

The Role of Technology in Outsourcing Practices in the Oil and Gas Industry

by

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STUDENT DECLARATION FORM

I declare that while registered as a candidate for the research degree, I have not been a registered candidate or enrolled student for another award of the University or other academic or professional institution.

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ABSTRACT

This study examines the role of technology in outsourcing practices in the oil and gas industry. The aim is to verify the association between technology and outsourcing and their relevance as solution enablers that organisations within oil and gas sector should employ to facilitate future growth. The study assesses how firms benefit from outsourcing practices as a growth strategy to achieve competitive advantage. The resource-based view (RBV) theory was adopted as the main organisational theory that underpins this study. The theory justifies outsourcing and technology through resource-related advantages and capabilities. More so, the resource-based view supports the idea that firms can strengthen their internal operations to achieve superior performance by exploiting external outsourcing arrangements through access to new technologies. These enablers are considered as the main source of firm's sustainable competitive advantage when they are valuable, rare, imperfectly imitable and non-substitutable.

Comprehensive reviews were carried out on the evolution and current state of outsourcing practices, as well as new technologies to determine their impacts in driving performance within oil and gas industry. In attempt to answer the research questions, a self-administered questionnaire was adopted. A total of 200 administered questionnaires were sent to Nigerian oil and gas companies. Out of 200 questionnaires sent, 120 were returned which amount to 60% response rate. From the 120 questionnaires received, only 100 were considered valid for further analysis. Explorative interviews were conducted to validate the findings from the surveyed data. The interviews results also provided further clarity and understanding, in terms of operational frameworks, additional measures and contextual definitions which the participants consider important beyond those obtained from the literature.

The outcomes of the survey clarify the impacts of outsourcing technology in oil and gas industry with a view to how this affected the long-term business performance of the organisations. The study identified that the most important drivers of outsourcing practices in oil and gas industry is access to new technologies. Additionally, a moderating construct that was linked to the deployed technologies and outsourcing drivers provided further enhanced performance measures. The evidence shown that in addition to performance advantage of having access to enabling technologies and outsourcing initiatives, organisations' competitive performance can be further enhanced through the trio of effective quality management, expertise best practices and modern infrastructure. The implication of this research may demonstrate that implementation of outsourcing initiatives and technology solutions will be a significant growth strategy, particularly to SMEs, and may also provide economic opportunities that are not sufficiently available in most developing oil and gas economies.

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ABBREVIATION

B

BPO: Business Process Outsourcing

BPM: Business Process Management

EDI: Electronic Data Interchange

GE: General Electric

I

IEA: International Energy Agency

IT: Information Technology

IOCs: International Oil Companies

N

NEITI: Nigeria Extractive Industry Transparency Initiative

NNPC: Nigeria National Petroleum Corporation

NGL: Natural Gas Liquid

NLNG: Nigerian Liquefied Natural Gas

NNPC: Nigerian National Petroleum Corporation

M

MNOCs: Multinational Oil Companies

O

OPEC: Organisation of Petroleum Exporting Country

OPA: Offshore Process Arrangement

R

R&D: Research and Development

S

SPSS: Statistical Package for the Social Sciences

SMEs: Small-scale and Medium-sized Enterprises

SC: Supply Chain

SCM: Supply Chain Management

CHAPTER 1

INTRODUCTION

1.1 Introduction to the Chapter

Oil and gas exploration started in 1954 when the concession- based regime of imperial Russia produced around 3500 tons of oil (Baaij et al., 2011; cited by Obisanya, 2013). The focus of the industry was largely on oil alone, whilst gas was unwanted by-product of the extraction process that often flared off into the atmosphere. The first century of the industry witnessed the emergence of International Oil Companies (IOCs), the so called group of ‘Seven Sisters,’ who dominated the world’s oil supplies at the time (Obisanya, 2013). But, by way of institutional response, in 1960 a small number of oil-producing nations formed Organisation of Petroleum and Exporting Countries (OPEC) to break the stronghold that the Seven Sisters had placed on the industry (Collin et al., 2014).

Despite the discovery of alternative energy, oil and gas remain the major sources of energy today (Energy and Environment in the European Union, 2006; cited by Menhat and Yusuf, 2017), as well as the reflection of the world economy (Batoul et al., 2016). Similarly, in spite of the dwindling resources and price fluctuation of the petroleum products, oil continue to receive accelerated demand and high consumption rate, particularly within the transportation industry, whilst gas is highly consumed and utilised for residential and industrial purposes. As energy source of choice, oil and gas required massive investment to access new technologies for exploration of new fields and refurbishing of existing infrastructure. As such, firms are pressured to develop unconventional and highly costly reserves to mitigate the growing demand for hydrocarbons (International Energy Agency, 2015).

Oil and gas industry, unlike other discrete manufacturing industries is process-oriented, with different operational arrangements. Additionally, several scholars (Chima and Hills, 2007; Robert, 2013; Batoul et al., 2016) have maintained that oil and gas sector has distinguishing characteristics that made it a classic model for supply chain management. These features according to the scholars, include higher technical complexities, involvement of diverse expertise, bigger project size, high transportation, state-of-the-art infrastructure and high machinery costs. Thus, operations in the industry usually involved multiple companies that execute and complete different projects. The integration between these companies may be in

form of joint venture and partnership, or in most cases it could be in form of outsourcing collaborations. Modarress et al. (2016) confirm that in oil and gas sector, outsourcing practices is increasingly employed across all the three sectors of the upstream, midstream and downstream supply chain. In fact, the authors pointed out that outsourcing arrangements has become a preferred significant potential component for most industry's business strategy, including oil and gas industry, particularly for costs saving, access to advance technologies and expertise practices.

Most literature also support the view that outsourcing practices in which new technologies played an important roles, has become an important activity that enables company to achieve long-term strategic benefits. These strategic benefits include, improved quality and low cost products, enhanced organisational focus on core competency, increase flexibility, technology capabilities and market competitiveness (Piachaud, 2005). Other strategic benefits are its competition effect on suppliers in using modern infrastructure, high level automation and global best practices, which ensure the availability of higher-quality products and services. Technology outsourcing arrangements has also contributed to the lead-time in the petroleum industry, from exploration to production, reducing to overall cost of development (International Energy Agency, 2015).

According to Gewald and Dibbern (2009), access to cutting-edge technology has become one of the main indicators of outsourcing success and important drivers for outsourcing decision. In other words, firms can take advantage of emerging technology in outsourcing arrangements without investing much in resources (Gomez-Conde, 2015). Thus, these benefits make outsourcing practices to grow rapidly, a prevalent option for organisations entering new markets. Also in the past, outsourcing initiatives has been used primarily by larger organisation as opposed to small and medium enterprises (SMEs). But in recent time, through outsourcing arrangements, smaller indigenous firms have developed their internal performance operations and technology capabilities through outsourcing arrangements with foreign-owned firms (Hayakawa and Ito, 2018).

However, despite the substantial strategic benefits the industry has witnessed since inception of petroleum exploration, oil and gas sector has also experienced several challenges. Some of these challenges are the inability of oil firms to adequately balance the supply and demand, macroeconomic situations, the issue of price fluctuation, lack of access to cutting-edge technologies, the geopolitical crises, local content policy and market forces (Ralf, 2007).

A case in point is the consistent attack on onshore and shallow water in Nigerian oil Delta Region by Militants. There are also geopolitical issues that caused supply disruptions in Libya, Syria, Yemen, more recently in Venezuela, including the standoff between UK and Iran, heightened by economic sanction imposed on Iran by US. In addition, access to new technologies could also influence the global oil price, as lack of advance technology makes it almost impossible to access the difficult terrain like sub-sea regions or the exploration of alternative energy source which is technology-driven. According to Lukoil (2013), new technologies help companies to increase the depth of offshore to about 27% of shell production, which is currently at the depth of 300m with more future growth prospects.

Given these complexities of oil and gas supply chain, occasioned by factors such as price fluctuation, geopolitical issues and inaccessibility of new technologies, and their significant impacts on performance in oil and gas companies, one way to stem the tides of these challenges is leveraging on outsourcing arrangements among partners. Outsourcing initiatives allows companies to focus on their core competencies, whilst gaining access to superior technical resources and technological capabilities, as well as reducing costs, particularly in specialist functions such as information technology (IT) (Ellram et al., 2009). This implies that outsourcing arrangements, when leveraging new technologies will reconfigure a firm's value chain, as well as allows firm not only to compete effectively, but also to sustain future market dominance. A good example is the technology innovation in the rise of 3D printing, which has provided firms with opportunity of reconfiguring supply chains and hence shortening or virtually eliminating lead times (Berman 2012; Mellor, et al., 2014; cited by Siavash, 2016).

1.2: Background of the Study

In today's knowledge-based economy and with heterogeneous customer demand, outsourcing practice has become a vital ingredient employed by organisations to enhance their business initiatives, corporate memory and intellectual assets (McIvor et al., 2017). Outsourcing arrangements has also become an integral part of organisations re-engineering and a tool to achieve competitive advantages in terms of cost, quality, technical capabilities and customer satisfaction (Broedner et al., 2009). As such, outsourcing has received increasing academic attention, and in business operations. In fact, according Kotabe et al. (2008), outsourcing arrangements has become a competitive tool, rather than just a simple means of costs control.

In oil and gas industry, new technologies have also enhanced the industry operational capabilities, especially within the upstream sector, where these enablers helped the oil-drilling companies to exceed the depth of their offshore field to about 3,000m, despite the high cost of operation and operating risks (Lukoil, 2013). According to Silver (2000), technologies are solutions to knowledge management and firm's competitive advantage lies in how they access, efficiently manage and transfer technologies across the industries. Previous global research agencies including the following Reports (KPMG, Potter, Pricewaterhouse Coopers, 2007; Technology Partners International Inc., 2009; cited by Swoboda et al., 2011), have noted that outsourcing engagements have been growing and will continue to grow consistently both in terms of number of contracts and their average contract value (Kumar and Ramachandran, 2011). Although these reports are still within the scope of developed nations, and with limited information in the context of developing oil and gas economies.

However, outsourcing growing body of literature has shown both the benefits and the disadvantages for business performance (Gomez-Conde, 2015). Similarly, several scholars have investigated outsourcing performance related practices and technology innovation in oil and gas sector (Yusuf et al., 2012; Rajesh and Tore, 2007; Muhindo et al. 2014; Yusuf and Menhat, 2017), with limited information on the developing oil and gas nations. More so, the majority of these research outcomes focused on discrete manufacturing and the empirical data materials collected were significantly based on secondary data. More so, the evidence on the association between outsourcing and technology and their combined impacts in driving organisations performance were lacking. In addition, most of the reviewed literature in outsourcing arrangements concentrated more in investigating the drivers of outsourcing from the shareholder's perspective of cost reduction.

This study will assess outsourcing operations from the standpoint of technology development and long-term performance. The study will provide a new insights on outsourcing decisions and also identify various drivers and deployed technologies that would influence outsourcing decisions in the oil and gas industry. The resource-based view (RBV) theory is adopted as the main organisational theory that underpins this study. The theory justify outsourcing practices and technology through resource-related advantages and capabilities. More so, the resource-based view suggests that firm can strengthened its internal operations to achieve superior performance by exploiting its external outsourcing collaborations and access to new technologies.

Furthermore, the external factors mentioned earlier such as geopolitical crises, price fluctuation, macroeconomic issues, local content policy, market forces and balance of supply and demand are quite uncertain and hardly controlled by the oil and gas firms. More so, due to the nature of the industry, oil and gas sector experiences lack of products differentiation to gain competitive advantage. Therefore, organisations particularly in a developing countries can leverage outsourcing arrangements to enhance performance, particularly in areas of quality, flexibility, expertise, technical capability, modern infrastructure, core competencies, economies of scale, and most importantly, access to new technologies (Piachaud, 2005). Moreover, Jean-Marie and Dogui (2013) have clearly noted that outsourcing practices in the developing countries will arise the future markets through the migration of technology from Europe, USA and China.

The above statement appears very plausible since outsourcing usually occurs through collaboration, leading to sharing of expertise, new technologies, and best practices. Therefore, this study will examine the impacts of deployed technologies and outsourcing drivers as solution enablers that organisations within oil and gas sector employed in measuring their performance. Ultimately, the research will improve the current level of understanding and address some of the challenges companies experienced in adopting and implementing technology outsourcing across the supply chain.

1. 3: Research Questions

To achieve the aims and objectives of the research, the following the research questions are addressed:

- Q1.** What is the level of association between outsourcing drivers and deployed technologies in oil and gas industry?
- Q2.** What are the most important drivers of outsourcing practices in oil and gas industry?
- Q3.** What are the impacts of outsourcing drivers and deployed technologies on business performance?
- Q4.** What is the extent of relationship between competitive attributes and deployed technologies?
- Q5.** What are the business performance outcomes of outsourcing drivers and deployed technologies when moderated through a competitive attribute?

1.4: Objectives of the Research

In order to achieve the overall aim of the research, we considered the following research objectives:

- (1) To explore how firms, manage their outsourcing practices.
- (2) To investigate the role of technology on firms' outsourcing practices.
- (3) To determine the impacts of outsourcing and technology on organisations performance
- (4) To assess the benefit of outsourcing practices to IOCs and SMEs.

1.5: Implication of the Study

This research is expected to provide more insights and significant contributions that drive the long-term business performance in oil and gas industry through the association of technology and outsourcing practices. The study will identify the most important drivers of outsourcing practices in oil and gas industry. More so, the research will explore how organisations' competitive performance can be further enhanced through the trio of effective quality management, expertise best practices and state-of-the-art infrastructure. The resource-based view (RBV) theory is used as the main organisational theory that underpins this study. The theory justify outsourcing practices and technology through resource-related advantages and capabilities. The findings of this research may demonstrate that implementation of outsourcing initiatives and technology solutions will be a significant growth strategy, particularly to SMEs, and may also provide economic opportunities in most developing oil and gas economies.

1.6: Structure of the Thesis

This thesis contained seven chapters as outlined below:

Chapter Two discusses the literature on the major concepts of the research. These include definitions of the strategic and evolution of outsourcing practices in supply chain management (SCM), deployed technologies in oil and gas supply chain and organisations business performance. The Focus of the review was also on current state of outsourcing practices, drivers of outsourcing operations and competitive attributes. Moreover, these reviews underscores the importance of the research, formed the research questions and helped in

developing the conceptual model of the research. The reviews also identify the key drivers of outsourcing practices in the oil and gas industry.

Chapter Three outlines the conceptual model and all the key element of methodology, as well as the research questions, methodology flow diagram, moderation framework, research philosophies and questionnaire administration. The proposed conceptual framework is used to provide insights and a guide for the study. It also underscores the relationship between the key constructs in the study. The conceptual framework gives focus and direction to the study and also in deciding the methodological steps of subsequent chapters.

Chapter Four presents and explains the outcomes of the quantitative phase of this study. This chapter consists of the structure of the questionnaire, planning and administration of a survey by questionnaire, the response rate, preliminary analysis, descriptive statistics, inferential statistics and the relationship of the main constructs. In general, it answers all the five research questions presented in section 1.3 of this chapter.

Chapter Five outlines findings for the explorative interviews. Since there are limited research on the outsourcing related performance in the context of developing oil and gas nation, the interview is considered as an exploratory research. The interviews provided further insights and understanding from the practitioners perspectives about the additional measures, as well as the contextual definitions and operational frameworks that are consider important beyond those obtained from the literature. The interview findings also validate the survey results.

Chapter Six provides the details explanations of the results in **Chapter 4** and the research questions. The chapter also outlines the research objectives and implications of the study. Moreover, the study demonstrate how the results were generated by providing the findings and justifications.

Chapter Seven draws the conclusion from the study. The chapter begins with the general overview of the study, restating the research aims and objectives, research methodology, as well as all the key processes performed in this study. The conclusions were further presented by outlining the research questions and providing the research outcomes, justifications and re-evaluation of the research goals. This chapter also outlines the novel contributions of the research to knowledge, limitations, and recommendations for further research.

1.7: Summary

The historical perspectives of oil and gas industry was presented in this chapter. This chapter also pointed out that despite the discovery of alternative energy, oil and gas remain the major sources of energy and the reflection of the world economy today. More so, it presented some of major challenging factors that influenced oil and gas industry balance of supply and demand. These factors include the volatility of oil price, macroeconomic situations, the geopolitical crises, market force, local content policy and the complexities of its supply chain. This is followed by the background of the study, which briefly discussed the literature of deployed technologies and outsourcing operations. Previous and current research on outsourcing practices were also outlined, which were majorly within the context of developed nations.

The literature reviewed presented limited information on the outsourcing and technology operations within the developing oil and gas economies. This discussion raised the need to study outsourcing practices within the developing oil and gas nations in order to appreciate the challenges and impacts of this practices, especially on the local indigenous companies. Accordingly, the research objectives and as well as the implication of the research were demonstrated to provide a general insights about this research. The final section presented the structure of the thesis.

CHAPTER 2

LITERATURE REVIEW

2.1: Introduction to the Chapter

The primary aim of this chapter is to provide a comprehensive reviews of the academic literature on the definitions and the evolution of outsourcing practices in supply chain management (SCM). This chapter will further explores the impact of technologies and business performance measures employed in oil and gas sector. In addition, the chapter discusses the enhancing attributes stemming from the modern infrastructure, quality management and expertise best practices. The chapter will finally looks at the challenges, benefits and the drivers of outsourcing practices in organisations.

2. 2: Definitions of Outsourcing Practices

Outsourcing literature has provided various approaches for explaining and defining outsourcing operations. According to Siakas (2015), outsourcing can be defined as an activity where on organisation, called vendor/supplier/service provider, delivered services to another organisation (customer/client/buyer) at a pre-determined price and according to agreed-upon quality criteria and at certain time schedule. Outsourcing is also defined as mechanism for the reconfiguring a firm's value chain in a way that allows it not only to compete effectively but also to sustain future market dominance (Dmitriy, 2018). The authors confirm that in outsourcing arrangements, there are number of the value chain activities that can be performed externally such as logistics, maintenance, marketing and sales, service support, technology development, computer information systems, HRM, and check processing.

In the same vein, outsourcing practices entails a long-term relationship between suppliers and a beneficiary, with high degree of risk sharing (Anon, 1995; cited by Dmitriy, 2018). Jean-Marie and Dolgui (2013) explain outsourcing practices as an act of obtaining semi-finished products, finished products or services from external organisations, particularly when these activities were not traditionally performed internally. Lei and Hitt (1995) refer outsourcing as 'reliance on external sources for manufacturing components and other value-added activities'.

The definitions of outsourcing used in previous study are so broad that they include particularly, any good or service that a company obtains from an outside organisation (Grilley and Rasheed, 2000). Additionally, Wasner, (1999; cited by Sankalp, 2014) conceptualized outsourcing as externalization of activity which was formally being carried out within the firm. According to Engelke (1996; cited by Jean-Maria and Dolgui, 2013) outsourcing is finding new suppliers and new ways to secure the delivery of raw materials, goods, components and services, by utilizing the knowledge, experience and creativity of new suppliers not used previously? Busi and McIvor (2008) classified outsourcing into two process: production related (namely production and logistics) vs support process related (information system (IS), accounting, human resources, etc.).

Table 2.1. Outsourcing Characterization

Outsourcing Practices	Characterization	Examples
Tactical arrangements	Basic relationship	Telemarketing, payroll processing and manufacturing
Strategic arrangements	Closer relationship	Facility management, Software development and Project service provision.
Transformation arrangements	Very closer supplier relationship	Technical support, Product design and Customer relationship management.

However, according to Busi and McIvor (2008), explaining outsourcing only in terms of activities does not completely capture its strategic nature. The authors point out that strategic outsourcing practices entails a long-term relationship between suppliers and a buying organisations, with a high degree of risk sharing. Strategic sourcing decisions must take into account a number of factors such as development of new technologies and exploitation of its core activities, as well as the need to relate sourcing decisions to the organisation’s competitive business strategy (Piachaud, 2005). Thus, outsourcing is not just a simple decision to buy because most firms obtain goods or services from external companies (Jacobo et al., 2015). Javalgi et al. (2009) explained outsourcing in different forms such as tactical, strategic and transformational. Tactical outsourcing is a basic type of outsourcing relationships such as delivery of telemarketing, payroll processing and simple contract manufacturing.

Strategic outsourcing characterised a closer supplier relationship like in facilities management, software development, and project management service provisions. Transformational outsourcing is characterised by a very close supplier relationships involving technical support, product design and customer relationship management (Bharma, 2012) (See table 2.1).

Furthermore, Babin and Quayle (2016) explored outsourcing in relation to the following elements: (1) Economics – a consideration of economies of scale, variability of demand and the longevity of demand for the activity, (2) Quality – the access to skills, the competency and focus of potential suppliers and geographical coverage, (3) Innovation – the intersection of two previously dissociated thoughts, (4) Knowledge transfer – namely, knowledge ambiguity as a mediator of tacitness, experience, complexity, cultural and organisational distance or closeness, (5) Behaviour – ways of changing the mindset of the business activity of outsourcing and changing the mindset of the function providing the activity, (6) Business risk – the ability to reverse the outsourcing/partnership decisions or change the supplier/partnership if things go wrong, and competency for effective partnership negotiation, project management, as well as the capacity to tap into a service provider’s enabling expertise, technology and resources, (7) Customers satisfaction – how business agreements need to focus on customer satisfaction.

Vashistha and Atul (2006) provided further insights that outsourcing complements trade liberalization strategies by promoting technology spill overs, capital inflows and offset the increasing level of unemployment through opening up domestic markets. Some authors argue that outsourcing strategy allows organisations to pay for the services and business functions they need, when they need it, without necessarily hiring a train specialized staff, or bringing in fresh engineering expertise. The above context clearly explained the concept of outsourcing practices. Although these definitions are concise, they are situated within the context of discrete manufacturing, with limited in-depth study of the process-oriented industry, particularly oil and gas (Modarress et al., 2016). The objectives of this study is to investigate outsourcing technology operations in the context of process-oriented oil and gas industry.

In attempt to address the gaps in the literature, the study outlines relevant prior research works conducted by several researchers: An empirical study was carried out by Rajesh and Tore (2007) in Norwegian oil and gas sector. The researchers designed a framework that assessed performance-based outsourcing arrangements between the oil and gas operators and services providers. The findings indicate an increasing dependent of oil and gas operators on

services providers in achieving any level of performance particularly in cost reductions. The findings confirm the contention in literature that outsourcing practices is designed in a way to make the buyers more dependent on the service providers (Jean-Marie and Dolgui, 2013). Another empirical research was carried out by Muhindo et al. (2014). The researchers investigated the role of logistics outsourcing in business contracts in the oil and gas industry in Uganda. The research outcomes indicate that in any outsourcing arrangements involving full or part of logistics service (e.g. transport, warehousing and equipment) , the service providers will always contributes significantly in minimizing the operational cost and at the same time spreading the risk between the parties engaged in the business contracts.

Grobler et al. (2013) analysed differences in outsourcing strategies between manufacturing firms from emerging markets and from developed markets. The results suggest that companies outsource internationally to achieve cost advantages, whilst companies that outsource domestically focus on achieving capacity flexibility. The authors admitted that their work was limited in other outsourcing drivers and therefore encourage research into other criteria such as access to new technologies, core competencies and desire for quality. Vathsala (2015) investigated the effect of knowledge sharing and innovativeness in offshore outsourced software development firms. The findings revealed that both knowledge sharing, best practises and knowledge availability significantly predicted innovativeness.

Batoul et al. (2016) identified the challenges, benefits and drivers of petroleum companies in Persian Gulf towards outsourcing strategy. The findings indicate that the oil and gas exporters have mixed but broad positive view of outsourcing arrangements. And that outsourcing could provide savings across the entire supply chain and at the same time generate a distracting resistance in area of organisational culture and infrastructure. Larsen (2013) conducted an empirical research that involved over 100 organizations, which had outsourced their information technology process. The research findings confirm that managers who believed that vendors would provide services at lower cost because of scale economies were disappointed. It turned out that cost reduction was not an obvious outcome. Cost reduction was override because of system incompatibilities and the desire for other drivers.

Clearly, the above outlined research studies have provided limited information about outsourcing practices in the context of developing countries. More so, the researchers adopted a different methodological and theoretical approaches. This study will employ an empirical and qualitative approach involving primary data from questionnaire, semi-structured interview and

resource base view (RBV) as the underpinning theory. Additionally, the previous studies focused on stakeholder's performance perspective of cost reduction. The research will explore technology driven performance. Additionally, this study will propose a conceptual framework and develop moderating attributes of quality management, modern infrastructure and best practices that will enhance technology outsourcing performance.

2.3: Evolution of Outsourcing Practices

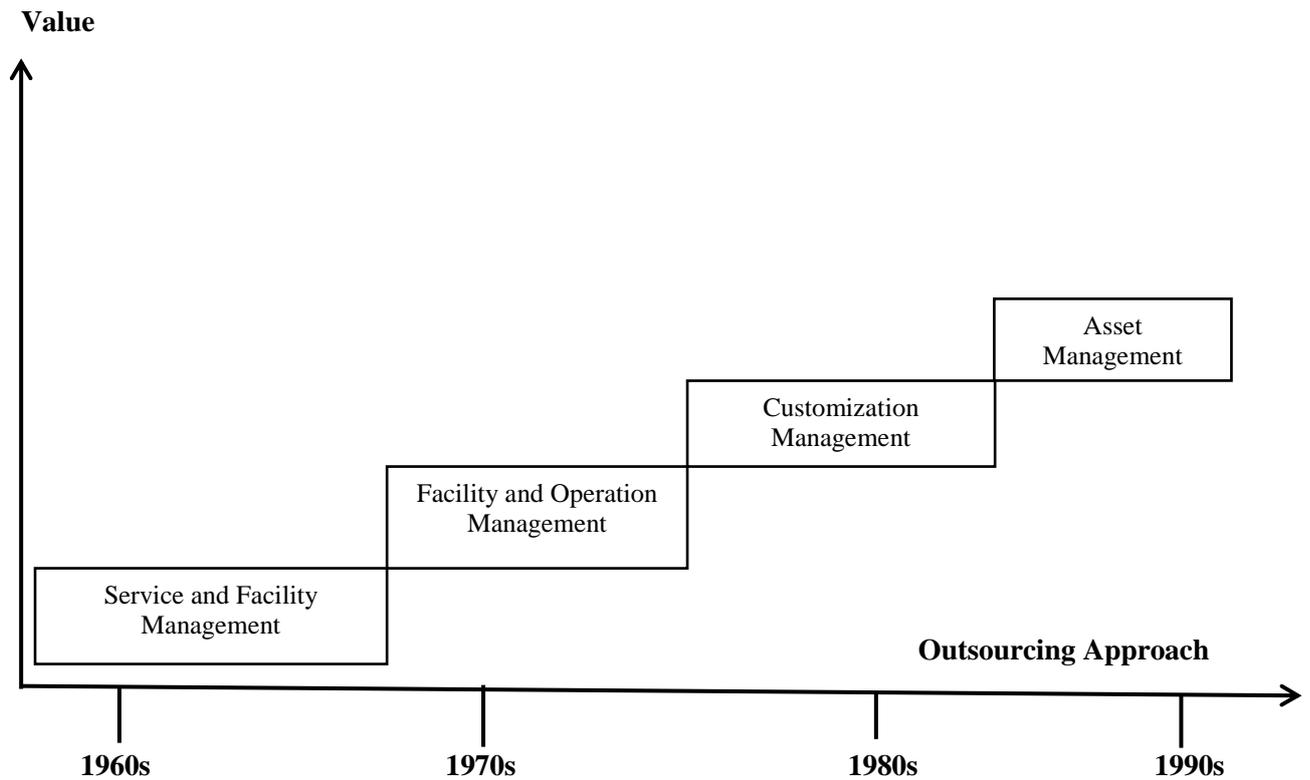
There is no consensus among the researchers on the origin of outsourcing as a practice or a scientific concept (Marco and Ronan, 2008). The authors noted that some researchers, mostly from manufacturing and supply chain management background, see outsourcing as nothing more than an evolution of older research on 'make-or-buy,' whilst others mostly from a service operations management background, see it as revolutionary trend that started few years ago. Interestingly, there is no contention among practitioners about the impacts of outsourcing activities on organisations, particularly across key value chain, namely: logistics, maintenance, marketing and sales, service support, technology development, computer information systems and human resource management (HRM) (Anon, 1995; cited by Dmitriy, 2018).

In the past, before the industrial revolution, outsourcing initiatives were never adopted by companies to look after their sales, storage, transportation, legal affairs, technology capabilities and taxes (Handfield, 2006). The entire value-chain functions were performed mainly by the organisation itself. In fact, the author pointed out that the business model during that era, for most organisations, was largely integrated companies designed to retain all activities including increase markets and profits. Some scholars (Hendry, 1995; cited by Sankalp, 2014) also argued that the boost for strategic outsourcing emerged from the failing economy of the 1980s and 1990s. The authors noted that during this period, the combined forces of intense competition and recession forced organisations to introduce solutions such as de-layering, business process re-engineering and outsourcing in their value chain. In fact, according to Embleton et al. (1998), the emphasis on cutting costs became the primary focus of successful firms across the industries.

According to Handfield (2006), the stages of evolution of outsourcing strategic partnership did not start until in late 1970s and 1980s, when many large companies began to outsource such activities like accounting services, insurance, engineering, and legal needs to specialized firms. Jean-Marie and Dolgui (2013) confirm that in the seventies, outsourcing

activities were restricted to products like textiles, consumer electronics, whilst in the eighties, outsourcing arrangements extended to car parts and full assembly of cars, as well as software, semiconductors and medical equipment. The authors maintained that from the middle of nineties to twenties, outsourcing practices extended to China with higher added value products and services like research and development (R&D), key auto parts, major airplane components and machineries.

Figure 2.1: Evolution of outsourcing practices



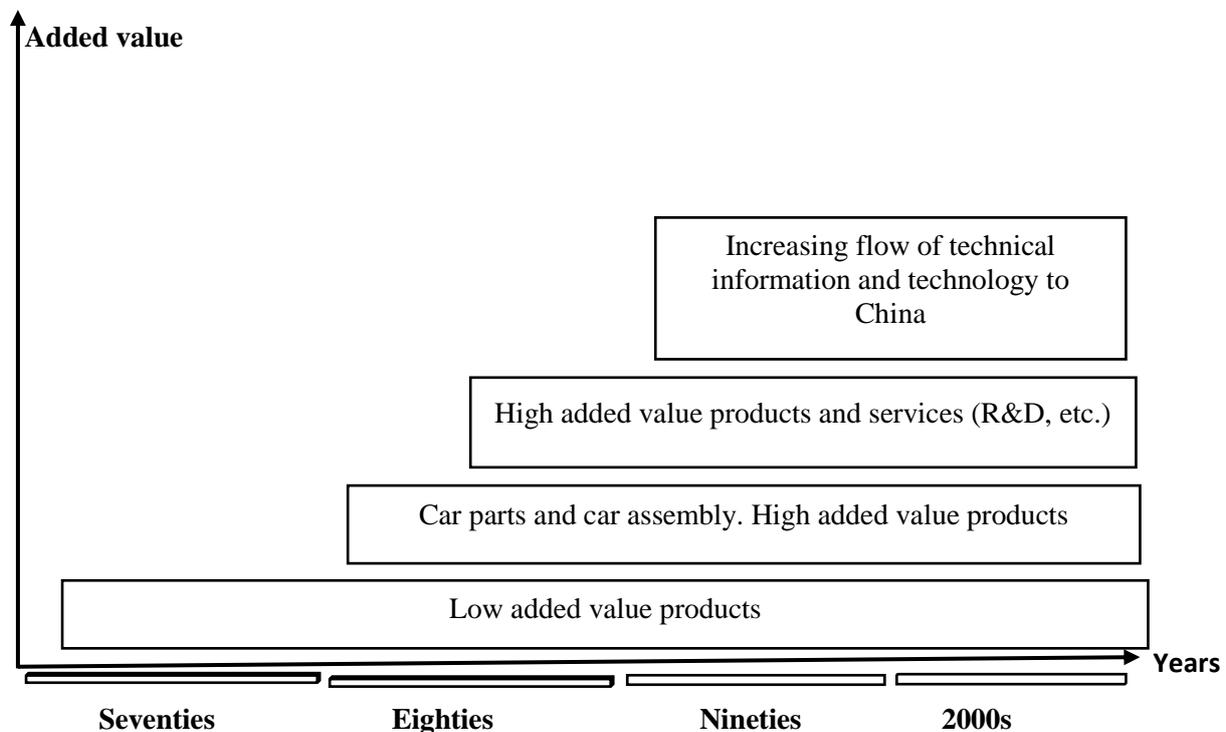
Sources: Quinn (1999)

Quinn (1999; cited by Ellram et al., 2009) have also argued that outsourcing activities has shifted, particularly in the middle of nineties to twenties from outsourcing parts, facilities and components, to outsourcing the intellectual base systems, such as customer response handling, procurement and management. Figure 2.1 outlines the evolutionary trend of the outsourcing practices. Clearly, this progressive trend confirms the current state of outsourcing arrangements as will discuss in next section.

2. 3.1: Current state of outsourcing practices

According to Gomez-Conde (2015), the evolution of the Internet, as well as the information and communication technologies (ICT), have increasingly facilitated outsourcing organisations to establish business partnerships beyond their geographical boundaries. The author argued that better communication contributes to a better platform for both partners to participate in coordination and problem-solving activities. Pope et al. (2015) pointed out that outsourcing operations that was previously dominated by larger organisations, are now beginning to impact on small and medium-sized enterprises (SMEs). This growing surge may be attributed to the innovative idea of shifting from outsourcing a particular item to reconfiguring a whole process, in a bid to achieve shareholders' value.

Figure 2.2: Current state of outsourcing practices



Source: Dolgui and Jean (2013)

Jean-Marie and Dolgui (2013) also confirm that current state of outsourcing practices have witnessed a higher value added products and services, which are now more domiciled within China and India (Jean-Marie and Dolgui, 2013) (see figure 2.2). In fact, other outsourcing literature confirm that outsourcing operations has moved from the evolutionary context and economic dimension of cost advantage, to strategic re-positioning, core competence enhancement, greater service integration, higher value creation and technology advancement

(Ellram et al., 2009). As such, these scale of technology migrations have been viewed as a fallout of increasing collaboration of joint ventures, equity stakes and partnership, alliance, and co-production agreements among companies.

Some scholars have also argued that these collaborative engagements practices of sharing of technological know-how, expertise, and best practices, particularly, between foreign-owned companies and indigenous firms, are designed in a way to make the buyers more dependent on the service providers (Jean-Marie and Dolgui, 2013). These viewpoints are still within the realm of speculations, since there are limited empirical evidence. This study will assess the current state of outsourcing operations with a view to addressing the level of impacts new technologies have created in driving business performance within the industry.

2.4: The Impacts of Technologies on Outsourcing Operations

According to Gomez-Conde (2015), most organisations would always consider outsourcing when in-house performance falls below performance of external suppliers. In fact, Chalos (1994; cited by Kakabadse, 2000) suggest that unless a firm develops best-in-world capabilities, the company should purchase goods and services from providers who have best-in-world skills. Similarly, Sanjay et al. (2014) suggest that assessing outsourcing initiatives through new technologies has enabled smaller companies (SMEs') to expand beyond their traditional market reach. The authors underscore the needs for new technologies in business development and sustainable competitive advantage. Pope et al. (2015) confirm that new technologies have brought more approach that is agile in outsourcing arrangements, as well as lowering the barriers to entry, particularly for small and medium-sized enterprises. In addition, outsourcing arrangements enables small lenders to expand their market areas since better technology means processing quicker and cheaper (Sanjay, 2011).

Piachaud (2005) suggests that when a company lacks sufficient technical expertise to appraise new technologies or processes, it is prudent to hire a supplier to work with the internal department so that the staff may acquire the 'esoteric' knowledge needed to make better sourcing decisions in the future. BusinessWeek Special Report (2005) also pointed out that because of technology, small business can now behave like big businesses and can outsource service anywhere. The special reports gave example of the likes of Dell, Motorola, and Philips who are buying complete designs of some digital devices from Asian developers, tweaking them to their own specifications, and slapping on their own brand names, including their cell

phones segment. Interestingly, this trend has empowered Asian contract manufacturers and independent design houses and made them forces in nearly every tech device; from laptops and high-definition to TVs, MP3 music players and digital cameras. Tafti et al. (2012) corroborated this perception in his statement that in United States, there is a definite trend towards outsourcing arrangements with 90% of all new for-profit businesses are classified as SMEs, which is likely to continue. Literature sources also indicate that despite all the controversies surrounding outsourcing practices, almost every activity: customer service, business, telemarketing, logistics, computer hardware, software, IT services, finance and accounting, medical transcription, research and development, legal and human resource development, are all being outsourced (Dmitriy, 2018).

Furthermore, technology capability allows managers to effectively segment their value chains, thereby presenting companies with a number of options and flexibilities to outsource some or all of their components to suppliers anywhere in the world with minimum costs. Thus, better technology means processing quicker and cheaper. In addition, outsourcing collaboration empowers the contracting firms to benefits from a superior set of cost drivers which include such factors as scale economies, learning and locations, all which are readily available in the supplier (Piachaud, 2005). Moreover, outsourcing arrangement offers a comprehensive framework that allows assessments of other interesting benefits to contracting firms such as effective and efficient quality management, development of core competency, expertise best practice and state-of-the- art infrastructure.

The above Literature has shown the emerging issues on outsourcing arrangements and the deployment of technologies to enhance business performance. The contexts clearly present significant solutions to different industries however, there is limited discussion in the body of literature that relate to petroleum industry outsourcing arrangements, especially within the context of developing oil and gas economies. This paper seeks to address this gap.

As with most partnership arrangements, however, outsourcing operations has its own disadvantages and challenges despite the broad positive view of the above context. For example, outsourcing evolving from self-sufficient approach, to technology development and to one of strategic sourcing, is a challenge because internal processes often required their own specific gravity and inertial over a long period of time (Piachaud, 2005). Some scholars have also argued that the likelihood that outsourcing practices may contribute to profitability in the petroleum industry has unexplored links (Modarress et al., 2016). Gomez-Conde (2015)

believed that one of the most serious problems with outsourcing operations may be the outsourcer's lack of innovation. Mullin (2000; cited by Piachaud, 2005) noted that outsourcing issues may have originated from the failure to clearly define performance expectations and measurement criteria within the contract. Other problems are associated with purchasing issues, managing a specific service or infrastructural functions with external partners.

Stuckey and White (2000; cited by Piachaud, 2005) have also noted that the use of outside suppliers require careful consideration of the potential power of suppliers. The authors stated that in the event that the supplier should prove disappointing, or attempt to impose price increases, the contracting company may incur substantial switching costs from negotiating a new agreement with new suppliers. The contracting company must also consider the strategic intent of potential suppliers, as it cannot exclude the possibility of an outsourcing partner becoming a future competitor (Piachaud, 2005).

Therefore, the objectives of this study are to explore how firms, manage their outsourcing practices, as well as verify the roles of new technologies, particularly information technology on firm's' outsourcing operations.

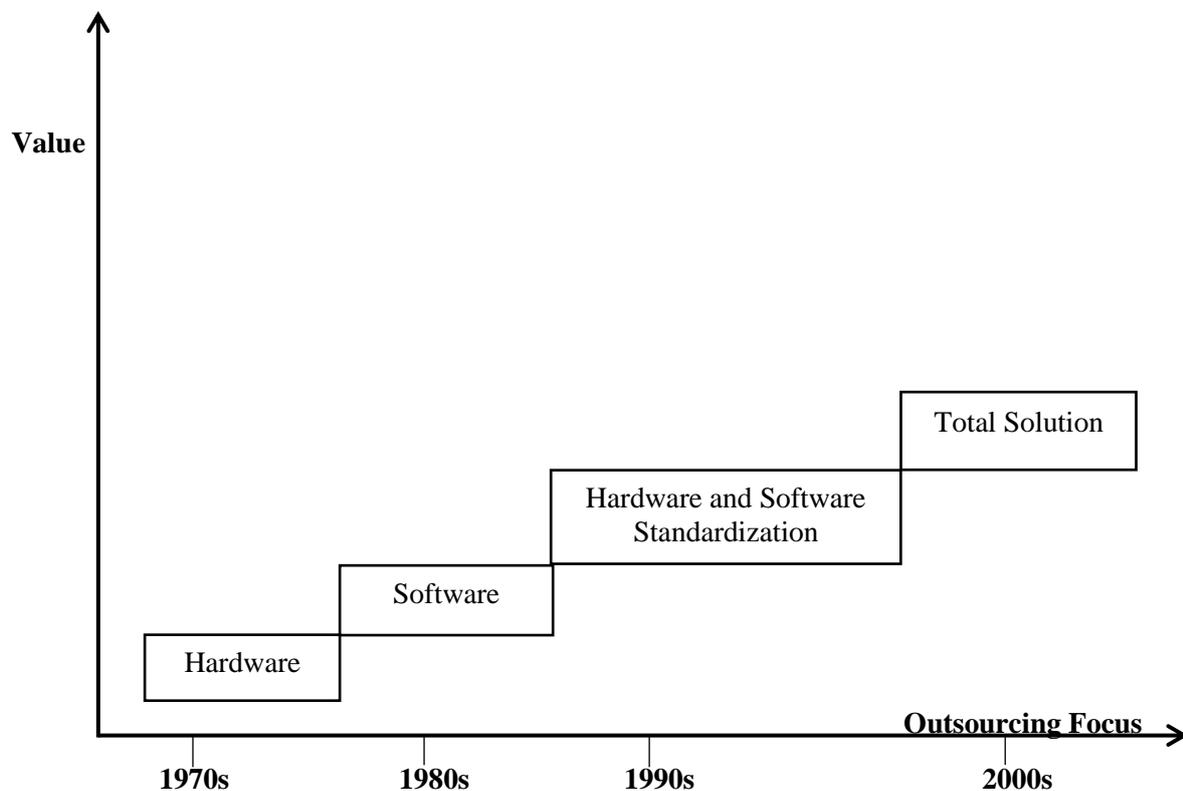
2.4.1: The effects of information technology outsourcing (ITO)

According to (Jiang et al., 2017), the IT evolution and the improvement in computer technology will continue to play a greater part in the next stage of outsourcing history and practices. Similarly, Yakhlef and Laurel (2009) suggest that outsourcing information technology leads to learning new knowledge, as organisations are exposed to the kind of information exchange that ordinarily they would not have had on their own. Choy and Lee (2003) confirm that outsourcing of certain value chain activities including technology functions, computer information systems and logistics have shifted the role of many organisations from a producer of goods to a coordinator of the industry value chain. Tatikonda and Stock (2003) do also highlighted that efficient and effective technology outsourcing gives firms access to variety of new technology options, improve a firm's ability to offer significant differentiated products, deepens the firm's competencies, and positively influences and sustained products development.

Quinn (1999; cited in Sankalp, 2014), on the other hand, maintained that technology solutions have enhanced outsourcing arrangements from a traditional cost containment approach to a strategic re-positioning. According to Frankel (2000), for any firm to be good at

outsourcing, it has to be good at innovation since outsourcing is a function of technology that allowed it to happen. Alan (2005) clearly shows that most innovations in technologies come in response to people’s need. Additionally, Narin et al. (2009) confirm that in IT industry, the production of data storage has increased in quality and at the same time enhance price reduction. A case in point is how, according to the author, data storage services are being charged on a cost-per-megabyte-per-month basis in a similar way that clients pay for utilities like electricity and water. According to Meyer et al. (2017) software applications have made it easier for companies to control and integrate their offshore operations and services, using a particular new category of software called - collaboration software. Figure 2.3 presents the developmental stages in information technology outsourcing.

Figure 2.3: Developmental stages of IT outsourcing



The authors emphasised that these applications require the assimilation of new communication methods such as voice over IP, Instant messaging, and Issue tracking systems.

According to Cederlund et al. (2007), most firms in an attempt to manage and achieve better efficiency have often outsourced their IT services. In addition, some literature attributed firms’ concentration on core competencies as the major drivers for the upsurge and rapid change in IT outsourcing (Dmistry, 2018). Therefore, one of the objectives of this research is

to assess the drivers of current outsourcing arrangements and ascertain the significance performance of new technologies when deployed in outsourcing operations.

Furthermore, Kakabadse and Andrew (2000) also maintained that the rapid growth of internet has created economic ways of application hosting, which many businesses are using today to eliminate the burden of buying and running expensive, complex-to-run computer system. Sumita (2009; cited by Bajgoric, 2011) noted that convincing customers to get, their work done 8,000 miles away shows the magic of information and communication technology. According to the author, technology innovations have made it more possible to solve a particular problem in hours, which ordinarily could have taken days. Atul and Vashistha (2006) confirmed that improved quality of audio and visual communications, as well as more bandwidth and connectivity, has empowered service providers in remote part of the world. For example, in the past, clients ship paper documents to their vendors, now with innovation in File Transfer Protocol (FTP), large files are transferred to services providers.

Modarress et al. (2016) stated that in oil and gas upstream sector, information outsourcing promotes new sub-sea technologies, as well as provided new management methods with time-tracking software, new cost-and schedule-assessment tools such as cost estimation software. A good example of an outsourcing partnership, involving a major oil production/exploratory company and another major oil servicing company, is the Mobil and Halliburton outsourcing collaboration. Both parties invested \$10 million to drill five horizontal wells in Mobil's Parks Devonian field in west Texas (Lukoil, 2013). Hartwell et al. (2015) also highlighted that oil and gas companies on enterprise mobility solutions have spent \$168 billion, whilst some \$8 billion was expended exclusively on other activities.

Despite this windfall of investment in the mobile solutions, the authors pointed out that only 1 in 3 of the top 50 oil and gas companies have their own mobile apps, indicating an on-going potential prospects in this sector. IEA (2015) have confirm that the global investment in upstream oil production has declined almost 20 percent to settle at \$100 billion. The agency attributed some of these significant challenges to lack of new equipment that is required in a particular oil well/field discovery, inappropriate production systems and structures, the unavailability of technology base to carry out the project economically. Bruno et al. (2009) also corroborated that in most cases, in the oil and gas upstream sector, new technologies are highly needed to extract the resources.

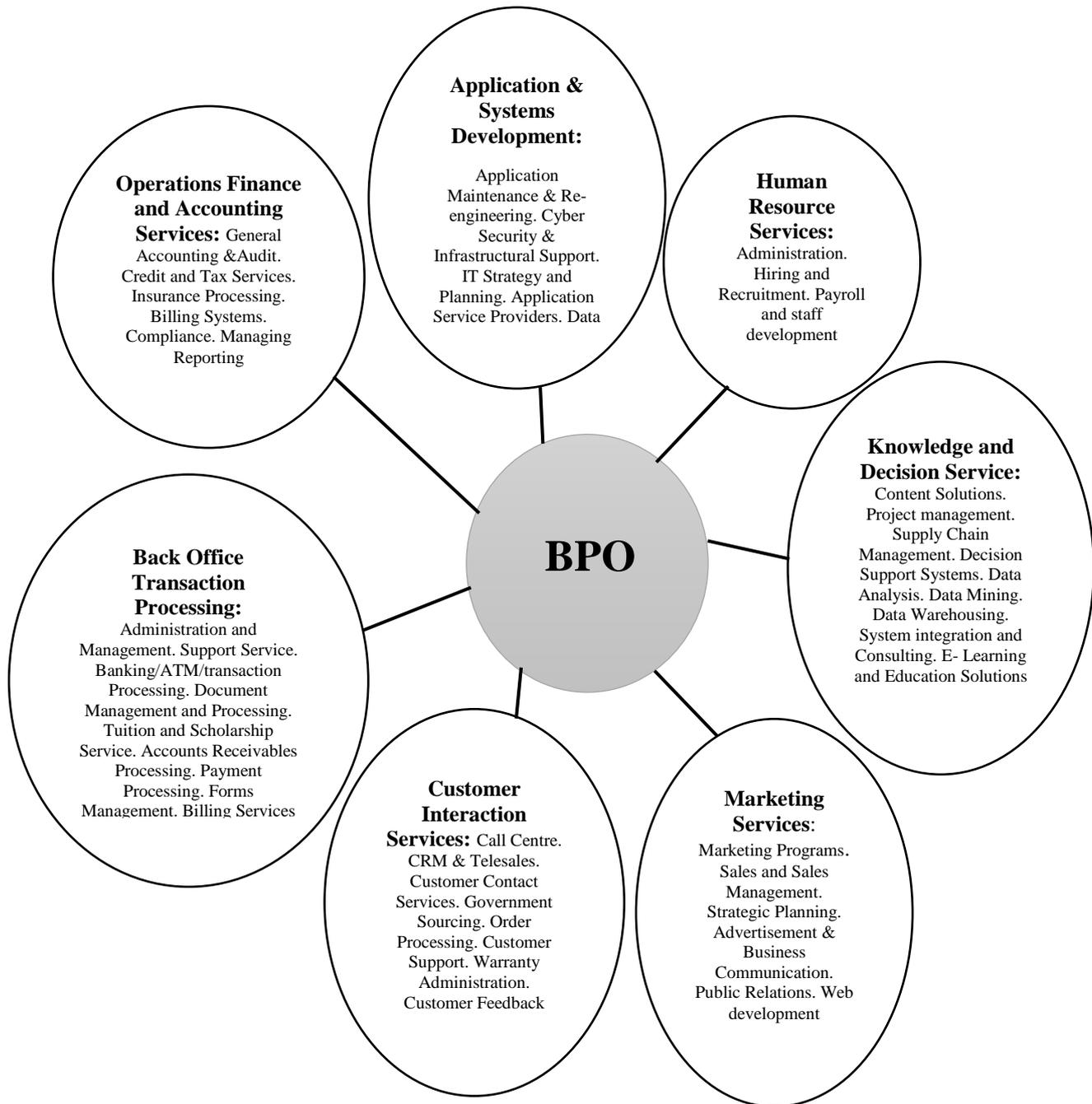
However, according to Oshri et al. (2015), outsourcing suppliers are now looking beyond running IT systems to Business Process Management (BPM), in which they will take over functions like billing, cheque processing and accounting (Oshri et al., 2015). Therefore the study assesses the current trend of Business Process Outsourcing (BPO) in the next subsection.

2.4.2: Business process outsourcing (BPO)

Ghodeswar and Vaidyanathan (2008) confirmed that the beginning of business process outsourcing resulted from the major shift in the knowledge management of data centre and desktop support to a more specific specialisation in intensive domain. According to Jones (1994), BPO involves a non-IT business process. Though in most cases, according to the author, they are IT-intensive or facilitated by IT. According to Gewald and Dibbern (2009), BPO entails delegation of an entire business process to a third party provider, as well as its supporting services. Kshetri (2007) explains business process outsourcing as a long-term contracting of firm's (client firm) non-core business process to an external service provider (the outsourcing firm).

Additionally, Ghodeswar and Vaidyanathan (2008) summarised BPO into eight categories, based on its functions and capabilities, namely: HR service, knowledge and decision services, operations support services, back office transaction processing, marketing services, customer interaction services, application and system development. Figure 2.4 outlines the BPO functions and capabilities. In fact, several scholars (Gartner, 1999; Sumita, 2009; Oshri et al., 2015) confirm that Business Process Outsourcing (BPO) was the fastest growing element of the outsourcing market. According to the authors, BPO market value rose from \$6.1 billion in 1997 to \$31 billion in 2015. Atul and Vashistha (2006) suggest that business process outsourcing (BPO) Increases Company's desire for higher productivities, lower costs and matching supply with demand.

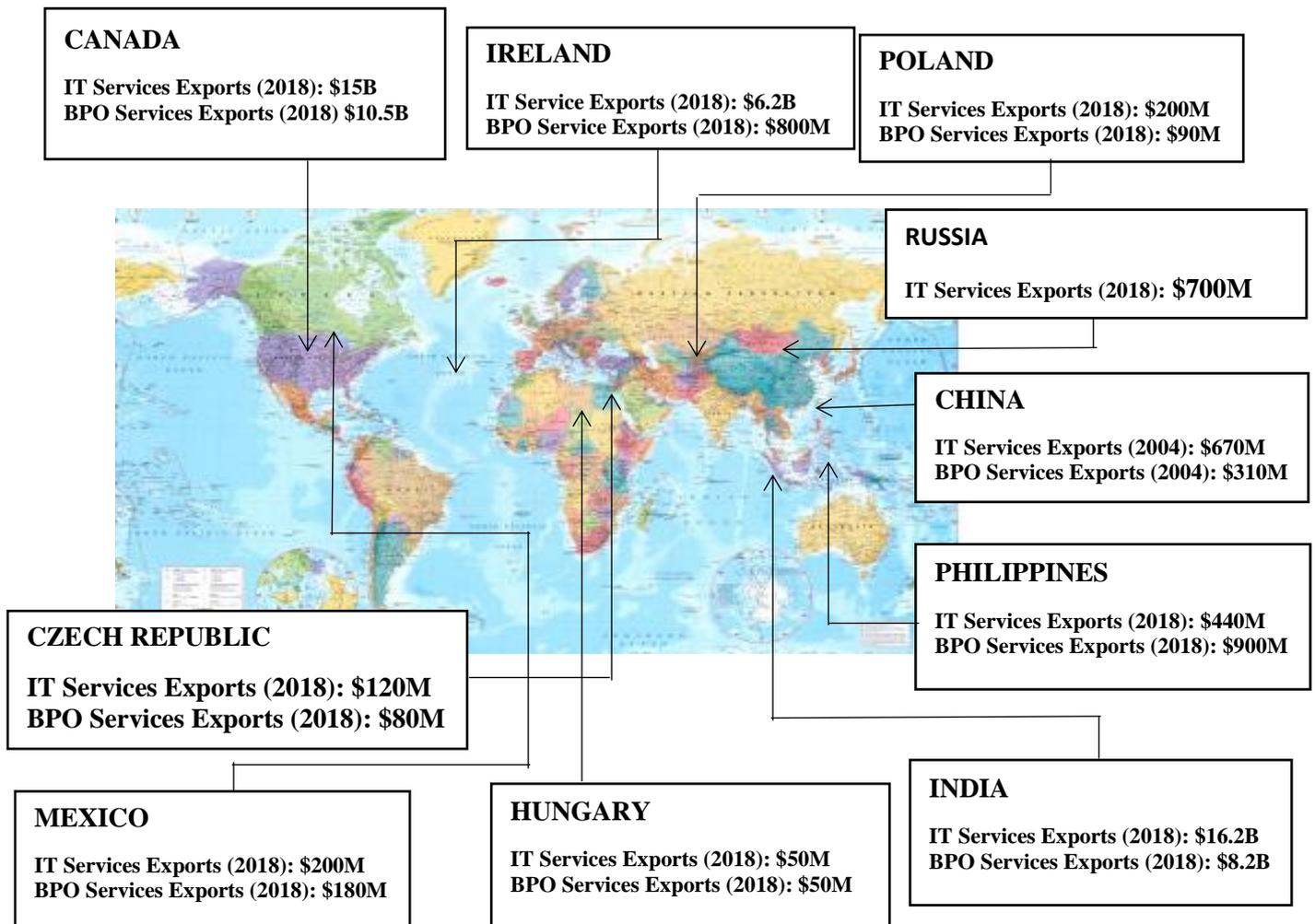
Figure 2.4: BPO functions and capabilities



The authors also gave evidence of how US in 2003, spent over \$10 billion on outsourced software and IT services alone. There are also clear examples from the authors of how country like India, Canada, Russia, China and Philippines, are exporting more than \$15 billion a year in IT and business process services. Another good example of BPO collaboration is the 50/50 joint venture between Andersen consulting and Pacific Dunlop. This was the first

Asian-pacific joint venture arrangements designed to take a full business support and IT functions (Namasivayam, 2004; cited by Oshri et al., 2015). Figure 2.5 outlines the key offshore countries and their ITO and BPO export.

Figure 2.5: Key offshore country ITO and BPO industry export



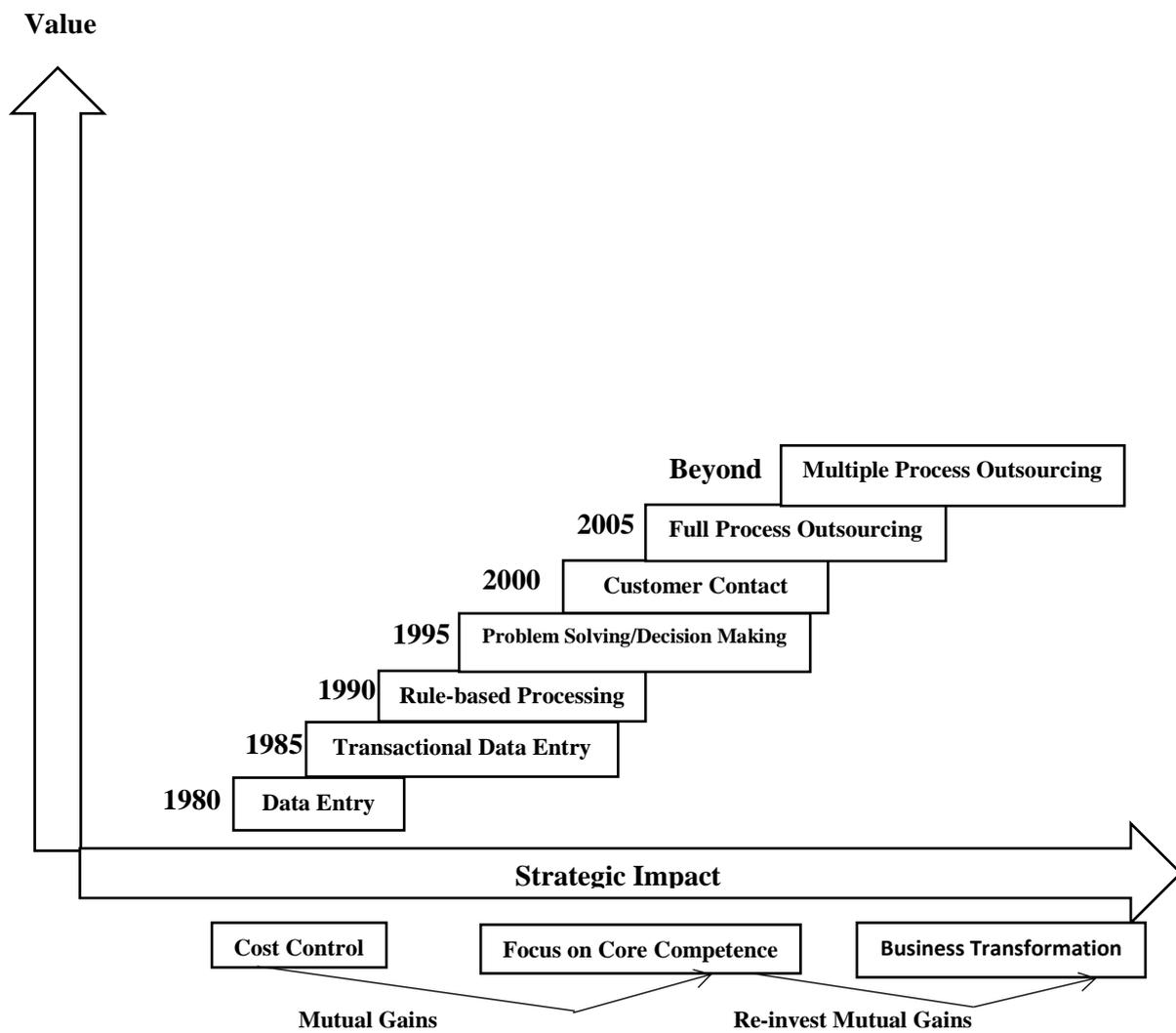
Source: Atul and Vashistha (2006).

However, since BPO is primarily driven by labour costs advantage, its biggest challenge would be in ensuring that quality people are available do the job (Sumita, 2009). The author indicate that quality of employees is very crucial, especially now that multinationals outsource this knowledge to countries like India and China, with other preferred destinations like Philippines, Brazil, Ireland, Russia, Canada, Czech Republic and US (see figure 2.5).

The above contexts suggest that BPO is the next logical step with distinct opportunities that must be leveraged to access new technologies for performance advantage. In addition, it

appears many researchers see BPO as a company's natural evolution from ITO outsourcing. Several literatures also indicate that BPO industry has caused a critical mass of suppliers across nations, although some would argue that established areas of BPO expertise are yet to be mature. Figure 2.6 above outlines the stages of offshore business process outsourcing (BPO). This study will therefore, offers useful insights and contributions by verifying the level of association between outsourcing drivers and deployed technologies and how they impact performance in the industry.

Figure 2.6: Stages of offshore business process outsourcing (BPO)



Source: Atul and Vashistha (2006)

2.5: Organisations Performance in Outsourcing Practices

According to Zadjabbari et al. (2008), the main responsibility of operations manager in any organisation is to make the organisation more productive and sustainable. As such, outsourcing issues may have originated from the failure to clearly define performance expectations and measurement criteria within the outsourcing contract (Mullin, 2000; cited by Piachaud, 2005). In evaluating outsourcing activities, most companies employ different measurement metrics and profit objectives such as annual sales turnover, market shares and return on investment (Stuart, 2012). According to Jiang et al. (2006), the principle reasons for these measurement evaluations are to determine whether their current operating cost can be reduced and proceeds reinvested in a more competitive process that would result to profit margins. The authors confirm that several business performance methods have been developed to reflect data requirement needed in the decision making in any organisations. Unlike in the recent past, where physical asset indicators were successfully used as evidence of organisational performance.

Wongthongtham (1998; cited by Smith et al., 2008) strongly indicate that profitability is the most important criterial for evaluating the performance of any organisations. The author developed a set of performance metrics to study pre-outsourcing firm characteristics. These performance metrics were in six categories, namely: cost, efficiency, productivity, profitability, growth, cash management, and market ratios. The metrics were designed to provide a comprehensive view of the financial characteristics of the firm at the time of outsourcing. Bin et al. (2006) support these viewpoints by presenting productivity metrics ratios of outputs and inputs. The authors measured outputs through the total revenues or sales of the firm, whilst inputs were measured through the number of employees, total assets or inventory required to generate the output.

Quinn (1999) on the other hand, outlines practical ways in which outsourcing can influence profitability and in turn may leads to performance, namely: (1) Staffing - outsourcing of staffing will allow firms to avoid having to provide costly benefits in terms of overhead cost. For example, using independent contractors to create flexibility for employers to hire when the need arises; (2) Capability - outsourcing empowers small firms to contract marketing experts, researcher, or other specialist staff on temporary basis which ordinary company could not have afforded financially as a permanent staff. This capability can position the firm ahead of its competitors in terms of market share values; (1) Facilities - whenever is possible, firms should

focus on reducing inventory, another cash drain, to minimise the need for additional facilities; (2) Payroll - mostly, in service industries, salary is large part of business cost, so firms could outsource this value chain to save cost.

According to Green (2008), logistics performance and supply chain management strategy positively influence marketing performance, which in turn enhances financial performance. De Kluyver and Pearce (2006; cited by Green, 2008) pointed out that the ultimate goal of any strategy is long-term, sustainable superior performance. Farookh (2008; cited by Lecocq, 2010) suggests that measuring performance is a set of process that helps organisations to sustain their business performance, access its capability and the level of productivity. This study supports the existing business performance models that are based on knowledge and physical financial performance. (Farookh et al., 2008; cited by Stuart, 2012). The research also supports the productivity output metrics ratios, which measured the total revenues, market shares and return on investment of firms (Bin et al., 2006).

Therefore, this research seeks to address the performance measurements that focus on financial indicators such as market shares, return on investment, annual returns and corporate social responsibility. Corporate social responsibility was added for the purpose of this study, as a way of linking the sustainability aspects of organisations. Although we recognise its importance, but is beyond the scope of this research.

However, whilst there is a substantial evidence in the literature that outsourcing arrangements has led to organisational performance, there is still not enough empirical evidence to suggest specific impacts of outsourcing activities on firm's performance (Bin, 2006). These perspectives support the contention in outsourcing literature and business model research about overall understandings of performance (Lecocq, 2010). According to Stuart (2012), some of the empirical studies showed little relationship between performance and outsourcing arrangements. Jiang et al. (2017) confirm that there are limited contributions in literature about studies relating to outsourcing impacts on firm's performance. The authors argue that the few available evidence are based on perception or self-reported data.

Therefore, the above submissions demonstrate the import of this research, which seeks to investigate the impacts of technology outsourcing relate performance in organisations. Additionally, this research will provide more objective evaluation of firm's outsourcing impacts on performance, rather than using perception-based intermediate metrics of case studies and survey in previous research.

Furthermore, the performance measurement measures adopted in this context were employed largely in a discrete industry, indicating the need for a significant and empirical investigation of the performance measurements within the oil and gas process-oriented industry, particularly within the context of oil and gas development economies. To this effect, this study will assess Nigerian crude oil value chain including the key stakeholders in crude/refined product distribution process to get a sense of their activities and performance, since samples were drawn from Nigerian oil and gas industry.

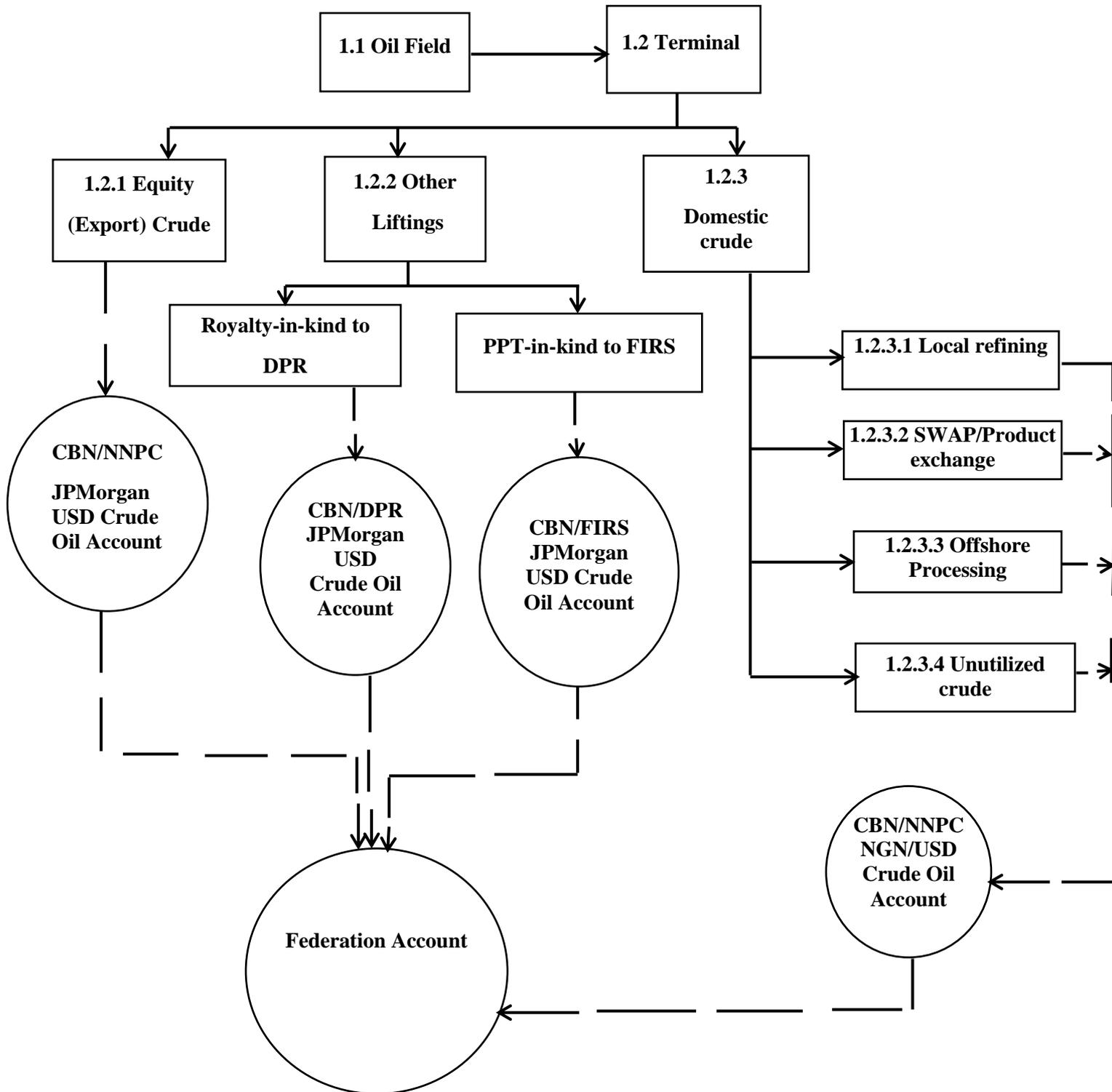
2.5.1: Nigerian crude oil value chain performance

Nigerian oil and gas industry is split into two main categories: the upstream and downstream sectors. The upstream sector involves exploration, development, production and transportation of crude oil, whilst the downstream sector involves operations such as refining of crude into its various constituents, distribution and marketing. In broad terms, the federation's share of the total crude lifted from oil terminals across the country can either be exported (Equity crude) or kept for conversion to refined products and sold locally (Domestic crude). The role of Nigerian National Petroleum Corporation (NNPC) in the downstream sector is to refine petroleum products and subsequently sell to bulk traders and retailers. Due to the decline in local refining capacity and increased domestic consumption, NNPC has resorted to importing products to compensate for the shortfalls. The Federal Government of Nigeria (FGN) subsidises the cost of petroleum products imported or refined locally. Typical process preceding subsidy claims includes verification and certification by Petroleum Products Pricing Regulatory Agency (PPRRA) of the products type, volume and specification of the imported or refined petroleum product before the subsidy is claimed and paid.

NNPC does not claim subsidy retrospectively as done by order marketers. Pipeline Product Marketing Company (PPMC) buys 445,000 bpd of domestic crude oil from the FGN. PPMC is expected to pay for the domestic crude oil 3 months after the purchase from the FGN. This period is to allow PPMC convert the crude oil to refined products, sell the refined products, and pay the FGN for the crude purchased, from the proceeds of sales of the refined products. However, NNPC (PPMC) sells the refined products at a subsidised amount, and pays the FGN for the crude purchased less subsidy incurred during the sales of the refined products. The Federation's equity interest, royalty interest, and PPT interest in crude oil production is sold to approved crude oil traders or off-takers and is exported with revenues accruing to the federation. These revenues accrue through three main agents of government (i.e., Nigerian

National Petroleum Corporation, the Department of Petroleum Resources, and the Federal Inland Revenue Service).

Figure 2.8: Overview of Nigerian crude oil production and sales flow



Sources: PwC (2013)

LEGEND: Oil Flow \longrightarrow Funds flow \dashrightarrow

The Central Bank of Nigeria maintains separate accounts with JP Morgan Chase for these agencies where funds from the applicable sales of crude by the off-takers are paid into. The term Domestic Crude Oil refers to the 445,000 barrels per day of crude oil allocated to NNPC out of the total crude oil production of the country for the purpose of domestic consumption. This quantity of 445000 barrels per day was derived from the installed capacity of the four (4) local refineries situated at Port Harcourt (2 refineries), Warri and Kaduna. NNPC sells to PPMC to supply the nation's four refinery, while PPMC pays for the crude within 90 days using proceeds from the refined products sales. NNPC is then expected to pay the FGN for this crude oil allocation at applicable international market prices. Domestic volume of crude oil lifted relates to the 445,000 barrels of crude oil allocated to NNPC per day out of the total crude oil production of the country for the purpose of domestic consumption. Figure 2.9 shows Nigerian oil and Gas Geopolitical Zone Demand and Distribution.

It is worthy to note that the 445,000 barrels per day was derived from the installed capacity of the four (4) local refineries situated at Port Harcourt (two refineries), Warri and Kaduna. However, due to the facts that local refineries operate at levels significantly below the installed capacity, the NNPC in addition to what is allocated to refineries designed ways to ensure there is availability of refined products for sales to local consumers. The ways include:

(1) Product exchange (swap) transactions – these are transactions in which the NNPC contracts to supply the other party with crude oil in return for the other party supplying the NNPC with refined products for sale locally on a value-for-value basis. (2) Offshore processing arrangements (OPA) – NNPC provides crude oil to another party who would refine the crude oil on behalf of the NNPC and return the refined products to the NNPC based on the yield slate of the party's refinery. The NNPC provides the crude oil and pays the refining and other incidental costs. (3) Allocation to local refineries – this is the portion of Domestic Crude oil allocated to local refineries. The crude oil is pumped from the terminals to the four refineries situated at Warri, Kaduna and two in Port Harcourt. (4) Outright sale – the domestic's crude that is not utilized for Swaps, OPAs or local refining is ultimately sold by the NNPC. These sales are made to various trading companies.

The above diagram in figure 2.8 could be summarily described in details below: Oil production: Nigeria produces over 2.5million barrels of crude oil per day; NNPC in joint partnerships with major licenced Oil companies operate oil wells for the exploration of Crude

Oil. There are usually cases of leakages in the pipeline distribution to the terminals due to pipeline vandalism, spillages etc. Oil liftings at terminals: At the terminals, crude oil lifted is allocated to NNPC and other oil producers; The total crude oil lifted can either be exported (Equity) or kept locally for Nigeria's use (Domestic). Equity crude: The Federation's equity interest in crude oil production is lifted as the FGN's share under Joint Venture (JV) and production Sharing Contract (PSC) arrangements with other Oil companies. Equity crude proceeds: Proceeds from the sales of NNPC liftings of the Federation's share of total crude liftings are paid into the CBN/NNPC USD account with JP Morgan. Upon NNPC's periodic instruction to the CBN, proceeds in the JP Morgan account are transferred to the Federation account. Deductions: Withdrawals are made from the JP Morgan accounts periodically, based on transfer instructions issued by NNPC to CBN.

Liftings by other producers: The Federation's equity interest in crude oil production also includes what other oil producers operating in the country pay in kind as Royalty and Petroleum Profit Tax. Royalties and taxes are also deducted on crude liftings under modified Carry Arrangements, Other Third Party Financing Arrangements, as well as liftings in favour of NPDC. Royalty -in- Kind: Royalty due on the various liftings as explained above are paid in kind. As such, NNPC lifts and sells the crude equivalent on behalf of DPR. Sale proceeds are then paid into 2.3 CBN/DPR USD Account maintained with JP Morgan. PPT-in-kind: Taxes due on the various liftings as explained above are paid in kind. As such, NNPC lifts and sells the crude equivalent on behalf of FIRS; Sale proceeds are then paid into 2.2 CBN/FIRS USD Account maintained with JP Morgan. These amounts are transferred from the two accounts to Federation account (see figure 2.8).

2.5.2: Key Stakeholders in Crude/Refined Product Distribution Process

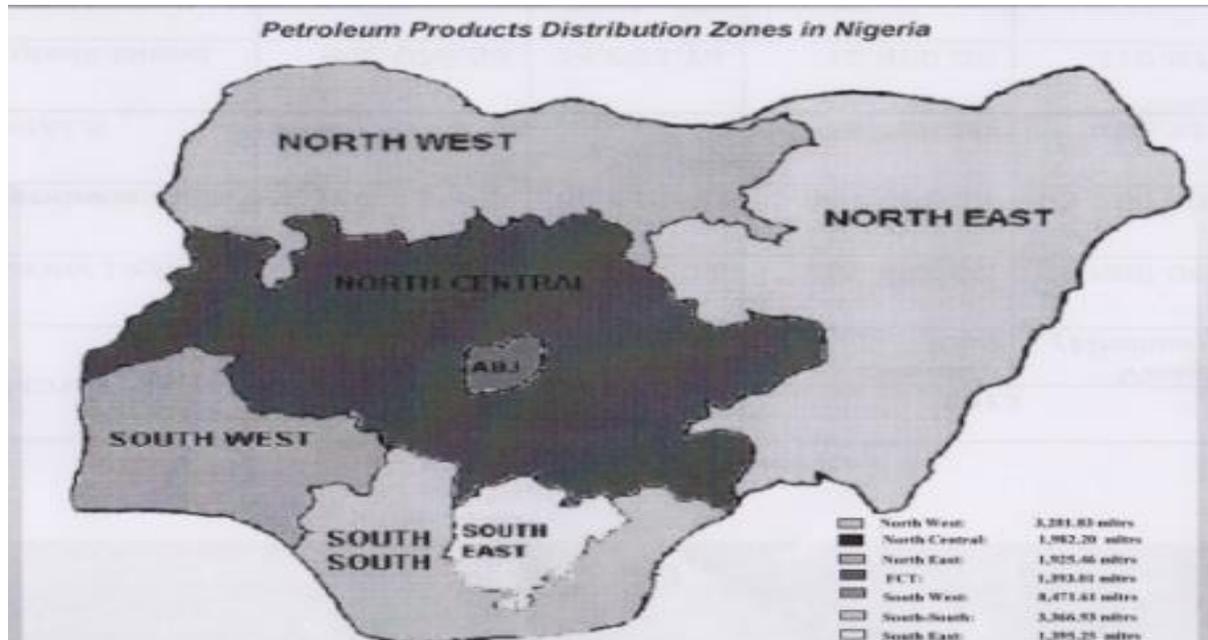
There are currently four (4) refineries owned by NNPC in Nigeria located in Port Harcourt, Warri and Kaduna. In addition, there is network of pipelines and depots strategically located throughout Nigeria linking these refineries. Below are the key stakeholders with their roles and responsibilities in the distribution of crude oil and from terminals to refineries and from refineries to depots or inter depot transfers:

Pipeline and Products Marketing Company (PPMC)

NNPC through its fully owned subsidiary, PPMC, supply only to bulk customers in order to meet the needs for petroleum products and ensure the availability across the country. PPMC is

the product distribution arm of the NNPC and is directly responsible for the distribution of petroleum products. Petroleum products either imported or refined locally are received by PPMC through pipelines and import jetties and further distributed to depots through pipelines.

Figure 2.9: Nigerian Oil and Gas Geopolitical Zone Demand and Distribution



Department of Petroleum Resources (DPR)

DPR is the petroleum agency of Nigeria that regulates the pipeline network and supervises all petroleum industries operations carried out under licences and leases in the country. One of its major functions is to keep and updates records on petroleum industry operations, particularly on matters relating to petroleum reserves, production and exports of crude oil, gas and condensate, licences and leases as well as rendering regular reports on them to Government. DPR is expected to keep records of the quantities of crude oil pumped at the terminals and quantities imported or delivered to refineries for processing.

Nigerian Petroleum Development Company (NPDC)

The company engaged in oil and gas exploration and production activities in the hydrocarbon-rich regions of coaster Nigeria, both onshore and offshore; and more recently, around Equatorial Guinea. Operations are centred mainly in the Niger Delta and span five states in Nigeria (Edo, Delta, Imo, Bayelsa and Rivers). The activities of the company cover the entire spectrum of the upstream oil and gas business form exploration to abandonment.

Petroleum Products Pricing Regulatory Agency (PPPRA)

PPPRA is the agency of the Government responsible for fixing the benchmark prices of petroleum products and regulating and monitoring the transportation and distribution of petroleum products in Nigeria. The function of PPPRA include establishing an information data bank to facilitate the making of informed and realistic decisions on pricing policies, moderating volatility in petroleum product prices, establishing code of conduct for operators, maintaining surveillance on key indices and preventing collusion and restrictive trade practices that are harmful to the sector among other things.

Independent Surveyors

These are inspection agencies, which are usually appointed by the buyer/marketer to inspect the quantity and quality of the product being pumped and transfer to the refineries. Examples of the Inspection agencies used are SGS Inspection Agency, General Maritime & Oil Service (GMO) Ltd, Konsult Control Services (KCS) and Marine Technical Service International (Nig.) Ltd (MTSI).

2.6: Drivers and Challenges of Outsourcing Arrangements

With recent oil price crash to near six-year low since early 2015, the pressure is on the entire oil and gas supply chain to sustain profits (Modarress et al., 2016). The authors posit that outsourcing arrangements was adopted as costs saving strategy in the industry's operational mix. Additionally, according to Gewald and Dibbern (2009), costs advantages presupposes that external vendors can provide business functions at lower costs due to specialization and the realization of economies of scale and scope. Thus, focusing on core competencies frees up resources to use more productively in areas that create value. In effect, contracting non-core functions to third parties for costs containment will result in added contributions to in-house efficiency, which enhances company's competitive position (Doh et al., 2005; Modarress et al., 2010; cited by Modarress et al., 2016). Current literature also confirm that cost containment would continue to drive outsourcing motivation, especially in traditional organisations (Kakabadse et al. 2014).

Therefore, one of the key objectives of this study is to empirically validate this viewpoints alongside other outsourcing drivers, including the desire to access new technologies. Besides oil and gas sector, all business, including discrete manufacturing

industries that compete through differentiation, need to achieve the lowest costs consistent with the company's business strategy. In essence, contracting organisations would always benefit from a superior set of cost drivers, which include factors such as economy of scale, learning and location, which are readily available in the suppliers (Piachaud, 2005). Economic of scale and scope allowed the service providers to utilize special resources. This clearly shows that outsourcing can make a significant contribution in reducing organisation's overall cost base.

However, there is a contention in the literature whether cost structure will remain the key motivation for outsourcing arrangements, based on the assumption that vendors would always provide service at lower cost because of economies of scale (Lacity et al., 1994; cited by Nada et al., 2014). Several authors (Kim, 2003; Aveni and Ravenscraft, 1994; cited by Sankalp, 2014) believe that the advantages of scale economies of the vendor could be eroded and wiped off in a matter of few years by other factor such as the costs of transferring knowledge for a new product. Jain and Natarajan (2011; cited by Modarress et al., 2016) confirm that cost reduction was losing out to other key motivations such as, customer improvement service, best practices, the desire to access advanced technologies.

Again, this demonstrate the need to further the argument about the dynamics of outsourcing as a promising area of research with respect to technology deployment, especially in small business growth (Congi Qi, et al., 2012). Therefore, this research will provides useful insights that will address this current issues, as well as explore the roles outsourcing and technology have played in advancing organisational performance, especially now that small entrepreneurial ventures are seeking to utilize outsourcing as growth strategy (Elango, 2008). According to BusinessWeek special report (2005), companies are turning towards a new model of innovation that employs global network of partners. These partners ranges from U.S chipmakers, Taiwanese engineers, Indian software developers, to Chinese factories.

In fact, most technology-based firms are in support of this innovative model, including IBM that is offering its smart famed research labs and a new global team of 1,200 engineers to help customers develop future products using next-generation of technologies. This clearly shows that when these chain of technology-based companies works in sync, there can be a dramatic leap in the speed and efficiency of product development. It also indicates that the impacts of the new technologies are reducing not only the demand for labour but also increases its supply. William Bridges (1994; cited by Embleton et al., 1998), highlighted the effects of technology on employment and organisational structure and how these created three major

changes that effect work and society today, namely: (1) Information technology – computers and the ability to produce products have dramatically changed the structure of work. The type of work and who does it are now dependent on computers. (2) Communication – The technology of communication has accelerated the pace of change. Events in one part of the world now have implications everywhere in the world. (3) Organisational change – The structure of organisations is also changing changing.

More so, re-engineering and just-in-time manufacturing are examples of processes that are transforming the way business is conducted. Dunning (1988) also suggested four prime reasons that motivated firms to outsource, namely: desire for market shares; organisational competitiveness; desire for resource seeking and efficiency seeking. Several authors (Lei et al., 1995; Gilly and Rasheed, 2000; cited by Boguslauska and Kvedaraviciene, 2009) have noted that apart from the cost saving and technology-related motivations, outsourcing is a key mechanism in transferring non-core activities and utilization of free resources to advance the core competencies of a firm. Additionally, key resources like financial and managerial bandwidth are now more gainfully used for those activities where the firm scores over its competitors (Lei et al., 1995). A typical example is the case of Nike and Reebok, which focus on design and marketing of footwear as their core-competence, and outsourced manufacturing activities.

However, according to Sankalp (2014), this particular approach is without risk. The drawback might be in exploring the possibility of the supplier itself entering into the market as a competitor (Bettis at al., 1992). For example, Motorola hired Taiwan's BenQ Corp. to design and manufacture millions its mobile phones. After BenQ was hired, the company began selling phones in the prized China market under its own brand (BusinessWeek, 2005). The significant risk is that brand name companies will lose the incentive to keep investing in new technologies. This concern explains why different companies are adopting widely new approaches to this new paradigm. For example, Motorola buys complete designs for its cheapest phones but controls all the development of high-end handsets phones like its hot-selling Razr. Table 2.3 shows the summary of outsourcing drivers and their benefits.

The next section examines others factors that drives outsourcing arrangements in the oil and gas sector, as well as their challenges.

Table 2.3. Outsourcing drivers and benefits.

Outsourcing drivers	Examples of the benefits	Authors
Outsourcing leads to access to new technologies	This is one of the most significant and sustainable benefits of outsourcing, as it gives smaller outsourcing organizations access to cutting-edge technology of larger contracting organization.	Jean-Marie and Dolgui (2013).
Outsourcing leads to cost reduction	Benchmarking when carried out leads to reductions in total operating costs and the pace of this change leads to service delivery, which enhances savings.	Pervaiz (1998). Gavin (2006).
Outsourcing provides the desire for increased flexibility.	It reduces head count or alteration to staffing variations in demand over time. It also significantly increases organisations staff flexibility.	Assink (2006).
Outsourcing leads to information and communication technology.	Information technology reduces not only demand for labour but also increases supply. For example, expertise, be it professional, technical, or operative, is needed more often than not on a call-off basis rather than on regular basis.	Jean-Marie and Dolgui (2013),
Outsourcing shares the risk in the business	The application of professional or technical expertise to reduce risk is distinct from the process of transferring business risk. Example: the PFI extends the market-testing program to a much fuller sharing of risk, with the risk of operation firmly attached to the ownership of the physical assets.	Assink (2006).
Outsourcing improves organisation focus.	Changes in management structure and improved operating practices like concentrating on core business activities, organization design improved business focus.	Pope et al. (2015), Jussi and Taina (2009).
Outsourcing leads to core competence and well trained staff	The combination of skills and knowledge residing within the team and extent of funding of training and other learning patterns both in-house and outside makes the difference and increase competency and motivation of the staff.	Jean-Marie and (2013), Vashistha and Atul (2006).
Outsourcing leads to market competitiveness	Outsourcing arrangement often engaged expertise with potentials in innovation and technology, and this attributes always result to greater productivity and higher quality and responsiveness within organization and to the customer.	Pervaize and Mohammed (1998), Assink (2006).

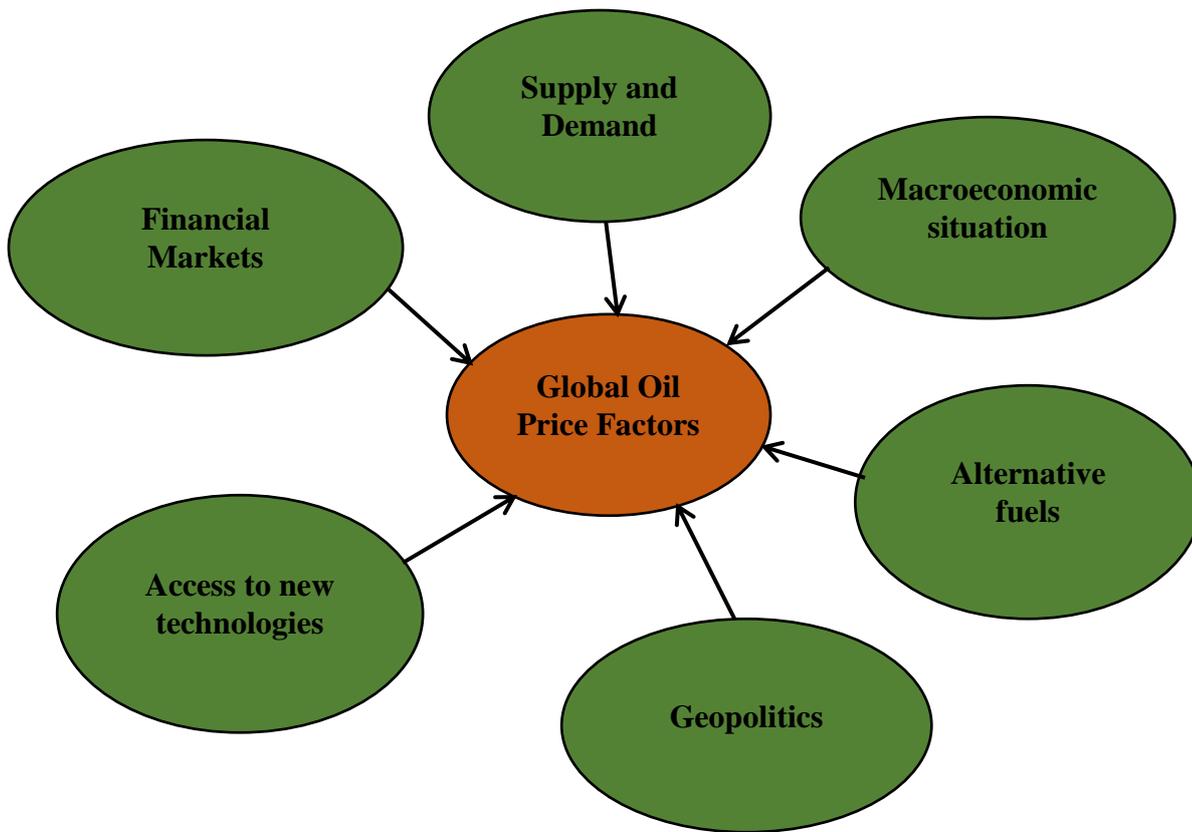
2.6.1: Drivers and challenges of global crude oil price

According to Modarress et al. (2016), the demand for hydrocarbon has placed corporate decision-makers at the crossroads between growth and stagnation, construction and destruction, dominance and compliance, depletion and restoration, future distress and present comfort. Lukoil report (2013) also highlighted that these demand has heightened the high oil price fluctuation and forced many companies to start active drilling in unconventional liquid hydrocarbons, using hi-tech production methods. The trend has further strengthened Ralf's (2007) argument that the surge in new discoveries and technology advancement have discredited the 'peak oil' scenarios, which predicted that the world was running out of oil.

The International Energy Agency's report (2015) has stress the need for firms to make important investment decisions in the technology that will access the deeper water, develop the subsea operations, extent the life of oil and gas fields, and work in increasingly more remote and dangerous field. Ralf (2007) confirm that global oil price is dynamic and could be impacted by several factors, such as the balance of supply and demand, the macroeconomic situation, the geopolitical issues and market forces. In essence, the main obstacle facing the oil firms is not the potentially vast and available global hydrocarbon base, but the fact that oil especially in sub-sea, is too expensive to harvest, given its unprecedented low prices challenge. A good example is the consistent attack on onshore and shallow water in Nigerian Delta oil region by militant which has rendered the country's Oil-Budget benchmark unrealistic. This also affect the operations of the IOCs in the region, who has to realign its strategy to cushion the effect.

Olayele (2015) however, has argue that geopolitics has so far remained out of the price equation despite supply disruptions. The author confirms that the industry has a lot of spare capacity designed as buffer zone, hence political risks are not big enough to move prices. In contrast, IEA (2015) in its last global oil prediction of 90,000 b/d in 2015, warned that uncertainty over how market is responding to the lower price environment is still a big concern. In addition, Joseph, the then Group Managing Director of Nigerian National Petroleum Corporation (NNPC, 2015) stated that in spite of the annual investment of millions of dollars in the last four years in gas supply and infrastructure, there are need for significant addition to infrastructure and supply development, especially in micro-Liquid Natural Gas, as well as Non-Associated Gas (NAG). Figure 2.6 outlines the global oil price factors.

Figure 2.6: Global Oil Price Factors



Furthermore, according to OPEC (2015), there are new capacity for unconventional sources of alternative non-fossil fuel, which the demand mainly comes from the developed economy. OPEC confirms that this demand will definitely compensates for shrinking use of PMS in highly developed country. The organization also indicates that the developed countries are reducing their oil consumption due to increasing fuel efficiency and environmental regulations, and that the alternative demand for oil will be in transportation and petrochemicals. For example, by 2025 the aggregate volume of liquid hydrocarbon and biofuel production in the US and Canada will amount to 19 mb/d, thus significantly reducing the region's dependency on oil importations (Lukoil, 2013).

The major challenge of this development, particularly for developing countries may be the unpreparedness of the transportation sector, petrochemicals and refining infrastructure for such production growth. The tanker traffic through the Persian Gulf that will double by 2020, will constitute another dilemma, as the world's demand increases (US Energy Information Administration, 2014).

Moreover, the consumption of gasoline in developed countries will continue to fall, whilst demand for distillates will increase due to a stricter environmental requirement for bunker fuel and increase in demand from the commercial transport sector. OPEC (2015) has also confirm that developed countries have reach their peak in oil production consumption. Both Europe and North America are at the stage where their car market is nearing saturation. Therefore, improvement in fuel economy will limit growth in oil production consumption. A worrisome trend that OPEC Countries must not overlooked, rather should be eager and alarmed in search of alternatives for their survival.

2. 7: Enhancing Attributes of Technology Outsourcing

In oil and gas industry, according to Modarress et al. (2016), production is considered risky, particularly whenever there is limited and aging infrastructure, leading to low-level automation and resultant variations. The authors also confirm that this situations automatically affect the overall quality issues. This research adopted a moderating attributes of quality management, expertise best practices and state-of-the-art infrastructure to enhance the business performance the firms. In addition, these attributes are part of the principal criteria that question the feasibility of a prospective partnership. They validate the prospective partners in terms of their sound reputation for reliability, consistency and ability to meet the requirements of prospective alliance.

Linton et al. (2000) divides oil and gas infrastructure into an ‘upstream’ and ‘downstream’ components. According to the authors, the upstream component deals with the technical newness of the radical innovation such as missing standard and processes, and the lack of production equipment. The downstream component refers to the market side such as market acceptance, availability of distribution channels, alliance, and external infrastructure. Current literature also maintained that, in petroleum industry, product quality advantage is highly recognisable, even though profitability through maximization of flow of materials is the primary goal of the industry. Gewalt and Dibbern (2009), on the other hand, suggest that quality improvement is the reason some corporations choose to outsource, since it is associated with gains in efficiency and effectiveness. According to Unsworth (200; cited by Modarress et al., 2016), in petroleum sector, expertise and global best practices are highly needed. The author indicates that standard routines often stifle the creative thought-process, as well as capable of feeding the intolerance of differences through diversity of knowledge.

Gomez-Conde (2015) confirms that the ability of an organisation to compete effectively in a global market is determined to a large extent by the quality of its products, the modern infrastructure and the potential to adopt global best practices. This clearly explained why effective quality management has the potential in marketing benefits and often employed in attracting some additional business. Quality management system may also create a chain of benefits that result in improved financial performance. Gavin (2009; cited by Mangan et al., 2008) also pointed out that quality improvement reduces variance in manufacturing cost, warranty claims and returns. For example, any market that differentiates on quality will always increase its units sold or revenues per unit. Pervaiz et al. (1998; cited by Mangan et al., 2008) indicate that quality requirement for success is not just for satisfaction but also to delight customers. Meyer et al. (2017) suggest that optimizing internal processes is not only a trigger to improve the quality and reduced the time for delivering a product or service, but a way to reduce overall time to market by accelerating research and development (R&D), as well as processing and creating a wider range of new product in a shorter time. For example, a new 3D printing technology enabled R&D teams to be more engaging in prototyping and experimenting their product ideas almost instantly (Rayna and Striukova, 2016; cited by Jiang et al., 2017).

However, as important as possession of expertise is, especially in the oil and gas industry, large corporations tend to lack the motivational capacity of the small companies to nurture or motivate innovative people who have new, creative and ‘‘break-the-rule’’ ideas (Stringer, 2000). According to Assink (2006), lack of mandatory infrastructure is capable of separating breakthrough inventions from their exploitation for commercial application. In addition, most companies in their continuous search for a stable environment, fall into the learning trap, a tendency to keep on doing the same thing even in situations where it is no longer effective. It appeared clearly today that experience, routines, procedures and familiar knowledge that were relevant in the past, might prove to be inadequate in this present dispensation. Levinthal and March (1993; cited by Assink, 2006) conclude that learning traps exemplify the conflict between efficient routines and processes to continue successful business and the need to challenge these capabilities in order to bring about future disruptive innovation. The study will design a moderating concept of quality management, modern infrastructure and best practices that will enhance the technology outsourcing performance in the oil and gas sector.

CHAPTER 3

RESEARCH METHODOLOGY AND DESIGNS

3. 1: Introduction to the Chapter

This chapter discuss all the elements of research methodology, which comprises mixed method research, sample frame, research questions, methodology flow diagram, and questionnaire administration. The chapter also explains all the components of design concepts developed in this study such as conceptual model, the moderation framework of the research, research philosophies and the semi-structured interview using fishbone diagram. The conceptual framework of the research involves four major constructs namely: outsourcing drivers, deployed technologies, competitive attributes and financial performance.

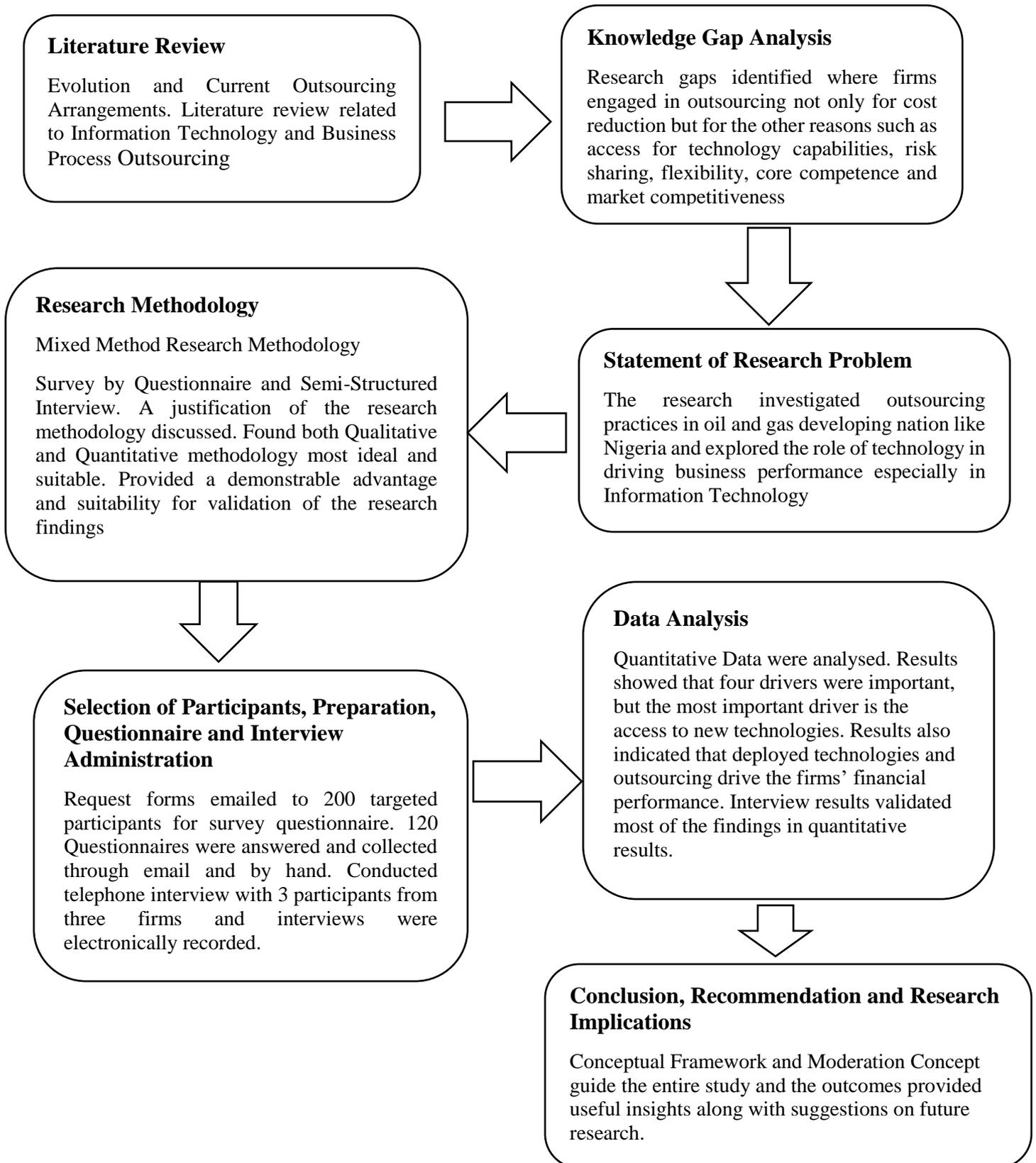
Whilst the moderation framework specifically addresses the three competitive attributes, which include – state-of-the-art infrastructure, quality management, and expertise best practices. These moderating constructs demonstrate how firm’s competitive performance can be further enhance, in addition to having access to enabling technology and outsourcing initiatives. More so, the research design required for validations of conceptual framework for this research was also presented. Lastly, the detail explanation of the semi-structured interview was outlined using fishbone diagram approach.

3. 2: Methodology of the Research

Outsourcing and Technology were considered as the solution enablers that organisation within oil and gas sector employed in achieving and measuring its financial performance. The study, therefore reviewed the evolution and current state of outsourcing practices with special emphasises on information technology (IT) and business process outsourcing (BPO). The research also employed another construct – competitive attributes (e.g. quality, expertise and infrastructure) as a moderating variable that enhanced performance.

For the research framework, every construct in the research was measured by a set of survey questions. The study was carried out within a sample frame of 200 registered oil and gas companies in Nigeria. Data generated for this research was collected, using survey by questionnaire. Figure 3.1 summarises the research design.

Figure 3.1: Research design flow



Questionnaire was intensively discussed with knowledgeable researchers and pre-tested with managers and supply chain experts in the oil and gas industry. These group of experts were also respondents and were identified from the website of the Nigerian National Petroleum Corporation (NNPC). The choice of the survey methodology was informed by the research questions, which were generated from reviewed literature. Respondent's feedbacks were also used in further analysis to answer the research questions.

The second phase of the research was a telephone interview conducted with 3 participants from three oil and gas firms. The semi-structured interview was conducted and recorded electronically. The interview findings were used to complement the survey by questionnaire and it also served in exploring and validating the survey results. Over all, these mixed method approaches were employed intentionally to address the methodological issues that might occur from this study. Furthermore, the focus of this research was based on two main themes: the first is on the theory that outsourcing arrangements may provide access to valuable resources, including talented human capital, capabilities or innovation, which an outsourcing firm may use to maintain and improve its competitive position and performance (Ellram et al., 2009). Whilst the second is that technology is a rare enabler and a by-product of innovation, which organisations could deploy in achieving its performance objectives (Jega, 2008).

In general, the theory that underpinned this research is resources-based theory (RBV). Resource-based theory justifies outsourcing through resource-related advantages. According to resource-based theory, the resources and capabilities possessed by organisations are the main source of its sustainable competitive advantage when they are valuable, rare, imperfectly imitable and non-substitutable (Barney, 1991; cited by Bustinza et al., 2010).

Therefore, the overall aim of the research is to statistically establish a relationship between these two main constructs (Outsourcing and Technology) and also determine their impacts on firm's business performance. The statistical tests conducted include correlation, regression and moderation analyses.

3.2.1: Mixed method research

The methodology adopted in this study is a mixed-method approach of quantitative and qualitative research. According to Kahn (1995), logistics research is populated by quantitative or positivistic approach. So introduction of qualitative method in this study was a conscious attempt by the researcher to tackle the imbalance and challenge a new thinking that will address

any methodological issues that may occur in this study. More so, in terms of questionnaire design, we adopted a comprehensive design approach known as Total Design Method (TDM) (Bryman and Bell, 2011), taking into account the broad set of questions to be asked, type of data, and analysis methods.

Mixed-method design began with the state-of-the-art reviews, subsequent development of research questions used in the survey questionnaire for data collections and exploratory interviews. The questionnaire findings are deepened and tested by the next round of qualitative research. The results were also used in developing a framework for selecting specific companies used for the interview in the second phase of the research. The interview findings were used to complement the survey by questionnaire and it also serve in validating the survey results.

The mixed method research is adopted for the following reasons (Cresswell, 2003; Blaikie, 2007; cited by Bryman and Bell, 2011).

- Strength of one method can complement the weakness of the other
- It provide more detailed evidence
- Aid in answering research questions that are unable to be answered by a single method
- Provide the researcher with multiple skills
- Encourage the use of multiple paradigms

Therefore, since quantitative and qualitative researches complement one another in explaining different aspects of social world (Blaikie, 1991; Yeung, 1997; Tashakkori and Teddlie, 1998 cited by Bryman and Bell, 2011), this study adopted survey by questionnaire and semi-structure interview approaches in order to conceptualise real world research in outsourcing practices and technology operations in petroleum sector.

3.2.2: Sample frame

Sample frame is (physical) representation of all elements in the population from which sample is drawn. Petroleum industry represents firms of different backgrounds. Within oil and gas industry, companies are of different sizes and engaged in various operations. For, examples, there are three types of companies according to their sizes, these are Small, Medium and Large-scale companies. Classifications in terms of activities of the companies are operators

(oil companies), contractors and suppliers. Oil companies (operators) are customers while contractors and suppliers (service providers) provide goods and services to the operators. The contractors and suppliers represent various industries. Diversity of contractors and suppliers is of importance to this research in order to decrease external validity problems, which are often associated with industry specific studies (Yusuf et al, 2013). Consequently, respondents for this study were drawn from operators (oil and gas firms), contractors and suppliers. Companies have their offices and operations site located within three Major oil and gas clusters in Nigeria – Abuja, Lagos and Port Harcourt where the samples were taken.

This research used: Nigerian National Petroleum Corporation Information (NNPC) Directory website, google search engine and Subsea oil and gas directory (www.subsea.org) to obtain a detail information of all oil and gas companies in Nigerian petroleum industry. These databases provided profile of oil and gas companies in Nigerian petroleum industry, such as companies' name, e-mail addresses, postal addresses, telephone numbers, fax numbers and the product and/or services produced by the companies.

NNPC information directories were crossed checked with NNPC top management team to determine their reliability and they were found reliable and up to date. Simple random sampling was adopted in selecting respondents (companies) from sample frames because every company has equal chances to be selected into the sample. Technical Units Heads (HODs) and Operations Managers of oil and gas companies were chosen as respondents of this research, because they are in better position to explain the deployment of technologies and their impacts on outsourcing practices in their companies. Samples are the true representatives of the population (Walliman, 2015), whilst operations managers (OM) are invariably right representatives of oil and gas companies.

3.2.3: Pilot testing

According to Gray (2016), piloting a questionnaire helps to eliminate or at least reduce questions that are likely to mislead. Additionally, the author believed the main purpose of pilot tests is to refine the questionnaire so that the respondents will have no problems in answering the questions, as well as in recording the data.

The pre-tested questionnaire was carried out with 20 survey questionnaires administered on-line to supply chain expert who are also participants. Sixteen (16) participants responded to the pilot tested survey, which represent 80 per cent responds rate. The responses from the pilot

tested survey were first considered in this study because; the feedback, comments and recommendation collected had contributed to the formation of the final questionnaire. The pilot survey questionnaire was intentionally design and administered in open-ended questions as way of stimulating more response rate.

Open-ended questions compel participants to volunteer more information (Henning, 2009). The feedback received from these people assisted in redesigning the questionnaire to its present level (see appendix A).

3.2.4: Questionnaire administration

There are four techniques of distributing questionnaire. They are by mail, telephone, personal interviews and online survey via internet. In this research, postal questionnaire was adopted because the methodology of this research is mixed methods research. According to Bryman and Bell (2011) postal questionnaires administration as a data collection method is favourable employ in a mixed methods research, since it increases the validity of research through triangulation. Therefore, we adopted both combination of postal/self-administered questionnaire and semi-structure interview by phone. The major consideration for adopting this style is its time saving and cost efficiency (Robson, 1999; cited by Walliman, 2015). Questionnaires were despatched contained covering letter and post-paid self-addressed return envelopes. University letterhead paper was used for covering letter. The covering letter carried name and signature of director of institute of logistics and operations management, University of Central Lancashire (UCLAN). The covering letter specifies details about the researcher, purpose of study and an assurance of confidentiality.

3.2.5: Response rate

Two hundred (200) questionnaires were posted to the addresses of the respondents taken from NNPC information directory of host oil and gas companies in Nigeria. The questionnaires were addressed to HODs and OM of companies, since they run the operations and have the institutional knowledge of company's activities. In case they are too busy to complete the questionnaire (based on work pressure or other reasons), they were recommended in the cover letter to pass it to appropriate person to complete it on their behalf. Out of 120 administered questionnaires in a sample size of 200 oil and gas companies in Nigeria, we collected 100 valid and 20 invalid samples, indicating 60% response rate. According to

Saunders and Lewis (2012) questionnaire with 60% response rate is acceptable. Consequently, this response rate is considered representative of studies of organisations.

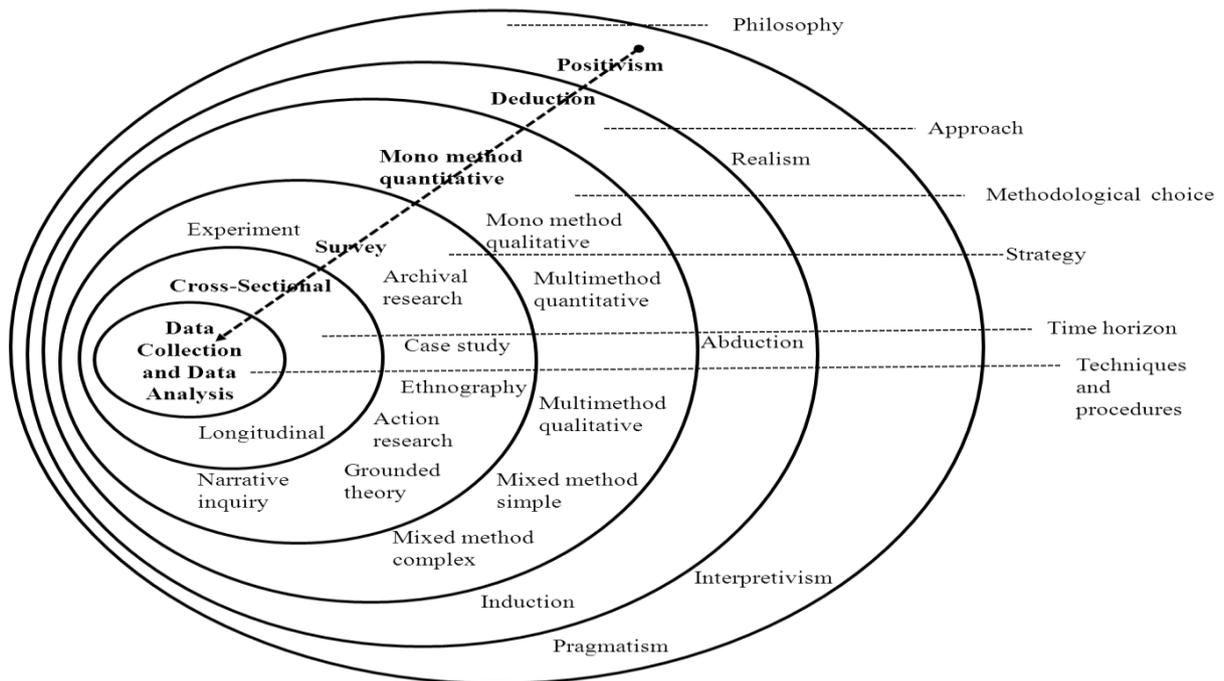
100 valid samples were analysed and 20 samples were excluded from the analysis because they were either partially filled or they are returned unfilled. Although poorly completed questionnaires still provide some data, we excluded such questionnaires in order to reduce incidence of missing data in statistical analysis as well as improve reliability of results (Bryman and Bell, 2011). The sampled companies are combinations of small, medium and large enterprises and the respondents selected for interviews include senior level managers. The techniques we employed to increase the rate of response in this study includes: stamp and self-address addressed envelope, secondly, confidentiality of responses was also assured.

Thirdly, reminder questionnaires were sent out at the end of third and fifth weeks of sending out initial questionnaires. Fourthly, follow up telephone calls were also made at phased intervals. Fifthly, the covering letter and statement made by the DOS in the covering letter, that responses are going to be used for research purpose only and result of the research will be made available to the respondents if they are interested. The research team consider these approaches as best way to make the study more participatory and also to persuade respondents to complete the questionnaire.

3. 3: Research Designs

A research design is essentially a plan or strategy aimed at enabling answers to be obtained to research questions (Burns and Bush, 2000). Therefore, the main parts of this chapter are concerned with key issues that are significant when designing a mixed- method research. Additionally, this study is identify as exploratory, descriptive and explanatory research. The study also discuss the research design in terms of conceptual models, moderation framework, research philosophies and then go on to detail in analysing the qualitative interview phase of the research using fishbone diagram (see table 3.2 and figure).

Figure 3.2 The Research ‘Onion’



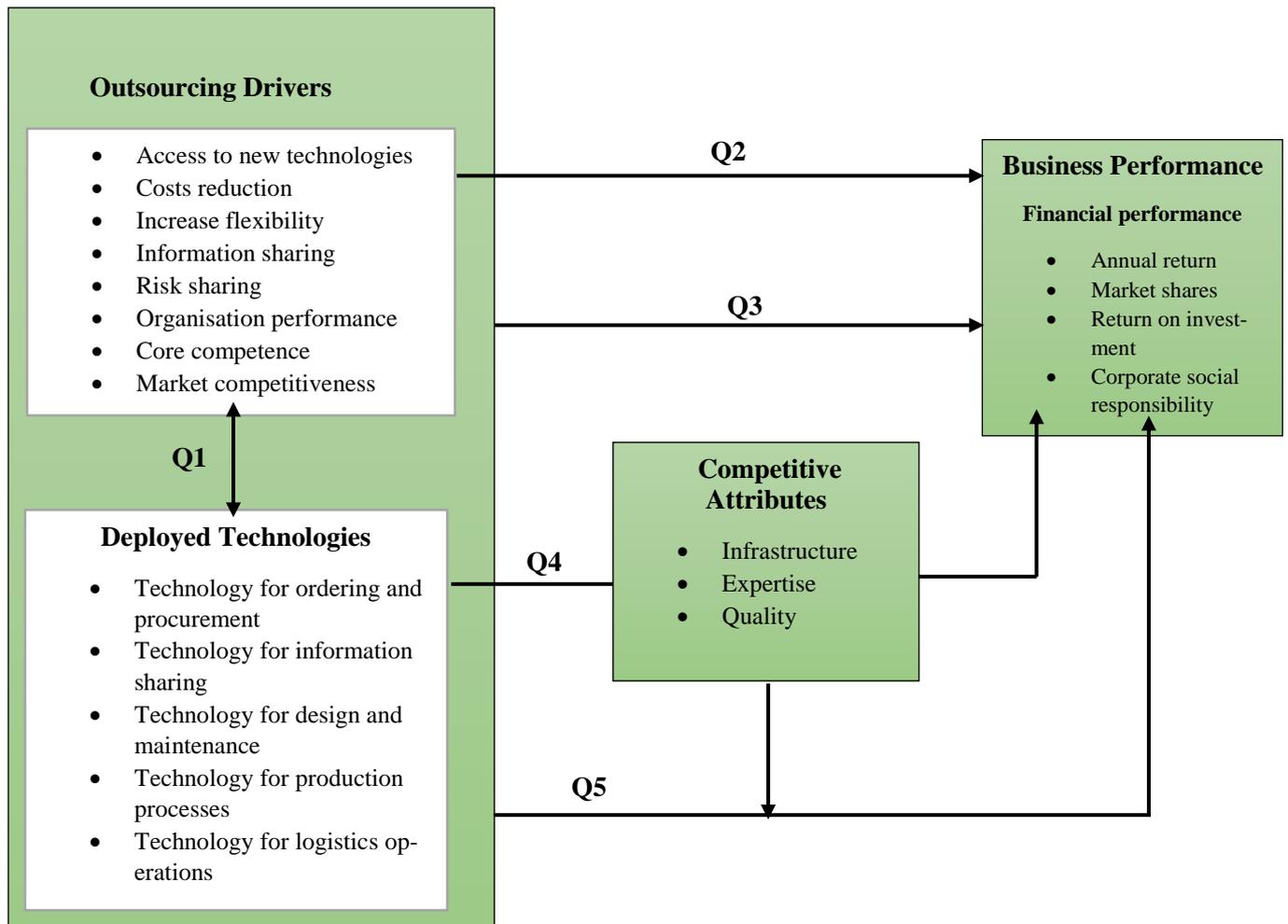
Source: Saunders et al, (2012)

The above diagram in figure 3.2 – the research ‘Onion’ is introduced as a metaphor for describing the process of research as demonstrated in this study. The outer layers of the onion contain the thinking about the research philosophies and approaches. The central layers reflect the need to consider research strategies and choices whilst at the centre of the onion data collection and analysis are the central concern (Saunders et al., 2012).

3.3.1: Research conceptual model

Primarily, a conceptual framework is as model depicting the constructs or variables studied and representation of the hypothetical relationships between them. Several scholars (Dewey, 1938; cited by Turner et al., 2009) believed that the use of conceptual model or framework is fundamental to research and it underpins the philosophy of science and logical inquiry. Therefore, the study adopted this conceptual framework, which we believed offers a sound base for design of research instruments. Additionally, it can act as a good tool for the study and guide the investigation of relationships amongst concepts under study (Ren et al., 2008).

Figure 3.3: Conceptual model of the research



More so, the benefits of this research model is that it identifies the important factors relevant in enhancing organisations performance effectiveness and characterisation of the nature of relationships among variable indicators.

However, before describing this proposed model, research questions are required in order to gain a better insight into the outsourcing concepts and deduce a clearer perspective on the beneficial role of technology outsourcing. Thus, it is important to reproduce the research questions in order to establish the right context for these particular sections.

Therefore, below are the research questions as depicted in conceptual model in figure 3.3

Q1. What is the level of association between outsourcing drivers and deployed technologies in oil and gas industry?

Q2. What are the most important drivers of outsourcing practices in oil and gas industry?

Q3. What are the impacts of outsourcing drivers and deployed technologies on business performance?

Q4. What is the extent of relationship between competitive attributes and deployed technologies?

Q5. What are the business performance outcomes of outsourcing drivers and deployed technologies when moderated through a competitive attribute?

In general, this chapter will be discussed the individual research element of these constructs, which include outsourcing drivers, the deployed technologies, financial performance and competitive attributes. This framework will be used to deduce research questions. The research questions will be answered and validated using survey data from empirical study.

Outsourcing drivers

Figure 3.3 represents outsourcing drivers, namely: access to new technology, cost reduction, increase flexibility, information sharing, risk sharing, organisational performance, core competency and market competitiveness. According to Natarajan and Jain (2011), a great deal of literature has been devoted to studying outsourcing arrangements and its various aspects of motivation. Several authors (Jones, 2009; Busi and McIvor, 2008; cited by Natarajan and Jain, 2011) argued that outsourcing decision is often seen as a rational decision that management exploit to generate several benefits such as costs reduction, economies of scale and scope, enhance management's focus on core competencies, and access to new technical skills. Some other literature also view outsourcing arrangements as a growth strategy in which organisations leverage their supply base to meet rapidly increasing customer demand and new market, gain competitive advantage through combination of in-house capabilities with outsourcing vendors. Some scholars see outsourcing as a tool to mitigate technological risk and uncertainty, improve business performance, and other strategic motives (Ogden et al., 2013; cited by Sherma et al., 2010).

Several global scholars and research agencies including KPMG, Potter, Pricewaterhouse Coopers (2007) and Technology Partners International Inc. (2009; Busi and McIvor, 2008; cited by Natarajan and Jain, 2011;) have reported that outsourcing engagements have been growing and will continue to grow consistently both in terms of number of contracts and their average contract value. Hence, the literature though has address a wide aspect of these outsourcing initiatives, the report is still within the scope of developed nations.

The literature does not address the outsourcing from the developing country perspective. The research seeks to identify and conceptualise various drivers that influence decisions maker's attitude towards outsourcing, particularly in oil and gas industry. Therefore, this research will summarise these outsourcing drivers in terms of access to new technologies, costs reduction, increase flexibility, risk sharing, organisations performance, core competence and market competitiveness.

Deployed technologies

Deployed technologies in figure 3.3 include technology for ordering and procurement, technology for information sharing, technology for design and maintenance, technology for production processes, and technology for logistics operations. In the recent past, outsourcing was originally not central to business functions and was mainly used as a tool for costs control. According to Rogers (2010; cited by Ramanathan and Krishnan, 2015), access to new technologies through multiple partnership and short-term contract, has developed into a routine strategic engagement. This move has indeed delivered incremental innovation to clients firms, as well as affect the heart of the competitive core of most outsourcing vendors. To sustain competitiveness, large firms, as well as smaller organisations outsource some of all of their IT activities. Brown (2007) posits that technology advances of recent years has led to potential massive shift of higher kinds of work to machines and software.

The author emphasise that, though new extraordinary technologies systematise and depersonalise work in a way that put workers in abstract position, he acknowledged that the ultimate outcome of such technologies has been more jobs. According to Ameha (2016) technology change is highly interlinked with utilisation, transfer, adoption, deployment and development of new innovative technologies by the stakeholders involved. In effect, outsourcing partnership engagements will link organisations with other firms to operate and access available tangibles and intangible assets, developed innovative capabilities, and enable them to create competitive advantages over their rivals.

The overview also shows that, whilst an increase competition continue to put pressure on oil and gas firms to reduce their cost for efficiency and profitability, technology enabling that trend will continue its accelerating advances. This research will explore the roles of deployed technologies in outsourcing arrangements and examine how they affect the industry financial performance.

Competitive attributes

In figure 3.3 competitive attributes is the dependent variables, namely: quality, expertise best practices and state-of-the-art infrastructure. These attributes are also part of the principal criteria that question the feasibility of a prospective partnership, as well as examine whether prospective partners actually have the sound reputation for reliability, consistency and ability to meet the requirements of prospective alliance. In fact, lack of mandatory infrastructure is capable of separating breakthrough inventions from their exploitation for commercial application (Assink, 2006). State-of-the-art infrastructure is very significant in petroleum industry, particularly in the upstream production supply side. Modarress et al. (2016) stated that in oil and gas sector, production is considered risky whenever there is limited and aging infrastructure, leading to low level automation and resultant variations, which automatically impact on the overall quality outputs.

Scholarly articles also maintained that, in petroleum industry, product quality advantage is highly recognisable, even though profitability through maximization of flow of materials is the primary goal of the industry. As a matter of fact, most organisations choose to outsource simply because quality improvement is associated with efficiency and effectiveness. As such, quality management system may create a chain of benefits that result in improved business financial performance. For example, Mangan et al. (2008) opined that quality improvement reduces variance in manufacturing cost, as well as control warranty claims and returns. More so, any outsourcing market that differentiates on quality is more likely to increase its units sold or revenues per unit.

According to Meyer et al. (2017) optimizing organisations internal processes is not only to trigger quality improvement and reduced the time for delivering a product or service, it is a way of reducing overall time to market and accelerating research and development (R&D). It also create a wider range of new product in a shorter time.

Financial performance

In figure 3.3, the financial performance construct is the dependent variable which to a great extent underpinned the entire conceptual model. Although, traditionally, firms evaluate outsourcing engagements to determine if the current operating cost can be reduced and proceeds reinvested in a more competitive process that affect shareholder's values (Jiang et al.,

2006). But in recent time, according to Ibbotson et al. (2014) outsourcing practices have also become very strategic and a well-established activities among organisations owing to an even geographical distribution of limited resources such as knowledge and technology.

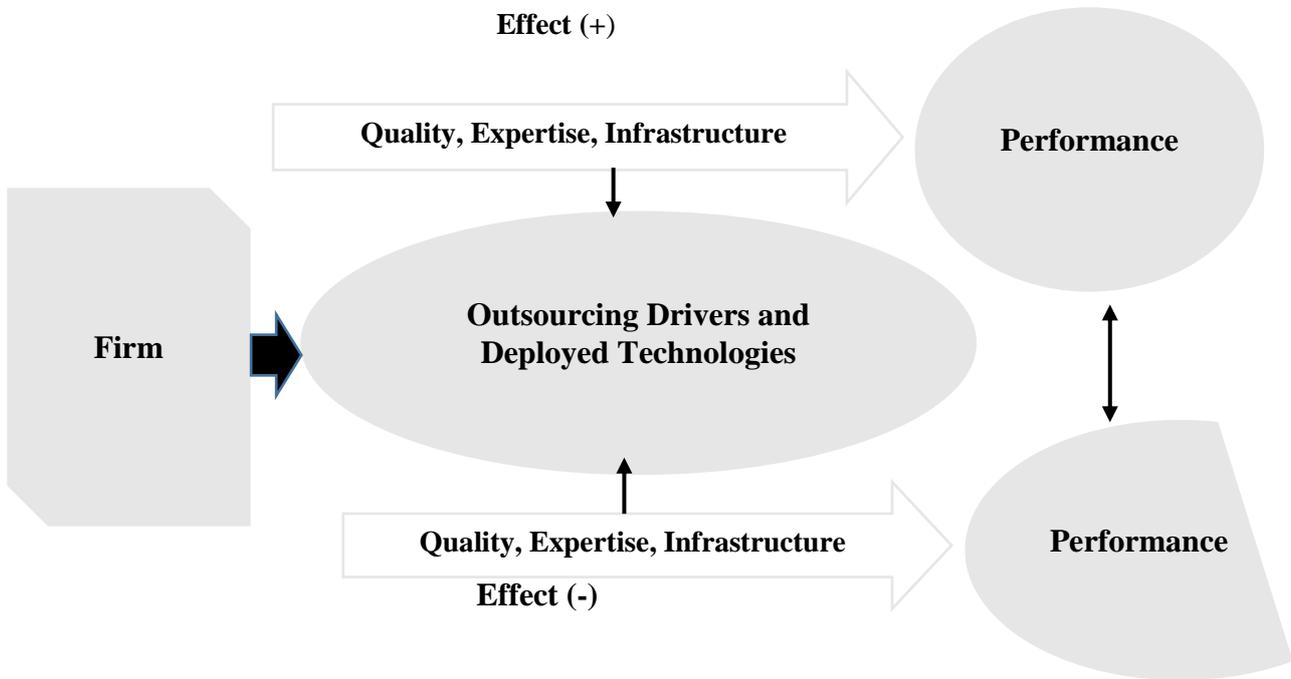
The situations has changed with emergence of information technology in a knowledge-based economy (Farook et al., 2008; cited by Ibbotson et al., 2014). According to the authors, a new metrics has been designed to provide a comprehensive view of the financial characteristics of firms at the time of outsourcing which represent the ratios of outputs and inputs. This performance measurement metrics are determined by the value difference between the outputs and inputs of any firm (Ibbotson et al., 2014). For the purpose of this research, we will concentrate on specific measurable indexes such as market shares, return on investment, annual return and cooperate responsibility, to determine the financial performance measurements in oil and gas industry.

3. 3.2: Moderation framework

Moderation occurs when the effect of independent variables on a dependent variable varies according to the level of a third variable, termed a moderator variable, which interacts with the independent variables (Baron and Kenny, 1986; J. Cohen, 1978; James & Brett, 1984; cited by Edward, 2007). Figure 3.4 illustrates this point.

The diagram shows a moderating impacts of competitive attributes on firm. It indicates that when competitive attributes - quality, expertise and infrastructure, are increase or decrease, (e.g. acting or moderating) on outsourcing drivers and deployed technologies, the organisation's financial performance is either reduces (to half), or increases (to fullness). This means that when the attributes are positive (+, increases), the firm will achieve a maximum performance in its operations. But whenever the attributes are negatives (-, reduces), the firm will attain a minimum performance. This concept does not appears to justify the thinking in scholarly article for a moderating constructs in outsourcing related performance, it provided the empirical evidence to this contestation.

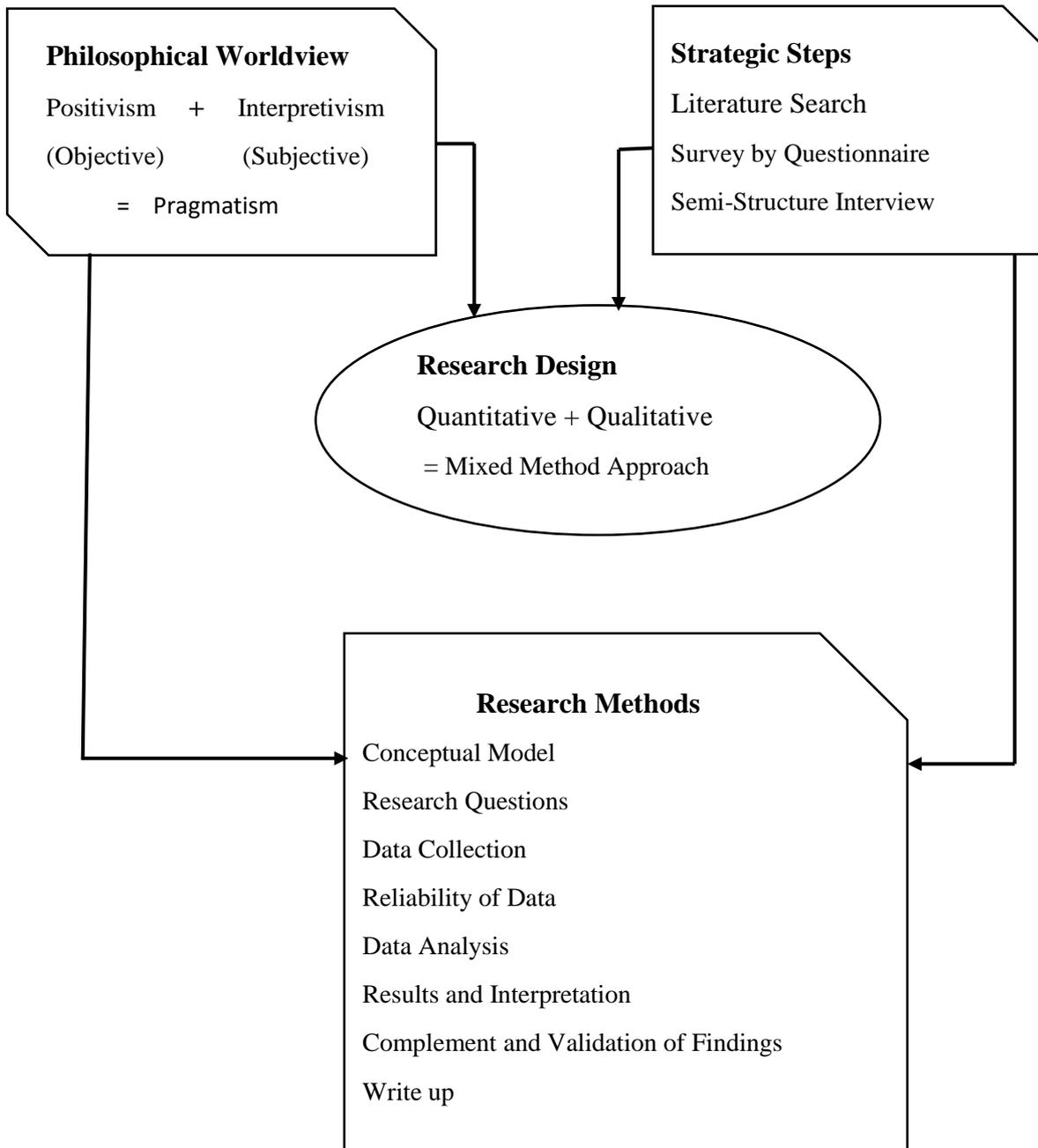
Figure 3.4: Moderating concept



3. 3.3: Research philosophies

In carrying out this social research, we adopted a mixed method research (MMR) which are: quantitative and qualitative. This study also proposed a model that guide the researcher towards Ontology, Epistemology and Methodology. The diagram is presented in figure 3.5 below.

Figure 3.5: Philosophical paradigm and triangulation framework



In line with what Philiber et al. (1980) and Yin (2004; cited by Onwuegbuzie and Burke, 2004) would consider as basic research design problems, this research therefore, considers at least four proposed design problems:

1. What to study. For example, this study examines how technology influences outsourcing practices in supply chain operations.

2. What type (approach) of data collection to be used (whether qualitative, or quantitative, or mixed method). We adopted a mixed-method approach- qualitative (personal in-depth interview) and quantitative (Survey by questionnaire) approach in data collection.

3. What data are relevant to gather so that one can improve research findings and consistency? This aspect bothers on whether one should depend on primary data, or secondary data, or both. We are keen in focusing on the role of technology and outsourcing practices and the impacts they have on business performance.

4. What approach to use in the data analysis in order to arrive at best result? We adopt SD model (Mixed method) which are both quantitative and qualitative in nature, based on data from interview and survey questionnaire from operations managers. The table depicts that if the researcher's philosophical worldview is subjectivism, the likely epistemology will be Interpretivism and the methodology will be qualitative methods of data collection and analysis. Likewise, if the worldviews of the researcher are realism; the researcher's most suitable epistemology will be positivism. The methodology will be quantitative data collection and analysis. Therefore, it goes to suggest that, since the methodology of this study is mixed-methods, the two philosophies will be used in this research.

In general, this strategy of using different research approaches, methods and techniques in the same study known as triangulation is recommended in literature for this kind of social inquires (Hussey and Hussey, 1997; cited by Mangan et al., 2004). In infants, there was also claim from literature sources that this trend from positivism towards phenomenology has become more evidence in business and management research.

3.4: Theoretical Perspective

The resource-based view (RBV) theory is adopted as the main organisational theory that underpins this study. The theory justify outsourcing practices and technology through resource-related advantages and capabilities. More so, the resource-based view suggests that firm can strengthened its internal operations to achieve superior performance by exploiting its external outsourcing collaborations and access to new technologies. These enablers are considered as the main source of firm's sustainable competitive advantage when they are valuable, rare, imperfectly imitable and non-substitutable. This theory justify outsourcing initiatives and superior technology through resource-related advantages. Additionally, outsourcing arrangements and technology may provide the access to such valuable resources, including talented human capital, capabilities or innovation. These resources and capabilities

possessed by a company would be the main source of its sustainable competitive advantage, especially when they are valuable, rare, imperfectly imitable and non-substitutable.

The survey design was adopted to undertake the study that demonstrate the understanding that outsourcing and technology were considered as the solution enablers that organisation within oil and gas sector employed in achieving and measuring its financial performance. Outsourcing arrangements provided the access to valuable resources, including talented human capital, capabilities, which an outsourcing firm may use to maintain and improve its competitive position and performance (Lewin et al., 2009). On the other hand, technology is regarded as rare enabler and a by-product of innovation which company could deploy in achieving its performance objectives (Jega, 2008).

Since a questionnaire is deductive in nature, the overarching objective of this survey will be to statistically establish a relationship between variables. Survey by questionnaire is deemed as an appropriate method because it is frequently used design in production and operations management research (Kahn and Mentzer, 1995). More so, the questionnaire is mostly adopted in upstream oil and gas industry, which comprises a large multinational firms and National oil company. This sector often has a global reputable approach to managing innovation and new technologies (Robert, 2014).

CHAPTER 4

SURVEY BY QUESTIONNAIRE

4.1: Introduction to the Chapter

This chapter explains the quantitative phase of this study. The phase consists of the structure of the questionnaire, planning and administration of a survey by questionnaire, the response rate, preliminary analysis, descriptive statistics, inferential statistics and the relationship of the main constructs. The survey by questionnaire was used for data collections to gather opinions from oil and gas operators on the impacts of technology and outsourcing practices in driving organisational financial performance, as well as to answer the research questions. In additions, regression analysis of the variable indicators were conducted to establish the causes and effects of the research constructs. Thereafter, the regression analysis result was used to conduct t-test and moderation analysis of the variables.

This research was conducted based on the theory of resource-based view (RBV). The theory explained that any resources that add to the strength of an organisation must have the attributes of values, rareness, difficult to emulate and non-substitutability. In order word, the resources are considered valuable if they add to the positive value of the firm, rare if they are unique or scare among current and potential competitors, difficult to imitate or replicate by competitors and cannot be used in by competing firms to achieve the same or identical results (Wernerfelt, 1994). This theory justify outsourcing initiatives and superior technology through resource-related advantages. Additionally, outsourcing arrangements and technology may provide the access to such valuable resources, including talented human capital, capabilities or innovation. These resources and capabilities possessed by a company would be the main source of its sustainable competitive advantage, especially when they are valuable, rare, imperfectly imitable and non-substitutable.

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This Quantitative phase is derived from rigorous literature review and exploratory interview which has been reported in the subsequent chapter. A mixed methods approach design involving qualitative (exploratory interview) and quantitative phase (survey by questionnaire) is a preferred practice among researchers in order to achieve significant rigorous research outcomes (Brannen, 2005; cited by Ostlund et al., 2011). To date, quite a significant amount of research work has been conducted to investigate outsourcing performance related practices and technology innovation in oil and gas sector (Yusuf et al. 2012; Rajesh and Tore, 2007; Grobler et al. 2013; Muhindo et al. 2014). However, a majority of previous research focused on discrete manufacturing and empirical data materials collected were significantly based on secondary data. The research on the relationship between outsourcing and technology and their combined impacts in driving organisations performance is lacking.

In addition, the current studies reviewed were very limited on the impacts of technology on outsourcing practices in a developing oil and gas economy. Most of the literature reviewed have insufficient information on technology outsourcing within the context of a developing oil and gas economies. The survey by questionnaire provided more insight in the above context and was deemed appropriate in testing the relationships between the outsourcing drivers and deployed technologies. Most literature in outsourcing arrangements concentrated more in investigating the driver of outsourcing from the shareholder's perspective of cost reduction. Whilst this paper explores the drivers of outsourcing from technology development perspective. Although there are quite some exiting research on performance related outsourcing and deployed technologies (Vathsala, 2015; Batoul et al. 2016), a significant amount of studies are primarily focused on the midstream and downstream sector of the petroleum industry. The upstream sector tends to have more outsourcing potential and required more advanced technology, yet this sector is often neglected. More so, the operators of complex oil and gas

production facilities are becoming more dependent on service providers to support their efforts to perform according to demands (Kumar, 2011). This underscores the importance of outsourcing arrangements and its role in exploring organisations external capabilities, especially in the area of technology and technical know-how.

So to capture these imbalance, both in upstream and downstream oil and gas sectors, practitioners' views were sort using survey be questionnaire and semi-structure interview. The survey was designed to explore answers from research question about how technology innovation and outsourcing related activities were managed at the business unit level. Smaller firms and companies that outsourced and deployed upstream oil and gas technologies in a consistent way throughout their operations around the world were instructed to consider their entire operations in Nigeria as a 'business unit' for the purpose of this survey. The survey method, being a deductive approach provided a triangulation in this mixed-method research, hence dealing with any potential bias. Respondent were informed before completing the survey that their results would be made anonymous and aggregated with data from other respondents, thereby removing any incentive to distort their responses or provide untrue data.

Prior to the release of the survey, a manager in NNPC - who is an expert in oil and gas industry and my supervisor - academic professor, who is familiar with questionnaires and survey-based research, tested it. Questionnaires were iteratively refined and improved based on this feedback, thereby reducing the potential for measurement error in the survey instrument (Lindner et al., 2001; cited by Robert, 2014). More so, this survey is conducted after a rigorous literature review on the subject was performed as described in **Chapter 2**. The self-rated questionnaire was designed with sole aim of answering the research questions. The entire questionnaires collected were analysed using a statistical software, IBM SPSS.

4.2: Questionnaire Layout

Questionnaires reflect the designer's view of the world, no matter how objective it seems to be (Gray, 2016). The survey instrument was designed and implemented using Total Design Method (TMD) (Nachmias and Nachmias, 1992; Dillman, 1978; cited by Gray, 2016). Total Design Method (TDM) consists broad set of questions to be asked, taking into account the type of data, analysis and research questions to be addressed.

The survey questionnaire as shown in **Appendix A** is categorized into 8 sections with 20 main questions. In addition, a covering letter soliciting for participation was included in the questionnaire.

These sections were made of the following:

Section A.	General Company information
Section B.	Outsourcing activities
Section C.	Technological impacts
Section D.	Locations/clusters of outsourcing decisions
Section E.	Performance measurement
Section F.	Collaborations with supply network
Section G.	Technology capabilities
Section H.	Length of relationship with suppliers and customers.

Sections A: This first part of the questionnaire seeks to collect the demographic characteristics of the company including information on the rank of the respondents, when the company was established and how long it has been operating in Nigeria, the number of employees, the legal

Section B: This section deals with the questions concerning company-outsourcing activities, and its motivations for outsourcing arrangements. This section was designed to explore the argument that outsourcing arrangement was only a tool for cost cutting rather than for other strategic benefits such as access to advance technology, flexibility, risk sharing, market shares core competence that great value for shareholder's return.

Section C: This section account for the impact of technology on organisations. It contains various information for respondents to indicate the kind of deployed technology that has impacted their outsourcing operations. It also contains various knowledge institutions that organisations could explored and seek knowledge from. Literature maintain that companies are outsourcing largely to tap into the much richer innovative skills of their external suppliers using sophisticated new electronic communications, modelling, and monitoring techniques.

Section D: This forth section Addresses Company's geographical location in its outsourcing decision. It contains information explaining the factors that might influence the choice of locations for company's outsourcing practices. Scholarly articles have identify market experience and technology capability as major factors that could hamper oversea manufacturers with required products in meeting clients need (BCG, 2014; cited by Robert, 2014). This

section also seeks to examine the various types of technology spillovers that are from multinational companies (MNOCs) to the domestic small and medium scale companies. This section explain the dynamics of technology innovation process and outsourcing practices, and the role played by IOCs firms and other smaller institutions (service providers).

Section E: This is about performance measurement. It examines the financial performance of the firm: market shares, ROI, annual return, and corporate social responsibility. Reviewed literature revealed that outsourcing firm success is typically measured in terms of delivery on service level agreements and client-centred benefit (Feinberg et al., 2000; Goles, 2001; Hillmer et al., 2004; cited by Sharma and Chatterjee, 2011). Also the objective firm-level performance measures such as sales productivity, sales growth, net revenues, market shares, turnover, CSR, ROI have received few attentions in recent years (Loveman, 1998; Holman et al., 2009; cited by Batt, 2013).

Section F: This contains information about outsourcing collaborations, which determine the level of company's relationships with its supply network. It appears now to be a consensus in the strategic management's literature, that organisational competences can be handled and developed by alliances and collaborations (Brandes et al., 1997; cited by Hoecht and Trott, 2006).

Section G: This section addresses the technology capability information of the company. It examines how technology capabilities have helped the organisations in achieving organisational performance. Reviewed literature emphasise technology as a crucial variable that determines companies' commercial flow and performance (Vernon, 1996; cited by Santos et al., 2007). An example based on product life cycle theory, shows that new products are more likely to originate in high income countries, where both the required skills and demand exist, such that when the products mature and standardized, its production is easier to transfer to other countries of lower income and skills (Jafer, 2006).

Section H: This section contains information about the organisation length of relationship with its customers and suppliers. It reviews the extent of relationship of principal client with its suppliers. Reviewed literature has shown that strong relationships allowed the producers to focus on the larger strategic functions, and paid less attentions to other non-strategic issues that sometimes can clog the supply chain (BCG, 2014; cited by Robert, 2014). Literature sources have proved that outsourcing to third party distributors often mitigate the supplier's lack of application knowledge to serve highly specialized markets, such as oil and gas.

4.3: Response Rate Across Major Area of Operations

The survey instrument was pre-tested by academics and senior managers in the industry. Their response, comments and suggestions from the pilot testing stages were fed back into the questionnaire and a final version was produced. This final version was administered partly by mail and some delivered by hand in the spring of 2016 to oil and gas expert in the industry, including IOCs, NOCs and Indigenous companies. The addresses of the respondents were taken from the companies' database and business directory of corporations. Participants were asked to regard their firm's region-to-region operations in Nigerian as a 'business unit' for the purpose of this study. A 'business unit' is defined as an organisation that produces a particular line of products. From 200 administered questionnaires in Nigeria, 120 questionnaires were returned which amount to 60% response rate. Out of 120 received, only 100 were deemed complete and considered valid for further analysis. 20 questionnaires were excluded from the analysis because they were either partially filled or they were returned unfilled. Although poorly completed questionnaires still provide some data, researchers often exclude such questionnaires in order to reduce incidence of missing data in statistical analysis as well as improve reliability of results (Bryman and Bell, 2011).

The response rates considered reasonable, given it is an empirical survey of organisations (Yusuf et al., 2013) and questionnaire with 60% response rates is acceptable, especially in exploratory research (Saunders and Lewis, 2012). The sampled companies are combinations of small, medium and large enterprises. The techniques employed to increase the rates of response in this study includes: stamp and self-address addressed envelope enclosed in the questionnaire, letter consent assuring the confidentiality of participants. Also a letter of reminder were sent out at the end of third and fifth weeks of sending out initial questionnaires, as well as a follow up telephone calls made at phased intervals. A statement was made by the DOS in the covering letter affirming that responses are only going to be used for research purpose and result of the research will be made available to the respondents if they are interested.

Table 4.1: Response rates according to major area of operations

Major area of operations		Nigeria
Exploration and Production	Count	28
	% within country	33.0%
	% of total	23.3%
Base Logistics	Count	15
	% within country	19.0%
	% of total	12.5%
Geographical services	Count	3
	% within country	3.0%
	% of total	2.5%
Repair and maintenance	Count	2
	% within country	2.0%
	% of total	1.6%
Engineering service	Count	4
	% within country	5.0%
	% of total	3.3%
Maritime, Transport and allied services	Count	2
	% within country	2.0%
	% of total	1.6%
Electrical and Electronic Equipment	Count	5
	% within country	6.0%
	% of total	4.2%
Offshore construction	Count	6
	% within country	7.0%
	% of total	5.0%
Transport, storage, IT and communication	Count	13
	% within country	16.0%
	% of total	10.8%
Construction, operation and landing services	Count	2
	% within country	3.0%
	% of total	1.7%
Procurement and Equipment	Count	3
	% within country	4.0%
	% of total	2.5%
Total	Count	83
	% of total	69%

Table 4.1 presents the responses from the Nigerian according to the major areas of business operations. The data demonstrates that the responses are well-distributed between the business sectors. As such, no response bias based on demographic profile may be assume.

Exploration and production was the highest among the major area of the business operations, which account for 33.0% out of the total response rates. This highest responses, demonstrate the nature of upstream operations and the scale of companies involved to accomplish the work requirement. The second highest responses is Transport, storage, IT and communication, and this also is an indication of the importance of information sharing among the operators, whether in upstream, midstream and downstream sector of the industry.

4.4: Preliminary Screening

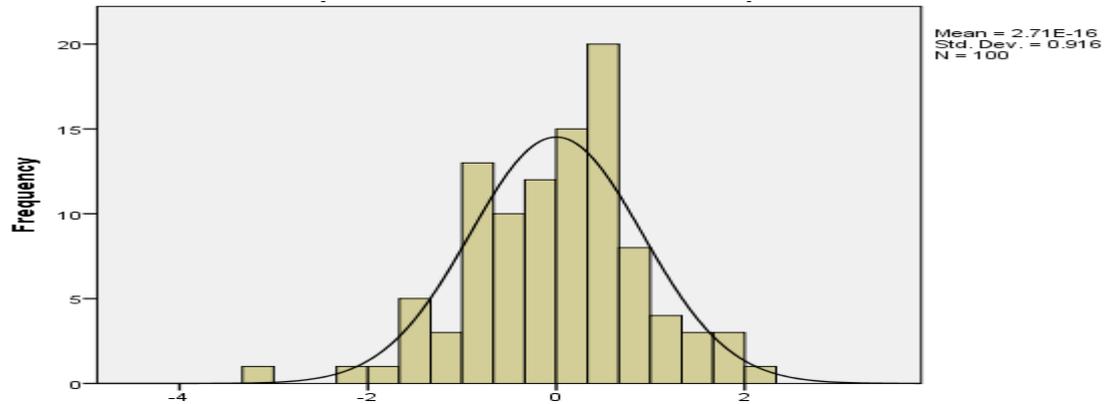
The preliminary screening was employed in this section. These include assessment of normality, reliability and validity testing, common bias, and non-response bias.

4.4.1: Assessing the assumption of normality

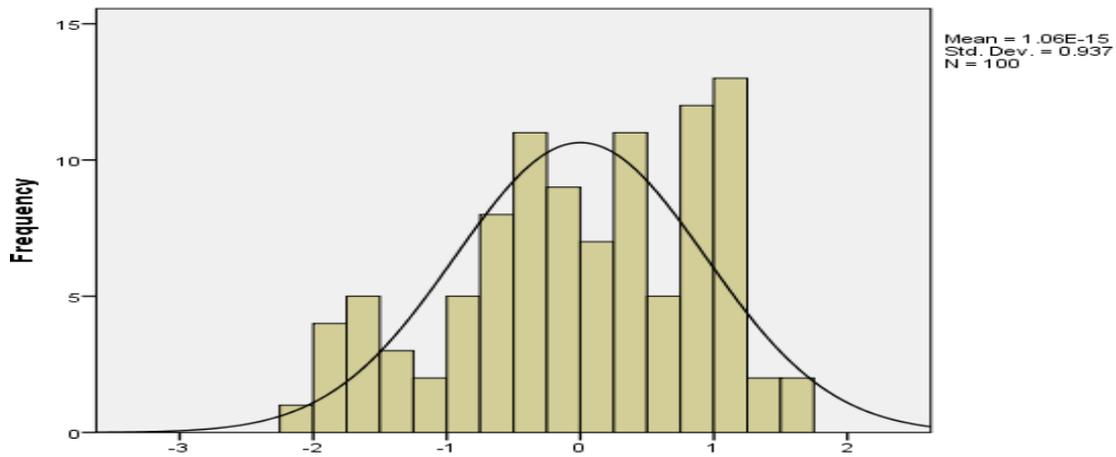
Normality is used to describe a symmetrical bell-shaped curve that has the highest frequency of scores in the centre with smaller frequencies at the ends. Before the commencement of any statistical analysis, it is mandatory to assess characteristics of distribution of the data to ensure the variables are normally distributed. The methods for normality assessment in this study were Histograms, Normal Q-Q plots, Scatterplot, Detrended Q-Q plot, Box plot and two statistics methods, namely, Kolmogorov- Smirnov (K-S) and Shapiro-Wilk test. Figure 4.1 to 4.5 present histogram, normal and detrended q-q plot, scatterplot and box plot for normal distribution data for organisations business performance, outsourcing drivers and deployed technologies. Moreover table 4.2 and 4.3 reports the K-S and Shapiro- Wilk test for all the variables.

Figure 4.1 depicts the histogram of the data for the two constructs: the business financial performance and deployed technology. The outcomes indicate the histogram for both constructs was normally distributed. More so, the normality of data may also be explained from the normal quantile –quantile plot (q-q-plot). This shows a straight line plot in figure 4.2, demonstrating the data is normally distributed.

Figure 4 -1: Histogram of overall financial performance and deployed technology



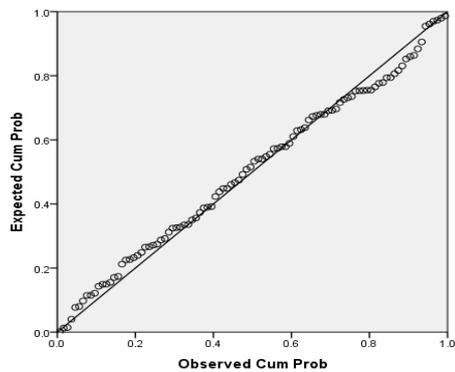
Overall organisation financial performance



Overall organisation deployed technologies

Figure 4 .2: Normal Q-Q Plot of overall Financial Performance and deployed technology

Normal Q-Q Plot of financial performance



Normal Q-Q Plot of deployed technology

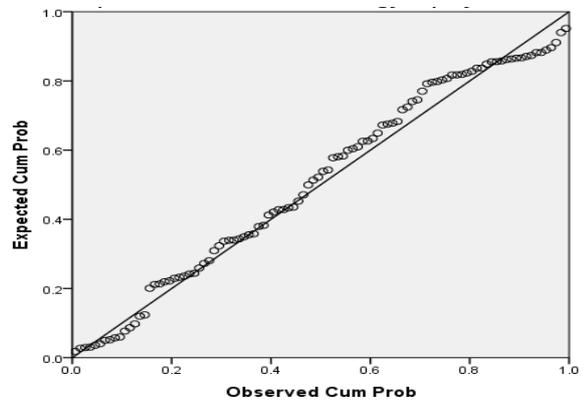


Figure 4.3: Scatterplot of overall financial performance and Outsourcing driver

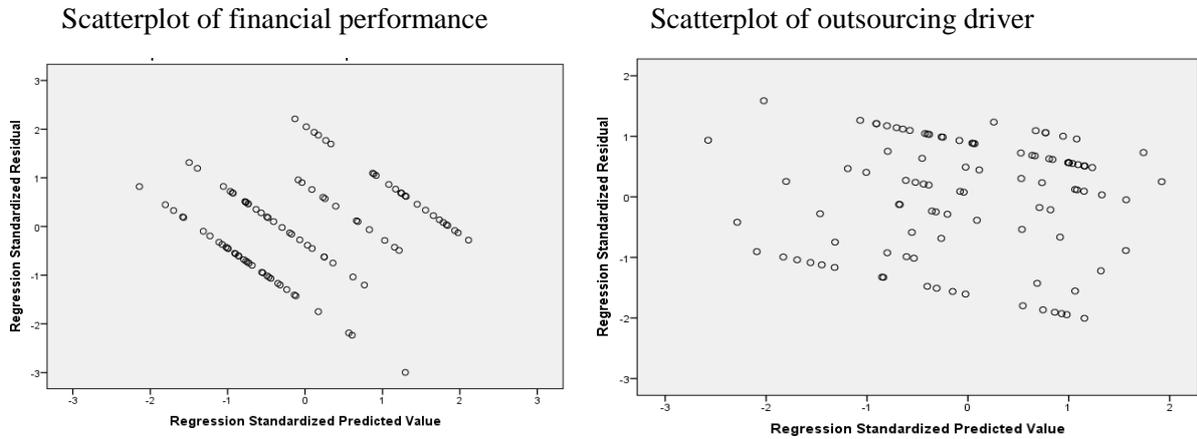


Figure 4.4: Detrended normal q-q plot of overall outsourcing driver and deployed technology

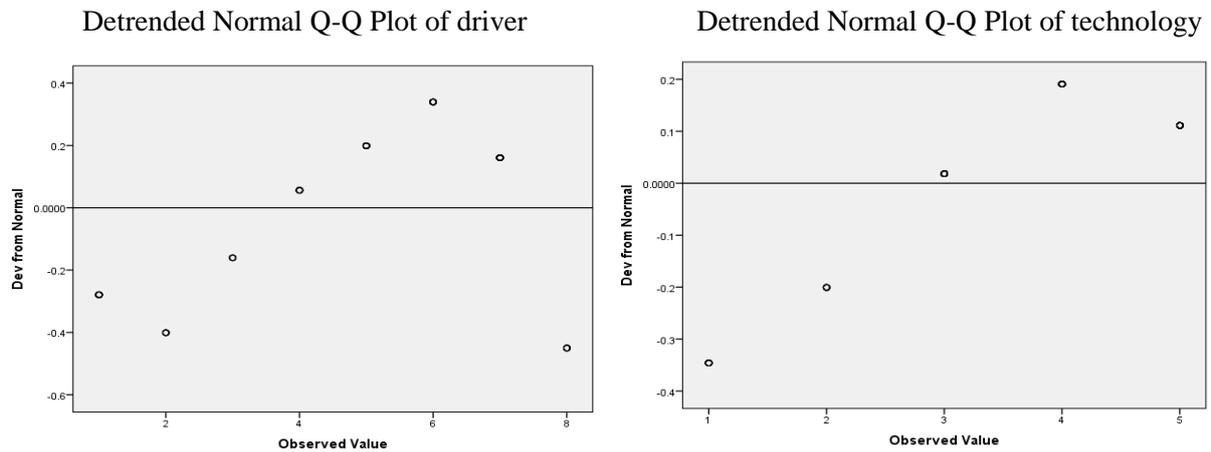
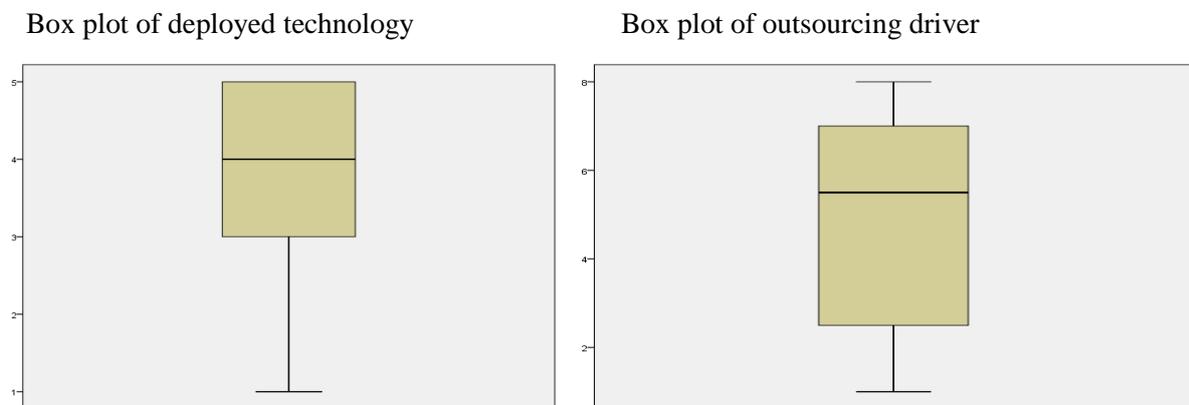


Figure 4.5: Overall Box plot of deployed technology and outsourcing driver



Furthermore, the scatter plot, detrended and box plot figure 4.3, 4.4 and 4.5 respectively show that financial performance, outsourcing drivers and deployed technology are normally distributed. These figures above essentially demonstrate that all the constructs are normally distributed. Table 4.2 presents the statistical results of the normality assessment based on the Kolmogorov-Smirnov (K-S) and Shapiro-Wilk test for overall outsourcing drivers and deployed technologies. Test for normality contains the Shapiro – Wilk statistics with samples generally ranging from 3 to 2000 whilst Kolmogorov – Smirnov utilized samples above 2000 (Gray, 2018). In this normality text, any result with significant level above 0.05 indicate normality, whilst results that is below 0.05 violet the assumption of normality. Given that the sample size here in this research is within 100, we employed the Shapiro-Wilk statistics.

Table 4.2 indicates that the statistics for outsourcing driver is above 0.05, demonstrating normality, whereas the statistic result for technology is below 0.05 violating the assumption of normality.

Table 4.2: Kolmogorov – Smirnov (K-S) statistics

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Driver	.093	99	.056	.874	99	.032
Technology	.188	97	.000	.861	97	.006

a. Lilliefors Significance Correction

Table 4.3: Paired Samples Test

	Pair differences						T	df	Sign (2-tailed)
	Mean	Std. deviation	Std. Error mean	95% confidence interval of the difference					
				Lower	Upper				
Pair 1 Driver - Technology	1.290	2.965	.297	.702	1.878	4.350	99	.000	

However, this does not indicate that we must employ a non-parametric test, since parametric test is permissible for sample sizes over 30 (Pallant 2011; cited by Gray, 2016). More so, the results of Skewness and Kurtosis in the Descriptive statistics show the outcomes between -1.0 and +1.0 (see table 4.7). Therefore, we can conclude that the distribution is sufficiently normal for the use of parametric tests as explained.

In addition, as long as the Skewness and Kurtosis results in table 4.7 is between -1.0 and +1.0, we can assume that the distribution is sufficiently normal for the use of parametric test. The result at the right hand column in table 4.3, demonstrates that the probability value is significant at .000, which clearly explains the normality of the variables. Although few results of assessment were presented for parsimony as all variables were assessed for all the dimensions and they all meet the requirement of normality. This requirement of normality must be satisfied before further analysis such as correlation and regression analysis can be conducted. Furthermore, table 4.7 shows the skewness and Kurtosis, another statistics analytical tool for the assessment of normality as mentioned in earlier section of this chapter.

4.4.2: Reliability and validity

Without assessing reliability and validity of research, it will be impossible to account for the effects of measurement errors on the theoretical relationships that are being measured (Forza, 2002). In order word, the validity and reliability methods for survey data will be easy to assess if there is a clear explanation of the questionnaire used in collecting the data (Saunders et al., 2009; cited by Gray, 2016). Cronbach's coefficient alpha computes an average of all possible split-half estimates and most widely used to test for internal consistency (Flynn et al., 1994; Ngai and Cheng, 1997).

Table 4.4 reports the Cronbach alpha values for the entire questionnaire, the demographic data and the main constructs of the research. The Cronbach alpha value for the entire questionnaire is 0.825, which demonstrates a high reliability. More so, another three main constructs namely, business performance, outsourcing driver and deployed technology main constructs indicate high-reliability values with 0.613, 0.683 and 0.799 respectively. Moreover, another two constructs such as collaboration and competitive attributes show Cronbach alpha values of above 0.6, which are acceptable and adequate. The reliability results for the research instrument as reported in table 4.4 demonstrate that Cronbach's alpha values for the overall scale of the survey instrument were within the range of .613 to.825.

Table 4.4: Cronbach's Alpha Coefficient Reliability Test

Focus of Tests	Cronbach's Alpha	Number of Items
Entire questionnaire	.825	80
Collaboration	.631	5
Deployed technology	.799	5
Business performance	.613	4
Outsourcing driver	.683	8
Competitive attributes	.648	5

4.4.3: Non response bias

In this research, wave analysis was used to analyse the validity of survey instrument (the questionnaire). Validity is a crucial factor, which is concern about whether the findings are really about what they appear to be about (Saunders and Lewis, 2012). Table 4.5 depicts the wave analysis methods that was undertaking, which involves comparing the variance of the attributes of the questionnaire. In this method, the returned questionnaires are representative of those willing to participate in the study, whilst the last batch of the returned questionnaires are representative of the non-responding organisations.

The attributes computed for wave analysis were demographics information (turnover rates, the number of employees), the major line of operations and types of companies. In the table, 1st and 2nd wave indicate the mean scores information for each group. The levene test demonstrates the quality of variance, 2 tailed significant shows the significant values, and the df details explains the degree of freedom. The table 4.5 clearly details that all the significant values exceeded 0.05 apart from the turnover rates and outsourcing driver (Pallant, 2011; cited by Gray, 2016). Therefore, with the exceptions of the two variables (turnover and outsourcing driver), the assumptions of homogeneity of variances may be appears to be applicable for the rest of the constructs.

Table 4.5 shows that the reading of 2 tailed sig. for all the constructs exceeded 0.05, demonstrating that there is no significant difference between the 1st wave (Participants that willing to response) and the 2nd wave (non-response organisations).

Furthermore, the finding as depicted in the figure 4.5 implies that the null hypothesis cannot be rejected, as it clearly stated that there is no significant difference between the 1st group

(willing to participate) and the 2nd group (non-response organisations). In general, non-response bias did not significantly influence the research results.

Table 4.5: Wave analysis of external validity for non-response bias

Research constructs	1 st Wave	2 nd Wave	Levene test	2 tailed sig.	df
Turnover	3.22	3.29	0.028	0.93 0.94	57 55.1
Employees	2.62	2.71	0.075	0.229 0.230	54 52.1
Major line of operations	5.56	3.57	0.945	0.335 0.333	57 57
Financial performance	3.64	3.65	0.327	0.296 0.295	57 57.5
Deployed technology	3.21	3.23	0.17	0.524 0.526	59 55
Outsourcing driver	3.09	2.61	0.038	0.864 0.865	57 46.5

4.5: Demographic Profiles Analysis

This section presents the demographic profiles of the participants and the distribution statistics of the research variables. Table 4.6 depicted the demographic characteristics of the participants. These demographic characteristics consist of the size of the company in terms of number of employees and annual sales turnover, major line of business and types of business ownerships.

4.5.1: The size of the organisation

The size of organisation is usually demonstrated by the number of employees and the annual sales turnover. More so, the classification of organisation into small-sized organisations, medium-sized organisation and large-sized organisations is significantly influenced by the nature of the business and the country of its domicile. A small- sized and medium-sized organisation according to European Union (2003) is defined as those firms who have less than 250 employees with an annual turnover not exceeding 50 million Pounds (Yusuf et al., 2013). Meanwhile, a company with a sales turnover rate of more than £500million is referred as a large company (Department of business and innovation skill, 2012). Therefore, the

categorisation of the organisational size according to European Union, is adopted in this research in the context of Nigeria.

Table 4.6 depicts that the small and medium-sized companies in Nigeria (less than £50M) accounted for 40 % of the total population whilst large firms accounted for (more than £500M) only 8.0% of the surveyed companies. Furthermore, the size of an organisation can also be determined by the number of its employees. European Union agrees that an organisation with less than 50 number of employees is classified as a small-sized organisation, 51 -250 number of employees is in the small-medium sized category, whilst organisation with workforce within the range of 251 – 500 staff is a mid-sized organisation. Moreover, organisation with more than 500 employees is regarded as a large organisation (Department of business and innovation skill, 2012).

Therefore, it can be seen in table 4.6 that a majority of the respondents in this survey is categorised under small-sized organisations accounting for 32.2% out the total surveyed firms. Meanwhile, a total of 26.9% of surveyed firms have 51 - 250 of workforce, 19.9% of the surveyed companies have workforce in the range of 251 – 550 and 15.3% of the surveyed organisations accounted for 551 – 2500 numbers of employees. A total of 7.7% accounted for survey companies with employees numbers above 3000. The results show that the distribution of respondents is spread across small-sized, medium-sized to large-sized organisations. Although, the majority of the surveyed companies comprises of small and medium-size enterprises (SMEs). This findings support the previous literature that maintained that most petroleum industries are dominated by small and medium-sized companies (Yusuf et al., 2013).

Table 4.6 also describes the core demographic characteristics of the survey respondents such as company's sales annual turnover (£m), size of the company by number of employees, major line of business activities of the responding firms, and forms of business ownerships.

4.5.2: Types of business ownerships

Types of business ownership are presented in Table 4.6. A total of 16.6% of the surveyed organisations are a sole proprietorship, while 22.5% of the surveyed companies accounted for business partnership. Meanwhile, Public liability companies from the surveyed organisations consist only 28% and whilst a total of 25.9% of the surveyed companies are private limited liability companies. Unlimited company contributed up to 6.1% of the surveyed organisations in the overall research.

Table 4.6: Demographic characteristics of the respondents

Total Number of respondents	Frequency	Percentage
Size by annual sales turnover rates		
Less than 50M	40	40%
51M – 100M	19	19%
101M	12	12%
251M – 500M	10	10.0%
500M – 1B	8	8.0%
Above 1B	6	6.0%
Total	95	95%
Types of business ownerships		
Sole proprietorship	16	16.6%
Partnership	20	22.5%
Public limited company(PLC)	28	28.9%
Private limited liability company (LTD)	25	25.9%
Unlimited Company	6	6.1%
Sized by number of employees		
Up to 50	30.2	30.2%
51 – 250	26	26.9%
251 – 550	19	19.9%
551 – 2500	15	15.3%
Above 3000	7	7.7%
Major line of business		
Exploration and Production	28	30.1%
Base logistics	11	12.3%
Geography services	3	3.3%
Oil services and Operations	2	2.1%
Engineering services	5	5.2%
Maritime, Transport and Allied service	6	6.2%
Electrical and Electronics equipment	7	7.1%
Offshore construction and Maintenance	10	10.2%
Transport, Storage and IT Communication	3	3.2%
Construction, Operations and Landing facility	4	4.1%
Procurement and Equipment supplier	16	16.2%

4.5.3: Major line of business operations

Major line of business was also presented in the table 4.6. Respondents were encouraged to choose more than one sector in case they have various business operations. The table 4.6 reports that exploration and production has the highest majority, accounting for 30.1% of surveyed companies. 12.3% are involved in base logistics which is the second majority of surveyed companies. Procurement and equipment supplier sector ranked fourth with 16.2% among the surveyed organisations. The outcomes clearly show that the major line of activities are within the exploration and production sector.

The findings demonstrated similar trend in terms of proportions with number of firms according to the business sector reports. This results is also in line with contention in literature that outsourcing activities and technology applications are more predominate within the upstream sector as oppose to downstream oil gas sector. Hence, the demographic of the participants according the major line of business operations are considered true in the context of Nigeria oil and gas clusters.

4.6: Inferential Statistics

To further describes the relationship between variables of this study, inferential statistics were undertaken. Inference statistics is about the confidence with which we can generalise from the sample to the entire populations. In addition, the likelihood selection for each element in the population must be known. Inference statistics involves bivariate analysis and multivariate analysis of the research variables. Bivariate analysis is concerned with the analysis of two variables at the same time to find if they are related with each other. Whilst multivariate analysis is a simultaneous analysis of three or more variables to know whether the variables are related and if they are related which variable causes the other variable to change (Bryman and Bell, 2007; cited by Yusuf 2013). Correlation analysis is included to investigate the association between variables. Additionally, regression analysis is conducted to explore the cause and effect relationship between variables.

4.6.1: Descriptive statistics of research variables

Table 4.7 outlines the resulting minimum, maximum, mean, standard deviation, skewness and kurtosis for each item in the research variables. The minimum and maximum values describe the lowest and maximum scale of the surveyed organisation respectively. Meanwhile, the value of the mean demonstrates the average scores of each item. Accordingly,

information on measures of dispersions on the variables are indicated from the standard deviations as depicted in table 4.7. From the skewness and kurtosis data in table 4.7, the dataset is normally distributed as long as the values is between -1.0 and +1.0, and also reports the dataset contains a mix of positive and negative values within the range of values for 2 variables.

Table 4.7: Descriptive statistics of research variables

RESEARCH VARIABLES		Min	Max	Mean	SD	Skewness	Kurtosis
Deployed technologies	Technology for ordering and procurement	1	3	1.69	.647	.399	-.686
	Technology for information sharing	1	5	1.85	.783	1.301	.609
	Technology for design and maintenance	1	5	2.14	1.035	.997	.943
	Technology for production process	1	5	2.33	1.074	.553	-.205
	Technology for logistics operations	1	4	1.84	.825	.638	-.368
Financial Performance	Annual return	1	4	1.89	.840	.630	-.289
	Market shares	1	5	2.41	1.173	.413	-.967
	Return on investment	1	5	2.71	1.094	.131	-.657
	Corporate social responsibility	1	4	1.97	.989	.827	-.295
Outsourcing drivers	Cost reduction	1	5	2.66	1.380	.542	-.913
	Core competence	1	5	2.53	1.123	.316	-.758
	Increase flexibility	1	5	2.73	1.033	.006	-.656
	Organisational performance	1	5	2.55	1.192	.207	-1.185
	Market shares	1	5	2.73	1.370	.407	-1.029
	Information sharing	1	5	3.50	.847	-.458	.438
	R&D technology	1	5	3.98	1.310	-1.062	-.183
	Risk sharing	1	5	2.32	.851	.231	-.006
Competitive attributes	Infrastructure	1	2	1.27	.446	1.052	-.912
	Expertise	1	5	2.44	1.572	.734	-1.080
	Collaboration	1	5	3.50	.847	-.458	.438
	Local content	1	5	2.32	.851	.231	-.006
	Quality	1	5	2.41	1.280	.603	-.680

Partnership and Alliance	Knowledge sharing	1	3	1.59	.726	.810	-.665
	Exchange of core competence	1	5	3.59	1.147	-.615	-.205
	Supplier integration	1	3	1.70	.718	.519	-.911
	Customer involvement	1	3	1.56	.592	.510	-.635
	Interaction with competitors	1	5	2.23	1.238	.723	-.524
Demography	Company size	1	5	2.85	1.192	-.069	-.942
	Number of employees	1	5	2.59	1.342	.380	-1.365
	Annual turnover	1	6	3.15	1.720	.079	-1.365
	Major line of activities	1	11	4.41	3.542	.480	-1.448
Knowledge and Labour Sources	Market Research	1	5	2.58	1.365	.412	-1.067
	Universities	1	5	2.73	1.370	.407	-1.029
	Research Institutes	1	5	2.32	.851	.231	-.006
	National Government	1	6	1.91	.911	1.244	-1.946
Outsourcing locations	To Streamline engineering and manufacturing	1	5	2.71	1.094	.131	-.657
	Increase ability to recruit IT operations	1	5	3.50	.847	-.458	.438
	Increase proximity to production for more innovation	1	5	2.41	1.280	.603	-.680
	Proximity to large market	1	5	3.45	.880	-.479	.492
	Reducing shipping and distribution	1	5	1.74	.787	1.007	1.510
	To received regulatory approval to sell products	1	5	2.85	1.192	-.069	-.942
	Increase customisation by having control over processes to large market	1	3	1.56	.592	.510	-.635
	To mitigate technological risk and uncertainty	1	5	2.66	1.380	.542	-.913
	For corporate growth	1	6	3.15	1.720	.079	-1.365
	To achieve flexibility	1	5	2.57	1.358	.430	-1.026
	For risk sharing	1	6	2.99	1.648	.306	-1.177

As such, none of the values is too high which demonstrates the data are well-distributed. In general, there is a measure of dispersion in the constructs, which shows that descriptive

statistics illustrates respondents viewpoints on the firms' technology deployed strategies, outsourcing initiatives in driving performance measures. It also provides information on the impacts of other moderating attributes in managing organisations' competitive performance

4.6.2: Respondents' results on outsourcing drivers

Prior to the inferential statistics analysis, the overall outcomes of the surveyed organisations on outsourcing drivers and competitive attributes were evaluated in attempt to determine the answer as contained in the research questions.

Previous literature maintained that the primary motivation for organisations involving in outsourcing arrangements is to achieve cost reduction, before other secondary motivations such as increase in flexibility, risk sharing and markets shares (Michael and Lucy, 1998; Majid et al., 2013). However, current literature sees outsourcing decisions from a more strategic position; moving from a cost discipline position to strategic re-positioning of core competency, greater service integration, higher value creation, and technology capability (Quinn, 1999; Kakabadse, 1999; Jean-Marie and Dolgui, 2013; Adams and Fred, 2015). Table 4.8 reports the findings of the surveyed organisations on outsourcing drivers, which essentially is one aspects of research questions.

Table 4.8: Respondents' results on outsourcing drivers

Overall respondents	Percentage
Access to new technologies	31.7%
Cost reduction	10.9%
Increase in flexibility	7.0%
Information sharing	17.8%
Risk sharing	4.0%
Organisational performance	9.0%
Core competence	6.9%
Market competitiveness	10.0%
Others (please specify)	0.9%

The study focused on the most relevant outsourcing drivers in oil and gas industry, using both previous and existing literature. Table 4.8 reports that majority of surveyed respondents' opted

for access for new technologies as their most outsourcing drivers accounting for 31.7%. Meanwhile, 17.8% of surveyed firms considered information sharing as their most important motivation, whilst 10.9% maintained that cost advantage still remain their priority in any outsourcing arrangements. It therefore, clearly demonstrates that the surveyed company's major consideration in any outsourcing arrangements within oil and gas industry, is their ability to access new technologies, followed by ability to share information. Considerations for cost advantage is the third options according this research survey.

Oil and gas industry required information systems technologies, especially in production and explorations in order to benefit from data access sharing, business-process modelling, and automated notification (Chima, 2007). The author pointed out that lack of information and communication sharing could fail the outsourcing arrangements, especially in a strategic alliance. The revelation of this key outsourcing motivation is crucial in any outsourcing arrangements, especially in this day and age where management carefully weighs the costs and benefits of every discretionary dollar investment. Previous studies focus on how the concept of technology innovation leads to organisational innovation rather than emphasizing on the role of organisational innovation in creating flexibility and creativity, which in turn foster developments and technology innovation (Walter et al., 2015).

Moreover, Jiang and Qureshi (2006) whilst acknowledging that outsourcing is now broadly an attractive option, maintained that its specific impact on firms' performance, has not yet been well confirmed by research. The authors questioned the reliance of outsourcing results (financial impacts) by some managers', based on estimation rather than on tangible metrics or empirical evidence. This findings explains the importance of new technologies, particularly for companies in a developing country, in area of extraction and transformation of crude oil into final petroleum products. The accessibility of advance technologies will provide avenues for endogenous technology acquisition, through learning-by-doing. This finding has also provided the empirical evidence to support current literature position that technologies could migrate, especially from developed nations to developing economies through outsourcing collaborations.

More so, academic literature has attributed these collaborative benefits between foreign-owned firms to indigenous firms to spillover effects (Hayakwa and Ito, 2018). The authors classified these spillover effects into four: imitation; skill acquisition and proliferation;

competition and export. Therefore, the study seeks to investigate these outsourcing technology and explore how they drive organisational performance.

4.6.3: Respondents’ results on competitive attributes

Also before the inferential statistics, the result of the surveyed organisations were reported in Table 4.9 outlines the results of responding sample companies on the competitive attributes: Infrastructure, Quality management and Expertise practices.

Table 4.9: Respondents’ results on competitive attributes

Competitive attributes	Percentage
Quality	
Very high	30.7%
High	28.7%
Moderate	19.8%
Low	11.9%
Very low	8.9%
Expertise	
Very high	37.6%
High	29.7%
Moderate	4.0%
Low	5.9%
Very low	21.8%
Infrastructure	
Very high	39.6%
High	26.7%
Moderate	17.0%
Low	10.4%
Very low	6.3%

Table 4.9 depicts the overall results of surveyed organisations on competitive attributes (quality management, expertise practices and cutting-edge infrastructure). On quality management: The surveyed participants rated the extent quality has affected their firms outsourcing arrangements in a Likert-scale of 1 to 5. The results in table 4.9 indicates that 30.7% of the majority of the surveyed organisations rated quality management as key consideration in their

outsourcing and technology engagements. Meanwhile, on the expertise best practices, on the scale of 1 -5, 37.6% majority of surveyed organisations agreed that expertise practices are considered most important in their outsourcing operations. On cutting-edge infrastructure, majority of participants considered infrastructure very significant, accounting for 39.6% of the surveyed organisations.

These findings justify the research conceptual model in **Chapter 3** which consider competitive attributes as a moderating constructs that may leverage firm's competitive performance, in addition to the advantages of advance technologies and outsourcing initiatives. For example, literature maintain that outsourcing practices provides the much better quality and supply-chain performance (Chima, 2007). According to Jeynes and Michael, 1998), state-of-the art equipment is one of the most significant benefit of outsourcing. Majid et al. (2013) underscore the importance of expertise and specialist contractors who have all the means to perform and advance new technologies and innovative practice, because they perform only one service. In addition, outsourcing may help organisations to gain new skill and knowledge and can afford to develop its expertise to maintained high-level technology. For instance, outsourcing arrangements create that sustainable access for external contractor to transfer cutting-edge equipment from a larger organisations. Thus, when some service is outsourced, an organisation will gain new skills or new technical knowledge from the outside supplier (McDonough and Hayward, 2000; cited by Rothaermel, 2017)

4.6.4: Respondents' results on financial performance

Table 4.10 depicts the overall results of the surveyed organisations on firm's financial performance in a Likert scale of 1 -5. The metrics of these performance measures consist of annual return, return on investment, market shares and cooperate social responsibility. On the performance measures of annual return, the surveyed organisations measured 36.6% sharp increase of their annual return, whilst 33.7% of surveyed firms recorded moderate increase of market shares in their performance measurements. Meanwhile, on annual return on investment, surveyed organisation recorded highest of 32.7% static financial measures on their outsourcing activities. On corporate social responsibility rating, the surveyed organisations have a sharp increase of 38.6% of performance measures in their outsourcing engagements. These results support previous literature suggestion that an outsourcing organisation's cash flow will improve because of fewer employees, due to high-level infrastructural automation, resulting to greater efficiency and reduced variable cost (Majid et al., 2013). In addition, current literature

maintain that reducing the need to invest capital funds in a non-core functions, and making them available for core areas, makes outsourcing a tool to increase flexibility in finance. This ensures availability of capital funds for core activities (Djavanshir, 2005). The author also suggest that outsourcing motivations is sometime economic, such as scale efficiency.

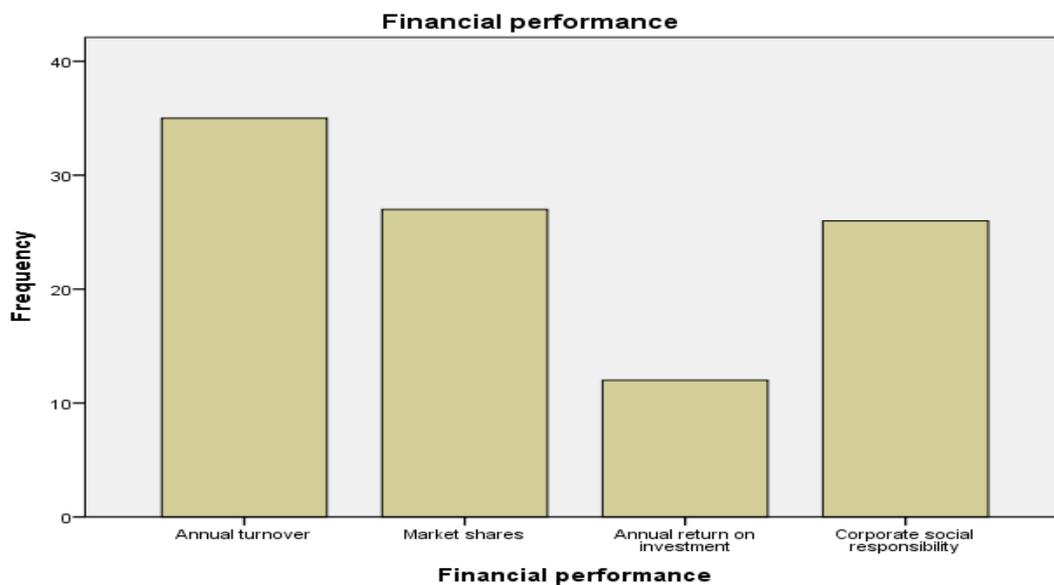
Table 4.10: Respondents' results of financial performance

Business Financial Performance	Percentage
Annual sales return	
Sharp increase	36.6%
Moderate increase	40.6%
Static	17.8%
Moderate decrease	4.0%
Sharp decrease	4.0%
Market shares	
Sharp increase	25.7%
Moderate increase	33.7%
Static	15.8%
Moderate decrease	20.8%
Sharp decrease	3.0%
Annual return on investment	
Sharp increase	14.9%
Moderate increase	27.7%
Static	32.7%
Moderate decrease	18.8%
Sharp decrease	5.0%
Corporate social responsibility	
Sharp increase	38.6%
Moderate increase	37.6%
Static	11.9%
Moderate decrease	10.9%
Sharp decrease	10.8%

For example, organisation that specializes in a particular services makes a relative large business volume, which allows the firm to take advantage of economies of scale, thereby operating and maintaining the services more cost-effectively (Duhamel, 2003).

Furthermore, previous literature source had always maintain that outsourcing arrangements helps organisations to move fixed costs (such as payroll or labour productivity and materials) to variable costs. In another instance, these results are in line with the existing literature perspectives that company no matter its size, required a significant implementation of a competitive, sustainable and socially responsible strategy in respect to its competitors, supplier and customers (Yohannes, 2014). Figure 4.6 summarised the overall results of the surveyed organisations.

Figure 4.6: Overall respondents’ results on financial performance.



4.6.5: Respondents’ results of deployed technologies

Table 4:11 outlines the overall outcomes of the surveyed organisations on the deployed technologies in a Likert scale of 1 -5. There are five deployed technologies, ranging from technology for ordering and procurement, technology for information and communication, technology for design and maintenance, technology for production processes and technology for logistics operations. Table 4.11 demonstrate the overall results of the surveyed organisations on five technologies that are deployed.

For ordering and procurement technology, 4.6% majority of the survey organisations agreed that this aspect technology has a very high consideration in any of their outsourcing arrangements. Also the deployed technology for information and communication has also 40.7% very high rating of the surveyed organisations. Meanwhile, for Technology deployed in design and maintenance, surveyed firms considered this aspect very significant in its outsourcing operations. But they see it as their second consideration, accounting for 28.7% high, whilst for technology deployed for production processes, 33.7% majority of the surveyed organisations considered this aspect of technology very high in their outsourcing arrangements. Table 4.11 reports Technology deployed for logistics operations very high by surveyed companies, accounting for 39.6% majority.

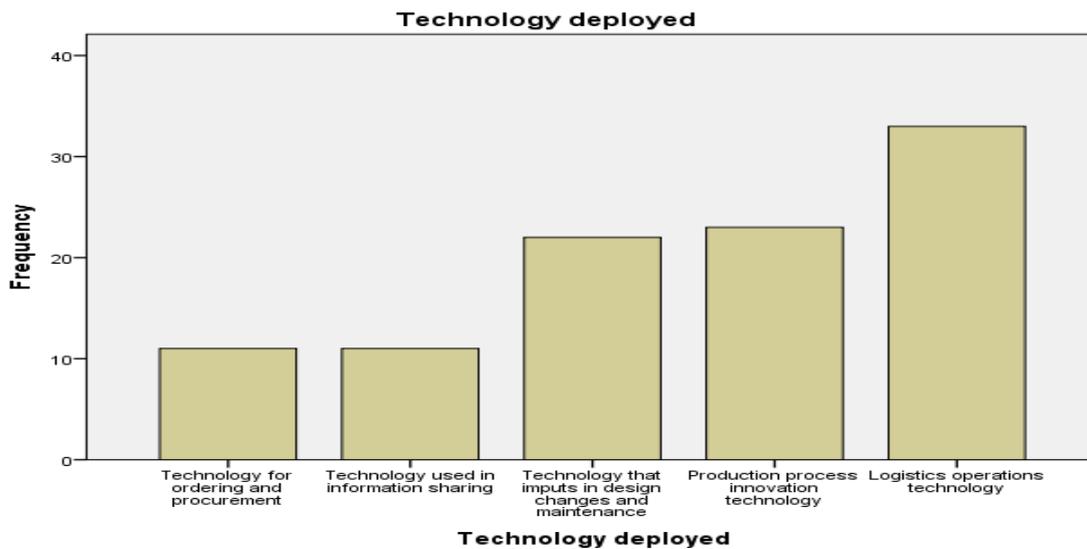
These results are in line with existing literature argument that the cutting-edge outsourcing practices has made every production processes and services outsourceable, (Sumita, 2009). In addition, the rise in 3D printing (also known as additive manufacturing technologies) has created the opportunity for companies to reconfigured supply chains in a manner that brings manufacturing closer to home, as well as shortening or virtually eliminating lead times (Berman 2012; Mellor, et al., 2014; Weller et al., 2015). Software suppliers have also adopted outsourcing arrangements and are forming application service providers (ASP) to supply and manage applications remotely, charging a flat fee per user (Kakabadse, 2000). And by extension, this has created business opportunities for reputable service providers that offers SAP services to small and medium enterprise market.

According to Manufacturing and Logistics IT special report (June, 2015), technologies when properly deployed, offer direct communication with suppliers via electron data interchange (EDI) and can align production/distribution schedules. The report suggested that these solutions could also enable Demand Sensing and Demand Shaping techniques in raw material flow intake through the production schedule and to distribution. Additionally, integrated EDI appears to be a potential support and foundation for cost transparency along the supply chain (Yusuf et al., 2012). In general, the overall results as depicted in figure 4.10 shows that deployed technology for logistics operations has the highest rating among surveyed organisations. These results also support the existing literature position that suppliers are now looking beyond running IT systems to business process management (BPM), such as supply chain management, system integration, consulting, infrastructural support, data analysis, data mining, content solutions, design and re-engineering (Economist, 2005).

Table 4.11: Respondents' results on deployed technologies

Deployed Technologies	Percentage
Technology for ordering and procurement	
Very high	40.6%
High	30.8%
Moderate	12.6%
Low	16.9%
Very low	3.0%
Technology for information and communication	
Very high	40.7%
High	13.0%
Moderate	18.0%
Low	4.4%
Very low	5.0%
Technology for design and maintenance	
Very high	28.7%
High	40.6%
Moderate	21.8%
Low	3.0%
Very low	5.0%
Technology for production process	
Very high	33.7%
High	24.8%
Moderate	27.7%
Low	8.9%
Very low	4.0%
Technology for logistics operations	
Very high	39.6%
High	30.6%
Moderate	17.0%
Low	8.8%
Very low	3.0%

Figure 4.7: Overall Respondents' results on deployed Technologies



4.7: Correlation Analysis

This section outlines correlation between the major constructs of the research. The correlation was conducted to investigate the level of association between variables. There are seven correlation analysis between the research constructs that will be presented in this section. Correlation is a techniques employed by researcher to establish an association between two variables (Gray, 2016). Additionally, Correlation is concerned with describing relationships between two research constructs (for example, between X and Y) (Fink, 2003). More so, this technique is employed where variables are not deliberately controlled, but are described, as they exist naturally (Pallant, 2010; cited by Gray, 2016). It is also one of the method of explaining bivariate relationship. When an association is measured numerically, we get a correlation coefficient that gives the strength and the directions of the relationship between the two variables. The coefficient is denoted by the letter r ranges from -1 to +1 with the value signifying the strength of the relationship while the sign (- or +) indicates the direction of association. Hence, a value of correlation coefficient close to -1 or +1 denotes strong negative or positive association respectively between the variables.

However, correlation does not enable the manipulation of the research variables for casual analysis of relationship between the variables. Although the existence of a correlation does not prove causality, but it denotes a necessary precondition for it. Thus, the absence of correlation shows that no causality is present, precluding the need for undertaking regression analysis. To explore the relationship between outsourcing practices and technologies deployed,

bivariate correlation analysis between outsourcing drivers, deployed technologies, competitive attributes and financial performance were conducted.

From the **SPSS** procedure, A ‘Pearson product-moment correlation coefficient’ describes the relationship between two continuous variables, and is available through these menus:

ANALYSE → CORRELATE → BIVARIATE

The output of these results are shown in the following tables: 4.13, 4.14, 4.15, 4.16, 4.17, 4.18, and 4.19, respectively.

4.7.1: Relationship of the main constructs of the research

Correlations analysis was carried out in this research as depicted in table 4.11 to established relationship among the variables: deployed technologies, financial performance and outsourcing drivers. Table 4.12 indicates the correlation matrix of the main variables of the research (outsourcing driver, deployed technology, financial performance and competitive attribute). In this case, the correlation coefficient, or r , between the variables are as follows: Financial performance and Outsourcing driver = 0.231, Financial performance and Deployed technology = 0.379, Deployed technology and Outsourcing driver = -0.202.

This findings confirms our earlier visual inspection of scatterplot – indicating an association. Existing literature has also maintain that outsourcing using technology solution, has led most organisations and individuals into various level of change, especially in production and supplier networks (Ameha et al., 2016). Previous researchers suggested that understanding the link between outsourcing of technology would create a link with value creation (Adelaide and Zoccoli, 2010).

Furthermore, this analysis tests the validity of the assumption that technology outsourcing practices in oil and gas sector is a classic model for supply chain management. Outsourcing practices in petroleum sector mainly includes logistics or manufacturing operations, information technology and marketing. Literature maintain that these functions are excellent examples of strategic non-core functions with a major impact on operational efficiency and financial performance. This invariable means that an association between technology and outsourcing practices could lead to organisational performance, which certainly has significantly address the research question two of this study.

Table 4.12: Correlation between outsourcing with technology and performance

	Outsourcing driver	Performance	Deployed technologies
Outsourcing driver	1		
Performance	.231* (.026)	1	
Deployed technologies	-.202* (.044)	.379** (.001)	1
*Correlation is significant at .05 levels (1-tailed). **Correlation is significant at .01 levels (2-tailed). NS = not significant			

This findings also support the literature claim that more efficient technological firm perform better than less efficient technological firm. Just as more outsourcing firm out-performed less outsourcing firm. A case in point is the experience of Nike and Reebok, the companies focused on design and marketing of footwear, their core-competence, whilst outsourcing manufacturing activities (Sankalp, 2014). However, the level of significant does not indicate how strongly the two variables are correlated; rather it shows how much confidence we should have in the results that have been obtained (Gray, 2016).

4.7.2: Correlation analysis of outsourcing drivers and deployed technologies

Bivariate correlation was carried out to determine the association between firms' outsourcing drivers and their choices of deployed technologies. This correlation involved eight outsourcing drivers and five choices of deployed technologies. Prior to correlation analysis, the scores of each organisation outsourcing eight drivers were aggregated and the mean values were conducted using **SPSS**. Thereafter, analysis of correlation was conducted and the findings were reported in table 4.13. These correlation outcomes as depicted in table 4.13 support the findings of this research which reports that the drivers of outsourcing operations in oil and gas industry required information and communications systems technologies, especially in major line of activities such as production and explorations (see table 4.5), so as to benefit from data access sharing and business-process modelling.

Table 4.13: Correlation between outsourcing drivers and deployed technologies

Variables	Access new technologies	Cost reduction	Increase flexibility	Information sharing	Risk sharing	Organisational focus	Core competencies	Market competitiveness
Technology for ordering and procurement	-.210* (.036)	NSC	NSC	-.397** (.000)	-.206* (.040)	NSC	NSC	NSC
Technology for information and communications	NSC	NSC	NSC	NSC	NSC	NSC	NSC	NSC
Technology for design and maintenance	NSC	NSC	NSC	-.212** (.003)	NSC	NSC	NSC	NSC
Technology for production processes	NSC	NSC	NSC	-.295** (.003)	NSC	NSC	NSC	NSC
Technology for Logistics operations	NSC	NSC	NSC	NSC	NSC	NSC	NSC	NSC
*Correlation is significant at .05 levels (2-tailed). **Correlation is significant at .01 levels (2-tailed). NSC: NO significant correlation								

Furthermore, there is correlation significant between desire for information and communication sharing and the following variables: technology for ordering and procurement, technology for design and maintenance, and technology for production process. Additionally, there are significant correlation between technology for ordering and procurement and desire for technological development, and finally technology for ordering and procurement and desire for risk sharing. The implication of this research will invariable means that organisations can leverage technological innovation and outsourcing capabilities to achieve an effective business financial performance. Previous researcher suggest that convincing customers to get their work done 8,000 miles away shows the magic of information and communication outsourcing technology (Sumita, 2009).

4.7.3: Correlation between outsourcing drivers and financial Performance

Bivariate correlation was also conducted to understand the association between firms' outsourcing drivers and organisational financial performance. This correlation involved eight outsourcing drivers and four financial measurement indices.

Table 4.14: Correlation between outsourcing drivers and financial Performance

Variables	Access to new technologies	Cost reduction	Increase flexibility	Information sharing	Risk sharing	Organisational focus	Core competence	Market competitiveness
Annual sales return	NSC	.346** (.000)	NSC	-.216* (.031)	NSC	.203* (.043)	NSC	NSC
Market shares	NSC	NSC	.410** (.000)	-.222* (.020)	NSC	.307** (.000)	.826** (.000)	NSC
Annual return on investment	NSC	NSC	.915** (.000)	NSC	NSC	.267** (.007)	.279** (.000)	NSC
Corporate social responsibility	NSC	NSC	.362** (.000)	NSC	NSC	.440** (.000)	.352* (.000)	NSC

*Correlation is significant at .05 levels (2-tailed). **Correlation is significant at .01 levels (2-tailed).NSC: NO significant correlation

The outcomes as depicted in table 4.14 demonstrates that there are some significant relationship among the variables. For examples, there are quite significant relationships between increase flexibility and annual return on investment, annual sales return and desires for cost reduction, market shares and desire for core competence. However, this outcomes contradict the existing literature contention, that outsourcing arrangements lacked empirical evidence to show any kind of relationship or impact towards organisational performance, as their contributions are limited to narrow areas and therefore, qualitative (Jiang and Qureshi, 2006).

4.7.4: Correlation analysis of competitive attributes and outsourcing drivers.

Bivariate correlation analysis was conducted to demonstrate that there is an association between firms' outsourcing drivers and their competitive attributes. This correlation involved eight outsourcing drivers and their three competitive attributes.

Table 4.15: Correlation between competitive attributes and outsourcing drivers

Variables	Access to new technologies	Cost of reduction	Increase flexibility	Information sharing	Risk sharing	Organisational focus	Core competence	Market competitiveness
Infrastructure	NSC	NSC	NSC	.205* (.041)	NSC	NSC		.236** (.018)
Expertise	NSC	NSC	NSC	NSC	-.302** (.002)	NSC	NSC	.722** (.000)
Quality	NSC	NSC	NSC	.256** (.010)	NSC	NSC	NSC	.617** (.000)

*Correlation is significant at .05 levels (2- tailed). **Correlation is significant at .01 levels (2-tailed).
NSC: NO significant correlation

The results in table 4.15 reports significant relationships between some variables. Expertise best practices demonstrates a high significant with market competitiveness, whilst quality has a strong significant relationship with market competitiveness. The implications of the results invariably mean that for effective and efficient organisational financial performance, quality in all the business functions must be enforced to gain the market competitiveness that will impact on business performance. Jeynes and Michael, (1998) defined this quality as a combination of skills and knowledge residing within a team and the extent of training and other learning patterns which are applied which make the change – greater productivity, higher quality and responsiveness. Other authors describe it as service quality, which include quality planning, quality control, quality assurance, and quality improvement, which influence the decision of outsource service (Majid et al., 2013).

These results also implies that high level of expertise would translate into very high market competitiveness among the company’s competitors, which by extension will translate into credible financial performance. Current literature maintain that there are need for expertise and specialist contractors who can afford to advance new technologies and innovative practice, because they perform only one service and have all the means to performance.

4.7.5: Correlation analysis of deployed technologies and competitive attributes.

Bivariate correlation was also conducted to understand the association between firms' choice of deployed technologies and organisations competitive attributes. This correlation involved five deployed technologies and three competitive attributes.

Table 4.16: Correlation between competitive attributes and deployed technologies

Variables	Technology for ordering and procurement	Technology for information sharing and communications	Technology for design and maintenance	Technology for production processes	Technology for logistics and operations
Infrastructure	NSC	NSC	-.200* (.046)	-.319** (.001)	-.210* (.036)
Expertise	NSC	NSC	-.318** (.001)	-.265** (.008)	NSC
Quality	-.199* (.047)	NSC	.337** (.001)	-.244* (.014)	-.213* (.034)
*Correlations is significant at .05 (2-tailed). **Correlation is significant at .01 (2-tailed).NSC: NO significant correlation					

In the results, as depicted in table 4.16, there are significant correlations between the following indicator variables: quality and deployed technology for ordering and procurement, quality and deployed technology for design and maintenance, quality and deployed technology for production processes, quality and technology deployed for logistics operations. In addition, there is significant correlation between infrastructure and technology for design and maintenance, infrastructure and deployed technology for production process, and infrastructure and technology for logistics operations.

Furthermore, there is significant correlation between expertise and technology for design and maintenance, and significant correlation between expertise and deployed technology for production processes. The strongest correlation significant is between quality and deployed technology for design and maintenance, followed by infrastructure and technology deployed for production processes. The implications of the above results invariable

means that outsourcing empowers organisations to gain new skill and knowledge so that it can afford to develop it expertise to maintained high-level technology. The second point is that outsourcing offers opportunities to firms by exposing them to state-of-the art infrastructural facilities of larger organisations.

4.7.6: Correlations analysis of deployed technologies and financial performance.

Bivariate correlation was also conducted to understand the association between firms’ choice of deployed technologies and organisational financial performance. This correlation involved five choices of deployed technologies and four indices of financial performance measurements.

Table 4.17: Correlation between deployed technologies and financial performance

Variables	Technology for ordering and procurement	Technology for information and communication	Technology for design and maintenance	Technology for production process	Technology for logistics operations
Annual turnover	.197* (.049)	NSC	NSC	.340** (.001)	NSC
Market shares	NSC	NSC	NSC	NSC	NSC
Annual return on investment	NSC	NSC	NSC	NSC	NSC
Corporate social responsibility	NSC	NSC	NSC	NSC	NSC
*Correlation is significant at .05 levels (2-tailed). **Correlation is significant at.05 levels (2-tailed).NSC: NO significant correlation					

The results as depicted in table 4.17demonstrates significant relationship between annual sales return and technology deployed for ordering and procurement, significant relationship between annual sales return and deployed technology for production processes. These findings support the research results that indicates a high surveyed respondents’ perspectives in accepting technology deployment in outsourcing arrangements as key to their organisations financial performance (see table 4.12).

4.7.7: Correlation coefficient of financial performance and competitive attributes

Bivariate correlation was carried out to determine the association between firms' financial performance measurement and their competitive attributes. This correlation involved four indices of measuring financial performance and three competitive attributes of the organisation.

Table 4.18: Correlation between financial performance and competitive attributes

Variables	Annual return	Market shares	Annual return on investment	Corporate social responsibility
Infrastructure	NSC	NSC	NSC	NSC
Expertise	NSC	-.258** (.010)	NSC	NSC
Quality	NSC	-.207* (.038)	NSC	-.214* (.033)

*Correlations is significant at .05 levels (2-tailed). **Correction is significant at .01 levels (2-tailed).NSC: NO significant correlation

The results in table 4.18 report a significant correlation between expertise and market shares, significant correlation between quality and market shares and significant correlation between quality and corporate social responsibility. The implication of the results invariably explains that expertise, be it professional, technical or operational, is needed to readily transform knowledge into concrete financial performance, in terms of market shares. Additionally, through operational quality, improvement quality and a holistic total quality management, outsourcing organisation will become profitable and may invest some of the proceeds towards social engagement with its host community.

4.8: Regression Analysis of the Research

Regression analysis is a family of techniques including simple regression, multiple regression and other forms of regression. Simple regression occurs when analysis involves one independent and one dependent variable. However, when analysis involves multiple independent variables and one dependent variable, the term is called multiple regression (Gray, 2018).

In facts, the primary purpose of regression analysis is to test the effect of one or more independent variable on one dependent variable. In order words, regression analysis is used to measure the relationship between the dependent and independent variable and assess the significance of this relationship (Gray, 2016). Another important objective of regression analysis is to obtain a formula to predict the value of the dependent variable for a new case based knowledge of one or more independent variables.

However, one of the key differences between the Regression analysis and Correlation analysis is that correlation accesses only the relationship between the two variables, which tend to move together in the same (positive) or opposite (negative) direction, and has no assumption that one variable (independent variable) is affecting the other variable (or dependent variable). But regression analysis explores how the value of the dependent variable changes when any one of the independent variable is varied, whilst the other independent variables are held constant (Bryman and Bell, 2011). It is the most widely used techniques employed in social science for analysis of data research which is accessible for computer packages.

For the purpose of this research, multiple regression analysis using **SPSS version 23** were employed to determine the relationship between the independent variables (outsourcing drivers, deployed technologies and competitive attributes) and dependent variable (financial performance) of the study. Regression analysis were conducted after independent variables were correlated with the dependent variables (Coakes, 2013; cited by Rahman, 2013). We demonstrated this points in the test for normality involving scatterplot, normal p-p plot and we show example how straight line shows 'best fit' on the graph (see figure 4-2, 4-3, and 4- 4).

Q3. What are the impact of outsourcing drivers and deployed technology on business performance?

Regression analysis model employ this 'line of fit' to predict the value of dependent variable from the assign values of an independent variables. Thus this line is regarded as the regression line. Just like any straight line on a graph, the regression line can be expressed as an equation:

$$\mathbf{Y = a + bX}$$

Where:

- a is the intercept. This signifies the value of Y at the point where the regression line crosses the Y axis. It is referred as the regression constant.

- b is the slope. It signifies the number of units by which Y changes for each change in a unit of X . This is regarded as the regression coefficient. Y is generally referred as dependent variable, whilst X is the independent variable.

Additionally, if $b = 1$, then the line is at 45 degrees. If $b > 1$ then the slope is steeper, and if $b < 1$, then it is less than 45 degrees. More so if $b = 0$, it indicates the changes in X have no effect on the values of Y . Therefore, if b is positive, it follows that Y increases as X increases (the line rises from left to right), and if it is negative, it follows that Y decrease as X increases (the line falls from left to right) (Saunders, 2012).

There are also an account for an error, where equation predicting any value of Y is:

$$Y = a + bx + e.$$

Although when constructing regression model, the error is often ignore. One of the key points in this study is to determine how far X predict the value of Y . Other influences on Y are less significant for the model that this research is testing.

4.8.1: Regression analysis between outsourcing drivers and deployed technologies

4.8.1.1: SPSS procedure for regression analysis

To calculate a bivariate regression of Y (the dependent variable – Financial Performance) on the independent variables (deployed technology and outsourcing driver):

- Under the ‘Analysed’ I highlighted ‘Regression’ and then clicked on ‘Linear’.
- A dialog box opened showing ‘Linear Regression’. I scrolled down the list of variables and found the independent and dependent variables, and transferred them into the appropriate boxes.
- There was no need to select ‘Statistics’ since by default, SPSS produces regression coefficients and ‘model fit’ statistics, including Pearson’s r and R Square. I ignored the ‘WLS’ button (standing for ‘weighted least squares’), the ‘Options’ and saved button, and click on the ‘Plots’ and select the ‘Histogram’ and the ‘Normal probability plot’ in order to obtain the plots of standardised residuals.
- Since I want to obtain a casewise plot of standardised residuals (‘ZRESID’) by standardised predicted scores (‘ZPRED’), so I pasted ‘ZRESID’ into the box next to ‘ Y ’ and ‘ZPRED’ into the box next to ‘ X ’. I clicked on continue so I could return to the ‘Linear Regression’ dialog box, and then on ‘OK’.

4.8.1.2: Explaining the outputs the data in model summary 1

In these results of regression analysis, there are three most important outputs, which include: The model summary, the table of ANOVA and the table of coefficients. These outputs are contain in the table 4.19, 4.20 and 4.22 respectively.

The first set of output - **Model Summary**, demonstrates four statistics that summarise the model:

- R is the correlation coefficient, with two variables (deployed technology and outsourcing driver). For this research, this is exactly the same as Person’s r statistic at 0.766.
- R Square is the square correlation coefficient, or the determination coefficients. It demonstrates the extent to which X Predicts Y. In order word, it shows the proportion of variation in the dependent variable explained by the independent variables. In this case, 58% of variance in firm’s financial performance is explained by outsourcing drivers and deployed technologies.
- Adjusted R Square mitigate the fact that the R Square for any sample tends to slightly exaggerate the goodness of fit actually found in the population from which it is taken. What it means from this table is that, R Square is reduced from 0.587 to 0.525.
- The standard Error is the standard deviation of the residuals of the estimate. In the simple language, it is the amount by which any prediction of the value of Y (based on the value of X) is likely to be wrong.

Table 4.19: Model Summary outsourcing drivers and deployed technologies on performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.766(a)	0.587	0.525	0.828

a. Predictors: (Constant), Outsourcing drivers, deployed technologies b. Dependent variable: Financial Performance

Table 4.20: Analysis of variance (ANOVA)

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	83.698	13	83.698	9.402	.000 (b)
Residual	58.892	86	.685		
Total	142.590	99			

Table 4.21: Coefficient Beta

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	6.159	.853		7.224	.000
Deployed Technology	-.369	.181	-.181	-1.799	.001
Outsourcing Driver	-.325	.179	-.179	-1.806	.074

The second part of the results is **ANOVA**. It contains the statistics that determine whether the effect of the X on Y is significant. This is determined by dividing the variation in Y (the dependent variable) which is explained by the model by the variation in Y which is left unexplained (e.g. the analysis of the proportion of variance that we have explained). In other words, what is left unexplained is known as residual.

- The first column of the ANOVA, shows the ‘Sum of Square’. This explains the distance between each observation of Y and the mean of Y, square to remove minus signs, and all added together (the total variation in Y). The Sum of Squares of the Regression (the first row) is the amount of the variance explained by the model (the variations in Y that can be likened to the association with X), whilst the Sum of Squares of the Residual (in the second row) is the amount of variance that remained unexplained. This must have been caused by other variables not in the model, or other inaccurate measurement of Y.

In a more practical step, if we divide the sum of the squares of the regression by the total sum of the squares, we will get R square statistics (the proportion of the total variance in Y explained in the regression). Hence, the sum of squares of the regression (83.698) divided by the total sum of the squares (142.590) produces the R Square value of 0.587.

- The ‘Mean Square’ column is the average amount in which each observation of Y differs from the mean. It is determined by dividing the sum of the squares by degrees of freedom.

- The 'F test' demonstrates the statistical test of the significance. It expresses the mean square of the regression and the mean square of the residual as a ratio. If this is sufficiently high, then the probability slightly shows that the fit of the model to the data could have occurred by chance. In this instance, the $p = .000$, so the relationship exceed 99% significance level. Therefore, we can be fairly confident that the association between technology and outsourcing does exist in the population from which the sample was drawn.

The last output in table 4.21 is 'Coefficients'. This provides the figure from which we can construct the equation for the regression line. There are five statistical results in this table that are very significant and are interest:

- 'B' is the regression coefficients, or the slope of the line. This figure for the dependent variable shows the amount in which the Y changes for each unit increase in X. For example, for every unit we improve the Outsourcing strategies and deployed technologies, organisations performance is enhanced. The minus sign demonstrate that there is a negative relationship between the two variables.
- The figure for Constant shows the intercept. It predicted the value of the Y when the dependent variable is zero. In this case, financial performance is equals 6.159 at the point when outsourcing technology is zero (this is of course is the result of the extrapolation of the line).
- The 'Std. Error' is the Standard Error of B. This is the number of standard error in which the predicted value of Y, which is based on the value of X, could be wrong. When a figure is greater than 2, it would indicate a problem, for 2 or more standard errors from the mean violet the accepted probability levels of 95 per cent. Therefore, predictions will not be statistically significant. In the case of this findings, the standard error of B is .181 and .179 respectively.
- 'Beta' is the standardised regression coefficient. In a simple regression, this is the same as Pearson's r, but in a multiple regression models involving more than one independent variable, the betas will shows the relative strength of the different independent variables impacting on the dependent variable.
- 't' is the t test which assesses if the relation of the independent variable to Y could have occurred by chance. The value of t is determined by dividing B by the standard error of B. In this case, one of the t value is statistically significant ($p < 0.000$) whilst the other is not ($p = .074$).

Predicting the value of independent variables using the regression statistics

The 'coefficients' table provides the information that can be used to construct the regression model/equation. It is also important to observe that the outsourcing driver is not statistically significant.

Based on the statistical results in table 4.21, we can now develop our regression equation.

We know that $Y = a + bX$. Where Y = Dependent variable, X = Independent variable, a = constant, and b = regression coefficient. This generates the prediction that firm's financial performance (Y) will be:

6.159 (a , the constant).

Plus - 0.694 (b , the regression coefficient) for every units increase in the outsourcing technology (X).

But table 4.1 contains more than two variables (Deployed technology and Outsourcing driver)

Therefore, the final regression equation follows:

$$Y = bX_1 + bX_2 + a$$

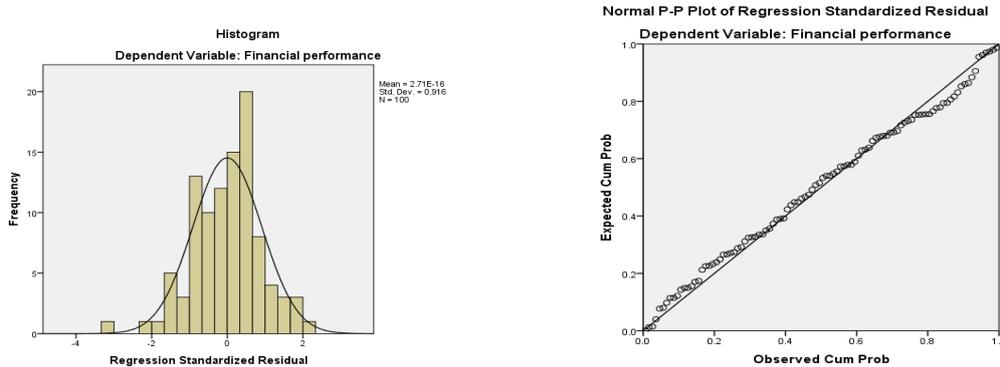
$$Y^* = -.369X_1^* -.325X_2^* + 6.159^*$$

*statically significant at the $p < 0.05$ level.

Additionally, the two graph that follow indicate the histogram of the regression standardised residual for the dependent variable as well as the observed by expected cumulative probability for the dependent variable, Financial performance.

Histogram is a statistical chart, which is used to determine the distribution of a database. The histogram demonstrate that the scores were reasonably distributed. In any case, the assessment of other characteristics is required and necessary including the Normal Q-Q Plot which also supported the histogram as shown below.

Figure 4.8: Histogram and Normal q-q plot



Interpreting the output of the multiple regression results in table 4.22

The equation regression model is:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + \dots b_kX_k$$

The value of Y is predicted at the constant (intercept on the Y axis of the graph), plus a multiple of the value of the first independent variables, plus a multiple of the value of the second independent variables and so on. It also important to note in this case, that it is increasingly difficult to visually represent this in terms of best line of fit in scatterplot since it involves more than two independent variables unlike in the table 4.1 above. Additionally, when more than one independent variable is entered in a regression model, the influence effect each has on the dependent variable is calculated while holding the influence of all the other independent variables constant.

For an example, in a multiple regression equation with just three variables such as in this study, the following scenarios will play out>

b_1 = the change in Y for each unit change in X_1 while holding X_2 constant

b_2 = the change in Y for each unit change in X_2 while holding X_1 constant

b_3 = the change in Y for each unit change in X_3 while holding X_2 constant

Q5. What are the business performance outcomes of outsourcing drivers and deployed technologies when moderated through a competitive attributes?

Therefore, the model summary statistics and coefficients from a multiple regression of outsourcing drivers, deployed technologies and competitive attributes on financial performance are demonstrated in table 4.23.

4.8.1.3: Explaining the outputs of data in the model summary 2

The model summary statistics describe the model as a whole, rather than to the association between Y and any specific independent variable:

- The R Statistics is the multiple regression coefficient (the capital letter employed to distinguish it from the Pearson coefficient, r , which is employed only for the bivariate correlations). So in a multiple regression statistics, R shows the extent in which all the independent variables together are correlated with the dependent variable.
- The 'R Square' and 'Adjusted R Square' demonstrate the proportion of the linear variance in Y explained by the model as a whole (it means all the independent variable working together). The R Square value is 0.603, indicating 60% variance of the three independent variables (deployed technology, outsourcing driver and competitive attributes) on firm's financial performance. The Adjusted R Square value is 0.526.
- The 'Standard Error' measures the amount by which predictions of Y based on all independent variable values are likely to be wrong, and the F test included in the ANOVA is a test of significance of the model as a whole. The Standard Error is 0.826. In this research output, the $p = 0.000$.

The Coefficients output is explained as follows:

- 'B' is the regression coefficients, or the slope of the line. This figure for the dependent variable shows the amount in which the Y changes for each unit increase in X_1 , X_2 and X_3 . For example, for every unit we improve the outsourcing strategies, deployed technologies, and competitive attribute, the organisations performance is enhanced. The minus sign demonstrate that there is a negative relationship between the variables.
- The figure for Constant shows the intercept. It predicted the value of the Y when the dependent variable is zero. In this case, financial performance is equals 6.181 at the point when independent variable is zero (this is of course is the result of the extrapolation of the line).
- The 'Std. Error' is the Standard Error of B. This is the number of standard error in that predicted value of Y, which is based on the value of X. In the case of these findings, the standard error of B is .181, .189 and .103 respectively.
- 'Beta' is the standardised regression coefficient. In a simple regression, this is the same as Pearson's r , but in a multiple regression models involving more than one independent

variable, the betas will shows the relative strength of the different independent variables impacting on the dependent variable.

- ‘t’ is the t test which assesses if the relation of the independent variable to Y could have occurred by chance. The value of t is determined by dividing B by the standard error of B. In this case, Deployed technology is significant at $p < 0.005$), the outsourcing driver is not significant at 0,074 and lastly competitive attributes is insignificant at 0.61

Table 4.22: Model Summary moderating attributive on Outsourcing driver and deployed technologies

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
2	0.766 (a)	0.603	0.526	0.826

a. Dependent variable: Financial Performance

b. Predictors: (Constant), Outsourcing Driver, Deployed Technology, Competitive Attributes

Table 4.23: Coefficients Beta

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
2 (Constant)	6.181	.771		8.014	.000
Deployed Technology	.625	.181	.381	2.799	.005
Outsourcing Driver	-.362	.189	-.179	-1.906	.074
Competitive Attributes	-.103	.203	-.051	-.508	.613

Table 4- 24: Analysis of variance (ANOVA)

Model	Sum of Square	Df	Mean Square	F	Sig.
2 Regression	85.931	16	85.931	7.868	.000 (b)
Residual	56.659	83	.683		
Total	142.590	99			

a. Dependent variable: Financial Performance

b. Predictors: (constant), Competitive Attribute, Deployed Technology and Outsourcing Drivers

The AVOVA results

- The 'ANOVA', shows the 'Sum of Square'. This explains the distance between each observation of Y and the mean of Y, square to remove minus signs, and all added together (the total variation in Y). Additionally, the sum of squares of the regression (85.931) divided by the total sum of the squares (142.590) produces the R Square value of 0.603.
- The 'Mean Square' column is the average amount in which each observation of Y differs from the mean. It is determined by dividing the sum of the squares by degrees of freedom.
- The 'F test' demonstrates the statistical test of the significance. It expresses the mean square of the regression and the mean square of the residual as a ratio. If this is sufficiently high, then the probability slightly shows that the fit of the model to the data could have occurred by chance. In this instance, the $p = .000$, so the relationship exceed 99% significance level.

Furthermore, the outcomes of regression analysis is an equation that represents the best prediction of independent variable from several independent variables. This equation is often represented by:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + \dots b_kX_k$$

$$Y^* = .625X_1^* + (-.362X_2^*) + (-.103X_3^*) + 6.159^*$$

*statically significant at the $p < 0.05$ level.

4.9: Conclusion

This chapter reported the result of a survey by questionnaire conducted to test and validate the research questions and objectives of this study. This study specifically revealed an association between technology and outsourcing and their strongly influence in driving financial performance of an organisation. It also proved that competitive attributes like infrastructure, quality and expertise can moderate, weakens, strengthens or increase the impact of outsourcing and technology on the organisational financial performance. Essentially the study has demonstrated that outsourcing and technology can provide opportunities that are not available domestically in most developing oil and gas economies. Additionally, outsourcing and technology can also mitigate the nature of risks and hazards, which may limit a SME's prospects.

CHAPTER 5

EXPLORATIVE INTERVIEW

5.1: Introduction to Qualitative Interviews

This chapter outlines in details the exploratory interviews conducted among three outsourcing and supply chain experts in the oil and gas industry. The purpose of the interview was to explore the role of technologies in outsourcing practices in oil and gas sector. Existing literature has studied the outsourcing arrangements and the various roles technology innovations have played in oil and gas industry. However, there is limited information concerning the combined roles and associated relationship between deployed technologies and outsourcing operations in driving business performance. The interview questions were developed from the review of previous and existing literature in oil and gas research papers, consultant corporate reports, and government policies, especially in the context of developing oil and gas nations. The reason for adopting semi-structured interview is to validate the findings from the quantitative research and provided the balance needed to mitigate any inherent bias from the study. Qualitative data provide the rich descriptions and explanation that demonstrate the chronological flow of events as well as often leading to unexpected findings (Gray, 2016).

The use of semi-structured interviews gives the researcher (interviewer) the opportunity to ‘probe’ for more detailed responses where the respondent is asked to clarify what they have said (Saunders and Lewis, 2012). Probing might also allow for the diversion of the interview into new pathways that was not originally considered as part of the interview. Miles and Huberman (1994) maintain that qualitative studies have a quality of ‘undeniability’ because words have more concrete and vivid flavour that is more convincing to the reader than pages of numbers. Nevertheless, qualitative analysis has been criticized for lacking in methodological rigour, prone to researcher subjectivity and based on small cases or limited evidence. Thus, there are no widely accepted rules of the extent it should be analysed (David Gray, 2016).

5.2: Demographic Information of Participants

This section outlines the demographic information of the interviewees. The interviewees were renamed as A B C to protect their confidentiality. The participants have experiences ranging from 10 to 20 years in the oil and gas sector. The participants' details were presented in this sections. Table 5-1, reports the summary of the participants including their education background, the nature of their company, the country of domicile and their individual roles in the industry.

5.2.1: Participant A

Participant A is the head of supply chain and procurement in the oil and gas operations. The participant manages all the procurement, logistics and warehouse, stock and inventory activities. The participant Optimises cost and value creation in the procurement and distribution of materials and other services. Additionally, the participant leads and developed supply management staff, developed systems and strategies for upgrading supply chain practices. Additionally, the participants play the role of enhancing due process and compliance to all relevant laws and regulations in procurement and contracting.

He is qualified engineer and a member of Nigerian societies of engineers. He has 20 years of experience in oil and gas industry. In his career, has worked with many national and international companies including Nigerian National Petroleum Corporations (NNPC) and British American Tobacco (BAT).

Table 5.1: Demographic characteristics of participants

Participant	Year of experience	Position in company	Educational background	Country	Current company
A	20	Head of supply chain/procurement	Engineering	Nigeria	Oil and gas operator (national)
B	15	Manager outsourcing/material processing	Business administration	Nigeria	Services advisory – oil and gas operator (indigenous)
C	10	Operations/Project manager	Engineering	Nigeria	Oil and gas operator and contractor (multinational)

5.2.2: Participants B

Interviewee B has 15 years of experience in energy and oil services industries. She has held a managerial roles in material management and productions sharing contracts. She manage the planning of work programmes and budgets for all the PSC operating oil companies in Nigeria. She also manages budget performance, governance meetings and oversight value creation in project conception selection and implementation. She is working for an upstream exploration and services company in Nigeria. Prior to that, she worked with many indigenous and international oil and gas firms including Transoceanic oil and gas and British Petroleum (BP).

5.2.3: Participant C

Interviewee C is the operations/project manager for one of the multinational oil and gas companies in Nigeria. He began his career in the petroleum industry in 2008 and has played different roles in the industry, ranging from reviewer of strategies, tactical and operational materials requisitions against key controls and criteria. He also assess materials demand against supplier and market availability and determination of the appropriate acquisition tactics (e.g. call-off, multiple tender, credit card purchase etc.). He also oversees and support resolution of all issues hampering the timely delivery of fit-for purpose materials to assist in expecting on time goods delivery. The participant also played a key roles in supporting senior and principal buyers to develop and implement category strategies within their business areas, to ensure high percentage of planned optimal solutions, as well as ensure availability of materials required for budgets/operational/ activity plans implementation.

5.3: Interview Methods

The explorative interview in this section is between interviewee and interviewer. It is an in-depth semi-structured interview designed to explore the wealth of experience of the participants and their view points, as it relates to the activities of technology outsourcing arrangements in oil and gas industry. The choice of this approach is in line with other various literature, where interview method is seen as a complement to quantitative approach. Interview technique is generally believed to provide an opportunity to interrogate, stir people's mind, hearts and souls and by so doing, generate new insights into the subject, their problems and their human conditions (Reason, 1981; cited by Gray, 2016).

In fact, in any research, what determines the most logical techniques to use is the circumstances of that particular research. In this case, the objective of this research was largely exploratory, involving the examination of feelings, attitudes, and perceptions. Furthermore, there are other reasons in literature that emphasize the advantages of qualitative interview techniques over the quantitative survey questionnaire method.

The explorative semi-structured interview was conducted by the researcher among three participants with a range of institutional experience, as well as a good background knowledge in oil and gas industry, spanning over 10 to 20 years (see table 5-1). The interview conversations were carried out via telephone in English language. It was recorded and transcribed. The interview was conducted within the early evening of 6pm and 6:59pm during the Spring Month of March–April 2016. The interview recorded a high response rate with very low cost. We believed that the high response rate was because of the timing of the scheduled interview. This is in line with the extant literature which maintained that interview conducted with this time frame and season often resulted in high response rate. Interview schedules in the months of spring (March, April and May) and autumn (September, October and November) are generally more successful than summer or winter months (Gray, 2016).

However, we experienced some level of measurable disappointment during the interview process. We discovered that participants were a bit conscious in the beginning of the interview, as their telephone line were showing a Nigerian number instead of the UK line. Though we were able to quickly discover that it was network issues emanating from the Nigeria telecommunication service provider. The second issue was that we could not exhaust the allotted time for the interview owing to initial disruption from the Nigerian telecom service provider. More so, we recognised that face to face contact would have yielded more results as over telephone conversations, in terms of reading the body language and physical expressions of the participants.

5.3.1: Interview questions

We developed the interview protocol based on the research questions originated from reviewed past and current literatures on technology outsourcing operations. In this phase, we went for an extensive literature search through gathering of data from different sources. The objective was to gain a deeper understanding of primary conceptual framework, expose the areas of interest and relevance to the scope of the research, as well as facilitates compatibility between respondents' answering during analysis (Roland et al., 2015). Additionally, the questions were

designed to understand the perceptions and opinions of supply chain expert in oil and gas industry; the role of deployed technologies and their impacts on organisational performance. A large number of potentially interesting questions were picked up from literature reviewed, seminars, and conferences attended by researcher as well as during paper presentation sessions. Access to participants were widened through personal interactions and advertisement of research topic at conferences both in Taiwan and USA. It is also worth mentioning that the influence of my Principal supervisor and his contacts within the research community, enhances the accessibility, identification, and participation of the respondents in the interview.

Other steps that enhances the interview response rates include:

- Ensured that the questionnaire was sent to the potential respondent and they were informed in advance that they would be telephoning within the next week to conduct interview.
- We also contacted each potential respondent at least twice more, each at different time and on different day, noting down the same information.
- We were flexibility as regards the availability of the potential respondent and made alternative appointment that suit them.

Interview questions were processed; grouped under common ideas or themes; and were categorised into a sequence of topics and subtopics to tally with the research objectives and challenges. After the first interview segment was conducted, in the subsequent interviews, questions were updated from the addendum generated from the probing methods deployed by the interviewer. This approach supported the literature claim that probing helped the researcher maximise the potentials to exploit new insights from the interviewee and opportunity to enhance the establishment of rapport, as well as reduced the risk of socially desirable answers (Patton, 1990; cited by Roland et al., 2015).

However, prior to the interview, initial questions were piloted and internally tested' by small group of PhD research colleagues in Operations management in Lancashire Business School (LBS), resulting in some major rephrasing of the questions. The pilot interviews also prompted us to use probes to elicit deeper responses (Hussey, 1997; cited by Roland et al., 2015). The interviews were conducted via telephone in English language. This done so that colleagues can assess the questions, detect the ambiguity, and give their general critique in relations to the correctness of questions.

Table 5.2: The summary of interview techniques over survey data

Advantages of interview techniques to data collections	Authors
The technique has the potential for high response and return rate as oppose to questionnaire by survey	Austin, 1998.
Semi-structured interview explores attitudes, values, belief, motives and behaviours when compare to quantitative approach	Richardson et al., 1965; cited by Smith, 1981.
It provides the research with an opportunity to evaluate the validity of the answer given by the respondent as the researcher can observed and account for the non-verbal expressions	Gordon, 1987.
Interview can facilitate comparability of answers provided by respondents on particular themes or questions	Barley, 1987.
Interview ensure the view of the respondents are devoid of assistance and makes his or her views less biased by outside influence.	Barley, 1987

Additionally, we also trialled the questions on people who have institutional knowledge and have worked in similar settings such as in Nigerian oil and gas industry where the research was carried out. This process gave the investigator a feel of real-world interview process, as well as created the alertness about how the questions could be managed. Another important reason for testing the research questions at this level was to enable the research to concentrate on the structure of the interview (e.g. introduction, development, and closure). In addition, this process offered the researcher the opportunity to test the each interview allotted time, which was between 1-2 hours per case-interviewee, for the actual interview.

These steps are in line with literature recommendation that respondent should be considered throughout the construction of an interview schedule, since the participants will be doing the work by supplying the answers to the questions (Mann, 1985; cited by Gray, 2018). This protocol provided the needed structure for analysis as demonstrated in **Chapter 2**. In general, qualitative researchers often expresses various concerns about the accuracy of selections, synthesis and description of the data in a detached and objective way as possible. Some are more concern about theory building, interpreting the data to build concepts and categorising

them into the theoretical frameworks (Gray, 2018). Nevertheless, other researchers primarily agree that qualitative research is all about story telling (Wolcott, 1994).

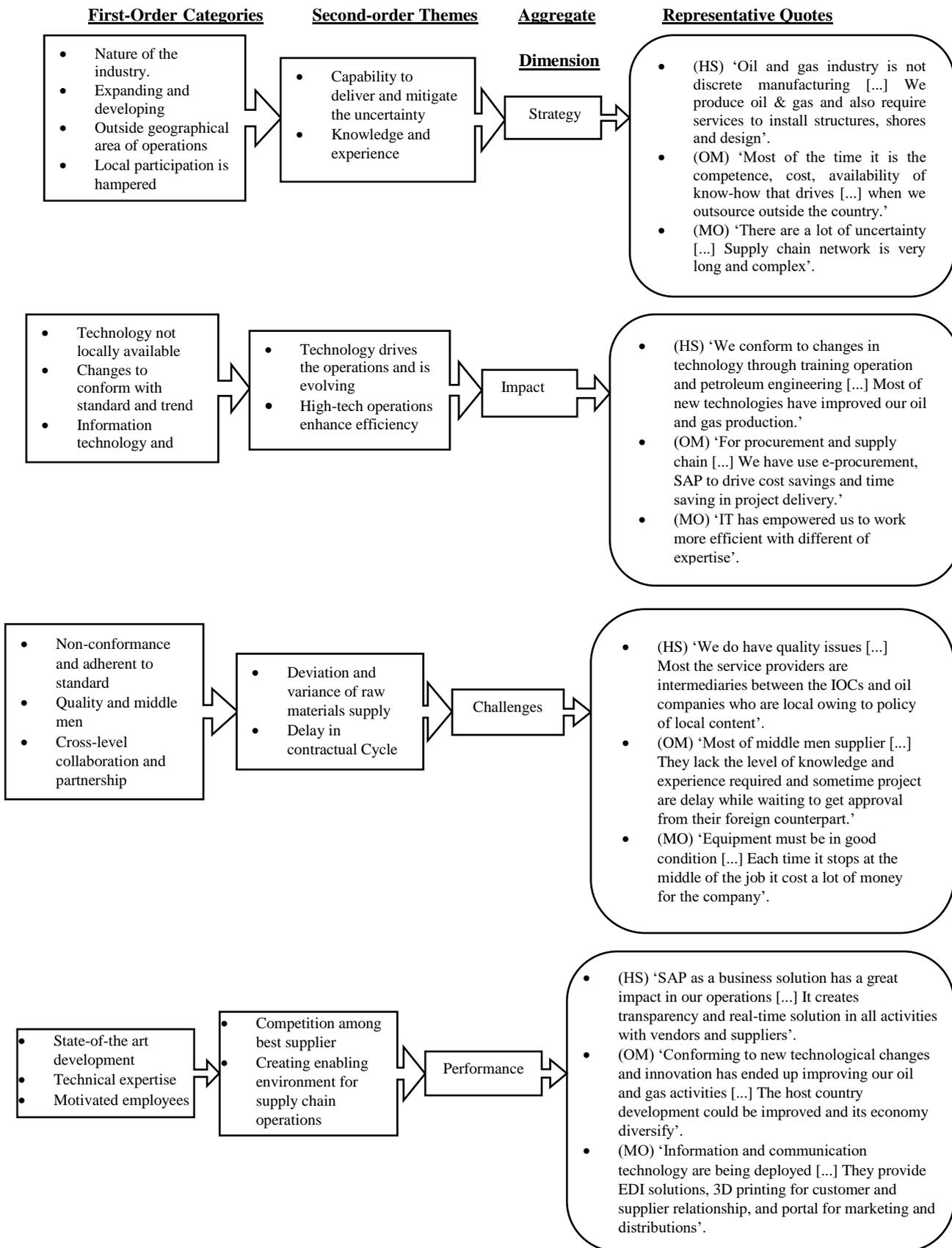
5.3.2: Equipment and interview process

One of the strengths of telephone interview over questionnaire is that interviewer can help respondents with any misunderstandings or difficulties they may have during the interview process (Gray, 2016). In other words, according to Roland et al. (2015) telephone interview create the opportunity to replicate the content of each interview session in a manner that facilitate analysis. In addition, response rate in telephone interview could be raised and encouraged if the interviewer has a slick and persuasive manner. Although the procedures used for this technique are important and must be giving a considerable attention, it also crucial to consider the dynamic nature and subtle problem of topic control and data interpretation.

In the tele interview process, we adopted a professional telephone manner that necessitate long interview such as good rapportage, and making preliminary call to set up a time for the interview. The following field equipment were procured and used in the interview: audio recorder for recording interview proceedings, and transcribing machine. Each interview session was taped recorded and the transcription began as soon as we conclude each interview. These equipment provide an accurate and unbiased record (Saunders and Lewis, 2012) and offers us the opportunity to listen and validate the content after the field interview and during transcription.

Two team of researchers were supposed to take part in the entire interview proceedings. This is in line with Eisenhardt (1989; cited by Saunders and Lewis, 2012)) who recommends that this nature of semi-structured interview required at least two people per interview session so that one of the team members can introduced the topics to the interviewee while the other one records the proceedings. However, there was no need to do so since the entire conversations were recorded. Furthermore, to give enough time for preparation for the next interview, and in order not to lose memory of the previous data, we adopted a three-day time space between two consecutives interviews. This also allowed the researcher to listen to the tape severally before transcribing the conversations. Additionally, it helps the researcher reflect over any pitfalls in the interview schedule before the next session commences. The significant of these steps were that, it enabled

Figure 5.1: Thematic analysis of the interview



Note: Head Supply chain (HS); Outsourcing/material processing Manager (OM); Manager Operations and Project management (MO).

the research to fill in the gaps that were identified in the data, as well as incorporate such identified lapses as part of the probing questions in the next interview session. The transcribed reports were made available to the respondents for clarification in case there were any misunderstood statements as well as any omissions. At the end, we labelled each specimen, evaluate, and analysed each content in the transcript in turn. Substantive statements were highlighted so that we ignored repetitions, digression and irrelevant materials.

5.4: Interview Analysis and Findings

This interview section began with descriptions of the overall processes which lay the basis for analysis. It went further from interpretation, to understanding and explanation. In this qualitative interview, the researcher asks the participants a series of open-ended questions, whilst the participants responded in their own words. The conversation was audio-recorded and recording was transformed into written text, through a process of transcription. The data analysis was organised on the thematic basis employing both manual and software approach to help make sense of the data. In figure 5.1, the interview data was coded based on recurrence of words used, representative quotes, guided by probes and keywords. Also Pattern matching and recurring themes were finalized using Nvivo nodes (Lee and Kim, 2007; cited by Roland et al., 2015). The first-order theme was examine based on broad categories, while the second-order themes emerge from the data.

Furthermore, in the third stage, thematic patterns were group into a meaningful concepts or aggregate dimensions (Krippendoff, 1980; cited by Roland et al., 20013). This process as depicted in figure 5.1, depended on the conceptual framework (see figure 5.1 chapter 5), research objectives and research questions, in order to provide the analytical procedure required to achieve a pattern matching (Miles and Huberman, 1994). This step also provides the understanding about relationship between the concepts and empirical data, as illustrated in figure 5.1. The research findings demonstrated the respondents' interpretations of outsourcing practices, deployed technologies, competitive attributes and their impacts on organisations performance. These processes were designed to evaluate the association of deployed technologies, outsourcing drivers, competitive attributes and the roles they played in business functions through dimension elements of strategy, impacts, challenges and performance.

5.4.1: Organisations outsourcing arrangements

Outsourcing arrangements appears to be one of the most principal objective tools for firms for reducing uncertainty and improvement of flexibilities. Most literature sources also maintained that any firm that embraces outsourcing strategy reap numerous benefits such as competitive advantages in form of reduced-costs, increased value factors of production, business networking and market shares. Also firm's strategic alliance is increasingly dependent on outsourcing arrangements, in such a way that company can leverage client's expertise, technology know-how, intellectual property and market to expand their products and services without expending internal resources.

Furthermore, the major line of activities in outsourcing operations include transportation, storage, warehousing and value addition services like packaging and labelling. According to some literature source pointed out that for the past 20 years, outsourcing of logistics activities has been one of the most used services in many companies. Several authors (Levy, 1995; Weidenbaum, 2005; Hofmann and Belin, 2011; cited by Muhindo, 2013) maintain that strategic outsourcing is a smart way to obtain capabilities without investments.

The following extracts from the discussion confirmed these statements:

"Oil and gas industry by its volatility nature, long and complex supply-chain network is a classic model for outsourcing managements." [Participant A]

"Outsourcing arrangements is mitigating the uncertainty, as the sector continues in its ever expanding and developing trend. " [Participant A]

"Yes, there are a lot of competition in the industry." [Participant B]

"We compete for raw materials, technological skills and other resources." [Participant A]

"It is absolutely necessary we source externally because of middleman issue leading to delay in contractual cycle." [Participant B]

"Delayed project is owing to waiting time for middleman to get approval from foreign counterpart." [Participant C]

"These are the motivating factors why our firms outsource externally." [Participant C]

Current literature stated that in petroleum industry, outsourcing arrangements has maintained a significant role in mitigating the costs of maintaining existing aging infrastructures and skills shortage (over 50% per cent are retiring) (Modarress et al., 2016). Essentially, through outsourcing engagements, oil and gas firms are offered the opportunity of diversity and breadth

of knowledge to developed technology or product innovations outside their business's dominant field. In fact, it means that a company can search and buy any knowledge that answered any of its recognised needs, be it technology, manufacturing procedures, or a product component (Baloh et al., 2008).

More so, increase in reliance on outsourcing activities is also increasingly recognised in other diverse industries. These comprises the discrete manufacturing industry (Wisner, 2003; Chen et al., 2004; Gunasekan et al., 2004; Young et al., 2014; cited by Yusuf and Menhat, 2017), as well as automotive industry and hospitality industry. In a sense, outsourcing initiatives would undoubtedly provide strategic options in industry's operational mix.

In general, none of the qualitative responses on the issue of outsourcing decisions to access new technologies contradicts any of the others as summaries in table 5.8. Although their supporting arguments varies, it can be seen that they are closely related in a way that complements the other respondents' viewpoints. More importantly, these various motivations are in line with current literature on this topic. These eight factors are what informed and drive organisations decisions in any outsourcing arrangements, especially within the oil and gas sector.

Table 5.3: Overall industry outsourcing decisions

Outsourcing decisions for the industry	Participant A	Participant B	Participant C
Access to new technologies	×	×	×
Cost of reduction		×	
Increase in flexibility	×		×
Information sharing	×	×	
Risk sharing		×	×
Organisational performance			
Core competence		×	
Market competitiveness	×		×

5.4.2: Influence of technologies on organisations performance

Outsourcing of logistics, IT and production have shifted the role of many organisations from a producer of goods to a coordinator of the industry value chain (Choy and Lee, 2003). The evolution of IT and improvement in computer technology have increasingly enhanced logistics supply chain history, as well as the outsourcing practices. For example, EDI (electron data interchange) solutions and 3D printing (in area of mass customisation) are being used today for customer and supplier relationship management. In additions, several literature maintained that the use of IT tools enables continuous, real time communication between supply chain links (Muhindo et al., 2014). In fact, most literature maintained that outsourcing collaboration encouraged real-time communication and better platform for both partners – services providers and contracting firms, to participate in coordination and problem-solving activities (Gomez-Conde, 2015). This collaboration could be sustained especially in area of technology, especially with indigenous local firms and foreign Multinational partners.

Some scholars (Le, 2008; cited by Isaac et al., 2012) suggest that outsourcing arrangement has often empowered local firms with ability to generate technology externalities, in their non-core operations, though training with large organisations (Le, 2008; cited by Isaac et al., 2012). Additionally, technology spillovers may also come from competition generated by the presence of foreign firms in the market, and this can also induce domestic firms to introduce new products or new technology to defend their market share, as well as adopt new management methods to increase productivity (Isaac, 2012).

Besides the above points, the following extracts from the discussion confirmed these statements:

“I think technology drives our cost saving and time saving, especially in project delivery.”

“Most of the issue we face in this company is lack of know-how and inaccessibility of new technologies, particularly IT to enhance our operations.”

“I am very sure information and communication technology will enhance the efficiency of work in this company.”

“Through collaboration with foreign firms in employee training and development, I believe we will conform to technology changes, thereby improving our oil and gas productions.”

“In oil and gas sector, supply chain network is very long and complex and this poses challenges, in terms of developing capabilities in-house.”

“We have to source for competent services providers that will install structures, shores and design for the company.”

5.4.3: The challenges of outsourcing operations

Most outsourcing organisations are striving to standardize their services and products so that they can grow rapidly while keeping cost under control (Ruzzier, 2012). Literature sources has also maintained that standardization problems in outsourcing practices will always create as many challenges at it solves, since the arrangements, more often than not involved both external provider, as well as with organisation itself. Some of the shortcomings, according to Ruzzier (2012) include miscommunication, misalignment, poor governance, lack of coordinated management, and inaccessibility of new technologies, lack of technical know-how and global expertise practices and poor infrastructure.

Moreover, other literature have confirm that the major challenge in any outsourcing engagements, is when there is variation which impacts on the quality of the entire outsourcing operations. The authors agreed that since quality requirements involves statutory and regulatory compliance with minimum standards of material and implementations; therefore, before service or products is outsourced, quality of services or products should be measured against the standards.

Some of the major challenges discussed in the above context complement the respondents’ statements:

“some of the major challenges in achieving these goals include poor quality services in area of material processes”

“I think Poor quality has to do with non-conformance and adherent to quality standard, which leads to deviation and variations of raw materials supplied. ”

“Also quality issues emanated from the local content policy and middleman element, which mandated IOCs to collaborate with local companies.”

“Most local companies that registered as middleman with multinationals do not have the level of experience and knowledge to execute the job, and sometimes project is delayed because

they have to speak to their parent company, which often takes time leading to delay in contractual cycle.”

5.4.4: The overall performance of the outsourcing arrangements

Extant literature suggest that most firms traditionally outsource either to improve their operations capability and services or to reduce cost. In other words, if these performance measures are not satisfactorily achieved, outsourcing is assumed to fails because the objective is not achieved. In addition, several literature defined performance in different ways. Literature sources also explained performance as way of getting people to do what you want them to do and like doing. Barker et al. (2008; Zadjabari et al. 2008)) explained performance as a process of continuous learning and development. Other sources measured performance as a set of processes that helps organisations to sustain their business performance, access their capability, and measure the level of productivity (Zadjabari et al. 2008).

Furthermore, previous literature traditionally measured performance only on the account of physical and tangible assets, whilst ignoring the intangible assets like skills and knowledge. However, most current literature agreed to business performance that are sustainable and based on social capital, human capital and physical capital measurable indices. Additionally, previous literature measured performance focusing on different methods that is based entirely on Skandia navigator model and BSC. However, the interview questions were quite different and addresses specific indices of financial measurement such as market shares, return on investment, annual sales income and corporate social responsibility.

The following extracts from the discussion confirmed the above statements, particularly one the central points of this research:

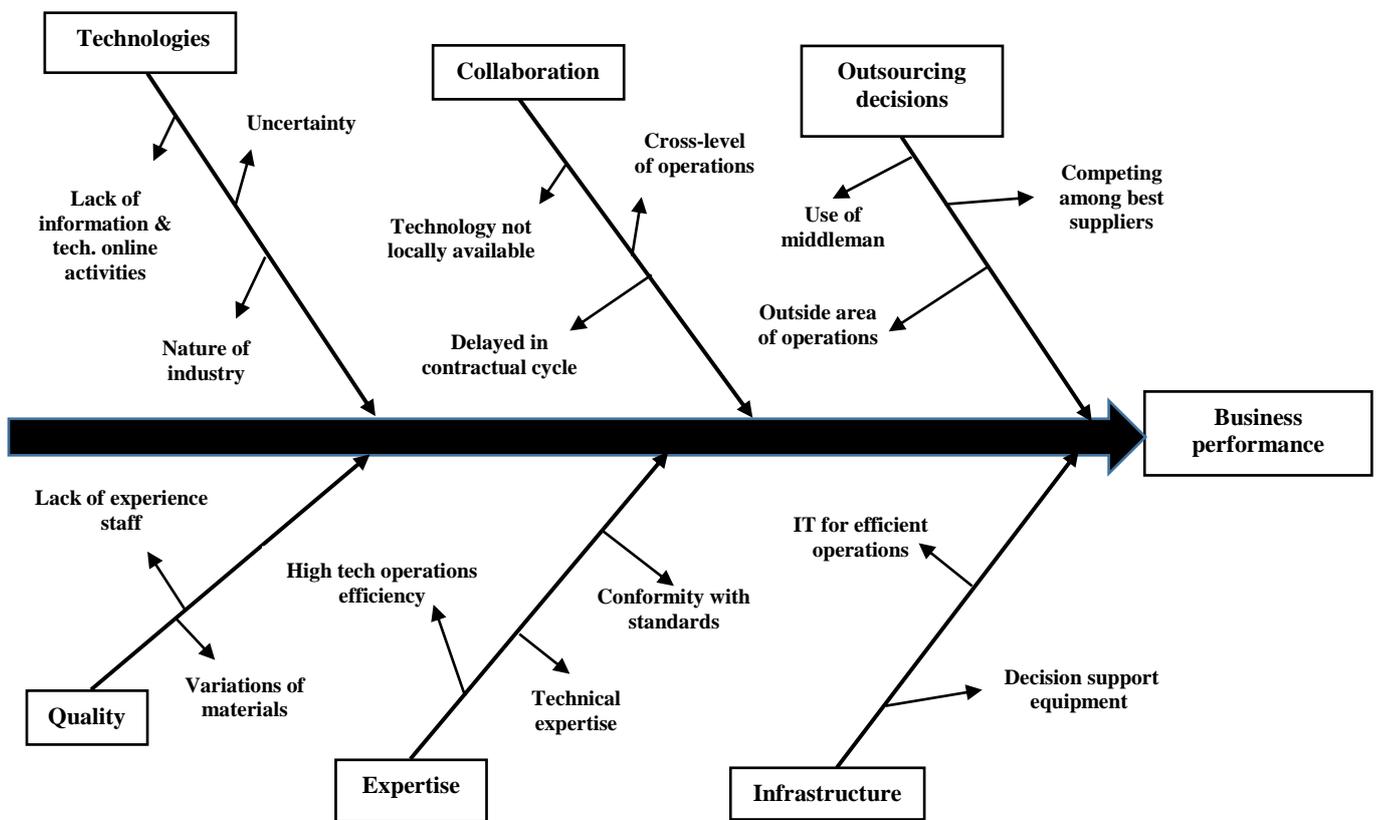
“when companies, especially smaller local firms (e.g.SMEs) conform to new technology changes and innovation, they end up improving their various operational activities.”

“The change could also lead to technology development of the firm and by extension improve the diversification of the economy of the host country.”

5.4.5: Interviews summary using fishbone diagram

The figure 5.2 reports the summary of interview discussion using cause and effect diagram known as fishbone diagram (Masoud, 2011). This approach combined brainstorming and a concept map. It also very efficient in combining qualitative and quantitative methodology.

Figure 5. 2: Fishbone diagram for oil and gas outsourcing operations



This process in figure 5.2 above has four major steps: identifying the problems; working out the major factors involved; identifying possible causes and analysing the cause and effects.

Furthermore, table 5.4 summarised the overall respondents' comments on the entire qualitative interview discussions on the major research constructs.

Table 5.4: Analysis results from the fishbone diagram

Outsourcing factors	Interviewees' comment
<p>Deployed technologies</p> <ul style="list-style-type: none"> • Lack of information • Uncertainty • Nature of the industry • Cost of raw materials 	<p>“Most of the issues we face in this company are cost of raw materials, lack of know-how and inaccessibility of new technologies, particularly IT to enhance our operations’. ‘There are also a lot of uncertainties due to the nature of the industry. In oil and gas industry, supply chain network is very long and complex and this poses challenges in terms of developing capabilities in-house or sourcing competent service providers that will install structures, shores and design”.</p>
<p>Collaboration</p> <ul style="list-style-type: none"> • Technologies not locally available • Cross-level operations • Delayed in contractual cycle due to middlemen issues 	<p>“We conform to the challenges of technological changes through training of our staff on the use of basic available tools and by collaborating with IOCs. Through this partnership, our staff will have access to new technologies and other cross-level operations. We also experience delay in contractual cycle. Some of the local service providers act as middlemen to big multinationals and would always seek their approval and clearance before embarking on any major contract “.</p>
<p>Outsourcing motivation</p> <ul style="list-style-type: none"> • Competing among the best Suppliers • Use of middlemen • Outside area of operations 	<p>“There are a lot competition in this industry, in terms of raw materials, technological skills and other resources. So we have to outsource our non-core functions outside the geographical locations. Another factor that necessitated this external sourcing is to avoid the middleman issue and the resultant delay in executing signed contract within the timescale. Projects are delayed while waiting to get approval from their foreign counterpart. The above points are the major motivating factors why our firm outsource outside its area of operations”.</p>
<p>Quality</p> <ul style="list-style-type: none"> • Train staff with knowledge and experience • Deviation and variance of materials 	<p>“We do have quality issues in terms of skilled staff and capable services providers that can deliver the job. Most of the services providers within these clusters are intermediaries between the IOCs and local oil and gas companies. Sometimes through this arrangement, quality are compromised. There are also issues of deviation and variance of material we often encountered from raw material procurement especially from the so called middlemen suppliers. They lack the level of knowledge and experience required”.</p>
<p>Expertise</p> <ul style="list-style-type: none"> • High technological efficiency • Technical know-how • Conformity of standards 	<p>“Global expertise best practices in oil and gas industry is key. So we often source the services of technology and technical expertise, who ordinary we may not afford to hire as a permanent staff. Through this arrangements, we have been able to inspired, nurtured and motivate our own staff into creating and developing new innovative ideals that enhances our operations and activities. In addition, through expertise practices, our organisation has been able to conform to both local and international standard practices”.</p>

<p>Infrastructure</p> <ul style="list-style-type: none"> • IT for efficient operations • Decision support equipment 	<p>“Equipment must be in good condition especially in production upstream sector of the industry. Each time there are breakdown of machines, particularly at the middle of the operations, it cost a lot of money for our firm. More so, poor infrastructure requires updating with advance technologies to secure digital integrated oil field and to collate on-time data from various sources on a common platform. Additionally, high level automation reduces any variance or deviations that may affect the quality and efficiency of the entire operations processes”.</p>
<p>Business performance</p> <ul style="list-style-type: none"> • SAP solutions • EDI solutions • 3D Printing 	<p>“Confirming to new technology changes and innovations, as well as accessing and deployment of technologies have significantly improved our oil and gas operations. For example, SAP as a business solution created transparency and real-time solution in all our activities with vendors and suppliers. Information and communication technology have also significantly enhanced our processes. These enablers provided EDI and 3D printing solutions for customer and supplier relationship, and portal for marketing and distributions”.</p>

CHAPTER 6

DISCUSSION

6.1: Introduction to Discussion Chapter

This chapter provides the details explanations of the results in **Chapter 4** and the research questions. The chapter also outlines the research objectives and implications of the study. Moreover, the study demonstrate how the results were generated by providing the findings and justifications.

6.2: Research Questions

The aim of this research was to investigate the impacts of deployed technologies and outsourcing drivers in oil and gas industry. Outsourcing and technology were considered as solution enablers that organisation within oil and gas sector employed in achieving and measuring its financial performance. The study also employed another construct – competitive attributes (e.g. quality, expertise and infrastructure) as a moderating variables to enhance performance. The study contains five research questions. In an attempt to answer these questions, a mixed method approached - a survey by questionnaire and semi-structured interview were adopted. The data collected from the survey was analysed using SPSS version 23, whilst the qualitative interview data was recorded, transcribed and thematically analysed. The details of these findings have been presented in **Chapter 4** of this thesis.

6.3: Findings of the Research

The purpose of this research is to study the role of technology in outsourcing practices in oil and gas industry. In doing so, five research questions were investigated.

The research questions and relevant finding are as follows:

6.3.1: Research question 1

Q1: Assessing the level of association between outsourcing drivers and deployed technologies in oil and gas industry

New technologies and outsourcing practices have contributed to the reduction of operational costs in the petroleum industry, from proof-of-concept to production, leading to overall cost of development (IEA, 2015). Similarly, Elango (2018) has stated that access to new technologies and outsourcing arrangements will increasingly empowered organisations in enhancing their performance, especially now that small entrepreneurial ventures are seeking to utilize outsourcing arrangements as a growth strategy.

According to Sanjay (2011), outsourcing has enabled smaller companies (SMEs') to expand beyond their traditional market reach by offering them access to data on market trends. Piachaud (2005) also believed that if a company lacks sufficient technical expertise to appraise new technologies or processes, it is prudent to hire a supplier to work with the internal department so that the staff may acquire the 'esoteric' knowledge needed to make better sourcing decisions in the future. Although, the author agreed that the decision as to which technologies should be developed in-house must be made on the selective basis of the one which can sustain the competitive advantage of the firm. Despite the consensus among most scholars that technology-efficient firms will always perform better than less efficient technological firms, and so also that better efficient-outsourcing organisations will always do better than less efficient outsourcing ones. Yet there is no empirical evidence that suggested any association between drivers of outsourcing practices and technologies deployed.

The findings of this research indicate an association between the outsourcing drivers and technologies deployed. Table 4.13 outlined significant correlations between the two enablers – technology and outsourcing. This is in line with previous research on outsourcing which suggests that outsourcing arrangements empowers the contracting firms to benefits from a superior set of cost drivers which include such factors as scale economies, learning and locations, as well as superior technologies, all which are readily available in the supplier (Piachaud, 2005). Additionally, the quantitative result in table 4.8, reports a complementary outcomes that indicate respondents' preference of access to technologies as their key outsourcing drivers.

The implication of this research will invariable means that organisations can employ outsourcing arrangements as a competitive tool to achieve financial performance. For example, technology capabilities can allow managers to effectively segment their value chains, thereby presenting companies with a number of options and flexibilities to outsource some or all of their components to suppliers anywhere in the world with the minimum of costs. In order word,

better technology means processing quicker and cheaper. In general, these results have contradicted the previous literature classifications of outsourcing practices as non-information-intensive sector that could not play central role in terms of firm competitiveness, or has any quantitative related performance.

6.3.2: Research question 2

Q2: Assessing the most important drivers of outsourcing practices in oil and gas industry

Extant outsourcing literature considered the motivations of outsourcing arrangements to include cost containment, increase in flexibility and risk sharing, as well as core competent and markets shares (Jeynes and Cant, 1998). Similarly, some scholars believed that outsourcing engagements has moved to more strategic positions, such as core competence, greater service integration, higher value creation and access to new technologies (Quinn, 1999; cited by Kakabadse, 1999).

The study investigated these key outsourcing drivers in oil and gas industry. Table 4.8 outlines these relevant outsourcing drivers in oil and gas supply chain, which include increase desire for cost reduction, increase desire for core competence, desire for flexibility, increase desire for organisational performance, increase desire for market shares, increase desire for information sharing, increase desire for new technologies and increase desire for risk sharing. The surveyed participants were requested to choose which of these drivers they considered most important in their outsourcing operations. Respondents' results in table 4.8 indicate that the desire for new technologies was 31.7%, accounting highest among all the listed outsourcing drivers. In this regards, the desire for new technologies has the greatest number of acceptance and this findings has provided the answer for **Research Question Two**.

This finding is also in line with current literature which suggests that technological revolution leading to internet accessibility, as well as the information and communication technologies (ITC), has increasingly facilitated outsourcing organisations to establish business partnerships beyond their geographical boundaries (Gomez-Conde, 2015). In fact, the author believed that a better communication will contributes to a better platform for both partners to participate in coordination, participation and problem-solving activities. Furthermore, the research in table 4.8 has shown that the desire for costs reduction lost out to desire for new technologies, as well as the desire to increase information sharing. This outcomes underscores the need for organisations, especially in a developing oil and gas countries to access new

technologies and best practices in order to combat the chains of activities involves in extraction and transformation of crude oil into final petroleum products. Also some oil and gas experts believed the industry required information systems technologies, especially in production and explorations in order to benefit from data access sharing, business-process modelling, and automated notification (Chima, 2007).

Murphy (2000; Gomez-Conde, 2015) also corroborated that lack of information and communication sharing could fail the outsourcing practices especially in strategic alliance. Moreover, the accessibility of technology solutions will provide avenues for endogenous technological acquisition for the developing oil and gas nations. The use of by-products of oil and gas resources within this supply chain network will reinforce learning-by-doing and obviously stimulate R&D for generating economic growth.

6.3.3: Research question 3

Q3: Assessing the impacts of outsourcing drivers and deployed technologies on business performance.

According to Adelaide and Zoccoli (2010), in addressing the questions on the impacts of outsourcing, it is necessary to investigate the link between technology and outsourcing, especially in value creation. The authors suggest that in understanding the link between the outsourcing of technology and the increase in knowledge, it is possible to understand its link with value creation, mediated by knowledge (see figure 7). The authors may have implied that, the dynamics of this process would have both the connotative and denotative value, which is able to generate new constructs.

Similarly, some scholarly articles have viewed the scale of technology migrations in outsourcing arrangements as a result of increasing collaboration of joint ventures, equity stakes, partnership, alliance, and co-production agreements, which has led to sharing of technology know-how, expertise, and best practices (Jean-Marie and Dogui, 2013). Current literature also suggests that, in today's outsourcing arrangements, emphasis is shifting from outsourcing a particular item to reconfiguring a whole process in a bid to achieve shareholders value. In fact, outsourcing practices that had been primarily dominated by larger organisations, is now beginning to impact on small and medium enterprises, who see outsourcing engagements as a tool for achieving financial performance (Pope et al., 2015).

The correlation and regression analysis was conducted between the outsourcing drivers and deployed technology to determine their relationship and impacts on the financial performance in oil and gas industry. The correlation result in table 4.13 demonstrates a significant relationship between drivers of outsourcing and deployed technologies. Meanwhile, the regression analysis result in Table 4.19 reports that outsourcing and technology accounted for 58% variance of the firm's financial performance. In other words, these two enablers increased the organisations business performance up to 58 per cent. This outcome invariably means that organisations can leverage technology know-how and outsourcing capabilities to achieve an effective business financial performance.

This finding is in line with several scholars who suggest that profitability is one of the most important criteria for evaluating the performance of any organisations, and so most companies ensured that a set of performance metrics to study pre-outsourcing characteristics is developed (Smith et al., 1998). The outcome also implies that outsourcing companies can search and buy any knowledge that will answer any of its recognized need, be it new technology, manufacturing procedures, or a product component. Additionally, this result suggested that when companies conform to new technology changes and innovation, they end up improving their various operational activities, which of course leads to profit margin. This result also supports previous literature which maintained that outsourcing empowers small firms to contract marketing experts, researchers, or other specialist staff on temporary basis which ordinarily the company could not have afforded financially as a permanent staff (Quinn, 1999).

Several scholars also believed that measuring performance is a set of process that helps company access its capability, as well as delivered its ultimate strategic goals of long-term, sustainable superior performance (De Kluyver and Pearce, 2006; Farookh, 2008; Zadjabari et al., 2008; cited by Green, 2008). In fact, if performance is not satisfied, outsourcing is assumed to fail because the objective of an outsourcing partner is to use outsourcing initiatives as tool for enhancing internal capabilities ahead of its competitors in terms of market share values and profit margins. This finding has also empirically improved the limited evidence in literature that outsourcing arrangements has led to organisational performance (Bin et al., 2006). According to Stuart (2012), some of the empirical studies showed little relationship between performance and outsourcing arrangements. According to Jiang and Qureshi (2006) there are limited contributions in literature about studies relating to outsourcing impacts on firm's

performance. The authors argued that the few available evidence are qualitative, based on perception or self-reported data.

6.3.4: Research question 4

Q4: Assessing the extent of relationship between competitive attributes and deployed technologies

In oil and gas industry, production is considered risky whenever there is limited and aging infrastructure, leading to low-level automation and resultant variations, which automatically affect the overall quality of the products (Modarress et al., 2016). In the same vein, the authors argued that poor infrastructure requires updating with advanced technologies to secure digital integrated oil fields and to collate on-time data from various sources on a common platform, especially in increasingly petroleum price volatility and global market demand.

Some outsourcing scholars believed that quality improvement is a reason some corporations, especially in oil gas sector, choose to outsource, since it is associated with gain in efficiency and effectiveness (Gewald and Dibbern, 2009). The scholars also maintain that in petroleum industry, product quality advantage is highly recognisable, even though profitability through maximization of flow of materials is the primary goal of the industry. The global market demand for these flows of material ranges from the entire collections, upstream to midstream and downstream which functions through the array of core and non-core competencies.

Oil and gas infrastructure is divided into an 'upstream' and 'downstream' component. The upstream component deals with the technical newness of the radical innovation such as missing standard and processes, and the lack of production equipment. The downstream component refers to the market side such as market acceptance, availability of distribution channels, alliance, and external infrastructure (Linton et al., 2000). Table 4.16 reported the correlation between the indicator variables of competitive attributes and deployed technologies. Competitive attributes are quality management, expertise best practices and state-of-the art infrastructure. The results indicated a strong correlation between the constructs.

This findings support the outsourcing literature which suggests that in petroleum sector, high level automation, best expertise practices and total quality management are highly needed, as standard routines stifled the creative thought-process, create variations and feed intolerance of differences, as well as denying diversity of knowledge (Unsworth, 200; cited by Modarress et

al., 2016). Furthermore, the findings in table 4.16 indicates a relationship between infrastructure and technology for design and maintenance, between infrastructure and deployed technology for production process, and infrastructure and technology for logistics operations. Table 4.16 also reports relationship between expertise and technology for design and maintenance, and correlation between expertise and deployed technology for production processes. The moreover, there is correlation between quality and deployed technology for design and maintenance, followed by infrastructure and technologies deployed for production processes.

The implications of these results invariably means that despite the competitive advantage of outsourcing initiatives and deployed technologies, oil and gas firm must also adopt total quality management and update its infrastructural facilities in order to be ahead of its competitor and gain market competitiveness and profitability.

6.3.5: Research question 5

Q5: Assessing the business performance outcomes of outsourcing drivers and deployed technologies when moderated through a competitive attributes

Outsourcing arrangements have provided firms with better solutions and stable external partnership and internal operations (Quinn, 1999). Outsourcing technology has also enabled organisations to become highly specialised in niche areas, allowing them to focus more on their core capabilities and specific expertise (Baloh et al., 2008). Meyer et al. (2017) corroborated that optimizing internal processes is not only a trigger to improve the quality and reduced the time for delivering a product or service, but a way to reduce overall time to market by accelerating research and development (R&D), as well as processing and creating a wider range of new product in a shorter time. For example, a new 3D printing technology enabled R&D teams to be more engaging in prototyping and experimenting their product ideas almost instantly (Rayna and Striukova, 2016; cited by Jiang et al., 2017).

Table 4.22 reports the regression analysis conducted to determine the business performance outcomes of outsourcing drivers and deployed technologies when moderated by competitive attributes. The findings in table 4.22 has shown that when deployed technology and outsourcing drivers are moderated by competitive attributes construct, the organisations financial performance increases up to 60%. The implication of this results demonstrate that when technology and outsourcing are moderated by competitive attributes construct (infrastructure, quality and expertise), the firm's financial performance (market shares, profit

margins, and return on investment) resulting from customer confidence and loyalty, is significantly enhanced.

This findings is in line with outsourcing literature which suggests that quality requirement for success is not just for satisfaction but also to delight customers (Pervaiz et al., 1998; cited by Mangan et al., 2008). Current literature also corroborated that the ability of an organisations to compete effectively in a global market is determine to a large extent by the quality of its products, up-to-date technology and the ability of its expert to adopt global best practices (Gomez-Conde, 2015). The author maintain that outsourcing does not only increase competitive pressures to produce low-cost and high-quality products, but also create the need to share the risk and to access world-class capabilities including new technologies, tools, methodologies and procedures that the organisation may not currently possess.

Other literature sources argued that outsourcing practices provides a mechanism to synergize resources for competitive advantages, whilst technology capability is the ability to make effective use of technology knowledge in production, engineering and innovation (Bell, 2007; Ameha, 2016). Also, lack of mandatory infrastructure is capable of separating breakthrough inventions from their exploitation for commercial application (Assink, 2006). As important as the possession of the above competitive tools are, especially in the oil and gas industry, large corporations tend to lack the motivational capacity of small companies to nurture or motivate innovative people who have new, creative and “break-the-rule” ideas (Stringer, 2000). Moreover, most companies in their continuous search for a stable environment fall into the learning trap, a tendency to keep on doing the same thing even in situations where it is no longer effective. It appeared clearly today that experience, routines, procedures and familiar knowledge that were relevant in the past, might prove to be inadequate in this present dispensation.

CHAPTER 7

CONCLUSION

7.1: Introduction to the Conclusion of the Research

This chapter explains the conclusion drawn from this research. The chapter begins with the general overview of the study, by restating the research aims and objectives, research methodology, as well as all the key processes performed in this study. The conclusions were further presented by outlining the research questions and providing the research outcomes, justifications and re-evaluation of the research goals. This chapter also outlines the novel contributions of the research to knowledge, limitations, and recommendations for further research.

7.2: Overview of the Research

This study examined outsourcing practices in oil and gas industry from long-term performance perspective, and from the viewpoint of technology deployment. In order to achieve the overall objectives, we aim to investigate the impacts of deployed technologies and outsourcing drivers as solution enablers that organisations within oil and gas sector employed in measuring their performance. In order to achieve the overall aim of this study, we considered the following research objectives: We explored how firms manage their outsourcing practices, investigated the role of technology on firms' outsourcing practices, determined the impacts of outsourcing and technology on organisations performance, and we finally assessed the benefits of outsourcing practices to IOCs and SMEs.

In explaining the methodology of this study, we reviewed the evolution and current state of outsourcing practices with special emphasises on information technology (IT) and business process outsourcing (BPO). The research also employed another construct – competitive attributes (e.g. quality, expertise and infrastructure) as a moderating variable to enhance performance. For the research framework, every construct in the research was measured by a set of survey questions. The study was carried out within a sample frame of 200 registered oil and gas companies in Nigeria. Data generated for this research was collected, using survey by questionnaire. Questionnaire was intensively discussed with knowledgeable

researchers and pre-tested with managers and supply chain experts in the oil and gas industry. These group of experts were identified from the website of the Nigerian National Petroleum Corporation (NNPC) and some of them also participated in the interview segment.

The second phase of the research was a telephone interview conducted with 3 participants, one each from 3 oil and gas firms, which comprises international oil and gas company (IOCs), indigenous oil and gas service firms (Local oil company) and national Nigerian oil and gas company (NNPC). The semi-structured interview was conducted and recorded electronically. The interview findings were used to complement and validate the survey by questionnaire's results. In general, these mixed method techniques were employed intentionally to address the methodological issues that might arise from this study. The findings have identified the most important drivers in oil and gas industry. Additionally, the result showed a strong correlation between deployed technologies and outsourcing drivers in driving organisations performance in the oil and gas industry.

More so, the study revealed that technology and outsourcing have a greater influence on organisations financial performance. The results also demonstrated that business performance measures increase tremendously when competitive attributes moderate the technologies deployed and outsourcing drivers. Also, empirical evidence showed that in addition to performance advantage of having access to enabling technology and outsourcing initiatives, organisations' competitive performance can be further enhanced through the trio of effective quality management, expertise best practices and up-to-date infrastructure.

The research flow diagram in figure 9.1 summarised these steps. In addition, the research also employed a conceptual framework as a fundamental that underpins the philosophy of science and logical inquiry of this study as depicted in figure 7.1 (Dewey, 1938; cited by Turner and George, 2009). Moreover, most literature maintained that conceptual model offers a realistic link between theoretical postulations underpinning the research and practical implication of the research in terms of direct link with reality. More so, conceptual framework offers a sound base for design of research instruments. Additionally, it can act as a good tool for the study and guide the investigation of relationships amongst concepts under study (Ren, 2004).

7.3: Regression Analysis Results from the Research Questions 3 and 5

Q3: What are the impacts of outsourcing drivers and deployed technologies on business performance?

The regression analysis result in table 4.19 presented model 1 summary that determined the impact of outsourcing drivers and deployed technologies on business performance. The findings indicate that 58% of variance in firm's financial performance is explained by outsourcing drivers and deployed technologies. This result demonstrates a significant positive impact between deployed technologies and outsourcing drivers on the financial performance of the organisations. This findings simply implies that the drivers of outsourcing and deployed technologies, accounted for 58 per cent increase of the firm's business performance.

Q5: What are the business performance outcomes of outsourcing drivers and deployed technologies when moderated through a competitive attributes?

The regression analysis result in table 4.22 presented in model 2 summary is based on the concept that outsourcing drivers and deployed technologies are the exogenous enabling variables that impact on the organisational financial performance with a moderating competitive attributes as the intervening variables. The regression was performed to establish the associations between this two enablers – deployed technology and outsourcing drivers. The findings in able 4.22 indicated that the characteristics of the regression model of outsourcing drivers, deployed technologies, competitive attributes and financial performance include: R square value is = 0.603, F change is significant at = .000, F = 7.868 and adjusted R square = .526.

The result as depicted in table 4.22 model 2, demonstrates that deployed technologies, outsourcing drivers and competitive attributes accounted for the 60% variance in organisations business financial performance. Therefore, indicating that business performance measures increase tremendously when competitive attributes moderate the technologies deployed and outsourcing drivers. Furthermore, ONE-WAY ANOVA test in table 4.20 and 4.24 revealed that the model is statistically significant at = .000. literature sources has often argued that the ability of an organisations to compete effectively in a global market is determine to a large extent the quality of its products (which is a function of quality inputs), the state-of-the art infrastructure (up-to-date technology) and the ability of its expert to adopt global best practices (Gomez-Conde, 2015).

More so, the Research Question 5 was answered using the statistical results of the surveyed respondents, which measured individually on five-point Likert scale ranging from (1) definitely not important to (5) Definitely important, in order to establish high statistical variability among the survey responses. Table 7.1 outlines the outcomes of respondents' views on the associations between competitive attributes and deployed technologies.

Table 7.1: Association between competitive attributes and deployed technologies

Important associations between variables	Definitely not Important	May be not important	Not sure	Maybe important	Definitely important	Total
Infrastructure /technology for design and maintenance	-	-	-	3.8	96.2	100
Expertise / technology for design and maintenance	-	-	-	2.0	98.0	100
Quality/technology for design and maintenance	-	-	-	3.9	96.1	100
Infrastructure/technology for production processes	-	-	-	12.9	87.1	100
Expertise/ technology for production processes	-	-	-	18.6	81.4	100
Quality/technology for production processes	-	-	-	16.4	83.6	100
Infrastructure /technology for logistics operations	-	-	-	26.9	75.1	100
Expertise / technology for logistics operations	-	-	-	20.8	79.2	100
Quality/ technology for logistics operations	-	-	-	17.3	82.7	100

Additionally, outsourcing drivers were measured individually on five-point Likert scale with anchors ranging from strongly disagree (1) to strongly agree (5) (see Table 4.7).

The majority of surveyed respondents as depicted in table 4.8 opted for access to new technologies as their most outsourcing driver, accounting for 31.7%. Meanwhile, 17.8% of surveyed firms considered information sharing as their most important driver, whilst 10.9% maintained that cost reduction remain their priority in any outsourcing arrangements. These outcomes clearly demonstrates that the surveyed company's major consideration in any outsourcing arrangements within oil and gas industry is to prioritise access to new technologies,

followed by ability to share information. Whilst considerations for cost reduction is the third option. These results, therefore support current literature which argued that outsourcing considerations have shifted from traditional cost discipline position to strategic re-positioning of core competency, greater service integration, higher value creation, information sharing and technology capability (Jean-Marie and Dolgui, 2013).

Additionally, several researchers (Chima, 2007; Murphy, 2000; Walter et al., 2015) pointed out that oil and gas industry required new technologies, particularly information systems technologies in production and explorations, in order to benefit from data access sharing, business-process modelling, and automated notification. In fact, the researchers argued that lack of information and communication sharing could fail the outsourcing activities, especially in a strategic alliance. In Table 7.2, an assessment of the research question was conducted by looking at the overall results of the survey respondents rating on the most important criteria that influence firms outsourcing locations. There are seven selected criteria for outsourcing locations, namely: Engineering and manufacturing purposes, ability to recruit IT operations, reducing shipping and distribution time, for customisation over target market, for corporate growth, to mitigate technological risk and uncertainty, to achieve flexibility and risk sharing.

These criteria were measured individually on five-point Likert scale with anchors ranging from definitely not important (1) to definitely important (5) in order to establish high statistical variability among the survey responses. The results indicate that 90.4% majority of the respondents agreed that all the seven listed criteria are definitely important criteria that influence their outsourcing locations. These findings are in support of several literature, which highlighted that outsourcing arrangements across geographical locations have enhanced the prospects and improved the competitiveness of organisations in reaching their final consumer.

Table 7.2: perceived criteria for outsourcing location in Nigerian oil and gas industry

Criteria for outsourcing locations	Definitely not important	Maybe not important	Not sure	Maybe important	Definitely important	Total
For engineering and manufacturing purposes	-	-	4.1	6.1	90.4	100
Ability to recruit IT operations	-	-	-	3.5	90.4	100
Reducing shipping and distribution time	-	-	6.8	9.5	90.6	100
For customisation over target market	-	-	3.2	6.4	90.4	100
For corporate growth	-	-	-	6.3	93.8	100
To mitigate technological risk and uncertainty	-	-	4.1	6.4	90.6	100
To achieve flexibility and risk sharing	-	-	12.9	16.2	73.0	100

These illustrations have also provided the understanding that organisations criteria for outsourcing arrangements and geographical locations are strategic, quite peculiar and varied, as well as largely dependent on their competitive advantage. Essentially, this result has demonstrated that outsourcing and technology can provide opportunities that are not available domestically in most developing oil and gas economies. It also implies that outsourcing arrangements and new technologies can mitigate the nature of risks and hazards, which may limit the prospects of some businesses, particularly the SMEs. The major significant outcomes of this study demonstrate that new technologies may significantly brought more agile approach in outsourcing arrangements by lowering barriers to entry, particularly for small and medium-scale enterprises (SMEs).

Previous studies have questioned the claim that SMEs use outsourcing arrangements as tool to leverage efficiency and enhance operations performance (Alvarez and Barney, 2001; Elango, 2008; cited by Cong Qi et al., 2012). Table 4.19 indicate that outsourcing initiatives and deployed technologies accounted for 58 percent increase in the oil and gas firms' financial performance. The result invariable means that organisations can leverage outsource arrangements to access new technologies, gain new skills and develop expertise practices for effective and efficient business performance.

Other current studies have pointed out that there are little or no empirical evidence in outsourcing related performance (Meyer et al., 2017; Alan and Stuart, 2011). Moreover, Table 7.2 seems to corroborate the results obtained from other studies, which highlighted the desire to mitigate technological risk and uncertainty as the most important criteria for outsourcing locations, as well as deploying new technologies as tools to bridge the gap and enhanced the prospects of Principal-Agent closer relationship.

There is also suggestion in Table 10 that firms engaged in external outsourcing in an attempt to customise target market. This outcome is completely in agreement with previous studies, which maintained that outsourcing market that differentiates its market through customisation is more likely to increase its units sold or revenues per unit, since quality improvement reduces variance in manufacturing cost, as well as control warranty claims and returns (Mangan et al., 2008). Several researchers echoed the idea that companies can produce their overall products and services in a large scale in different geographical locations in order to gain competitive advantage, mitigate technological risk and uncertainty, as well as improve business performance and other strategic moves (Ogden et al., 2013; cited by Sherma et al., 2010).

These outcomes clearly summarised that most organisations criteria for outsourcing locations could be the traditional reason for cost discipline, or for strategic repositioning such as core competency enhancement, superior technology, risk sharing, flexibility, or for superior customer service (Griffiths and Wall, 2011). Table 7.1 presents result, which indicate a strong correlation between Quality management and deployed technologies for design and maintenance. Furthermore, Table 7.1 results demonstrated various significant relationships between the variables. For example, there are strong relationship between quality and deployed technology for ordering and procurement, quality and deployed technology for design and maintenance, quality and deployed technology for production processes, quality and technology deployed for logistics operations, as well as infrastructure and technology deployed for production processes.

These outcomes support the current studies position that, in oil and gas sector, production is considered risky whenever there is limited and aging infrastructure, as these may lead to low level automation and resultant variations, which automatically will influence the overall quality outputs (Modarress et al., 2016). In other words, poor infrastructure requires updating with advanced technologies to secure digital integrated oil fields and to collate on-time data from various sources on a common platform (Gewald and Dibbern, 2009). One of the challenges in making comparison in this study with previous studies is that, while several

investigation have been made in many discrete industries, experiments focusing on the oil and gas industry are limited, particularly in the context of developing oil and gas nations (Jega, 2008).

However, as with most partnership arrangements, outsourcing evolving from self-sufficient approach, to technology development, as well as to one of strategic sourcing, is a challenge because internal processes often require long period. Table 7.3 summarises the entire research questions and their findings

Table 7.3: Summary of the research questions and findings

Research questions	Findings
Q1: What is the level of association between outsourcing drivers and deployed technologies in oil and gas industry?	There is a strong relationship between technology and outsourcing in driving organisations financial performance
Q2: What are the most important drivers of outsourcing practices in oil and gas industry?	Increase desires for new technologies, as well as desires for information sharing are the most important drivers for the organisations.
Q3: What are the impacts of outsourcing drivers and deployed technologies on business performance?	There is significant impact between outsourcing drivers and deployed technologies on organisations financial performance
Q4: What is the extent of relationship between competitive attributes and deployed technologies?	There is a positive relationship between competitive attributes and deployed technologies.
Q5: What are the business performance outcomes of outsourcing drivers and deployed technologies when moderated through a competitive attributes?	The findings indicate that business performance measures increase tremendously when competitive attributes moderate the technologies deployed and outsourcing drivers.

7.4: Conclusion

The outsourcing literature has shown that oil and gas industry required new technologies, particularly information systems technologies in the upstream production and explorations, in order for firms to benefit from data access sharing, business-process modelling, and automated notification. Just as lack of information and communication, sharing could also fail the outsourcing practices especially in strategic alliance.

The revelation of this key outsourcing decision has increasingly become very crucial in any outsourcing arrangements, especially in this day and age where management carefully weighs

the costs and benefits of every discretionary dollar for capital project and any other major investment. However, whilst acknowledging that outsourcing is now broadly an attractive option to maintained, its specific impact on firms' performance has not been well confirmed by research. More so, there is contention among some scholars that outsourcing related performance is based on estimation and qualitative outcomes rather than on a tangible metrics and quantitative evidence. This study has examined outsourcing practices in oil and gas industry from long-term performance perspective, and from the viewpoint of technology deployment. Similarly, the paper has explored how firms manage their outsourcing practices, determined the impacts of outsourcing initiatives and new technologies in driving organisations performance, and finally the study assessed the benefits of these arrangements to IOCs and SMEs.

The findings have identified that the most important driver in oil and gas outsourcing practices is access to new technologies. Additionally, the results showed strong correlation between deployed technologies and outsourcing drivers in driving organisations performance in the oil and gas industry. The results also indicated that business performance measures increase tremendously when competitive attributes moderate the technologies deployed and outsourcing arrangements. Moreover, empirical evidence showed that in addition to performance advantage of having access to enabling technology and outsourcing initiatives, organisations' competitive performance can be further enhanced through the trio of effective quality management, expertise best practices and up-to-date infrastructure.

These outcomes imply that outsourcing operations may help organisations to gain new skill and knowledge and firms can afford to develop their internal operations through expertise best practices and high-level technology. In fact, access to new technologies will increasingly empowered organisations in enhancing their performance, especially now that small entrepreneurial ventures are seeking to utilize outsourcing arrangements as a growth strategy. This also means that outsourcing may enabled smaller companies (SMEs') to expand beyond their traditional market reach by offering access to data on market trends. Although, the decisions as to which technologies should be developed in-house and target market, must be made on the selective basis of which can sustain the competitive advantage of the firm.

7.3.1: Theoretical implications

The study investigated the role of deployed technologies in the current outsourcing practices and the impact in driving performance within the oil and gas sector. There are consensus among researchers (Jiang and Qureshi, 2006; Lecocq, 2010; Stuart, 2012) on lack of empirical evidence to suggest specific impacts of outsourcing activities on organisations performance. The first contribution lies in establishing an association between deployed technologies and outsourcing drivers in driving firms' performance. Furthermore, this paper assess the current outsourcing decisions in petroleum sector, with a view to determining the most important driver. Scholars have focused on whether cost structure will remain the key driver for outsourcing activities, based on the assumption that vendors would always provide service at lower cost because of economies of scale and scope (Lacity et al., 1994; Kakabadse et al., 2014). Interestingly, the research finding pointed out that the desire to access new technologies is the most important drivers and consideration in the current outsourcing engagements.

This finding is in line with current literature which suggests that technology revolution leading to internet accessibility, as well as the information and communication technologies (ITC), has increasingly facilitated outsourcing organisations to establish business partnerships beyond their geographical boundaries (Gomez-Conde, 2015). This study further explore the long-term performance outcomes of outsourcing drivers and deployed technologies under a moderating competitive construct. The results also indicated that, in addition to performance advantage of having access to enabling technologies and outsourcing initiatives, organisations' competitive performance can be further enhanced through the trio of effective quality management, expertise best practices and state-of-the art infrastructure. Mangan et al. (2008) provide useful evidence to this outcomes when he noted that in any outsourcing market, differentiation on quality is more likely to increase its units sold or revenues per unit, since quality improvement reduces variance in manufacturing costs, as well as control warranty claims and returns.

Modarress et al. (2016) have also acknowledged that in petroleum sector, expertise and global best practices are highly needed, since standard routines stifle the creative thought-process and feed intolerance of differences by denying diversity of knowledge. More so, quality management system will not only delight customers but also ensure satisfaction, as well as enhance other chain of benefits, resulting in improved financial performance.

According to Meyer et al. (2017) optimising internal processes is not only a trigger to improve quality and reduce the time for delivering a product or service, but a way to reduce overall time to market, accelerating R&D processes and creating a wider range of new product in a shorter time.

7.3.2: Practical/Managerial contributions

This study may provide useful insights to operations managers of both foreign-owned and indigenous firms and SMEs, who are contemplating of strengthening its internal operations. Outsourcing arrangements does not only increase competitive pressures to produce low-cost and high-quality products, but also create the need to share the risk and to access world-class capabilities including new technologies, tools, methodologies and procedures that the organisation may not currently possess. The findings also illustrate the importance of new technologies for companies in a developing oil and gas economies, especially in area of extraction and transformation of crude oil into final petroleum products.

These results indicate that accessibility of advance technologies will provide avenues for endogenous technology acquisition, through learning-by-doing. The outcomes have also provided interesting insights and empirical evidence to support current literature position that technologies could migrate, especially from developed nations to developing economies through outsourcing collaborations. These capabilities can be imbibed through various spillover effects, namely: imitation; skill acquisition and proliferation; competition and export. More so, this research has demonstrated that outsourcing arrangement does not only increase competitive pressures to produce low-cost and high-quality products, it also creates the need to share the risk and to access world-class capabilities including new technologies. The findings further indicate that strategic outsourcing decisions will influence the prospects of organisations in reaching their final consumer, as new technologies may bridge the gap and enhanced the prospects of Principal-Agent closer relationship.

These findings could be linked to the needs of new technologies to indigenous firms within developing oil and gas nations, particularly in area of extraction and transformation of crude oil into final petroleum products. The accessibility of advance technologies will obviously provide avenues for endogenous technology acquisition, through learning-by-doing. This study has provided the empirical evidence to support current literature position that technologies could migrate, especially from developed nations to developing economies through outsourcing collaborations.

7.3.3: Recommendations for further research

Firstly, the outcomes of this research have significant implications for further studies in outsourcing technology operations. For example, more generalised studies are required in discrete manufacturing industry. This study was based on process-oriented oil and gas industry with different operational frameworks. Secondly, the study was restricted to Nigerian oil and gas companies. Therefore, more studies are suggested on a larger scale to other developing oil and gas economies for more potential applicability. Thirdly, the paper has demonstrated that business performance measures increases tremendously when deployed technologies and outsourcing initiatives are moderated through competitive attributes, namely: quality management, appropriate infrastructure and expertise practices. Thus, investigating the mediating roles of these attributes in further research will be required.

Finally, we recognised that the work described in this study may stimulate further conceptual and theoretical work on outsourcing operations. For instance, international oil and gas companies (IOCs) and some local firms may require to pursue a combination of local and distance strategies of outsourcing. This can include the future trend of IT infrastructure and its application solutions. Therefore, investigation of these combined approaches will be an interesting further research.

7.3.4: Novel contributions of this research

This research has contributed significantly to the body of literature and real world. To the literature, it is the first study of its nature that identified the strong correlation between technology and outsourcing in driving organisations performance. The study specifically revealed that an association of technology and outsourcing strongly influence the financial performance of an organisation. It also proved that competitive attributes like state-of-the art infrastructure, total quality management and expertise best practices can positively moderate business performance, as lack of these capabilities can as well weakens the organisations financial performance. This also demonstrates that business performance measures increase tremendously when competitive attributes moderate the technologies deployed and outsourcing drivers. So, in addition to performance advantage of having access to enabling technology and outsourcing initiatives, organisations' competitive performance can be further enhanced through the trio of effective quality management, expertise best practices and up-to-date infrastructure.

This findings supports the outsourcing literature which suggests that outsourcing initiatives have provided managers with greater array of strategic benefits, ranging from improved quality, flexibility, expertise, capability, core competencies, as well as costs reduction and access to new technologies (Piachaud, 2005). Moreover, currents literature has maintained that outsourcing arrangements has enabled smaller companies (SMEs') to expand beyond their traditional market reach, thereby offering them access to various data on market trend (Sanjay, 2011). This is essential for business development and sustainable competitive advantage, as companies must not only have access to more than one new information technologies, but must be empowered to develop one.

This findings has justified the import of this study; that outsourcing and technology can provide opportunities that are not available domestically in most developing oil and gas economies. Outsourcing and technology can also mitigate the nature of risks and hazards, which may limit the prospects of indigenous small-scale and medium-sized enterprises (SME's), who are the backbone of job creation in any nation. This can also engineered economic development. Secondly, this research is the first to provide an empirical evidence of strong association between technology and outsourcing, and their combined positive impacts in achieving business performance measurements.

Although, there is a substantial evidence in literature that outsourcing arrangements has led to organisational performance. Yet there is still not enough empirical evidence to suggest specific impacts of outsourcing activities on firm's performance (Bin, 2006). These perspectives support the contention in outsourcing literature and business model research about overall understandings of performance (Lecocq, 2010).

Another aspect of the contention is lack of adequate empirical evidence that showed relationship between performance and outsourcing arrangements (Stuart, 2012). In fact, according to Jiang and Qureshi (2006) some of the empirical studies available showed little relationship between performance and outsourcing arrangements. The authors argued that the few available evidences are purely qualitative, or based on perception and self-reported data. Therefore, the above submissions further demonstrate the importance of this research findings. The outcome has also underpinned the significant roles new technologies and outsourcing arrangements played in driving performance, especially in oil and gas sector. Additionally, this research has provided more objective evaluation of firm's outsourcing impacts on performance,

rather than using perception-based intermediate metrics in case studies and survey, as in the case in previous research.

Thirdly, the methodology adopted in this study is a mixed-method approach which provides some combined insights that guided the researcher in making decision towards the choice on Ontology and Epistemology as depicted (see figure 3.7). Most outsourcing and logistics literature reviewed are populated by quantitative or positivistic approach (Kahn, 1995). This study consciously included qualitative method in order to tackle any imbalance and challenge a new thinking that addresses all the methodological issues from the study. Moreover, for this kind of explorative study, the strategy of using different research approaches, methods and techniques in the same study is highly recommended in most outsourcing literature (Hussey and Hussey, 1997; cited by Sanjay, 2011).

More so, most current literature has also adopted this mixed method approach, especially in business and management research where this trend from positivism towards phenomenology has become more evidence. In fact, several researchers believed that quantitative and qualitative researches complement one another in explaining different aspects of social world (Blaikie, 1991; Yeung, 1997; Tashakkori and Teddlie, 1998; cited by Bustinza et al, 2010)

Fourthly, this research proposed a conceptual model that encourages small local contracting firms, especially (SMEs), to access cutting-edge technologies from the larger contracting organisations (see figure 3.3). Currents literature suggests that with access to new and advance technologies, outsourcing initiative has developed into a routine strategic engagement through multiple partnership and short-term contract (Ramanathan and Krishnan, 2015). This move has also delivered incremental innovation to clients firms, as well as affects the heart of the competitive core of most outsourcing vendors. Some other outsourcing literature maintained that conceptual model offers a realistic link between theoretical postulations underpinning the research and practical implication of the research in terms of direct link with reality (Dewey, 1938; cited by Turner and George, 2009). This conceptual framework was designed for the study and employed in the investigation of relationships amongst all the constructs under study (Ren, 2008).

Fifthly, this research further introduced a moderating construct (competitive attributes) with deployed technologies and outsourcing drivers, linking the independent financial performance variables. The association of technology deployed and drivers of outsourcing with a moderating competitive construct demonstrates that organisations are not only leveraging on

technological capabilities and outsourcing initiatives as competitive advantage, but also investing in the quality, expertise and infrastructural facilities to enhance business performance. In fact, the above context, supported the findings of this study which indicated that in addition to performance advantage of having access to enabling technologies and outsourcing initiatives, organisations' competitive performance can be further enhanced through the trio of effective quality management, expertise best practices and up-to-date infrastructure.

The diagram in figure 3.4 shows a moderating impacts of competitive attributes on organisations. It shows that when competitive attributes (quality, expertise and infrastructure) are increase or decrease on outsourcing drivers and deployed technologies, the organisation's financial performance is either reduces (to half), or increases (to fullness). In order words, when the attributes are positive (+, increases), the firms will achieved a maximum performance in its operations.

7.3.5: Limitations of the research

This study was undertaken after a rigorous review of the literature. The methodologies adopted was based on the understanding of the different methods in the outsourcing literature. The research also employed different approaches and precautions to tackle any, imbalance, error or bias. Some of the limitations of this study are giving below: (1) As already mentioned this research covers outsourcing current state of evolution and drivers of outsourcing practices, and the role of deployed technologies in oil and gas industry. The outcomes of this study cannot be generalised to discrete manufacturing which might require different operational framework. Therefore, more studies are needed in other industries that will focus on a large scale of issues and generalisations from the outcomes; (2) The interviews where done via telephone, which might lead to retrospective bias concerns. This is especially true for drivers of outsourcing and deployed technologies as we did not conduct any focus or team member interviews.

However, we followed several strategies to minimize retrospective bias, such as selecting the key participants, asking about concrete facts, maintaining respondent confidentiality, and validating retrospective facts using questionnaires. This limitation may be overcome by a wider number of respondents on one on one interview bases;

(3) The study was restricted to developing oil and gas economies. Therefore, more generalise studies are suggested on a larger scale within the developed oil and gas economies; (4) This

study has demonstrated that business performance measures increases tremendously when deployed technology and outsourcing are moderated through competitive attributes like quality management, appropriate infrastructure and expertise practices. Therefore, investigating the mediating role of these attributes in further research will be required.

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APPENDIX A: RESEARCH INSTRUMENT OF THE STUDY



INVESTOR IN PEOPLE



University of Central Lancashire

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31 March 2016

Dear Sir,

Re: The Role of Technology in Outsourcing Practices in Nigerian Oil and Gas Industry

Mr Nnamdi Ogbuke, a PhD student attached to the Institute of Logistics and Operations Management, University of Central Lancashire, Preston, is undertaking a research project to investigate the role of Technology in Outsourcing Practices in Nigerian Oil and Gas Industry. The project investigates the impacts of Technology in outsourcing practices in the Industry. We would very much appreciate your contribution to this important research by completing the enclosed questionnaire. It will take only a short time (approximately twenty minutes) to complete. It will be most helpful if you could return your response within two weeks. In the event that you are unable to respond to some or all of the questions we would welcome your passing the questionnaire to someone within your organisation you think qualified to respond to the questionnaire.

Information for the study and results will be used for academic purposes only, as you and your organization's names will remain confidential. Subsequent use of records and data will be subject to standard data use policies which protect the confidentiality of individuals and institutions. Your participation in this study is voluntary. You may withdraw and discontinue participation before the analysis without any penalty.

I volunteer to participate in this research project supervised by Professor Yahaya Yusuf from the University of Central Lancashire. I understand that the project is designed to gather information about my views and opinions on role of technology in outsourcing practices within the Nigerian oil and gas sector. I have read and understood the explanation provided to me. I have had all my questions answered to my satisfaction, and I voluntarily agree to participate in this study. I have been given a copy of this consent form.

.....
Signature of Respondent

.....
Date

31/03/2016

.....
Signature of Investigator

.....
Date

If you are interested in a summary of the findings, it will be made available to you. All queries should be directed to **Mr. Nnamdi Ogbuke** on phone +447902553773 or by email njogbuke@uclan.ac.uk. Thank you for your time and support.

Many thanks

Professor Yahaya Yusuf
Director of Institute of Logistics and Operations Management
University of Central Lancashire, Preston PR1 2HE, UK



englandsnorthwest
BE INSPIRED

A. General Company Information

1. Rank of the respondent (optional)

2. When this company was established? (Approximately).....

3. How many employees work in this Company?

Up to 50 51 – 250 251 – 550 551 – 2500

Above 3000 (Please Specify)

4. What legal form of classification of companies does this company falls in?

Sole proprietorship Partnership Private limited company (Ltd)

Public limited Company (PLC) Private Unlimited Company

Others (Please Specify)

5. What is the average sales turnover per annum of this company?

Less than £50M £51M – £100M £101M – £250M £251M – £500M

£500 – £1B

Above £1B (Please specify)

B. Outsourcing activities

6. What is the major line of products of this company? Please **Tick** all that apply below.

Line of products and activities	Tick
Exploration and Production	
Bases, logistics, catering, and administration	
Consultation including geographical services	
Oil services and operations	
Engineering services (reservoir, drilling, well engineering, facilities engineering and subsea services)	
Marine, transport and allied services	
Electrical and electronic equipment, components, and accessories	
Offshore construction, maintenance of platforms and vessels	
Transport, storage and communications	
Constructions, operation of processing and landing facilities	
Others (please specify)	

7. Which of these boxes describe the degree of agreement in your outsourcing decisions? Please **Tick** below.

Drivers	Strongly disagree	Disagree	Agree	Neutral	Strongly agree
Access to new technologies					
Cost reduction					
Increase in flexibility					
Information sharing					
Risk sharing					
Organisational performance					
Core competence					

Market competitiveness					
Others (please specify)					

C. Technological Impacts

8. To what extent does technology impacts on the company outsourcing practices? Please **Tick** below.

Level of deployment Technologies deployed	Definitely not important	Maybe not important	Not sure	May be important	Definitely Important
Technology for ordering and procurement					
Technology used for information sharing					
Technology for designs and maintenance					
Technology for Production processes					
Technology for logistics operations					
Others (please specify)					

9. How important the following Institutions are as a supplier of specialized labour and knowledge to your organisation? Please **Tick** below.

Knowledge and Labour Sources	Very low	Low	Moderate	High	Very high
Market Research					
Universities					
Other Firms					
Research Institute					
Government and NGOs					
Others (please specify)					

D. Clusters Location and Outsourcing Decisions

10. To what extent do the following factors influence the location decision of your company in its outsourcing activities? Please **Tick** below.

Criteria for outsourcing locations	Definitely not important	Maybe not important	Not sure	Maybe important	Definitely important
To streamline engineering and manufacturing					
Increase ability to recruit skilled labour for IT operation					
Increase engineers' proximity to production to allow for more innovation					
Increase proximity to large market					
Reducing shipping and distribution costs					
Received regulatory approval to sell products					
Increase customization by having control over process and increased speed to target market					

For corporate growth					
To mitigate technological risk and uncertainty					
To achieve flexibility					
For risk sharing					
Others (please specify) ----- -----					

E. Performance Measurement

11. How would you rate your company in the direction of change in the following measures of performance in the last four years? Please **Tick** below.

Business performance measurement	Sharp increase	Modest increase	Static	Modest decrease	Sharp decrease
Annual turnover					
Market shares					
Annual return on investment					
Corporate social responsibility					
Others (please specify)					

F. Collaboration and Relationship

12. How would you describe the company use of alliance and partnership within the supply network? Please **Tick** below.

Partnership and Alliance	Agree strongly	Agree	Neutral	Disagree	Disagree strongly
Knowledge sharing on design, engineering and manufacturing					
Exchange of core competency					
Supplier integration					
Customer involvement					
Interaction with competitors					
Others (please specify)					

G. Technological Capability and Competency

13. How can you describe the following core competencies contributions to the company performance in outsourcing operations? Please **Tick** below.

Emerging core competencies	Very high	High	Moderate	Low	Very low
Employees' knowledge and skills					
Effective adaptation of facilities and systems					
Networking for exchange of knowledge					
Concurrent or simultaneous conduct of operation					
Others (please specify)					

14. What difficulties do your organisation encounter in its offshore outsourcing operation? Please **Tick** below.

Competitive Attributes	Tick
Inappropriate infrastructures	
Lack of expertise/unskilled employees on offshore outsourcing	
Quality Management	

Others (please specify)	
----------------------------------	--

15. What is the length of relationship with your major suppliers..... (in years)?

16. What is the length of relationship with your major customers..... (in years)?

17. Do you agree that technological capabilities drive your outsourcing decisions?

Strongly Agree Agreed Neutral Disagree Strongly Disagree

18. Would you like to participate in a follow-up research involving visit to your company site?

Yes No

19. Would you like to view the summary of the results upon completion? Please Tick.

Yes No

20. Please comment freely and generally on any aspect of technology development and outsourcing practices in your company in the spaces provided below

.....

Please return the Questionnaire by mail (using the following enclosed self-addressed envelope) to the address below

**Ogbuke Nnamdi Johnson,
 Doctoral Research Student,
 Lancashire Business School,
 University of Central Lancashire,
 PR1 2HE Preston
 TEL: +44 7902335773**

INTERVIEW QUESTIONS

This is a research project and the aim of this interview is to explore the role of technology in outsourcing practices in the Nigerian oil and gas industry. We wish to interview you to understand your viewpoints as a supply chain expert in oil and gas industry.

1. What would you say is the current conditions in outsourcing practices in Nigerian oil and gas industry?
2. What is your company's major line of products?
3. Does your company outsource any of its operations?
4. What are those challenges your company experienced in its outsourcing operations?
5. Does technology in anyway impacts or influences your company's operations?
6. Does your organisation outsource outside its geographical location?
7. Can you share with us how technology contributed to your organisations performance?
8. What do you think are the reasons companies prefer to outsource outside their geographical locations?
9. What is your company's general experience in its offshore operations?

Thank you immensely for providing me time to explore about the technological impacts on outsourcing practices in Nigerian oil and gas industry

APPENDIX B: REPORT AND ANALYSIS OF NIGERIAN OIL AND GAS INDUSTRY

This report is reflection of the Nigerian National Petroleum Corporation (NNPC) in the year 2013.

Exploratory Activities: A total of 4,695.67 sq. kms of 3D Seismic data acquired. While 4,396 sq. kms was processed/reprocessed respectively. Thirty-Three rigs were in operation and One hundred and Eighty-One (181) wells were drilled.

Crude oil and gas production: Total crude oil and condensate production for the year was 800,488,102 barrels giving a daily average of 2.19 mmb/pd. This is lower than the previous year's by 6%. In the gas sector, twenty-five (25) Companies reported a total of 2,325.14 Billion Standard Cubic Feet (BSCF) of Natural Gas production. This shows a decrease of 9.88% when compared with 2012 production. Of the quantity produced, 1,916.53 BSCF (82%) WAS utilized, while 409.31 BSCF (18%) was flared.

Crude oil lifting: A total of 800,337.206 barrels (2.19 million barrels per day) of crude oil and condensate was lifted for domestic and export purposes, showing a decrease of 7.65% against year 2012. Of the total quantity, NNPC lifted 341,504,680 barrels (42.67%), averaging 935,629 barrels per day for both domestic utilization and export.

Upstream liquid gas production and export: Total Natural Gas Liquid (NGL) produced in 2013 was 1,191,370 Metric Tons. Mobil and NNPC had a share of 51% and 49% of the quantity respectively. A total of 1,176,259 Metric Tons was lifted. Liquefied petroleum Gas (LPG) production was about 409,712 Metric Tons while lifting was 417,924 Metric Tons.

Refining: The local refineries received a total of 36,193,237 barrels of (4,917,613 mt) of (dry) crude oil, condensate and slops and processed 35,233,126 barrels (4,761,496) into various petroleum products. The total production output by the refineries was 5,067,501 metric tons of various petroleum products. The combined average refining capacity utilization for the year 2013 was as against 21% in the previous year.

Product movement: PPMC evacuated 4,707,539 mt of petroleum products from the refineries and it also imported 6,648,757 mt of PMS, HHK and AGO for distribution at no cost since the discharges were Offshore Processing Agreement (OPA) and Crude oil for product swap arrangements. PPMC sold a total of 12.63 billion litres of LPFO and Naphtha worth about 116.67 billion naira was exported. A total of 21,816.29 million litres of petroleum products was distributed nationally giving an average daily consumption of 43.55 million litres of PMS, 7.76 million litres of AGO, 7.30 million litres of HHK and 1.17 million litres of ATK. Out of the total volume distributed, NNPC Retails outlets handled 1,645.25 million litres, which is about 7.5% of total volume. The distribution by zone shows the South-West with the lion share of 38.83% followed by the South-South with 15.43% North West with 15.04%, North Central with 9.09%, North East with 8.8%, South East with 6.40% and FCT with 6.39%.

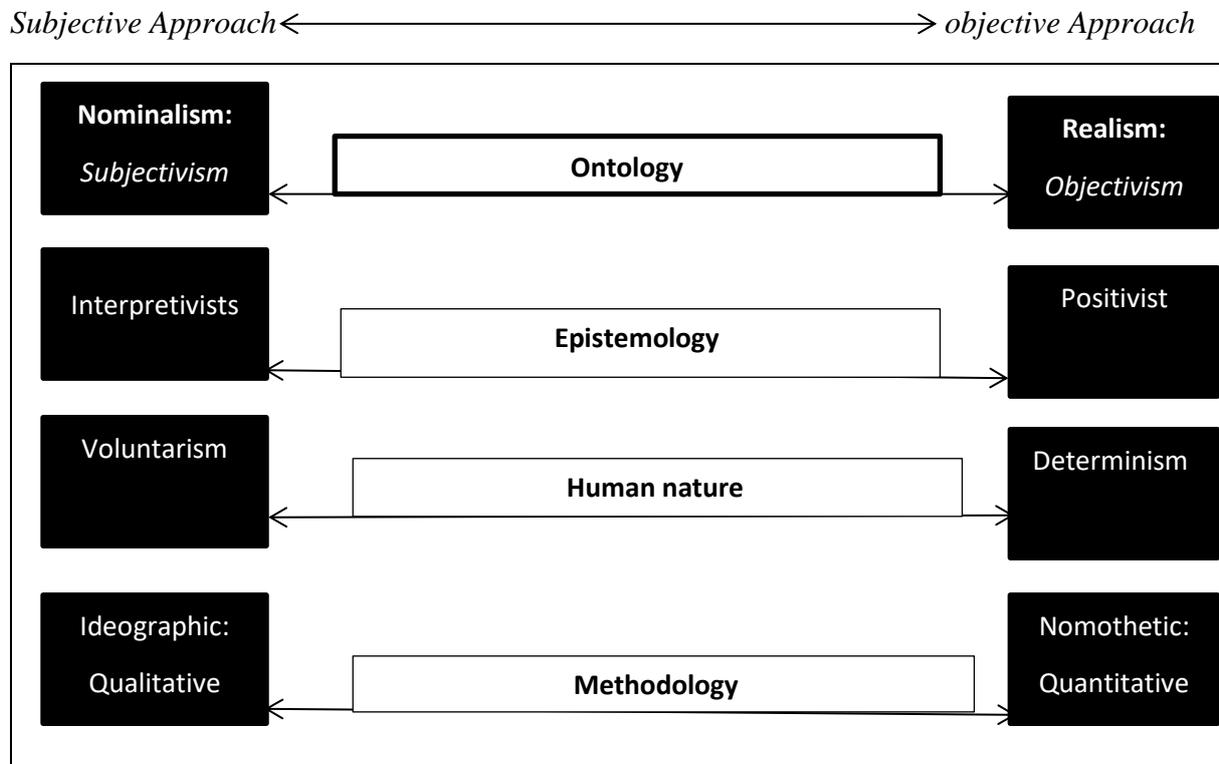
Incidence: Pipeline vandalism increased by 58% over the previous years. A total of 3,570 line breaks was reported on NNPC pipelines out of which 3,505 was as a result of vandalism, while 65 cases were due to systems deterioration resulting in a loss of 327.48 thousand mt of petroleum products worth about 38.88 billion naira. In addition, 2.1 million barrels of Crude oil worth about 38,992 million was lost in the same period. There were 34 cases of fire incidents during the year under review.

APPENDIX C: PHILOSOPHICAL POSITION OF THIS RESEARCH

This study provides a glimpse of the rapid pace at which the field of technology outsourcing operations has involved in recent years. Similarly, it has the potential to shape the researcher's worldview, provides relevant disciplinary perspectives, the epistemological understanding, as

well as enhance the habit of mind and experience (Greene, 2012). Figure 4.3 outlines the classification of Ontological and Epistemology of this research.

Figure 1: Classification of Ontological and Epistemological in Research



Source: Morgan and Smirich (1980, p. 492).

The methodology adopted was mixed-method approach of quantitative and qualitative research. This approach is in line with John et al. (2004) observation that in real-world research application, the majority of logistics research are primarily populated by quantitative research viewed through a positivist lens. It also important to highlight that qualitative research is generally associated with the phenomenological paradigm, and, as such, is not preferred by many positivists. Thus, it is multiparadigmatic (Denzin and Lincoln, 2006, cited by John et al., 2004). More so, there is a tendency for qualitative and quantitative research to be associated with ontological and epistemological positions in some cases (Bryman and Bell, 2011). Therefore, the new step forward seems to be the mixed methods, which, according to many scholars, is an extension of research triangulation (Gioia et al, 1989; Gioia and Pitre, 1990; Lewis and Grimes, 1999).

Consequently, objectivism is adopted as is consistent with one of the research methodologies of this study (quantitative approach). Outsourcing strategies as well as technological roles are

the mechanism while the organisations/performance are the structures. In fact, most literature argue that technology and outsourcing have both positivist and interpretivist tools. The researcher, in this study agree that reality exists independent of the investigator and that there are causal mechanisms and structures that generate observed events that are achieved through quantitative survey questionnaire.

Therefore, this study is designed to generalize, generate, test, and substantiate theories about respondents, which comprise empirically warranted propositions about cause and effect. In other words, the inherent factors that constitute performance and outsourcing practices in oil and gas companies are evident of causal mechanism and structures inside and outside the organisations. Example of this is technological capability and other resources availability of firms to achieve operational performance.

On the other hand, interpretivist argued that human beings, unlike plants, act with intentionality, which is rooted in the meanings that people are constructs of various settings (Greene, 2012). The author noted that this construct significantly guides and shape human behaviours, more than external forces and factors. As such, these different contexts present constellations of people, interactions, and events, as well as what is meaningful to a giving individual or group.

In general, interpretivist aim to contextualize understanding of the meaningfulness of humans' live experiences. This form of social knowledge is not generalizable nor propositional in form, but rather multiplistics, dynamic, and contingent. This approach is achieved in this research qualitatively by sharing the experiences of 'experts' through a semi-structure interview.

Furthermore, this research approach provides one with useful insights of different methodological viewpoints (Brewer and Hunter, 1989). Mixed method also has the potential to contribute to better understanding, which is distinctively marked by greater tolerance, acceptance, and respect for difference (Shaun, 2012).

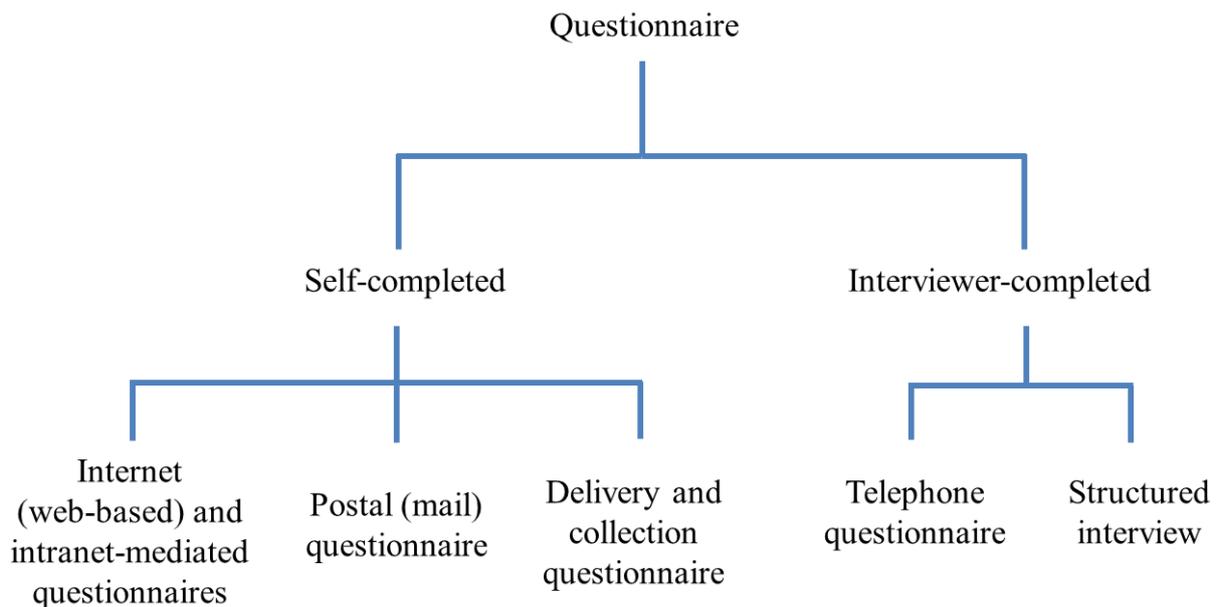
It improves the validity of findings of a research project and provides more data than either quantitative or qualitative methods when used alone. The data collection method adopted is survey by questionnaire and the data collected was analysed using SPSS version 23.

APPENDIX D: RESEARCH QUESTIONNAIRE AND ADMINISTRATION

Questionnaire

Questionnaires are research tools through which people are asked to respond to the same set of questions in a pre-determined order (Gray, 2014). In questionnaire data collection, respondents are asked to respond to a pre-formulated written set of questions and record their answers, usually within rather closely defined alternatives' (Sekaran and Bougie, 2009). Questionnaire collects information on three basic variables: opinion, behaviour and attitude (Dillman, 2007, as cited in Saunders et al, 2009). In other words, the questionnaire was designed to capture the interest, the values, perceptions and interests of the respondents should reflect these as much as possible (Gray, 2014).

Figure 2: Types of Questionnaire



Source: Adapted from Saunders et al. (2012, p. 420)

In this research, the Survey by questionnaire that fit the objectives of this research was adopted. The questionnaire was administered partly by hand and by post. The questionnaire was employed to collect and analyse primary data from respondents who are the senior managers with valuable experience across oil and gas companies in Nigeria. Survey by questionnaire was appropriately adopted since research involves examining causal relationships between variables (Sounders, et al, 2003). This technique was also adopted because part of the research aim was to examine causal relationships between deployed technologies and outsourcing drivers in oil and gas companies.

Additionally it was chosen because it is most frequently used design in production and operations management research (Mentzer and Kahn, 2005). Production and operations research relies on self-reports of factual data, as well as opinion. One central approach of this study is to administer a survey to a group, which is homogeneous with respect to at least one characteristic, such as industry, or use a common 'technology' (Flynn et al, 1990, p. 257). The adoption of survey by questionnaire is significant because one methods of this research is positivist approach.

Survey by questionnaires are favourites among those with positivistic worldview and methodology (Whisker, 2008). Also in the research design, part of the aim of this study is to make generalisation on the population from the survey sample results, which survey by questionnaire epitomises.

Questionnaire Design

According to (Gray, 2014), questionnaires reflect the designer's view of the world, no matter how objective a researcher tries to be (Gray, 2014). It also enables researcher to organise questions and receive replies without necessarily talking to respondents (Walliman, 2011). Furthermore, in questionnaire design, what we choose to not to ask about, may just as easily reflect our worldview as what we include in the questionnaire. In questionnaire design, it is crucial that as a researcher, you are aware of this and try, as far as possible, to be objective. It means you have to be clear about the data you are collecting, and design your questions to collect these data, minimising the chances of questions being misinterpreted (Saunders and Lewis, 2012).

Therefore, the study evaluate the level of technology adoptions and its impact in oil and gas outsourcing operations in the Nigerian oil and gas companies. Questionnaire is standardised list of questions where order and wording of questions has been carefully planned (Seale and Barnard, 1998). We adopted a comprehensive approach required in designing processes (Walliman, 2011, Bryman and Bell, 2003). This is known as Total Design Method (TDM). Total Design Method (TDM) entails broad set of questions to be asked, taking into account type of data, analysis and research questions to be addressed (Nachmias and Nachmias, 1992). TDM consists of 18 step process including: avoiding bad formatting, imprecision, repetition, leading questions, assumption questions, hypothetical questions, threatening and double barrel questions (Walliman, 2011). Other issues that were avoided and considered while designing the questionnaire in terms of overall content, style and structure.

Pilot Testing

Piloting a questionnaire helps to eliminate or at least reduce questions that are likely to mislead (Gray, 2014). As an integral part of questionnaire design, it provides feedback on how easy questionnaire is to be completed, which concepts are unclear or out of respondents' range of knowledge or responsibility. Questionnaire was pre-tested in this research to anticipate any problem of comprehension or other source of confusion (Whisker, 2008; Walliman, 2011). It also enables a researcher to determine whether there are systematic differences between the ways the researcher views specific measures versus the respondents' (Flynn et al, 1990, p. 262).

The drafted pre-tested questionnaire was carried out with 20 survey questionnaires administered to participants who are supply chain expert via online. Sixteen (16) participants responded to the pilot tested survey, which represent 80 per cent responds rate. The responses from the pilot tested survey were first considered in this study because; the feedbacks, comments and recommendation collected had contributed to the formation of the final questionnaire. The pilot survey questionnaire was intentionally design and administered in open-ended questions as way of stimulating more response rate. Open-ended questions compel participants to volunteer more information (Henning, 2009). The feedback received from these people assisted in redesigning the questionnaire to its present level (see appendix A).

Response Rate

Two hundred (200) questionnaires were posted (in March 2016) to the addresses of the respondents taken from NNPC information directory of host oil and gas companies in Nigeria. The questionnaires were addressed to senior managers across the industries who are responsible operational activities of the company. In case they are too busy to complete the questionnaire (based on work pressure or other reasons), they were recommended in the cover letter to pass it to appropriate person to complete it on their behalf.

Out of 200 administered questionnaires, we collected 120 samples, amounting to 60% response rate. 100 valid samples were analysed and 20 samples were excluded from the analysis because they were either partially filled or they are returned unfilled. Although poorly completed questionnaires still provide some data, researchers often exclude such questionnaires in order to reduce incidence of missing data in statistical analysis as well as improve reliability of results (Bryman and Bell, 2007; Creswell, 2007). This response rate is considered representative of

studies of organisations (Saunders and Lewis, 2012). The sampled companies were combinations of small, medium and large enterprises and the respondents selected for interviews included senior level managers.

The techniques we employed to increase the rate of response in this study includes: stamp and self-address addressed envelope was enclosed with the questionnaire, secondly, confidentiality of responses was assured. Thirdly, reminder questionnaires were sent out at the end of third and fifth weeks of sending out initial questionnaires. Fourthly, follow up telephone calls were also made at phased intervals. Fifthly, the covering letter and statement made by the DOS in the covering letter, that responses are going to be used for research purpose only and result of the research will be made available to the respondents if they are interested.

APPENDIX E: CONFERENCE PAPER PUBLICATIONS

Conference papers -

- Outsourcing Evolution and State-of-the Art Practices: Empirical Analysis of Oil and Gas Industry. Paper presented at Second European International Conference on Industrial Engineering and Operations Management at Paris, France, July 26 – 27, 2018.
- Impacts of deployed technologies and outsourcing arrangements in Oil and Gas Industry. Paper presented at Seventh Industrial Engineering and Operations Management - International Conference at Rabat, Morocco, April 8 -11, 2017.
- The role of technology in outsourcing practices in Oil and Gas Industry. Paper presented at 21st International Symposium on Logistics. Kaohsiung, Taiwan 3-6 July 2016.
- Further Analysis (Quantitative) - The role of technology in outsourcing practices in Oil and Gas Industry. Paper presented at Industrial Engineering and Operations Management - International Conference Detroit, Michigan, USA, September 23-25, 2016.

