

Disruptive Technology and Firm Capability of Some Selected Oil and Gas Organizations in Rivers State Nigeria

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Abstract:- It is no longer news that organizations had faced serious challenges due to the emergence and rapid development of disruptive technologies. This study explored the relationship between disruptive technology and firm capabilities of oil and gas companies in Port Harcourt, Rivers State Nigeria. The study adopted a survey design, the population of the study is 401, and the sample size was 200 using the sample size formula. The respondents was using the simple random technique. And Pearson Product Moment Correlation technique was used at 0.01 level of significance with the aid of SPSS. Our findings show a positive and significant relationship between dimensions and measures of disruptive technology and organizational capabilities in the companies under investigation. The study showed that there is a correlation between disruptive technology and organizational capabilities in the companies under survey. The researcher concludes that disruptive technology has a positive impact on the organizational capabilities. The researcher recommendations were as follows. The management should adopt cloud services technology to bring flexibility, security to businesses, supporting new investment area of the business and to make the business grow. This will enable the oil and gas companies to rapidly modernize their operating system to lower cost and increase the agility of their management in data storage, backup and complete information accessibility. The oil and gas organizations must invest in security service technology to combats different treats from different quarter and form a collaboration between national security and international security to fostering a safer and more connected business world. Management should ensure they are dynamic in their operations so that they can survive any types of changes that may pose a serious threat to the survival and growth of the organization. Oil and gas companies must furcate the environment and consider which disruptive technology might influence their performance and prepare resources and formulate a strategy that will helps to adjust to the disruptive technology for better performance.

Keyword:- Disruptive Technology, Firm Capabilities, Security Technology, Organizational Resources.

I. INTRODUCTION

It is no longer news that organizations had faced serious challenges due to the emergence and rapid development of disruptive technologies. The first major change in disruptive technology was the adoption of the steam engine during the industrial revolution. This technology displace a lot of workers in the workplace. The machine as a primary means of production displaced workers in workplace and gives rise to mass industrial production during this period.

The second phase was in 1920s, when electricity was introduced into production processes. This era of disruptive technology allowed production and consumption of energy to be disaggregated and transmitted over a long distances for different organization, this bringing industrial production to the world, greatly increasing production effectiveness and efficiency.

The Third disruptive revolution in the industry was the invention of the computer, mobile telephone, Internet etc. these caused a serious change in the digital world of business. These change helped the organization to replace analog electronic and mechanical devices with the digital technologies that are available today. The Digital period continues with the combination of disruptive and emerging technologies like Internet, mobile communications network, and processing power computers which can help business organization processes millions of data the same time. Looking ahead is something that organizations must understand the improvement we are seeing every day is a great challenge for so many companies because the moment they are used to one technology another one springe up. Therefore, organizations need to be ready for years ahead due to disruptive technology emergence.

According to Tidd & Bessant (2020), there are many disruptive technology like cloud services, technology security etc emergence recently, Organizations in the oil and gas which is the searchers focus are forced to regularly review their strategies to outperform their co-competitor competitors in the world. The question will be do these organizations have the capabilities to withstand these new challenges from these disruptive technologies especially Cloud service and Security Technology which are commonly used in the in the companies under investigation? To answer this question the researcher

seek to determine the relationship between disruptive technology and organizational capabilities of oil and gas companies in Port Harcourt Rivers State.

II. CONCEPTUAL FRAMEWORK

Disruptive technology, organizational capability and their dimension and measures form the conceptual frame work of this research work:

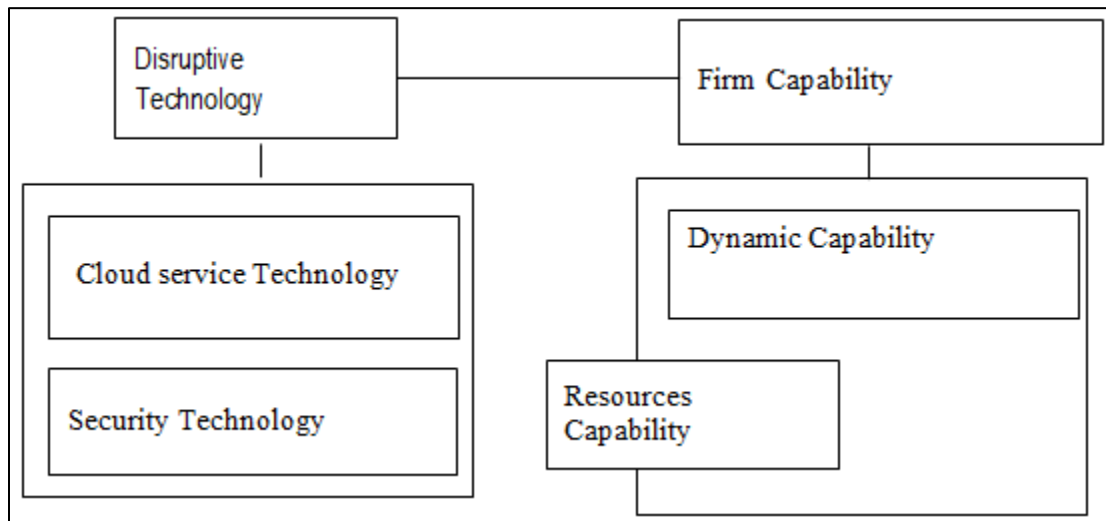


Fig 1. Conceptual framework
Source; 2024

A. The Purpose of the Study

The purpose of this study is to decide the following

- To decide the effect of cloud service technology on dynamic Capability
- To decide the effect of cloud service technology on resources capability
- To decide the effect of security technology on dynamic capability
- To decide the effect security technology on resources capability

B. Research Questions

The research questions are:

- To what degree does cloud service technology affect dynamic capability?
- To what degree does cloud service technology affect resources capability?
- To what degree does security Technology affect dynamic capability?
- To what degree does security Technology affect resources capability?

C. Research Hypothesis

- H₀₁:** There is no significant relationship between cloud service technology and dynamic capability
- H₀₂:** There is no significant relationship between cloud service technology and resource capability
- H₀₃:** There is no significant relationship between security technology and resources capability
- H₀₄:** There is no significant relationship between security technology and resources capability

D. Theoretical Review

The management of modern organization is very complex and difficult in the face of emergence of disruptive technology. This technology has pose a serious threat to the new organization especially the small one. It is important for organization to understand this theory that says that there is no one or particular way of solving problem. The adjustment of program and strategy is very import.

This study is hinge on the theory of contingency and this theory states that there shall be no particular way of doing things. This means that organization should always be ready to change to any new technology that is available and that have the capacity to cause any major impact in the business operation. The companies in the oil industries should be able

to get their resources, materials and strategy for anytime there is a need to adopt any new innovation or new technology.

The question will be that how does this theory relate with this paper. The relationship is that organizations must find different ways of approaching these different disruptive technology that have because a serious debate among the scholars.

III. LITERATURE REVIEW

A. Disruptive Technology

Christensen (2013) defined disruptive technology as a process of technological innovation that displaces or leaves obsolete previously used ones. It is also an innovation that significantly alters how customers, industries, or businesses function. It either disrupts an existing operations or creates a new system of operations. For Christensen disruptive technology is a way of doing a way with some of the technology that are no longer relevant to the system. In many cases this disruptive technologies occurs suddenly and disrupt the whole system either for good or for bad (Sataikina & Steiner, 2020) the set of organization always affected by this disruption are often the large and established players in the industry, sometimes even the leaders. As a result, the new or disruptive technology these leaders are not able to play that leading role they ought to play (Martínez-Vergara & Valls-Pasola, 2020), (Rossi et al., 2020), (Dolgui & Ivanov, 2020).

B. Cloud Services

Cloud services, is a service that allow organizational files to be saved on the computer for later uses or internet without needing external storage apparatus. This disruptive technology is very important for organizations because it present greater opportunity for them or for companies because it allows users to enjoy management tools from any place in the world by just connecting from their device. (Mouha. R.A. 2021) Organizations are increasingly using cloud computing to stand out in this competitive business market. Cloud computing has transformed the way technology is used and managed. It promotes efficiency by facilitating seamless data dissemination, processing, and storage across regional borders. With its ability to change the way businesses work and process things, cloud computing drives efficiency and innovation.

C. Security Technology

Security technology refers to the way company's resources like data and information can be protected by preventing unauthorized person access to the files for company's safety. Security technology will also help the organization to identifying the different cyber security threat to the companies. The identification of these threat will enable the organization to look for a way of preventing or blocking them to prevent any damage it may have cost the organization. In some cases the co-competitor could send virus to attack organizational system to weaken the operation of the company. (Obibhunun. L and Georgewill, A 2024).

D. Firm Capability

When we talk about firm capabilities, is when organization brings their resources together to solve and respond to changes that may emanated from the business environment as a result of one new technology introduces to the business environment. Organizational capabilities can be described as the ability of an organization to deploy its resources to solve a particular problem, that have the capacity to impact on the organization or activity to improve organizational performance (Amit and Schoemaker, 1993; Grant, 1991; Teece et al.,1997). Helfat and Peteraf (2003) define organizational capability as 'the ability of an organization to perform a coordinated set of tasks, utilizing organizational resources, for the purpose of achieving a particular end result'. Organizational capabilities are fundamental to firms' ability to solve effectively their organizational problems (Dosi et al., 2000)

E. Dynamic Capability

Teece et al. (1997) Dynamic capabilities helps an organization to integrate, coordinate, build, and organize the internal strength of the organization for a better performance and external ability to scan the environment to address some of fast, radical changes taking place in the business environments. Dynamic capabilities in another way can be seen as organizational strategic plan, system and routines by which companies were able to achieve new resources configurations as production emerge, collide, split, evolve and die (Eisenhardt and Martin,2000), (Zahra and George, 2002). Teece (2007) state that when an organization is rich dynamism it will enable the organization to gain competitive advantage in rapid changing global business world. They also enable firms to adapt internal and external changes (Zahra and George, 2002).

F. Resources Capability

According to Barney (1991), organizational resources consist of all benefits, potential, structure, attributes, and information owned by an organization that gives it the power to choose and adopt systems that enhances its profitability and long-term goals. Paladino (2009) argues that firms that strategically position will always do well when there is new technology. Organizations that use technology have been considered to have superior performance as they can believe in the acquisition of new technologies of product innovation (Altindag et al., 2010). The study argued that organizations should pay more attention to technological advancement in order to achieve sustainability. Wernerfelt (2014) did conclude that resource s such as technology and human resources significantly contribute to the adequate performance of an organization.

IV. METHODOLOGY

A. Research Design

The purpose of this work is to scientifically examine the relationship Disruptive technology and organizational capability of oil companies in Rivers State. The cross-sectional research is adopted for this study. Cross-sectional studies often provide correlative information about certain

variables and can lead researchers to further study variable relationships.

B. Population and Sampling

The population of this study was through the nominal roll the companies under investigation. The process was to pick the management staff and employees in the companies that have spent 9 years and above.

Table 1. Population and Sample Distribution

S/No	Sampling Unit	No. of Management Staff	Total
1.	SHELL	71	71
2.	SCHLUMBERGER	69	69
3.	PORTHARCOURT REFINING COMPANY	99	99
4.	OVH ENERGY	100	50
5.	PENGASSAN	51	51
6.	NUPENG	61	61
	TOTAL		401

Source: Desktop Study, 2024

The population was based on the following companies mention above in the table from the producing, servicing, marketing and processing companies. From the nominal roll of this companies we were able to get our population for this study. Since the capabilities of the organization can only be determined by the management, the management staff and employees who have spent 9 years in the organizations. This we do by picking the workers under the management category and employees who have spent over 9years in the system.

C. Sampling and Sample Size

This study adopts a simple random sampling; Meanwhile, Taro Yamen's sample size determination formula was used in determining the sample size for this research work.

Mathematically, the formula for Taro Yamen is expressed as follows:

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

Where;

n = Sample size
 N = Population of the study
 e = Significance level (usually .10, .05 and .01)

For the purpose of selecting our sample size (i.e. n) we have:

$$n = \frac{401}{1 + 401(0.05)^2}$$

$$n = \frac{401}{1 + 401(0.0025)}$$

$$= \frac{401}{1 + 1.0025}$$

$$= \frac{401}{2.0025}$$

$$n = 200$$

Table 2. Data Presentation

Questionnaire	Frequency	Percent %
Distributed	200	100.00
No It Distributed	-	00.00
Not retrieved	4	2
Retrieved	196	98
Discarded Response	3	1.5
Useful Response	193	96.5

Source: 2024.

Table above shows the copies of questionnaire distributed, retrieved, discarded and useful response on the study.

D. Gender of Respondents

Table 3 Gender of Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	100	42.00	51	51
	Female	96	48.17	58.17	48.0
	Total	196	100.0	100.0	

Source: SPSS Output, Version 21.0 2024

The table 3 above illustrates the result for the gender distribution of the study. The result indicates that out of the 196(100%) respondents who took part in the study, 100 (42.3%) of them where male, while 96 (42.1%) of them were female. The above table 4.2 indicates that respondents from both genders (male and female) were well covered in terms of participation and representativeness.

E. Age of Respondents

To acquire data concerning the age of our respondents, individual respondents were given options to choose the age bracket they fall within. These responses are presented in table below using frequencies and percentages respectively.

Table 4. Age of Respondents					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 20 Yrs	27	26.80	20.8	20.8
	21 - 30yrs	80	86.10	87.10	86.90
	31 - 40yrs	49	49.84	43.84	49.74
	41 yrs and Above	44	44.26	40.26	100.0
	Total	200	100.0	100.0	

Source: SPSS Output, Version 21.0 2024

Table above indicates that out of the 193(100%) of respondents sample on the study, 27 (26.8%) were less than 20 years of age, 80 (86.10%) of the respondents reported that they were within the age bracket of 21 - 30 years, 49 (84.84%) of the respondents reported that they were within 31-40 years of age and finally, 44(26.26%) of the respondents reported they are 41 years of age and above. The results reveal that more of the respondents were youthful employees within the studied firms and it is believed they should be able to have the capacity to learn and process information rapidly, ability to be logical and fair.

Table 5. Education of respondents

		Frequency	Percent
	SSCE	29	15.5
	OND	50	26.5
	HND	32	17.0
	BSC	84	44.2
	Other Certificates	21	11.0
	Total		100.0

Source: SPSS Output, Version 21.0 2024

Table 6 Length of Service by Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 2yrs	60	36.6	36.6	36.6
	9 yrs	53	28.8	28.8	65.4
	10yrs	49	20.3	20.3	85.6
	Over 10yrs	33	14.4	14.4	100.0
	Total	193	100.0	100.0	

Source: SPSS Output, Version 21.0 2024

The above indicates that out of the 193 (100%) respondents for the study, 60 (36.6%) of the respondents have served in their organizations for less than 2 years, 53 (28.8%) of the respondents have served in their organizations between 2 to 5 years, 49 (20.3%) of the respondents have served between 6 to 10 years while, 33 (14.4%) of the respondents have served for over 10 years.

F. Bivariate Analysis

➤ *Computing Spearman Rank Order Correlation Coefficient Cloud Service Technology (x) and (y) Dynamic Capability of oil Companies in Port- Harcourt Rivers State*

The stated hypotheses are as follows:

$H_{02}: \rho_s = 0$: There is no significant correlation between cloud service technology and dynamic capability in oil and gas companies in Rivers State, Nigeria

$H_{12}: \rho_s \neq 0$: There is a significant correlation between cloud service technology and dynamic capability of oil and gas companies in Rivers State, Nigeria

Table 7 Disruptive technology and organizational capability

			Cloud service Technology	Dynamic Capability
Spearman's rho	Cloud Service Technology	Correlation Coefficient	1.000	.887**
		Sig. (2-tailed)	.	.000
		N	193	193
	Dynamic Capability	Correlation Coefficient	.887**	1.000
		Sig. (2-tailed)	.000	.
		N	193	193

**significant at the 0.05 level (2-tailed).

Source: Field Survey Data, 2024.

The empirical result of the Spearman Rank Order Correlation Coefficient (ρ) in the table above indicates that the rank value $\rho = 0.887$, $p = 0.000$, ($p < 0.05$). The results showed that there is a direct, very strong, statistically positive significant relationship exist between cloud service security and dynamic capability. This means that cloud security technology makes a strong and significant relationship with dynamic capability in oil and gas companies in Port Harcourt, Rivers State.

➤ *Computing Spearman Rank Order Correlation coefficient between Cloud Security Technology (x) and (y) Resources Capability of Oil and Gas Companies in Port-Harcourt Rivers State, Nigeria*

The stated hypotheses are as follows:

H_{02} : $\rho_s = 0$: There is no significant correlation between cloud service technology and resources capability of oil and gas companies in Port-Harcourt Rivers State, Nigeria

H_{12} : $\rho_s \neq 0$: There is a significant correlation between cloud service technology and resources capability of oil and gas companies in Port-Harcourt Rivers State, Nigeria

The 8. Cloud Service Technology and Resources Capability

			Cloud Service Technology	Resources Capability
		Correlation Coefficient	1.000	.864**
		Sig. (2-tailed)	.	.000
		N	193	193
	Spearman's rho	Cloud service technology	.864**	1.000
		Sig. (2-tailed)	.000	.
		N	193	193

** Significant at the 0.05 level (2-tailed).

Source: 2024.

The empirical result of the Spearman Rank Order Correlation Coefficient (ρ) in the table above indicates that the rank value $\rho = 0.864$, p is 0.000, ($p < 0.05$). The results showed that there is a direct, very strong, statistically positive significant relationship exist between cloud service technology and Resource capability. Therefore, since the influence is statistically positive and significant, the null hypothesis is hereby rejected; we therefore state that cloud service technology has a very strong, positive significant relationship with Resource capability.

➤ *Computing spearman rank order correlation coefficient between Security Technology (x) and (y) Dynamic capability of oil and Gas Companies in Port-Harcourt Rivers State, Nigeria*

The stated hypotheses are as follows:

H_{02} : $\rho_s = 0$: There is no significant correlation between security technology and resources capability in oil and gas companies in Port-Harcourt Rivers State, Nigeria

H_{12} : $\rho_s \neq 0$: There is a significant correlation between security technology and resources capability in oil and gas companies in Port-Harcourt Rivers State, Nigeria

Table 9. Security Service Technology and Resources Capability

			Security Service Technology	Dynamic Capability
Spearman's rho	Security Service technology	Correlation Coefficient	1.000	.934**
		Sig. (2-tailed)	.	.000
		N	193	193
	Dynamic Capability	Correlation Coefficient	.934**	1.000
		Sig. (2-tailed)	.000	.
		N	193	193

** . Significant at the 0.05 level (2-tailed).

Source: Field Survey Data, 2024.

The empirical result of the Spearman Rank Order Correlation Coefficient (ρ) in table 4.12 above indicates that the rank value $\rho = 0.934$, $p=0.000$, ($p < 0.05$). The results showed that there is a direct, very strong, statistically positive significant relationship exist between security services technology and resources capability. Therefore, since the influence is statistically positive and significant, the null hypothesis is hereby rejected; we therefore state that cloud services has a very strong, positive significant relationship with resources capability in oil and gas companies in Port-Harcourt Rivers State, Nigeria.

➤ *Correlation between Security Service Technology and Resources Capability of Oil and Gas Companies in Port-Harcourt Rivers State, Nigeria*

The stated hypotheses are as follows:

H_{02} : $\rho_s = 0$: There is no significant correlation between security service technology and resources capability of oil and gas companies in Port-Harcourt Rivers State, Nigeria

H_{12} : $\rho_s \neq 0$: There is a significant correlation between security service technology and resources capability of oil and gas companies in Port-Harcourt Rivers State, Nigeria.

Table 10. Security technology and resource capability

			Security Technology	Resource Capability
Spearman's rho	Security technology	Correlation Coefficient	1.000	.764**
		Sig. (2-tailed)	.	.000
		N	193	193
	Dynamic capability	Correlation Coefficient	.764**	1.000
		Sig. (2-tailed)	.000	.
		N	193	193

** . Significant at the 0.05 level (2-tailed).

Source: Field Survey Data, 2024.

The empirical result of the Spearman Rank Order Correlation Coefficient (ρ) in table 4.12 above indicates that the rank value $\rho = 0.764$, $p=0.000$, ($p < 0.05$). The results showed that there is statistically positive significant relationship exist between security technology and resources capability. Therefore, since the influence is statistically positive and significant, the null hypothesis is hereby rejected; we therefore state that security technology has a very strong, positive significant relationship with resources capability in oil and gas companies.

V. DISCUSSION OF FINDINGS

The results of the test of hypothesized statements, H_{01} , H_{02} , H_{03} , and H_{04} the results of the hypotheses tested show strong positive relationships between the two variables under investigation.

When testing on the relationships between the dimension and the measures cloud service technology and dynamic capability of oil and gas companies in Port-Harcourt, Rivers State Nigeria. The result ρ outcome is 0.887 @ $p0.000 < 0.01$, meaning that a strong positive relationship exists between the examined variables and it is also significant. This implies that the alternate hypothesis (H_{11}) is rejected and null hypothesis (H_{01}) as stated accepted. To support this finding Obibhun. L and I.A. Georgewill. (2024) stated that organizations have been experiencing disruption in practice

and that it is only those organization with dynamic and resources capability that will be able to cope with technology disruption.

With respect to cloud service technology, the rho outcome of 0.867 @ $p0.000 < 0.01$ reveals that there is a strong positive relationship between cloud services technology and resources capability and it is also significant; which means that the alternate hypothesis (H_{02}) is rejected and null hypothesis (H_{02}) as stated accepted. To support this result Mouha. R.A. (2021) Organizations are increasingly using cloud services to stand out in this competitive business market. Cloud services has transformed the way technology is used and managed. It promotes efficiency by facilitating seamless data dissemination, processing, and storage across regional borders. With its ability to change the way businesses work and process things, cloud services drives efficiency and innovation.

In the case of security service technology and dynamic capability which is H_{02} the rho outcome $0.934 p0.000 < 0.01$, it shows very strong positive and significant relationship among the examined variables. The alternate hypothesis (H_{03}) is rejected and null hypothesis (H_{03}) as stated accepted. In line with our finding Teece et al. (1997) said dynamic capabilities is the ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments. The firm's processes that use resources – specifically the processes to integrate, reconfigure, gain and release resources, to match or even create market change. Also, Teece (2007) claims that dynamic capabilities enable firms to gain competitive advantage in rapid (technological) changing markets. They also enable firms to adopt internal and external changes to deal with changes (Zahra and George, 2002).

When testing on the relationships between the security technology and resources capability of oil and gas companies in Port-Harcourt, Rivers State Nigeria. The result rho outcome is 0.764 @ $p0.000 < 0.01$, meaning that a strong positive relationship exists between the examined variables and it is also significant. This implies that the alternate hypothesis (H_{03}) is rejected and null hypothesis (H_{03}) as stated accepted. Paladino (2009) argues that firms that have strategically invested in research and development have better results and produce better results. Organizations that use technology have been considered to have superior performance as they can believe to do better in the acquisition of new technologies of product innovation (Altindag et al., 2010). The study argued that organizations should pay more attention to technological advancement in order to achieve sustainability. Wernerfelt (2014) did conclude that resource s such as technology and human resources significantly contribute to the adequate performance of an organization.

➤ *From the inferential analysis so far, it can be stated that:*

Disruptive technology dimensions (dynamic capability and resources capability) has positive and significant relationship with the measures of organizational capability. This simply means that the organizations in the oil and gas have the capabilities to withstand any disruptive technology anytime if occur in their organization

VI. CONCLUSION

The essence of this correlational study was to empirically examine the nature and extent of relationship that exist between disruptive technology and organizational capabilities of oil and gas companies in Port Harcourt. The findings from the analyses showed that there exist, a positive relationship between the dimension of disruptive technology and organizational capabilities. Consequent upon these findings, the researcher thus, arrived at the following conclusions.

In the test of relationship between cloud services technology and dynamic capability, the results of the bivariate analyses revealed that there is a strongly positive and significant relationship between the between cloud services and dynamic capability. Thus, the researcher concludes that dynamic capability will help organizational to face any type of disruption that could face the organization.

In the statistical test of relationship between cloud services technology and resources capabilities, the result of the bivariate showed that there is a strong positive and significant relationship between cloud services and resources capabilities. Therefore, the researcher concludes that, the organization have the capability to withstand cloud services and get better competitive advantage.

In the test of association between security technology and resources capability the results of the bivariate analyses revealed that there is a strong positive and significant relationship exist between the variables. Thus, the researcher conclude that that the organizations in oil and gas companies will always survive any security technology as a result of the necessary resources available.

RECOMMENDATIONS

In view of our findings in this study as they relate to disruptive technology and organizational capability of oil and gas companies in Port Harcourt Rivers State, Nigeria, the following recommendations were made by the researcher;

- The management should adopt cloud services technology to bring flexibility and security to businesses, supporting new aspects such as hybrid and remote working models. This will enable the oil and gas companies to rapidly modernize their operating system to lower cost and increase the agility of their management in data storage, backup and complete information accessibility.

- The oil and gas organizations must invest in security service technology to combats different treats from different quarter and form a collaboration between national security and international security to fostering a safer and more connected business world.
- Management should ensure they are dynamic in their operations so that they can survive any types of changes that may pose a serious treat to the survival and growth of the organization.
- Oil and gas companies must furcate the environment and consider which disruptive technology might influence their performance and prepare resources and formulate a strategy that will helps to adjust to the disruptive technology for better performance.

CONTRIBUTION TO KNOWLEDGE

This paper contributes to the body of knowledge in the following ways,

- The knowledge of cloud service and security technology will help the organization in the oil and gas companies to protect their data and resource from being attack by cyber thieves.
- Disruptive technology will bring effectiveness, efficiency and improve the performance oil companies in the global market.
- Organizations with digital employees will always adapt to any new technology no matter how disruptive it is to the old way of doing something in organization.
- Organizations with the right resources and capabilities will be able to cope with both cloud services and security technology.

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