploying relevant technologies. Wong et al. (2017) found that Dubai has a strategy for blockchain and e-documents, aiming to eliminate more than 1 billion paper documents and unlocking US\$5.5 billion in savings annually. Increased usage of technologies could drive adoption costs down for all parties. They also, revealed that supportive policies and incentives help.

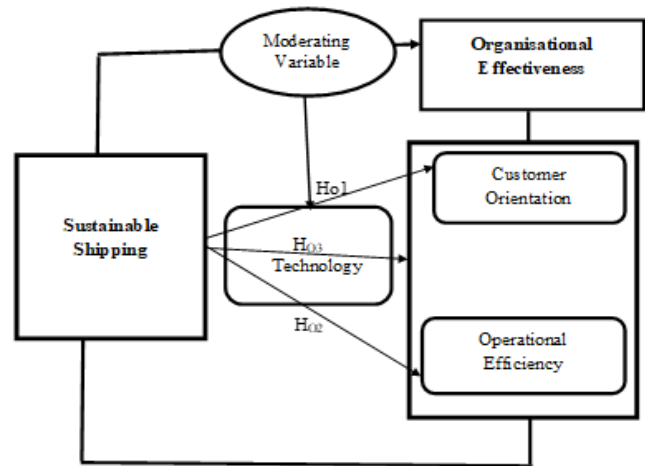
Yuan et al. (2017) did empirical research on relationships between subjective judgment, technology acceptance tendency and knowledge transfer. They found that Canada’s Shore Power Technology for Ports Programme a great and significant relationship with knowledge transfer. The Programme provides up to 50% of the funding for bringing electricity from the shore to ships docked in a port, meaning ships stopping at select Canadian ports will be able to turn off their auxiliary diesel engines and rely instead on local electric power. Bueger et al. (2020) investigated into the sea: capacity-building innovations and the maritime security challenge and found that the fear of the unknown can tend to undermine the potential of technology. They recommended that countries like the United Kingdom and India have piloted the use of regulatory sandboxes which are controlled environments, where regulators can safely test new technologies and business models and also determine how best to craft relevant policies. Singapore recently piloted the use of smart ships and drones in the maritime sector, testing these technologies on a small scale to understand their impact and adapt policy accordingly.

Aiello et al. (2020) found that technology has a critical role in addressing some of the key challenges facing the maritime sector, from COVID-19 to climate. But technological innovation alone cannot change the game. Aiello et al. (2020) suggested that to realize the full potential of technology, government and transport leaders need to create the right conditions, provide adequate incentives, and support the exchange of knowledge around the world. Stakeholders across the sector will have to play their part and cooperate effectively—when it comes to the future of shipping, we are all in the same boat.

Agrifoglio et al. (2017) in their study - how emerging digital technologies affect operations management through co-creation. Empirical evidence from the maritime industry posited found that digital technologies can improve integration between stakeholders, supporting information sharing, communication, and managerial processes, and researchers who have examined technology acceptance have adopted several theoretical views to investigate these factors.

Olaniyan (2020) revealed that technology diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. Olaniyan (2020) concluded that the rate of adoption is affected by five factors: “(i) perceived attributes of innovation (ii) type of innovation-decision (iii) communication channels (iv) nature of the social system [and] (v) extent of change agent’s promotion. Accordingly, the study hypothesizes that: H<sub>03</sub>: Technology has no significant influence on the relationship between sustainable shipping and organisational effectiveness of shipping companies in Port Harcourt.

Figure 2: Operationalized Framework of the Relationship between Sustainable Shipping and Organisational Effectiveness of Shipping Companies in Port Harcourt, Nigeria



Source: Researcher’s Conceptualization (2022). As Adapted from (Psarافتis & Kontovas, 2021; Özer; Canbay & Kirca, 2020; Shu, Wei & Peng, 2019)

### III. METHODOLOGY

The research design applied in this study was the cross-sectional survey research design. The cross-sectional survey research design emphasizes quantitative analysis whereby data are collected through questionnaire, interviews, or from existing documents for example. Population of this study consisted of forty-five (45) shipping companies for which 10 staff were selected from each of the forty-five (45) shipping companies in Port Harcourt (Nigerian Shippers Council, 2021).

The sampling technique used in this study was the simple random technique. The choice of this method was predicated on the fact that every element in the study had an equal chance of being studied. A total of forty-five (45) shipping firms (Nigeria Shippers Council, 2021). The study used Prof. Taro Yamane’s Sample Size Formula to determine the sample size as follows:

$$n = \frac{N}{1 + N(e)^2}$$

Where:  
n = Sample Size



$N$  = Population of the Study

$e$  = Level of Significance selected at 5%

Accordingly, the sample size ( $n$ ) for the study is calculated thus:

$n = 45/1+45 (0.05)^2 = 45/ 1.1125 = 40.44943820224719$  i.e. 41 Shipping companies

The study selected ten (10) staff from each of the shipping companies resulting to four hundred and ten (410) staff and this constituted the sample size. Ten (10) staff were drawn from each of the shipping companies as respondents. They are Operations Managers, Transport Managers, Finance and Accounts Managers, Business Development Managers and Logistics Managers and Transport Officers.

Data collection in this study was done through primary and secondary. The primary sources consisted of first-hand information or raw data obtained by the researcher himself through the administration of research instruments. The secondary sources were existing data obtained from relevant materials such, books, journals, magazines and so on an unpublished work of others as well as valuable documents available to the researcher.

Questionnaire was the major research instrument used to elicit data from respondents on whom they were administered to in this study. Reliability indicates the extent to which individual differences in test score are attributable to 'true' differences in the fluke characteristic being measured, and the extent to which they are attributable to chance (or unsystematic) errors. The Cronbach alpha that was computed using the SPSS software. Hence, only result of 0.7 and above were considered as acceptable while any result below 0.7 was discarded.

Analysis as defined by Akujuru and Enyioko (2018) is the breaking and ordering of the quantitative information gathered for research purposes into their component parts to uncover their interrelationships, understand their nature or to determine their essential ingredients. In this study, percentages, ratios, frequency distribution, scaling, ranking and other statistical tools were used to analyse and achieve research objectives. Also, Pearson's Product Moment Correlation Coefficient ( $r$ ) was used to test the hypotheses formulated in the study. All these analyses were computed by using statistical package for social sciences (SPSS) version 25.0.

#### IV. RESULTS AND DISCUSSION

The field and survey exercises were carried out by the researcher which involved the administration of the copies of questionnaire to the respondent ship companies. After administering the instruments, the respondents were given a time space of three months to respond to the instruments. Thereafter copies of questionnaire were retrieved physically from the respondents by the researcher through well-established enumerators. A total number of 410 copies of

questionnaire were distributed to the respondents from forty-one (41) shipping companies in Port Harcourt, Nigeria. A total of 374 copies of questionnaire were retrieved from them. After editing the retrieved copies of questionnaire, the copies found useful were 354. The 354 copies of questionnaire were considered as valid and suitable for data analysis in this study. The administration and retrieval of copies of the questionnaire are shown in Table 1:

Table 1: Questionnaire Administration and Retrieval

Nature of Staff	Copies of Questionnaire Distributed to the Respondents	Copies of Questionnaire Retrieved	Copies of Questionnaire Found Useful	Response Rate
Shipping Managers	70	58	55	78.58%
Supervisors	116	111	103	88.80%
Billing Clerks/Officers	78	72	69	88.46%
Financial Controllers	74	68	66	89.20%
Operations Managers	72	65	61	84.72%
Total	410	374	354	86.34%

Source: Survey Data, 2022, and SPSS Window Output, Version 25.0

Table 1 shows the details of how the copies of questionnaire (survey instruments) were distributed and retrieved from the respondent shipping companies. The breakdown shows that Shipping Managers, 70 copies of questionnaire were administered to the rural dwellers and 58 copies of questionnaire were retrieved from them. However, after going through them, 55 copies of questionnaire representing 78.58% were found useful from this State. In Supervisors State, 114 copies of questionnaire were administered to the rural dwellers and 111 copies of questionnaire were retrieved from them of which 103 copies of questionnaire, representing 88.80% were found useful from this State. In Billing Clerks/Officers State 76 copies of questionnaire were distributed to the rural dwellers and 72 copies of questionnaire were retrieved. However, after going through them 69 copies of questionnaire were (representing 88.46% were found useful for the study analysis.

With reference to Financial Controllers State, 72 copies of questionnaire were administered to the rural dwellers and 68 copies of questionnaire were retrieved from them of which 66 copies of questionnaire representing 89.20% were found useful from Financial Controllers State. In Operations Managers State, 70 copies of questionnaire were administered to the rural dwellers and 65 copies of questionnaire were retrieved from them. However, after going through them, 61 copies of questionnaire representing 84.72% were found useful from this State. In all, a total of 410 copies of questionnaire were distributed to the respondents from shipping companies in Port Harcourt and 374 copies of questionnaire were retrieved from them. After editing them,

354 copies of questionnaire representing 86.34% response rate were found useful for the study. The 354 copies of questionnaire were considered as valid and suitable for data analysis in this study.

### *Sustainable shipping and Customer orientation of shipping companies in Port Harcourt*

Tables 2 gives the detailed analysis on how sustainable shipping affects organisational effectiveness of shipping companies in Port Harcourt and to show their statistical outcomes based on the questions scrutinized.

Table 2: Sustainable shipping and Customer orientation

Question Items on Sustainable shipping	Mean	SD	Question Items on Customer orientation	Mean	SD
Sustainable shipping is used to achieve organisational effectiveness objective.	3.398	1.008	Customer orientation is the extent to which organizations and their employees are committed to meeting customer needs and improving customer well-being	3.864	0.520
With organisational effectiveness, there would be no reason for sustainable shipping not to exist.	3.189	1.046	The market and customer orientation credence are robust and sustainable geared at increasing demand for our company's product and services	3.452	1.009
Sustainable shipping services encourage the non-regular, sustainable shipping of bulk cargo that is not containerised, and include a range of economically important services to achieve organisational effectiveness	2.966	1.190	Customer orientation is practiced in shipping companies towards toward giving bundles of satisfaction to clients.	3.825	0.610
Shipping companies have developed and implemented strategies, initiatives and programmes that address issues related to air quality, climate change and water quality in maritime sector	3.215	1.129	Shipping companies constantly improve their customer-centric beliefs and provide customer-oriented services.	3.350	0.917
Shipping companies and maritime authorities have made tremendous progress during in the last decades to reduce the environmental impact of sustainable shipping in some regions leading to organizational effectiveness.	3.381	0.960	Effective sustainable shipping enhances the organizational effectiveness of shipping companies.	3.658	0.774
Valid N listwise					

Source: Survey Data, 2022, and SPSS Window Output, Version 25.0

Table 2 reveals that five statement items represent a dimension in the 5-point scale. The first statement item was to find out if sustainable shipping is used to achieve organisational effectiveness objective. From the mean and standard deviation scores of  $3.398 \pm 1.008$ , the respondents agree that sustainable shipping is used to achieve organisational effectiveness objective. With respect to the second statement item in this segment, it was aimed at finding whether with organisational effectiveness, there would be no reason for sustainable shipping not to exist. The mean score and standard deviation scores of  $3.189 \pm 1.046$  indicate that with organisational effectiveness, there would be no reason for sustainable shipping not to exist. The 3rd statement item sought to determine whether sustainable shipping services encourage the non-regular, sustainable shipping of bulk cargo that is not containerised, and include a range of economically important services to achieve organisational effectiveness. The mean score and standard deviation scores of  $2.966 \pm 1.190$  show that the respondents agreed that sustainable shipping services encourage the non-regular, sustainable shipping of bulk cargo that is not containerised, and include a range of economically important services to achieve organisational effectiveness.

The 4th statement item was to find whether shipping companies have developed and implemented strategies, initiatives and programmes that address issues related to air quality, climate change and water quality in maritime sector;

the mean score and standard deviation score of  $3.215 \pm 1.129$  also imply that descriptively shipping companies have developed and implemented strategies, initiatives and programmes that address issues related to air quality, climate change and water quality in maritime sector. In the case of the 5<sup>th</sup> item, with the mean and standard deviation scores of  $3.381 \pm 0.960$ , the respondents agree that shipping companies and maritime authorities have made tremendous progress during in the last decades to reduce the environmental impact of sustainable shipping in some regions leading to organizational effectiveness. Table 2 also, reveals that the first statement item on the right-hand side of the table relating to customer orientation has sought to know if customer orientation is the extent to which organizations and their employees are committed to meeting customer needs and improving customer well-being had the mean score and standard deviation scores of  $3.864 \pm 0.520$  which imply that respondents agreed that customer orientation is the extent to which organizations and their employees are committed to meeting customer needs and improving customer well-being.

The second statement at the right-hand side of the table sought to determine whether the market and customer orientation credence are robust and sustainable geared at increasing demand for our company's product and services. The result showed the mean score and standard deviation scores of  $3.452 \pm 1.009$  indicating that the consensus opinion of the respondent is that the market and customer orientation

credence are robust and sustainable geared at increasing demand for our company's product and services. In the case of the 3rd statement at the right-hand side of the table, the option of the respondents had a statistical result of the mean and standard deviation scores of  $3.825\pm 0.610$  indicating that customer orientation is practiced in shipping companies towards toward giving bundles of satisfaction to clients. With respect to the 4th statement item at the right-hand side of the table, the mean and standard deviation scores of  $3.350\pm 0.917$  implying that shipping companies constantly improve their customer-centric beliefs and provide customer-oriented services. For the 5th statement item at the right-hand side of Table 2, which sought to determine if effective sustainable

shipping enhances the organizational effectiveness of shipping companies, the mean score and standard deviation scores of  $3.658\pm 0.774$ . This means that the respondents agreed that effective sustainable shipping enhances the organizational effectiveness of shipping companies.

#### *Sustainable shipping and Operational efficiency of shipping companies in Port Harcourt*

Tables 3 gives the detailed analysis about influence of sustainable shipping on operational efficiency of shipping companies in Port Harcourt and to show their statistical outcomes based on the questions deposed.

Table 3: Sustainable shipping and operational efficiency of shipping companies in Port Harcourt

Question Items on Sustainable shipping	Mean	SD	Question Items on Operational efficiency	Mean	SD
Sustainable shipping is used to achieve organisational effectiveness objective.	3.398	1.008	Shipping companies value giving satisfactory and accurate information to the sustainable shipping in order to achieve operational efficiency.	3.172	0.920
With organisational effectiveness, there would be no reason for sustainable shipping not to exist.	3.189	1.046	Shipping companies engage in activities that encourage the conduct of sustainable shipping of sustainable shipping and operational efficiency.	3.421	0.757
Sustainable shipping services encourage the non-regular, sustainable shipping of bulk cargo that is not containerised, and include a range of economically important services to achieve organisational effectiveness	2.966	1.190	Shipping companies encourage the management staff to engage other staff in robust and critical issues pertaining to the effective performance of their organisations	3.144	1.001
Shipping companies have developed and implemented strategies, initiatives and programmes that address issues related to air quality, climate change and water quality in maritime sector.	3.215	1.129	Shipping companies allow staff to make variety of suggestions for the growth of sustainable shipping sector.	3.814	0.634
Shipping companies and maritime authorities have made tremendous progress during in the last decades to reduce the environmental impact of sustainable shipping in some regions leading to organizational effectiveness.	3.381	0.960	Shipping companies' staff have the prerequisite to engage in thorough sustainable shipping practices that elicit operational efficiency	3.031	0.895
Valid N listwise	354				

Source: Survey Data, 2022, and SPSS Window Output, Version 25.0

Table 3 shows the responses of the respondents on how sustainable shipping is related to operational efficiency of shipping companies in Port Harcourt. At the left-hand side Table 3 reveals the mean and standard deviation scores of  $3.398\pm 1.008$ , that sustainable shipping is used to achieve organisational effectiveness objective. Also, through the mean score and standard deviation scores of  $3.189\pm 1.046$  that with organisational effectiveness, there would be no reason for sustainable shipping not to exist. It is further revealed from the table through the mean score and standard deviation scores of  $2.966\pm 1.190$  that sustainable shipping services encourage the non-regular, sustainable shipping of bulk cargo that is not containerised, and include a range of economically important services to achieve organisational effectiveness. As to whether shipping companies have developed and implemented strategies, initiatives and programmes that address issues related to air quality, climate change and water quality in maritime sector; the mean score and standard deviation score of  $3.215\pm 1.129$  authenticate through descriptive statistics that

shipping companies have developed and implemented strategies, initiatives and programmes that address issues related to air quality, climate change and water quality in maritime sector. Furthermore, with the mean and standard deviation scores of  $3.381\pm 0.960$ , the respondents agreed that shipping companies and maritime authorities have made tremendous progress during in the last decades to reduce the environmental impact of sustainable shipping in some regions leading to organizational effectiveness.

Table 3 further reveals that shipping companies value giving satisfactory and accurate information to the sustainable shipping in order to achieve operational efficiency as the mean and standard deviation scores of  $3.172\pm 0.920$  authenticate that. The mean and standard deviation scores of  $3.421\pm 0.757$  indicate that shipping companies engage in activities that encourage the conduct of sustainable shipping of sustainable shipping and operational efficiency as the respondents agreed on this. Also, shipping companies encourage the management staff to engage other staff in

robust and critical issues pertaining to the effective performance of their organisations as indicated through the mean and standard deviation scores of  $3.144 \pm 1.001$ . Table 3 shows that shipping companies encourage the management staff to engage other staff in robust and critical issues pertaining to the effective performance of their organisations as confirmed by the mean and standard deviation scores of  $3.814 \pm 0.634$ . Finally, the mean score and standard deviation scores of  $3.031 \pm 0.895$  indicate that shipping companies' staff have the prerequisite to engage in thorough sustainable shipping practices that elicit operational efficiency.

*Technology As a Moderator between Sustainable shipping and Organisational Effectiveness of Shipping Companies in Port Harcourt*

Table 4 shows the descriptive results on how technology is a moderator between sustainable shipping and organisational effectiveness of shipping companies in Port Harcourt programmes which is measured with five statement items on the 5-point scale.

Table 4: Descriptive Results on the Moderating Influence of Technology on Maritime Transport and Organisational Effectiveness of Shipping Companies in Port Harcourt

	QUESTION ITEMS	MEAN	S. D
1	Shipping companies are skilled at collecting and analyzing sustainable shipping information about their customers via computer-based systems resulting to organizational effectiveness.	4.155	0.746
2	Shipping companies utilize computer-based systems to access transport information from outside databases for organizational effectiveness.	3.839	1.297
3	Shipping companies have set procedures for collecting customer information from online sources and they use computer-based systems to analyze customer and sustainable shipping information that elicit organizational effectiveness	4.266	0.879
4	Shipping companies have a formal Management Information System department and employ managers whose main duties include the management of information technology to achieve organizational effectiveness	3.794	1.291
5	Every year shipping companies budget a significant amount of funds for new information technology hardware and software, and this improves organizational effectiveness.	4.042	1.049

Source: Survey Data, 2022, and SPSS Window Output, Version 22.0

Keys: S.D: standard deviation.

Table 4 reveals that the first statement item which borders on whether shipping companies are skilled at collecting and analyzing sustainable shipping information about their customers via computer-based systems resulting to organizational effectiveness had the mean score and standard deviation scores of  $4.155 \pm 0.746$  which imply that respondents agreed that shipping companies are skilled at collecting and

analyzing sustainable shipping information about their customers via computer-based systems resulting to organizational effectiveness.

The second statement item sought to determine whether shipping companies utilize computer-based systems to access transport information from outside databases for organizational effectiveness. The result showed the mean score and standard deviation scores of  $3.839 \pm 1.297$  indicating that the consensus opinion of the respondent is that shipping companies utilize computer-based systems to access transport information from outside databases for organizational effectiveness. In the case of the 3rd statement item, the option had a statistical result of the mean and standard deviation scores of  $4.266 \pm 0.879$  indicating that shipping companies have set procedures for collecting customer information from online sources and they use computer-based systems to analyze customer and sustainable shipping information that elicit organizational effectiveness. With respect to the 4th statement item, the mean and standard deviation scores of  $3.794 \pm 1.291$  implying that shipping companies have a formal Management Information System department and employ managers whose main duties include the management of information technology to achieve organizational effectiveness For the 5th statement item which sought to determine whether every year shipping companies budget a significant amount of funds for new information technology hardware and software, and this improves organizational effectiveness, the mean score and standard deviation scores of  $4.042 \pm 1.049$ . This means that the respondents agreed that every year shipping companies budget a significant amount of funds for new information technology hardware and software, and this improves organizational effectiveness.

*Statistical Test of Hypotheses and their Interpretations*

The study has sought in chapter one to determine the nature of relationship between sustainable shipping and organisational effectiveness of shipping companies in Port Harcourt. As a result, six research questions and six hypotheses were raised to that effect. The next step of the study analysis sought and tested outcomes of the examined dimensions and measures of the variables in terms of relationship. Therefore, this section tested and interpreted the hypotheses formulated in this study.

*Sustainable shipping and customer orientation of shipping companies in Port Harcourt*

A research question and a hypothesis have earlier been raised to determine the relationship that exists between sustainable shipping and customer orientation of shipping companies in Port Harcourt.

Ho1: There is no significant relationship between sustainable shipping and customer orientation of shipping companies in Port Harcourt.

Table 5: Results of Sustainable shipping and customer orientation of shipping companies in Port Harcourt

Statistics	Sustainable shipping (SS)	Customer orientation (CO)
Pearson correlation Sustainable shipping (SS) Sig(2-tailed) N		0.807** 0.000 354
Pearson correlation- Customer orientation (CO) Sig(2-tailed) N	0.807** 0.000 354	

\*\*correlation is positive and significant at the 0.05 level (2-tailed)  
Source: Survey Data, 2022, and SPSS Window Output, Version 25.0

The sustainable shipping and customer orientation result of  $H_{01}$  shows that the rho outcome is 0.807 @  $p0.000 < 0.05$ , meaning that a strong positive relationship exists between the examined variables, and it is also significant. This implies that the null hypothesis 1 ( $H_{01}$ ) is rejected and the alternate hypothesis 1 ( $H_{11}$ ) accepted, hence; “there is significant relationship between sustainable shipping and customer orientation of shipping companies in Port Harcourt.

From the inferential analysis so far, it can be stated that: Sustainable shipping as a dimension of sustainable shipping has a positive and significant relationship with customer orientation as a measure of organisational effectiveness of shipping companies in Port Harcourt. This simply means that sustainable shipping as a shipping companies’ policy objective has strong relationship with customer orientation which is one of the key performance indicators for measuring organisational effectiveness of shipping companies in Port Harcourt.

*Sustainable shipping and Operational efficiency of shipping companies in Port Harcourt*

A research question and a hypothesis have earlier been raised to determine the relationship that exists between sustainable shipping and operational efficiency of shipping companies in Port Harcourt.

$H_{02}$ : There is no significant relationship between sustainable shipping and operational efficiency of shipping companies in Port Harcourt.

Table 6: Results of Sustainable shipping and Operational efficiency of shipping companies in Port Harcourt

Statistics	Sustainable shipping (SS)	operational efficiency of shipping companies (OESC)
Pearson correlation Sustainable shipping Sig(2-tailed) N	(SS)	0.782** 0.000 354
Pearson correlation- Operational efficiency of shipping companies (OESC) Sig(2-tailed) N	0.782** 0.000 354	

\*\*correlation is positive and significant at the 0.05 level (2-tailed)  
Source: Survey Data, 2022, and SPSS Window Output, Version 25.0

Table 6 above shows the results of the test of hypothesis,  $H_{02}$ . The results of the hypothesis tested show strong positive relationship. Hypothesis 2 ( $H_{02}$ ) - sustainable shipping and operational efficiency of shipping companies, the rho outcome of 0.782 @  $p0.000 < 0.05$  reveals that there is a strong positive relationship between sustainable shipping and operational efficiency of shipping companies in Port Harcourt and it is also significant; which means that the null hypothesis 2 ( $H_{02}$ ) is rejected and alternate hypothesis 2 ( $H_{12}$ ) accepted indicating that; “there is significant relationship between access to sustainable shipping and operational efficiency of shipping companies in Port Harcourt”.

From the inferential analysis so far, it can be stated that the outcome of the relationship between sustainable shipping as a dimension of sustainable shipping and the measure of organisational effectiveness of shipping companies in Port Harcourt, which is operational efficiency of shipping companies, is positive and significant. This simply means that sustainable shipping relates strongly and positively with operational efficiency of shipping companies in Port Harcourt.

*Technology Moderates Between sustainable shipping and organisational effectiveness of shipping companies in Port Harcourt*

The next step is to look at the moderating influence of technology on sustainable shipping and organisational effectiveness of shipping companies in Port Harcourt. To do this we formulated this hypothesis stated as follow:  $H_{03}$ : Technology has no significant influence on the relationship between sustainable shipping and organisational effectiveness of shipping companies in Port Harcourt. Table 7 shows the results of the statistical analysis on how technology moderates between sustainable shipping and organisational effectiveness of shipping companies in Port Harcourt

Table 7: Result of Test on the Moderating Influence of Technology on maritime transport and organisational effectiveness of shipping companies in Port Harcourt

Correlations					
Control Variables			Sustainable shipping	Organisational effectiveness	Technology
-None-a	Sustainable shipping	Correlation	1.000	.928	-.031
		Significance (2-tailed)	.	.000	.563
		df	0	352	352
	Organisational effectiveness	Correlation	.928	1.000	.005
		Significance (2-tailed)	.000	.	.931
		df	352	0	352
	Technology	Correlation	-.031	.005	1.000
		Significance (2-tailed)	.563	.931	.

		df	352	352	0
Techno logy	Sustainable shipping	Correlation	1.000	.929	
		Significanc e (2-tailed)	.	.000	
		df	0	351	
	Organisati onal effectivene ss	Correlation	.929	1.000	
		Significanc e (2-tailed)	.000	.	
		df	351	0	
A. Cells Contain Zero-Order (Pearson) Correlations.					

Source: Research Data 2022, and SPSS Window Output, Version 25.0

The results of the partial correlation as contained in Table 7 showing where “technology” is moderating, indicates that there is a moderate, positive partial correlation between the independent variable, "sustainable shipping and "dependent variable, "organisational effectiveness of shipping companies", while moderating for "technology", which is statistically significant @ = 0.929, n = 351, p = .000. However, when referred to the Pearson's product-moment correlation – also known as the zero-order correlation – between "sustainable shipping" and "organisational effectiveness of shipping companies", without moderating for "technology", it can be seen that there is also a statistically significant, moderate, positive correlation between "sustainable shipping" and "organisational effectiveness of shipping companies", @ = 0.928, n = 354, p = .000. This suggests that "technology" had very significant influence in moderating for the relationship between "sustainable shipping" and "organisational effectiveness of shipping companies". Hence the study has rejected the null hypothesis and concluded that: Technology moderates the relationship between sustainable shipping and organisational effectiveness of shipping companies in Port Harcourt.

Table 8: Summary of the Results on Test of the Research Hypotheses

Research Hypotheses	Rho Value	Result	Decision
H <sub>01</sub> : There is significant relationship between sustainable shipping and customer orientation of shipping companies in Port Harcourt	0.807	Positive and Significant	Reject
H <sub>02</sub> : There is significant relationship between sustainable shipping and operational efficiency of shipping companies in Port Harcourt	0.782	Positive and Significant	Reject
H <sub>05</sub> : Technology moderates between sustainable shipping and organisational effectiveness of shipping companies in Port Harcourt	0.929	Positive and Significant	Reject

Source: Survey Data, 2022, and SPSS Window Output, Version 25.0

Table 8 has revealed in summary that the study rejected all the null hypotheses and accepted the alternate hypotheses: H<sub>11</sub>: There is significant relationship between sustainable shipping and customer orientation of shipping companies in Port Harcourt; H<sub>12</sub>: There is significant relationship between sustainable shipping and operational efficiency of shipping companies in Port Harcourt; H<sub>13</sub>: Technology moderates between sustainable shipping and organisational effectiveness of shipping companies in Port Harcourt.

## V. DISCUSSION OF FINDINGS

The findings of this study were drawn from the analyses of the results in the previous section. In this section, the study discussed the findings and drew the conclusions there from.

### *Relationship Between Sustainable Shipping and Organizational Effectiveness of Shipping Companies*

The findings linked to the relationship between sustainable shipping and customer orientation of shipping companies in Port Harcourt revealed that sustainable shipping services encourage the non-regular, sustainable shipping of bulk cargo that is not containerised, and include a range of economically important services to achieve organisational effectiveness. A critical appraisal of the finding reveals that a strong, positive, and significant relationship exist between sustainable shipping and customer orientation leading to organisational effectiveness of shipping companies in Port Harcourt with rho value of 0.807. The full import of this finding is that sustainable shipping is a leeway to the achievement of organisational objectives and transformation. Sustainable shipping facilitates the possibility of increasing employment generation in shipping companies and improves the standard of living of the people (Akbulayev & Bayramli, 2020). Ferrari, Percoco and Tedeschi (2021) posit that the link between sustainability shipping and maritime economic growth, and related challenges have been widely discussed in the literature. For instance, sustainability issues in the maritime industry have become an important component of maritime logistics and supply chain management. In their study Lane and Pretes (2020) state that among three pillars of the sustainability, the social element is getting to be the main point of policy focus, since all ports areas have been influenced by ships' emissions, which cause lung cancer and heart-related illnesses.

The study found that shipping companies have developed and implemented strategies, initiatives and programmes that address issues related to air quality, climate change and water quality in maritime sector. The implication of this finding is that shipping companies stringently access sustainable shipping to identify the processes and procedures to locate, qualify and ultimately secure their businesses in sustainable shipping areas and that add to their effective and organisational effectiveness towards sustainable shipping transformation. In asserting this position, Psaraftis (2021) insists that sustainable shipping remains, first and foremost, a business endeavour, which delivers an essential public service to the world at

relatively low cost, while operating under many varying regulations in different jurisdictions. Furthermore, these regulations are not static. Ndikom and Olusegun (2020) submitted that changes are introduced to accommodate new challenges, such as technological advances and increased societal expectations for improved safety, security and environmental protection. Also, Shu, Wei and Peng (2019) observe that the goal of sustainable shipping is to create opportunities for citizenry sustainable empowerment, development and job creation.

A critical assessment of the finding reveals that positive and significant relationship exist between sustainable shipping and operational efficiency of shipping companies in Port Harcourt with rho value of 0.782. Song and Mi (2016) have earlier found that most of the journeys made by the poor are for subsistence tasks. For them, access to sustainable shipping facilities and the primary transport network is critical during times of need, especially for health, social and economic reasons. When sustainable shipping is properly harnessed it encourages operational efficiency. This study aligns with work of Teece (2018) who argue that considerations regarding the balance between cost and benefit, it is important to bear in mind value creation and value flows in the sustainable shipping, which is a chain of actors all of whom must share and distribute values. If all the actors in the shipping sector, while fulfilling their different functions, work together in support of this value chain, the sustainable shipping will not only function well for all stakeholders concerned, including civil society, it will also have a sustainable future.

#### *Moderating Influence of Technology on Sustainable shipping and organisational effectiveness of shipping companies in Port Harcourt*

The study revealed through matrix correlation co-efficient (partial correlation) between all three study variables (predictor, criterion and moderating) with the underlying moderating effect of technology on the relationship between sustainable shipping and organisational effectiveness of shipping companies in Port Harcourt. With strong  $r$  value of 0.928, statistically, significant relationship at  $p0.000 < 0.05$  exists among the variables. At the partial level correlation, the  $r$  value = 0.929 @  $0,000 < 0.05$  which indicates control for moderating the influence of technology on the relationship between sustainable shipping and organisational effectiveness of shipping companies in Port Harcourt. These findings agree with the position of Wong, Kong and Hui (2017), that technology is an evolving issue especially in the developing economies given the increasing level of poverty, hunger, starvation, economic backwardness, and poverty prevalent in rural areas.

The technology variables (indicators) as identified by Domi, Capelleras and Musabelliu (2020), which include; income generation, employment, better education or training, participation in community development, investment in economic opportunities/ savings (quality health care, and social network/community relations were equally found to

correlate with sustainable shipping variables such as; accessibility, quality, reliability, safety, efficiency, comfortability, affordability, and customer relation of public transport operators of public transport system in rural communities. New technologies use can exacerbate problems for the planet and, at the same time, contribute toward the UN's SDGs. In general, the digital revolution, integration and automation provide transparency and increase the accountability of the shipping industry (European Commission, 2020).

Likewise, Wang (2020), found that employment, participation in community development, investment in economic opportunities/savings and social network/community had significant positive relationships with accessibility to sustainable shipping system and technology. So far, the impact and correlates of sustainable shipping on technology have been very tremendous and important in transforming rural areas.

Enyinda et al. (2021) revealed that almost all the shipping companies in Nigeria are quite aware of the digital medium as a segment of technological innovation. Nevertheless, they find it difficult to embrace the technologies for their activities.

Also, Bagoulla and Guillotreau, (2020). examined the impact/correlates of using technology to moderate between innovativeness and socio-economic status of the people. They found what aligns with this study that technology has significant influence in moderating between transportation and socio-economic development in rural settings. Enyinda et al. (2021) found that all segments in maritime clusters are deeply connected with the technologies use and innovations in a fundamental way. An important question is whether the maritime industry has the right competence, capacity and willingness to continue to exploit these megatrends to reduce costs, increase market shares and gain competitiveness.

## VI. CONCLUSIONS

The emergence of modern means of sustainable shipping in the Nigeria and most importantly in cities with riverine areas has a remarkable influence on the socio-economic development of the country. From the test of the hypotheses in this study it is evident and conclusive that:

1. Sustainable shipping has significant relationship with customer orientation which is one of the key performance indicators for measuring organisational effectiveness of shipping companies.
2. Sustainable shipping is significantly related with operational efficiency of shipping companies.
3. Technology has moderating influence on the relationship between sustainable shipping and organisational effectiveness of shipping companies

## VII. RECOMMENDATIONS

This study has been embarked upon to empirically examine the relationship between sustainable shipping and

organisational effectiveness of shipping companies in Port Harcourt. Based on the findings and conclusions of the study, the following recommendations have been made:

1. Government should create and encourage conducive sustainable shipping environment so that shipping companies can benefit from the economic and social gains arising from sustainable shipping practices for organisational effectiveness.
2. A sustainable shipping braced-up with innovativeness transition within the sustainable shipping and its related activities within Port Harcourt and by extension Nigeria should be supported by financing and reform incentives rather than by imposing levies, as they would have a negative impact on aggregate supply and prices, with a subsequent poor influence on customer orientation and operational efficiency.
3. Shipping firms in Nigeria should adapt technology in various forms so that their sustainable shipping activities could be effectively and efficiently operated for optimal performance.

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Computing Pearson Product Moment Correlation Coefficient Between Sustainable Shipping (X) And Customer Orientation (Y)  
Of Shipping Companies In Port Harcourt

The stated hypotheses are as follows:

$H_0: \rho_s = 0$ : There is no significant correlation between sustainable shipping and customer orientation (y) of shipping companies in Port Harcourt;

$H_1: \rho_s \neq 0$ : There is a significant correlation between sustainable shipping and customer orientation (y) of shipping companies in Port Harcourt.

correlations			
		Sustainable Shipping	Customer Orientation
sustainable shipping	Pearson correlation	1	.807**
	sig. (2-tailed)		.000
	n	354	354
customer orientation	Pearson correlation	.807**	1
	sig. (2-tailed)	.000	
	n	354	354

\*\*. correlation is significant at the 0.01 level (2-tailed).

Source: SPSS ver. 25 Output window

From the SPSS output window, the correlation coefficient of the variables x and y is 0.807

*Interpretation*

This positive large value of  $r$  ( $= 0.807$ ) says that there is a strong positive correlation between Sustainable shipping (x) and Customer orientation (y) in the sample of rural areas in South-Eastern Nigeria.

Because of the positive value of  $r$  direction is said to be the same: That is, as one increases, so also does the other.

Since the p-value ( $= 0.000$ ) is less than the level of significance,  $\alpha$  ( $= 0.05$ ), we therefore, reject the null hypothesis and conclude that:

$H_1: \rho_s \neq 0$ : There is a significant correlation between sustainable shipping and customer orientation (y) of shipping companies in Port Harcourt;

Computing Pearson Product Moment Correlation Coefficient Between Sustainable Shipping (X) And Operational Efficiency(Y)  
Of Shipping Companies In Port Harcourt

The stated hypotheses are as follows:

$H_0: \rho_s = 0$ : There is no significant correlation between sustainable shipping and operational efficiency(y) of shipping companies in Port Harcourt;

$H_1: \rho_s \neq 0$ : There is a significant correlation between sustainable shipping and operational efficiency(y) of shipping companies in Port Harcourt;

Correlations			
		Sustainable Shipping	Operational Efficiency
Sustainable Shipping	Pearson Correlation	1	.782**
	Sig. (2-Tailed)		.000
	N	354	354
Operational Efficiency	Pearson Correlation	.782**	1
	Sig. (2-Tailed)	.000	
	N	354	354

\*\*. Correlation Is Significant At The 0.01 Level (2-Tailed).

Source: SPSS ver. 25 Output window

From the SPSS output window, the correlation coefficient of the variables x and y is 0.782

*Interpretation*

This positive large value of  $r (= 0.782)$  says that there is a strong positive correlation between Sustainable shipping (x) and Operational efficiency(y) in the sample of rural areas in South-Eastern Nigeria.

Because of the positive value of  $r$  direction is said to be the same: That is, as one increases, so also does the other.

Since the p-value ( $= 0.000$ ) is less than the level of significance,  $\alpha (= 0.05)$ , we therefore, reject the null hypothesis and conclude that:

$H_1: \rho_s \neq 0$ : There is a significant correlation between sustainable shipping and operational efficiency(y) of shipping companies in Port Harcourt;

Computing Partial Correlation Analysis Between Sustainable Shipping And Organisational Effectiveness While Moderating The Effect Of Technology

The stated hypotheses are as follows:

$H_0: \rho_s = 0$ : Technology does not moderate the relationship between sustainable shipping and organisational effectiveness of shipping companies in Port Harcourt;

$H_1: \rho_s \neq 0$ : Technology does moderate the relationship between sustainable shipping and organisational effectiveness of shipping companies in Port Harcourt;

Correlations					
Control Variables			Sustainable shipping	Organisational Effectiveness of Shipping Companies	Technology
-None <sup>A</sup>	Sustainable shipping	Correlation	1.000	.928	-.031
		Significance (2-Tailed)	.	.000	.563
		Df	0	352	352
	Organisational Effectiveness of Shipping Companies	Correlation	.928	1.000	.005
		Significance (2-Tailed)	.000	.	.931
		Df	352	0	352
	Technology	Correlation	-.031	.005	1.000
		Significance (2-Tailed)	.563	.931	.
		Df	352	352	0
Technology	Sustainable shipping	Correlation	1.000	.929	
		Significance (2-Tailed)	.	.000	
		Df	0	351	
	Organisational Effectiveness Of Shipping Companies	Correlation	.929	1.000	
		Significance (2-Tailed)	.000	.	
		Df	351	0	

A. Cells Contain Zero-Order (Pearson) Correlations.