

BUSINESS PROCESS REENGINEERING AND ORGANISATIONAL SUSTAINABILITY OF OIL AND GAS FIRMS IN PORT HARCOURT, RIVERS STATE, NIGERIA

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Abstract

The study investigated the nexus between business process reengineering (dimensioned by process improvement and information technology) and organisational sustainability (measured by environmental sustainability) of oil and gas firms in Port Harcourt, Rivers State. The baseline theories that underpin the study are the institutional theory and the upper echelon theory. The overriding philosophical bearing of the study is positivism, which assumes an ontological posture of realism. Consequently, a cross sectional survey design was adopted and the questionnaire was the main instrument for data collection. The target population for this study, consists of 187 midstream oil & gas firms (oil servicing) in Port Harcourt, as contained in the Yellow Book of the Rivers State Ministry of Commerce, while the accessible population consists of 328 management staff of 82 midstream oil & gas firms in Port Harcourt. The investigation used the Krejcie and Morgan's (1970) formula to determine the sample size of 177 and 20% adjustment was made to accommodate attrition and outliers, bringing the adjusted sample size to 212 respondents. The purposive sampling technique was adopted and the reliability statistics all exceeded the 0.7 cronbach's alpha threshold. Data obtained from 204 duly completed and usable copies of the instrument were analyzed, and the Spearman's Rank Order Correlation Coefficient was deployed to test hypotheses at 0.05 level of significance. The analysis revealed that while process improvement leads to environmental sustainability, information technology does not

have a linear bearing with environmental sustainability. The study recommends that managers of midstream oil and gas firms in Port Harcourt should identify and prioritize improvement potentials of the work, to achieve process improvement which will lead to business process reengineering. Furthermore, leaders of oil and gas firms should ensure that the selection, implementation, use, maintenance and improvement of technology solution is included in the organization's strategic/service planning, as a means of staying updated with information technology.

Keywords: environmental sustainability, process improvement, information technology.

Introduction

Nigeria is endowed with abundant mineral and natural resources such as iron ore, limestone, coal, lead, clays, sand, gravel, diatomite, kaolin, bentonite, silica, barite, gypsum, talc, zinc, columbite, marbles, bitumen, tar, crude oil, among others. Comparably, oil & gas remains the major economic driver and mainstay of the Nigerian economy, as it accounts more than 98% of export earnings, about 83% of federal government revenue, above 14% of its gross domestic product, almost 95% of foreign exchange earnings, and about 65% of government budgetary revenues (Ewubare & Kakain, 2017). Indeed, the country's oil and gas subsector has grown phenomenally over the past twenty years. However, the oil and gas firms face many problems, including those related to

general insecurity, inadequate social infrastructure, community agitation, Government underfunding of cash calls to the oil majors, bribery, corruption and mismanagement, long contract award process, as well as sustainability challenges. This has resulted in the oil and gas firms being categorized as “environmentally negligent” industry. The importance of organizational sustainability cannot be over emphasized. Dangelico and Pujari (2010) mentioned that adopting sustainability initiatives can provide firms with several forms of benefits, including a positive image, enhanced trust from stakeholders, efficiency in resource management, competitive advantage, superior returns on investments and profitability. Organizational sustainability balances the economic, environmental and social development, as much as in the internal as in the external sphere of the organization (Cellade-Oliveira, 2013). On the other hand, business process reengineering (BPR) refers to the elemental rethinking and radical redesigning of the business processes in order to achieve remarkable improvements in critical measures of performance like cost, service, quality, and speed (Ramanigopal, Palaniappan, Hemalatha & Murugan, 2011). On a similar note, Ozcelik (2009) noted that the value of BPR can be seen at both process such as cost and time reduction and overall organizational performance such as productivity, profitability and market advantages levels. Furthermore, Sharma (2006) mentioned that BPR involves a wide spectrum of activities procurement, order fulfillment, product development, customer service and sale. Sharma (2006) further posited that business process re-engineering implies transformed processes that together form a component of a larger system aimed at enabling organization to empower themselves with contemporary technologies business solution and innovations. Specifically, Aldiabat, Bataneh and Abu-Humour (2018) noted that the widespread dimensions of business process reengineering include strategic alignment, information technology, process improvement and employee involvement. According to Aldiabat, Bataneh & Abu-Humour, (2018), information technology refers to software, hardware and information systems that support operational activity. Similarly, the authors noted that process improvement refers to sustained incremental improvements of existing processes.

The severity of environmental crises, social disorder and climatic change emanating from the production of oil and gas has left grave repercussions for many societies. In general, the challenges of sustainable development in the oil and gas sector can be categorized as: gas flaring and venting; decommissioning of oil and gas installations; oil storage tank disposal; managing drill cuttings; produced water disposal/treatment; managing drilling muds and fluids, estimating and validating greenhouse gas emissions; subsidence; oil spillage; and safety. Other significant challenges for oil and gas industry include: price fluctuation (Regnier, 2007), complexity of drilling and production process (Gupta & Grossmann, 2017), protection of the social license of operation (Tomlinson, 2017), lack of corporate social responsibilities (Banerjee, 2017), and fluctuation of fiscal regimes. There are several causes of inadequate sustainability among oil and gas firms, and this can be traced to lack of maintenance (Agbola & Olurin, 2003). In a similar report, Maitland and Chapman (2014) noted that oil spills has resulted in diverse damage of environmental assets and has also caused difficult situations and increased poverty level among the host communities. Furthermore, Medugu (2012) mentioned that some of the problems of non-sustainability stemmed from poor extraction and poor handling of excess gas through the gas and oil pipes. On a similar note, Everett, Ishwaran, Ansaloni and Rubin (2010) mentioned that economic growth brought about by global demand will have negative consequences on the environment because the more production and consumption increases; the more the environment will be degraded. Besides, Shrivastava (1995) suggested that environmental problems caused by unintentional business activities in the oil and gas industry have increased substantially, yet efforts to address these problems are still lagging behind. According to Shrivastava, the risk of failing to engage in sustainability practices is growing; thereby making it necessary for management to incorporate it into their strategic plans. In essence, failure to fully comprehend the factors affecting sustainability in the oil & gas industry will lead to organizational sustainability strategies being unsuccessful. Several organizational sustainability strategies have been suggested by various scholars. Abubakar (2014) noted that the implementation of sustainability initiatives can give an organization distinctive competitive advantage, over those that are not

making any effort. According to Savitz and Weber (2007), eco-efficiency is an integral part of any movement towards organizational sustainability. The author's findings correlated the relationships between competences, organizational sustainability and eco-efficiency. Similarly, Maggi (2006) noted that management competences stand out in ensuring organizational sustainability. In some comparable reports, Biggemann, Williams, and Kro (2014) mentioned that sustainable organization leaders should be aware of the competition and the behaviors of direct and indirect competitors, while Chen and Uzelac (2015), noted that sustainable leaders should differentiate their products or services to get a competitive edge. However, some researchers and community leaders have called for regulations to ensure adequate protection of the environment from consequences of human activities (Ross, 2017), as a way of ensuring sustainability. For example, environmentalists raise attention about the negative impact of humans on the ecosystem such as decreasing of useful natural minerals, pollution, and climate change (Obradovic-Wochnik & Dodds, 2015).

However, despite the several studies on organizational sustainability, only a few scholarly works considered the perspective of business process reengineering. Hence, there is dearth in literature in the relationship between business process reengineering and organizational sustainability, within the context of oil and gas firms. It is on the basis of this fact that this work is structured to examine the link between business process reengineering and organizational sustainability of oil and gas firms in Port Harcourt. The specific objectives of the study are to:

- i. Evaluate the relationship between process improvement and environmental sustainability.
- ii. Ascertain the link between information technology and environmental sustainability.

The following research questions directed the investigation, to accomplish the above expressed objectives.

- (i) What is the relationship between process improvement and environmental sustainability?
- (ii) What is the link between information technology and environmental sustainability?

The following null hypotheses were formulated to provide tentative answers to the above research questions:

H₀₁: There is no significant relationship between process improvement and environmental sustainability.

H₀₂: There is no significant relationship between information technology and environmental sustainability.

Literature Review

Theoretical Framework

The baseline theories that underpin this study are the institutional theory and the upper echelon theory. Foundational articles related to institutional theory include Meyer and Rowan (1977), Zucker (1977), and DiMaggio and Powell (1983). Meyer and Rowan argued that institutions are rational entities. Zucker explained that institutions are socially constructed through institutionalizing processes. DiMaggio and Powell later argued that institutions are structured similarly because of shared social understandings of what an institution should look like (e.g., hierarchical structures). Together, these core articles laid the groundwork for the key premises of institutional theory. Institutional theory was developed in the field of sociology in the 1970s and 1980s as a means to consider how institutions are created and sustained through "widespread social understandings" (Greenwood, Kaodah, Micelotta & Lounsbury 2011). Institutional theory explains the diverse types of legitimacy an organization can attain as well as why organizations can be similar. The theory explains the reasons organizations are considered valid institutions and why they take the form they do. The underlining assumptions upon which the institutional theory is built is structuralism, which addresses issues relating to the form and structure of the organization, and the internal processes that constitute the organization. The theory has implications for both structural and contextual dimensions of organizations, as well as decision making, all of which are influenced by the shared institutionalized views in the environment. On the other hand, the upper echelon theory (UET) was founded on the premise that organizational outcomes are directly impacted by the knowledge, experiences and expertise of those individuals occupying prominent managerial roles in the organization (Hambrick & Mason, 1984). UET states that organizational outcomes can be predicted to

some degree based upon the characteristics of executive managers. The theory focuses on examining demography to suggest that managerial characteristics are reasonable proxies for underlying differences in cognitions, values, and perceptions (Carpenter, Geletkanycz, & Sanders, 2004). The central thesis of the upper echelon theory is that the strategic apex of the organization has the ultimate responsibility of visioning and is thus charged with ensuring that the organization serves its mission in an affective way. The theory has implication for research in areas of leadership and the intricacies associated with top level management in organizations. Studies that focus on board membership and management committees as well as ownership will all be improved within the context of upper echelon theory.

Conceptual Review

The dimensions of Business Process Reengineering (process improvement and information technology) were adopted from the works of Aldiabat, Bataineh & Abu-Hamour (2018), while the measure of Organizational Sustainability (environmental sustainability) was adopted from the work of Celle-Da-Oliveria (2013).

Organisational Sustainability: The sustainability of a firm is the ability of the company to meet the needs and requirements of current stakeholders while developing continuous investment and managerial strategies to ensure future profitability, social well-being, and environmental protection (Pantelica et al., 2016). A company is sustainable when leaders can develop strategies to increase market share, talent, stakeholders' benefits, and lower operational cost and workforce turnover (Banker, Seok & Gordon, 2014). Additionally, a firm is sustainable if it continues to exist regardless of market threats and internal change (Banker et al., 2014). Broadly, organizational sustainability is the ability of an organization to maintain practices over the time (Catlin, Luchs, & Phipps, 2017). On the other hand, organizational sustainability is also the balance between the economic, social, and environmental goals of an organization (Hansen & Schaltegger, 2016). In a similar note, organizational sustainability involves profitability, long-term growth, innovation and creativity, and competitive advantage over the rivals. As noted by Krauss (2017), every sustainable corporate strategy should involve the

equilibrium between the three interrelated elements of economy, social, and environment. Organizational sustainability implies satisfying the needs of current generation without compromising the chance of the future generation to satisfy their needs (Hales & Chakravorty, 2017).

Business Process Engineering: Business process reengineering (BPR) refers to the fundamental rethinking and redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service and speed (Hammer & Champy 1993). This implies that BPR requires radical transformation as opposed to incremental change and hence the fundamental question an organization must address before adopting BPR is whether there is a compelling business case for change. Business Process Re-engineering can be described as a means of facilitating significant - even fundamental - change in the way an organization operates (Wilcocks and Smith, 1995). Davenport and Short (1990) have defined business processes as "a set of logically related tasks performed to achieve a defined business outcome". Hammer and Champy (1993) defined business processes as "a collection of activities that takes one or more kinds of input and creates an output that is a value to the customer". Business process re-engineering draws together two critical concepts; the first is the fact that a few key processes determine the competitive success of a company. The second concept is that the entire set of activities involved in delivering a business process should be managed as one unit or flow of work and that the customer's expectations and needs should determine the objectives of that process (Craig and Yetton, 1994). According to Craig and Yetton (1994), however, "the innovation of BPR lies in rolling together, into one activity, the two steps of conducting a strategic analysis (identifying core business processes) and developing a detailed blueprint for the new vision (redesigning those processes)". Burke and Pepperd (1995) suggest that by identifying the processes which underlie the strategy, business process re-engineering gives a greater direction to implementation. One of the indications is that the forging of the link between business strategy and business process re-engineering is the first step in strategy implementation (Pepperd, 1984).

Environmental Sustainability: Environmental sustainability deals with topics such as preservation of biodiversity; resource regeneration capacity, re-usage and recycling; constraining non-renewable resources and waste generation (Dyllick & Hockerts, 2002). Environmental sustainability encompasses the prevention of the impacts created by the organization on the natural system, composed of living and non-living beings. As noted by Dyllick and Hockerts (2002), environmental sustainability goes beyond certifying the conformity to governmental regulations and initiatives, like recycling or efficient energy usage, since it does not exempt a comprehensive approach over the organizational operations, which are ruled by the evaluation of the impacts generated by the company's products, processes and daily services, by the elimination of unnecessary costs and of high emissions, besides minimizing practices that may affect the access of future generations to critical natural resources (Munck, Munck, & Souza, 2011).

Process Improvement: The Japanese phenomenon of process improvement goes back to 1946 when Japanese scientists and engineers were set to re-engineer and reconstruct the Japanese industry. Zolo and Winter (2002) noted that process improvement methods are a pattern of collectively gathered activities. These activities are developing and modifying the operating routines with the goal of improving the overall effectiveness. Mauri et al. (2002) explained that even though the concept of

process improvement is widely used around the world, organizations still have problems and are facing massive challenges with preserving the momentum of the activities in the organization. An example of one existing process improvement is Six Sigma which was developed in 1986 by Motorola and uses a data-driven review to limit mistakes or defects in a business process. The emphasis on Six Sigma is that mathematically, it would take a six-standard deviation event from the mean for an error to happen. The stages of the six sigma methodology are: define, measure, analyze, improve and control. Another process improvement is Lean Manufacturing. Even though Six Sigma and Lean have the same goal and similarities in approaches on how to reach the goal, Lean focuses on reducing waste and making the value stream flow, unlike Six Sigma that reduces variation throughout the process. Rastogi (2018) mentioned that it is crucial to find out which of all these methods works best for one specific process improvement within a department.

Information Technology: Information technology refers to the use of computer systems including hardware and software, to create, secure and exchange all forms of electronic data. Various studies have been done to understand the nature of information technology and its effect on the organizational characteristics. Davenport and Short (1990), identifies nine areas (Table 1) about information technology (IT) and the impacts on organizational:

Table 1.1: IT Capabilities and Organizational Impacts

S/N	IT Capability	Organizational Impacts
1	Transactional	IT can transform unstructured processes into routinized transactions
2	Geographical	IT can transfer information with rapidity and ease across large distances, making processes independent of geography.
3	Automational	IT can replace or reduce human labor in a process
4	Analytical	IT can bring complex analytical methods to bear on a process
5	Informational	IT can bring vast amounts of information into a process
6	Sequential	IT can enable changes in the sequence of tasks in a process, often allowing multiple tasks to be worked on simultaneously.
7	Knowledge Management	IT allows the capture and dissemination of knowledge and expertise to improve the process
8	Tracking	IT allows the detailed tracking of task status, inputs and outputs
9	Disintermediating	IT can be used to connect to parties within a process that could otherwise communicate through an intermediary

Source: Davenport and Short (1990)

Empirical Review

Various scholars have carried empirical studies of the variables, with different opinions. For example, Sidikat and Ayanda (2008), carried out a study on Impact Assessment of Business Process Reengineering on Organizational Performance in First Bank Nigeria. They used the case study method of which the sample size was 80 staffs of first bank Nigeria. Data was analyzed through simple percentage and regression analysis. The R-squared and Adjusted R-squared vary with 0.8991187 & 0.837375 respectively. The results revealed that business process reengineering (BPR), service quality (SQ), and innovative and strategic change (I & SC) are positively (directly) related to the success of organization. The study concludes that BPR has become useful weapon for any corporate organizations that is seeking for improvement in their current organizational performance and intends to achieve cost leadership strategy in its operating industry and environment. It recommended that reengineering process remains effective tools for organizations striving to operate as effectively and efficiently as possible and organizations are required to reengineer their business processes in order to achieve breakthrough performance and long term strategy for organizational growth and performance.

Similarly, Ringim, Razalli & Hasnan (2011), carried out a study on effect of business process reengineering factors on organizational performance of Nigerian banks: Information Technology Capability as the Moderating Factor. The survey method was used. A pilot test was conducted to seek the objectives. Instrument content and face validity and reliability were examined through panel of expert in both academic and practice. The data received from the commercial bank departments were analyzed using the SPSS software. The results show that the dimensions of BPR are reliable and valid.

Furthermore, Oliveira & Martins (2011), reviewed theories for adoption models at the firm level used in information systems literature and discussed two prominent models: diffusion on innovation (DOI) theory, and the technology, organization, and environment (TOE) framework. The data collected data was from a sample of 2626 Portuguese firms and the statistical technique used was probit test using two single models. Using a 5% significance level, the p value gotten is at (p-value=0.12). The scholars

found that individual characteristics, internal characteristics of organizational structure, and external characteristics of the organization are important antecedents to organizational innovativeness. In a comparable report, Attah (2010) examined the concept of environmental sustainability with a focus on global efforts to achieve it. The purpose of the study was to assess efforts made to curb the impact of environmental degradation on the society by some developed and developing countries such as Switzerland, United States of America and China. The scholar mentioned that excessive emphasis on environmental sustainability using some policies could hurt the economic activities of a country through loss of jobs and societal mishaps while on the other hand too much emphasis on economic growth could result into health risks, global warming and environmental degradation within the society. The study further mentioned the need to strive towards a balance between environmental sustainability and economic growth. From the analyses, the author concluded by outlining efforts that should be explored at the global level in order to achieve this desired balance.

However, Morelli (2011) summarized the problems that have been encountered in understanding and use of environmental sustainability. The study explored the efforts of others to define the concept within the context of specific disciplinary areas and sets forth a proposal for a basic understanding of the term “environmental sustainability” as an expansion of our common perception of the nature of human activity so as to more clearly connect it with the ecological concept of interdependence and to serve as a goal for environmental managers.

Methodology

The overriding philosophical bearing of the study is positivism, which assumes an ontological posture of realism. Consequently, a cross sectional survey design was adopted and the questionnaire was the main instrument for data collection. The target population for this study, consists of 187 midstream oil & gas firms (oil servicing) in Port Harcourt, as contained in the Yellow Book of the Rivers State Ministry of Commerce, while the accessible population consists of 328 management staff of 82 Midstream Oil & Gas firms in Port Harcourt. The investigation used the Krejcie and Morgan's (1970) formula to determine the sample size of

177 and 20% adjustment was made to accommodate attrition and outliers, bringing the adjusted sample size to 212 respondents. The purposive sampling technique was adopted and the reliability statistics all exceeded the 0.7 Cronbach's alpha threshold, based on the cut-off point recommended by Nunnally and Bernstein,

1994. Data obtained from 204 duly completed and usable copies of the instrument were analyzed, and the Spearman's Rank Order Correlation Coefficient was deployed to test hypotheses at 0.05 level of significance by means of the statistical package for social science (SPSS version 25.0).

Table 1.2: Methodological Analysis of Response Rate

Questionnaire Administered	212
Properly completed and returned questionnaire	204
Percentage of returned questionnaire	96.22%

Source: Research data, 2021.

Table 1.3 Summary of Cronbach reliability result

Variables (latent)	Dimensions/Measures	No. of items	Alpha Coefficients
Process Reengineering	Information Technology	7	.771
	Process Improvement	7	.815
Organizational Sustainability	Environmental Sustainability	7	.946

Source: Data result, 2021.

The measurement instrument was subjected to test of reliability with the following Cronbach's alpha values: Information Technology (0.771), Process Improvement (0.815) and Environmental Sustainability (0.946). According to Nunnally and Bernstein, (1994) an alpha value of 0.7 and above ensures internal consistency and reliability.

Measures for Psychometric Evaluation of the Instrument

The measures for the psychometric evaluation of the multiple testing instrument are given in table 1.4 below. The indicators for process improvement and information technology were adapted from Aldiabat, Bataineh and Abu-Hamour (2018), while the measures for environmental sustainability were adapted from Celle-Da-Oliveria (2013). Accordingly, exploratory factor analysis was performed, since these measures were adapted.

Table 1.4: Assessment of the Predictor and Criterion Variables

Constructs	Items	Mean	S.D	Factor Loadings	C.R	AVE	Sq Roots of AVEs
Process Improvement	Our top management feels responsible for process improvement strategies in our firm and approves plans for implementing these.	4.269	.421	.716	.814	.808	.899
	We address root causes of problems in our processes and systematically prevent them from recurring.	3.643	.502	.882			
	We have structured interdepartmental meetings to discuss process issues.	3.752	.628	.704			

	We demand and appreciate feedback to current process improvement activities.	4.015	.473	.888			
	We identify and prioritize improvement potentials of our work processes.	4.924	.382	.893			
	We are constantly improving our business processes.	3.631	.4432	.788			
	We address problems within a process and across interfaces.	3.743	.5060	.783			
Information Technology	The selection, implementation, use, maintenance and improvement of technology solution is included in our organization's strategic/services planning.	3.583	.4347		.784	.941	.812
	Some staff have access to the technology, including case management, electronic filing systems and other software tools, the need to do their work in the most effective and efficient ways.						.901
	Some staff receives appropriate training and refresher courses to	3.608	.4823				.865
	support the use of technology, including case management and reporting systems, allowing them to work effectively.	3.443	.6020	.718			
	Our organization has well developed, regularly reviewed and communicated policies, procedures and systems to ensure the security of staff and client information.	3.935	.4347	.843			
	Our organization has appropriate technology that allows us to effectively record and report on outcomes for people using our services and communities.	3.782	.4823	.798			
	Use e-mail to communicate with other customers.	3.319	.334	.811			
	Use e-mail to communicate with suppliers.	4.834	.464	.864			

Enviromental Sustainability	My organization has complied with all government environmental regulation requirement.	3.982	.441	.746	.896	.777	.882
	The penalty for noncompliance with government regulation requirement is high (significant).	3.864	.484	.788			
	My organization monitors emissions/effluent from industrial activities.	3.336	.398	.799			
	My organization ensures energy (electricity etc) is adequately conserved and efficiency used.	3.816	.420	.768			
	My organization ensures communication of environmental work (training, reporting and disclosure).	3.464	.493	.747			
	My organization ensures human capacity regarding environmental protection is excellent.	3.836	.463	.794			
	My organization ensures high safety standards through the use of Personal Protective Equipment (PPE).	3.463	.443	.797			

Source: IBM SPSS version 26. Analysis Result, 2021. Where: SD= standard deviation; C.R = composite reliability; AVE= average variance extracted.

Table 1.4 summarizes the process improvement, information technology and enviromental sustainability of oil and gas firms. The results show that most of the oil and gas firms place strong emphasis on these factors. The means values (mean>3.5) indicate evidence that the oil and gas firms are in agreement to the concepts of process improvement, embrace adequate

information technology and are positively disposed enviromental sustainability practices. The study determined convergance validity based on the following thresholds: Factor loadings ≥ 0.7 (Brown, 2014); average variance extracted (AVE) ≥ 0.5 , and composite reliability ≥ 0.7 (Fornell and Larcker, 1981).

Table 1.5: Correlation Matrix of Study Constructs

Constructs	Mean	S.D	Process Improvement	Information Technology	Enviromental Sustainability
Process Improvement	3.878	.3431	.899		
Information Technology	3.792	.3713	.014	.901	
Enviromental Sustainability	3.759	.3438	.663	.014	.882

* The square root of the AVEs on the diagonal

Source: IBM SPSS version 26. Analysis Result, 2021

Table 1.5 shows the correlation matrix of the latent constructs together with the square roots of the AVEs, mean and standard deviation. The correlation coefficients were assessed using the Pearson’s product moment correlation coefficient. The analysis revealed that the square root of the AVEs on the diagonals of the correlation matrix were greater than the correlation values for each sub-construct, which indicates that the constructs do not have similar items but are rather distinct from each other. This indicates that the items discriminated well; thus proving acceptable

discriminant validity as suggested by Sekaran and Bougie (2009).

The Kaiser-Mayer-Olkin (KMO) and Bartlett’s test of sphericity were computed to measure the sampling adequacy of the various constructs of the study (Kaiser, 1974; Cerny & Kaiser, 1977). The general benchmark for KMO test is $KMO > 0.5$, while Bartlett’s test result was considered satisfactory at a p value less than 0.05. The result of the analysis is shown thus:

Table 1.6: KMO and Bartlett’s Test of Sphericity

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.822
Approx. Chi-Square		72.246
Bartlett's Test of Sphericity	Df	3
	Sig.	.000

Source: IBM SPSS Analysis Result, 2021

Table 1.6 shows the result of the KMO test of sample adequacy and Bartlett’s test of sphericity for the constructs. The result showed a satisfactory KMO value of 0.822 which exceed the benchmark of 0.5. Similarly, the table showed a satisfactory outcome for the Bartlett’s test of sphericity as it boasts of a significant value of 0.000 which is significant at 95% confidence level.

Normality Tests

The null hypothesis of this test is that there is no significant difference between the observed data distribution and that of a normal distribution. A value less than 0.05 indicates that the data is non normal. After performing the normality test, the result is shown in the figure below:

Table 1.7 Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Information_Technology	.086	204	.001	.982	204	.010
Process_Improvement	.085	204	.001	.982	204	.009
Environmental_Sustainability	.346	204	.000	.692	204	.000

Source: Research Desk 2021.

The result indicates that information technology has a p-value of 0.010 which is less than 0.05 and significant indicating that information technology data is not normally distributed. Process improvement has a p-value of 0.009 which is less than 0.05 and showing a significant result. This indicates that process improvement data is not normally distributed. Environmental sustainability has a p-value of 0.000 which is less than 0.05 indicating that environmental sustainability data is not normally distributed. Following the results of the test in all the variables, there is an indication that the sample

data are not normally distribution. On this basis, it may be more appropriate to choose a nonparametric statistical technique to test the hypotheses. In the case of this study, Spearman Correlation Coefficient is deployed in testing the hypotheses.

Test of Hypotheses

H01: *There is no significant relationship between process improvement and enviromental sustainability of oil and gas firms in Port Harcourt.*

Table 1.8: Correlation between process improvement and environmental sustainability

		Process_Improvement	Environmental_Sustainability
Spearman's rho	Process_Improvement Correlation Coefficient	1.000	.663**
	Sig. (2-tailed)	.	.004
	N	204	204
	Environmental_Sustainability Correlation Coefficient	.663**	1.000
	Sig. (2-tailed)	.004	.
	N	204	204

Source: SPSS 25.0 output on research data

Table 1.8 reveals the outcome on the relationship between process improvement and environmental sustainability. The result shows a strong positive relationship between the variables (Rho = 0.663). The coefficient of determination ($r^2 = 0.44$) indicates that 44% change in environmental sustainability can be explained by process improvement. The significant value of 0.004 ($p <$

0.05) reveals a significant relationship. Therefore, the null hypothesis ($H_{0:1}$) was rejected, while its alternative hypothesis was supported.

H₀₂: *There is no significant relationship between information technology and environmental sustainability of oil and gas firms in Port Harcourt.*

Table 1.9: Correlation between information technology and environmental sustainability

		Information_Technology	Environmental_Sustainability
Spearman's rho	Information_Technology Correlation Coefficient	1.000	.014
	Sig. (2-tailed)	.	.844
	N	204	204
	Environmental_Sustainability Correlation Coefficient	.014	1.000
	Sig. (2-tailed)	.844	.
	N	204	204

Source: SPSS 25.0 output on research data

Table 1.9 shows the result on the correlation between information technology and environmental sustainability to be weak positive but not significant relationship (Rho = 0.014, $p = 0.844 > 0.05$), and the coefficient of determination ($r^2 = 1.96$) indicates that only 2% change in environmental sustainability can be explained by information technology. The analysis shows that information technology is not significantly correlated with environmental sustainability, thus, we failed to reject the null hypothesis which states that there is no significant relationship between

information technology and environmental sustainability.

Discussion of Findings

The study examined the relationship between business process reengineering and organisational sustainability of oil and gas firms in Port Harcourt and two (2) hypotheses were formulated as tentative answers to the research questions raised. The findings are discussed as follows:

Relationship between Process Improvement and Environmental Sustainability

One of the objectives of this study was to evaluate the relationship between Process Improvement and Environmental Sustainability. This objective was captured by a research question and expressed under **Ho1**. The findings indicate that process improvement has a positive relationship with environmental sustainability. The study reveals that the top management of oil and gas firms spend significant time in process improvement of their work processes. However, failing to monitor the process of emissions and effluent from industrial activities could cause significant damages to the environment. When companies constantly improve their business processes through equipment utilization and mechanization, they in turn improve the safety standards of the workforce. This finding is in harmony with Morelli (2011) who found that environmental sustainability relates to commercial perception of the organization. The oil and gas firms should, therefore, continue to improve their process holistically and not concentrate on certain areas of personal interest. The finding further validates the institutional theory which suggests that institutions are socially constructed through institutionalizing processes, and as such, addresses issues relating to the form and structure of the organization, and the internal processes that constitute the organization. Improvement in these processes are essential ingredients in ensuring environmental sustainability.

Relationship between Information Technology and Environmental Sustainability

The next objective was to examine the relationship between Information technology and environmental sustainability and was captured by a research question and expressed under **Ho2**. Analysis result show that information technology has a negative relationship with environmental sustainability. This finding synchronises with the work of Oliveria and Martins (2011) who found that technical innovation contextually enhances environmental context. The result therefore indicates that that optimising information technology facilities does not really have any effect in the environmental sustainability of oil & gas companies in Port Harcourt. Theoretically, this finding extends the postulation of the upper echelon theory, which was founded on the premise that organizational

outcomes are directly impacted by the knowledge, experiences and expertise of those individuals occupying prominent managerial roles in the organization. Thus, the knowledge and expertise of the the organisational leaders, regarding information technology, will largely affect the environmental sustainability bearing of the firm.

Conclusion and Recommendations

On the basis of the empirical evidence, this study revealed that business process reengineering (process improvement and information technology) significantly contributes towards organizational sustainability (environmental sustainability). Thus, process improvement should be a holistic process that will not only address the issues concerning the organization's profitability, but an improvement on the environmental sustainability. Sequel to the above, the following recommendations are made:

1. Managers of midstream oil & gas firms in Port Harcourt should identify and prioritize improvement potentials of the work, to achieve process improvement which will lead to environmental sustainability of their operations.
2. Managers of oil and gas firms in Port Harcourt should develop, regularly review and communicate policies, procedures and systems to ensure the security of staff and client information.
3. Management of oil and gas companies should put in place, processes of monitoring emissions/effluent from their industrial activities to bring about environmental sustainability. In this regards, issues related to gas flaring and other environmental degradation activities, should be promptly revisited and minimised.
4. Managers of oil and gas firms should ensure their staff are regularly trained to report and disclose health, safety and environmental (HSE) concerns in the organisation. In essence, every member of the organisation should have high HSE consciousness.
5. Management of oil and gas firms should ensure the framework for selecting, implementing, using, maintaining and improving technology solution is included in their organization's strategic/services planning. This is to ensure that technological usage is seamless in the organisation.

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