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Article

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ACCOUNTING, CORPORATE GOVERNANCE & BUSINESS ETHICS | RESEARCH ARTICLE

Corporate governance and firm innovation: Evidence from indigenous oil firms in Sub-Saharan Africa

Ekom Etim Akpan^{1*}, Mamdouh Abdulaziz Saleh Al-Faryan² and Jeremiah Favour Iromaka³

Abstract: Previous studies on the effect of corporate governance on firm innovation shows mixed outcomes, while some reveal statistically significant effects, others show non-significant effects. Hence, this study aims at shedding more light on this unresolved phenomenon and fill this gap in literature by empirically examining the effect of corporate governance on firm innovation with special interest in indigenous oil firms in Nigeria, a Sub-Saharan country. The study adopted a cross sectional research design, while data were collected from respondents using a structured questionnaire and administered at a single period in time. Hypotheses were formulated for the study and tested using partial least square—structural equation modelling (PLS-SEM) through SmartPLS 3.2.9. The results demonstrated that corporate governance dimensions of board effectiveness, board commitment and board involvement have positive and statistically significant effects on firm innovation measures of process and product/service innovation. This study was limited to only indigenous oil firms in Nigeria, hence may not be generalized to other sectors of the economy. However, this study has far reaching implications to the industry. Most importantly, the study recommends ways to boost the level of innovation among indigenous oil firms which will enable them to remain competitive and sustainable. This study broadens literature on corporate governance and firm innovation especially in the Sub-Saharan African perspective. The study reveals that corporate governance through board effectiveness, commitment and involvement is essential for process and product/service innovation among indigenous oil firms.

Subjects: Business, Management and Accounting; Innovation Management; Corporate Governance; Petroleum & Oil Industries

Keywords: Corporate governance; board effectiveness; board commitment; board involvement; firm innovation; process innovation; product/service innovation

Jel: G34; O31; N57

1. Introduction

Ensuring process, and product/service innovation is one of the vital aims of corporate governance which has gained broad attention within academic domain as well as across industries and countries (Bose et al., 2018; Csedo et al., 2022). Achieving innovation is challenging, especially in

the oil industry, where the firms are dealing with climate change, unstable prices, economic crisis, changing government policies, insecurities and social problems while at the same time expected to provide products and services that are safe and satisfactory to their clients (Matkovskaya, et al., 2021; Uzoma et al., 2016). Hence, a study on corporate governance in the oil sector could have practical and managerial impacts on the oil firms and their level of innovativeness.

In recent times, corporate governance and its influence on innovation have attracted increasing interests from scholars as illustrated by the upsurge in the amount of research in this field (Naciti et al., 2022; Sarwar et al., 2022). Generally, corporate governance is important in strengthening organizations to achieve higher goals, control internal risks while minimizing external risks, assist with formal decisions, aids in ensuring sustainability as well as driving innovation (Bose et al., 2018; Csedo et al., 2022). Additionally, corporate governance is central to the competitiveness of today's businesses by covering both the social and institutional aspects of the organization (Chi-Kun, 2005). It also influences how objectives of businesses are formulated and implemented, how risks are monitored and assessed as well as how internal performance is optimized (Akomea-Frimpong et al., 2022).

Empirical evidences have shown mixed results on corporate governance and organizational innovation (Alabdullah et al., 2022; Buallay et al., 2017; Jensen & Meckling, 1976; Samlal, 2020; Shapiro et al., 2015; Zhang et al., 2014). Samlal (2020) found corporate governance to significantly influence innovation of Moroccan quoted firms. Further, Miqžek (2021), Finet, (2009) and Charreaux and Wirtz (2006) found that corporate governance enhances innovation, since it involves decision makers whose decisions must support the interests of all shareholders and advance the overall interest of the firm. However, some studies found that corporate governance has little or statistically insignificant impact on firm innovation (Chen, 2012; Shapiro et al., 2015). Several reasons have been presented for these mixed results on corporate governance and innovation. The immediate justification is the variables' intricacy, which made them difficult to measure. Then, the presence of several theoretical viewpoints and assertions that might explain the link between corporate governance and innovation (Chen, 2012; Samlal, 2020; Shapiro et al., 2015). Hence, these scholars recommended more robust analyses considering different measures of corporate governance and innovation. Therefore, more research is still needed to fully understand how corporate governance drives innovation, especially in the oil sector which appears to be neglected in previous studies which focuses more on corporate governance and innovation in manufacturing, banking, SMEs and telecommunication sectors (Buallay et al., 2017; Chen, 2012; Csedo et al., 2022; Samlal, 2020; Shapiro et al., 2015). Also, in spite of the increasing interest in the operations of indigenous oil firms in Sub-Saharan Africa, most of the oil firms still display low levels of process and product/service innovation which has hindered their ability to compete with their foreign counterparts. Hence, this study raised the question if corporate governance dimensions of board effectiveness, board commitment, and board involvement could lead to higher levels of organizational innovation measures of process and product/service innovation? Thus, this study investigates the role of corporate governance (board effectiveness, board commitment, and board involvement) on firm innovation (process and product/service innovation) among indigenous oil services firms in Nigeria, Sub-Saharan Africa using the partial least squares model (PLS-SEM) approach.

2. Literature review and hypotheses development

2.1. Corporate governance

Several authors have attempted to define the concept of "corporate governance". However, there has been subjectivity about what constitutes corporate governance. Corporate governance practices differ from country and firm as it is related to economic, legal, social, cultural, and ownership-structural contextual elements (Oman Khan et al., 2013). Nikolić and Zlatanović (2018) argue that corporate governance exists in relevant areas of research which create many dilemmas and disagreements in contemporary theory and practice. Due to the dynamic nature of the business

environment, stakeholders are increasingly concerned with how businesses are governed to ensure a balance of the values of the economy, society, and the environment. Accordingly, how businesses create value for their stakeholders must be socially responsible and must not compromise on issues of society and the environment (Eweje et al., 2021).

Corporate governance is a process that encourages organizational managers to operate in the best interests of the entities' owners and other stakeholders (Samlal, 2020; Zhang et al., 2014). This implies that when managers take a strong interest in putting the appropriate frameworks in place, the business performs well and reports higher performance. The Organization for Economic Co-operation and Development (OECD; 2004) sees corporate governance as a series of interactions between a company's management, board, shareholders, and other stakeholders. Corporate governance offers the framework through which the company's goals are defined, as well as the methods for achieving those goals and evaluating success (Alda, 2021). Relationships between corporate managers and shareholders are part of corporate governance, and they enable agents to answer to shareholders (Chemmanur & Tian, 2018; Kowalewski, 2016).

Corporate governance refers to the laws and guidelines that organizations implement and adhere to in order to accomplish their missions and visions as stated goals for their boards of directors and resource managers (Alodat et al., 2021). Effective corporate governance promotes resource management that is accountable for managers' stewardship of such resources (Nikolić & Zlatanović, 2018). Good corporate governance practices increase the likelihood that institutions will accomplish their aims and objectives (Akomea-Frimpong et al., 2022). Corporate governance is a uniquely complex and multi-faceted construct. Among the facets of corporate governance construct are board's composition, board commitment, ownership structure, board independence, board effectiveness, executive compensation, board involvement, vigilant audit committee (Deutsch, 2007; Olori & Sylva, 2017; Samlal, 2020; Shapiro et al., 2015; Tsao & Chen, 2012). In this study, board effectiveness, board commitment and board involvement were adopted as dimensions of corporate governance.

2.2. Firm innovation

Management literature shows that innovation is one of the key determinants of firm success, competitiveness, performance and survival (Don-Baridam et al., 2021; Kiveu et al., 2019). Although there are countless definitions of innovation in the literature, there is no universally agreed definition. The term innovation was first used by Joseph Schumpeter, who defined innovation using several characteristics such as development of new sources of raw-materials or new inputs, novel market opportunities and new forms of companies. Hurley and Hult (1998) describe innovation as a company's openness to new concepts as well as the capacity of the organization to effectively adapt or execute new concepts, procedures, or products. In a previous research, Kadarusman and Rosyafah (2022) contended that innovation comes from gained knowledge and experiences and might be either an upswing in technological prospects or an incremental shift in technology.

In addition, Trott (2008) submitted that innovation aims at developing business ideas. Therefore, by introducing the novelty factor, new business opportunities can arise. Also, innovation is concerned about introducing novel products and services or improved systems, techniques or procedures of carrying out a business. Hence, innovation opens new opportunities and attracts new customers through the offering of improved products and services. Similarly, Mahama (2022) defined innovation as "the introduction of a new concept, idea, service, process, or product aimed at improving services with the long term goals of improving quality, safety, outcomes, efficiency and costs". Likewise, Lumpkin and Dess (1996) sees innovation as a "firm's tendency to engage in and support new ideas, to experiment, and be creative". So firm innovation can be defined as a firm's willingness to accept new methods in its business processes as well as in the execution of its business strategies.

Innovative firms are exceptional and achieve improved products and services giving their customers greater satisfaction (Ioanid & Iliescu, 2022). Also, innovative firms are proactive and

think long term (Ioanid & Iliescu, 2022). As the world changes continuously with increased competition and more substitutes for products and services, it is crucial for organizations to change along in order to remain competitive and sustainable. Hence, product and process innovation is critical in the innovation process (Wang & Ahmed, 2004). Firms must always improve their processes of doing business as well as their final products in order to continuously add value to customers and achieve customer satisfaction and loyalty to remain competitive. Thus, we adopted product/service and process innovation relying on the opinion of Wang and Ahmed (2004) who sees these as the major dimensions of organizational innovation. Also, process and product/service innovation are key to the operations of oil services firms.

2.3. Hypotheses development

2.3.1. Board effectiveness and firm innovation

Board of directors play a crucial role in ensuring firm innovation (Gu & Zhang, 2016). The role of the board of directors is crucial as a source of support and aid in decision-making as well as a tool for monitoring and control (Sierra-Morán et al., 2021). From the agency theory perspective, the board of directors constitute the primary internal control mechanism for managing and overseeing managers (Fama & Jensen, 1983), therefore they determine whether the firm will be innovative or not. The board of directors play an encouraging part for firm innovation through the development and generation of strategies, ideas and policies as well as the incubation of innovation within the firm (Gonzales-Bustos et al., 2020; Shapiro et al., 2015). Moreover, an effective board of directors aids in energizing, educating, mediating, and organizing interactions among the many stakeholders of a company. As a result, it provides a stimulus for increasing a company's capabilities, expertise, and ultimately innovation (Zona, 2016). Similar to this, Alabdullah et al. (2022) argue that a strong and knowledgeable board with good management and performance judgment is needed for a competitive and performing organization. From the arguments above, a strong board is required in an organization in order to ensure innovativeness. Hence, we hypothesize that:

H1a: Higher level of board effectiveness will lead to higher level of product/service innovation.

H1b: Higher level of board effectiveness will lead to higher level of process innovation.

2.3.2. Board commitment and firm innovation

There are many empirical studies on board commitment and its role in the organization. Most of these scholars are of the opinion that board commitment positively influences firm innovation (Cutting & Kouzmin, 2002; Olori & Sylva, 2017). The argument is that innovation will be encouraged due to new ideas from committed board members. Also, such board members who may be financial experts, politicians, management consultants will want to protect their reputation. Similarly, they may be more exposed to current happenings in the external environments and will want to adopt some of the latest ideas and strategies to boost the level of innovativeness in the firm (Chen et al., 2015; Sierra-Morán et al., 2021). Additionally, the board commitment–firm innovation relationship may be explained using the resource and capabilities theory (Barney, 1991). The theory asserts that board members serve as a medium through which businesses access outside resources which they may not have access to within the organization (Chen, 2012). The theory opine that every organization possesses a distinct collection of resources and competencies. These resources when appropriately developed might become dynamic capabilities like innovation (Sierra-Morán et al., 2021). Based on the review above, we proposed that:

H2a: Higher board commitment leads to better product/service innovation.

H2b: Higher board commitment leads to better process innovation.

2.3.3. Board involvement and firm innovation

Several studies have examined the relationship between board involvement as a dimension of corporate governance and firm innovation with varying results (Arifin et al., 2022; Molokwu et al., 2013; Samlal, 2020). Specifically, Arifin et al. (2022) used the theory of principal-agent framework to explain the level of corporate innovation, stating that the involvement of the board has direct influence on the level of innovation. Further, Sharma (2016) examined the impact of board involvement on innovation and concluded that the personal characteristics of board members have significant impact on innovation, thus urging the adoption of a diversely composed board. Similarly, Asensio-López et al. (2019) found that internal corporate governance mechanism is a determinant of business innovation. The argument that board involvement has a positive influence on firm innovation finds its theoretical support from the board capital theory (Hillman & Dalziel, 2003), and the agency theory (Jensen & Meckling, 1976). Board capital theory is of the opinion that innovation will be encouraged when board members have different views and visions (Hillman & Dalziel, 2003). On the other hand, according to the agency theory perspective, board involvement is crucial for innovation, especially when there are independent directors on the board as they will provide effective oversight and prevent opportunistic behaviour that could undermine the company. Moreover, independent directors are freer than internal directors to suggest new ideas or challenge the chief executives' decisions in the boardroom since they are not subject to the executives' control. They are also more prone to apply stringent control since they are often well-known experts who want to protect their own reputation (Gu & Zhang, 2016), and will adopt innovative ideas to achieve both their personal and company objectives. Thus, we proposed that:

H3a: Higher level of board involvement will lead to higher level of process innovation.

H3b: Higher level of board involvement will lead to higher level of product/service innovation.

3. Methodology

Cross sectional research design was used in this research. The study examined the effect and interactions between corporate governance and innovation of indigenous oil services enterprises. Thus, the study empirically examined the influence of the dimensions of corporate governance (board effectiveness, board commitment, and board involvement) and indicators of firm innovation (process and product/service innovation). Additionally, a cross-sectional design was used because the study's data were collected within a particular period (Labaree, 2009; Onwuegbuzie & Collins, 2007).

The study's population consisted of all indigenous oil companies in Nigeria and registered with Petroleum Technology Association of Nigeria (PETAN). There are a total of 77 registered members of PETAN, however data were collected from 55 of the indigenous oil services firms while a total of 330 respondents answered the study's questionnaire from these 55 firms. The respondents comprised senior managers, middle-level managers and top-level resident managers. All respondents are from managerial cadre and fully involve in decision-making in their firms. In addition, 83.6 percent of the respondents have over 5 experiences with their firms. Therefore, it is believed that they are capable of responding to issues pertaining to corporate governance and innovation. This is in line with previous studies such as Molokwu et al. (2013), and Olori and Sylva (2017). Copies of the questionnaire were sent using Google forms as well as physical contacts.

3.1. Measures of variables

The independent variable—corporate governance has three dimensions—board effectiveness, board commitment and board involvement, adopted from Olori and Sylva (2017). Board effectiveness has six statement items which include “The board sets clear organisational priority on innovative activities for the year ahead”, while board commitment has items such as “The

Governing Board members of my firm are always attuned to the concerns of a variety of stakeholders”. Lastly, board involvement has five items including “The Governing Board members of my firm are always attuned to the concerns of a variety of stakeholders”. The dimensions and items were adopted from Molokwu et al. (2013) and Olori and Sylva (2017). The dependent variable—organizational innovation has two proxies (process -, and service innovation). Process innovation was measured with four statement items such as “my organization has developed many new management approaches during the past five years”, while product/service innovativeness has five items including “my organization’s new services are often perceived as original by customers”. The items were adopted from Ezenwakwelu et al. (2021), and Wang and Ahmed (2004). The statement items were measured on a five-point Likert scale.

4. Results

The hypothesized relationships between the dimensions of corporate governance (board effectiveness, board commitment, and board involvement) and proxies of organizational innovation (product/service and process innovation) were tested using the Partial Least Square-Structural Equation Model (PLS-SEM) with the aid of SmartPLS 3.2.9 software. The technique was suitable because data for the study were ordinal (J.F. Hair et al., 2021). Also, the study involves the analyses of multiple interactions among the dimensions of corporate governance and the measures of organizational innovation. Additionally, the PLS-SEM technique allows for simultaneous examination of the relationships between the variables and their effects on one another (Chin, 1998).

PLS-SEM employs a two-step methodology. These are structural and measurement models (Chin et al., 2003; Hair et al., 2020). The structural model calculates path correlations and their significance level, whereas the measurement model assesses construct reliability, validity, indicator reliability, convergent validity, and discriminant validity of the constructs (Chin et al., 2020). Statistical Package for Social Sciences (SPSS) version 25 was used to conduct analyses of the demographic data of the respondents.

Table 1 shows the demographic details of the respondents as well as the firms’ characteristics. The analysis demonstrated that the majority of the respondents are men (219) (66.4%). Pertaining the age of the respondents, the majority are below 35 years of age, revealing a very youthful workforce. The result indicated that the respondents are highly educated with 231 (70%) having obtained a Higher National Diploma or a Bachelor’s degree.

As per the firms surveyed, the result showed that 18(32.7%) of the firms have between 10–50 employees, 30(54.5%) have between 51–250 workers, while 8(14.6%) have 250 employees. Thus, indicating that the majority of the firms have between 51–250 employees. Relating to the firms’ age, 9(16.4%) are between 1–5 years, 30(54.5%) have operated between 6–10 years, while 10 have been functional for over 10 years. Lastly, 17(30.9%) of the firms offer engineering and technical services, followed by consultancy and procurement, and waste management and environmental engineering services with 20% each, 9(16.4%) are into drilling services whereas 7(12.7%) provide general services.

4.1. Measurement model

This section deals with the validity and reliability of the research instrument. The essence of this was to establish the validity and reliability of the instrument. It showcased the factor loadings, the Cronbach alpha values, composite reliability (CR), the average variance extracted (AVE), and the correlation matrix which established the discriminant validity of the constructs. Each of these analyses was aided by SmartPLS 3.2.9.

Table 2 demonstrates the factor loadings, Cronbach Alpha values, composite reliability and AVEs of the constructs. The output shows that the factor loadings for all the items exceeded the threshold of 0.6 (Bagozzi et al., 1991; J. Hair et al., 2010) with the minimum loading being .718. These values were all significant at $p < 0.000$; thus establishing the convergent validity of the

Table 1. Sample demographics

| Respondents' Characteristics | Frequency (N = 330) | Percent (%) |
|--|----------------------------|--------------------|
| Respondents' Gender | | |
| Male | 219 | 66.4 |
| Female | 111 | 33.6 |
| Respondents' Age | | |
| < 35 Years | 158 | 47.9 |
| 35–50 Years | 124 | 37.6 |
| > 50 Years | 48 | 14.5 |
| Respondents' Education | | |
| WAEC/OND | 70 | 21.2 |
| HND/B.Sc. | 231 | 70 |
| Masters and Above | 29 | 8.8 |
| Firm Characteristics | | |
| Firms' Size | | |
| 10–50 Employees | 18 | 32.7 |
| (1) Employees | 29 | 52.7 |
| > 250 Employees | 8 | 14.6 |
| Firms' Age | | |
| 1–5 Years | 9 | 16.4 |
| 6–10 Years | 30 | 54.5 |
| > 10 | 16 | 29.1 |
| Firms' Sector of Activities | | |
| Drilling | 9 | 16.4 |
| Consulting and Procurement | 11 | 20 |
| Engineering and Technical Services | 17 | 30.9 |
| Waste management and environmental Engineering | 11 | 20 |
| General Services/others | 7 | 12.7 |

Note: WAEC/OND = West African Examination Certificate/Ordinary National Diploma, HND/B.Sc. = Higher National Diploma/Bachelor of Science.

Source: Survey Data, 2022.

constructs. The Cronbach alpha values were .913 for board effectiveness, .878 for board commitment, .861 for board involvement, .806 for process innovation and .871 for product innovation indicating acceptable level of internal consistency as suggested by Nunnally and Bernstein (1994). Likewise, The CR values for the constructs were .916, .930 and .898 for board effectiveness, board commitment and board involvement, respectively while it was .856 and .933 for process innovation and product innovation respectively. Therefore, indicating a high level of reliability (Bagozzi & Yi, 2012). The average variance extracted (AVE) values which are .649, .740, .682, .680 and .641 respectively, were above the 0.50 benchmark (Aker et al., 2019; Bagozzi & Yi, 2012; Hair et al., 2016), Thus, indicating satisfactory level of validity.

Table 3 demonstrated the correlation matrix of the constructs along with their AVEs, mean and standard deviation. This was done to confirm the discriminant validity of the constructs. The result revealed that the square root of the AVEs on the diagonals of the correlation matrix were greater than the correlation values, which indicates that the constructs do not have similar items but are rather distinct from each other (Hair et al., 2016). This means that the items discriminated well;

Table 2. Reliability and validity of the model

| Constructs | Items | Mean | S.D | F.L | C.R | C.A | AVE | Sq Roots of AVEs |
|--------------------------|-------|-------|-------|-------|-------|-------|-------|------------------|
| Board Effectiveness (BE) | BE1 | 3.585 | .957 | >0.60 | >0.70 | >0.70 | >0.50 | .860 |
| | BE2 | 3.710 | .933 | .842 | .916 | .913 | .739 | |
| | BE3 | 3.566 | .937 | .811 | | | | |
| | BE4 | 3.893 | .979 | .813 | | | | |
| | BE5 | 3.338 | 1.233 | .866 | | | | |
| | BE6 | 3.714 | 1.216 | .762 | | | | |
| Board Commitment (BC) | BC1 | 3.641 | 1.009 | .718 | .930 | .878 | .647 | .806 |
| | BC2 | 3.776 | .879 | .815 | | | | |
| | BC3 | 3.833 | .883 | .872 | | | | |
| | BC4 | 3.286 | 1.414 | .844 | | | | |
| | BC5 | 3.869 | 1.367 | .755 | | | | |
| | BC6 | 3.841 | 1.139 | .882 | | | | |
| Board Involvement (BI) | BI1 | 2.886 | 1.233 | .810 | .898 | .861 | .678 | .828 |
| | BI2 | 3.731 | .937 | .886 | | | | |
| | BI3 | 3.833 | .883 | .732 | | | | |
| | BI4 | 3.841 | 1.139 | .764 | | | | |
| | BI5 | 3.286 | 1.414 | .818 | | | | |
| Process Innovation (PI) | PI1 | 4.106 | .808 | .791 | .856 | .806 | .681 | .829 |
| | PI2 | 4.171 | .817 | .786 | | | | |
| | PI3 | 4.143 | .864 | .722 | | | | |
| | PI4 | 4.163 | .877 | .754 | | | | |

(Continued)

Table 2. (Continued)

| Constructs | Items | Mean | S.D | F.L | C.R | C.A | AVE | Sq Roots of AVEs |
|---------------------------------|-------|-------|------|------|------|------|------|------------------|
| Product/Service Innovation (PN) | PN1 | 3.739 | .917 | .888 | .923 | .871 | .638 | .808 |
| | PN2 | 3.751 | .927 | .788 | | | | |
| | PN3 | 3.755 | .926 | .744 | | | | |
| | PN4 | 3.767 | .923 | .892 | | | | |
| | PN5 | 3.784 | .904 | .884 | | | | |

Note: BE = Board Effectiveness, BC = Board Commitment, BI = Board Involvement, PI = Process Innovation, PN = Product/Service Innovation, FL=Factor Loadings, CA = Cronbach Alpha, CR = Composite Reliability, AVEs = Average Variance Extracted, S.D = Standard Deviation

Source: SmartPLS 3.2.9 Output, 2022.

Table 3. Discriminant validities of study constructs

| | Constructs | Mean | S.D | AVEs | BE | BC | BI | PI |
|-----------|------------|-------|-------------|-------------|-------------|-------------|-------------|-------------|
| PN | | | | | | | | |
| BE | 3.634 | 1.043 | .739 | .860 | | | | |
| BC | 3.708 | 1.115 | .647 | .212 | .804 | | | |
| BI | 3.515 | 1.121 | .678 | .318 | .320 | .823 | | |
| PI | 4.146 | .842 | .681 | .324 | .232 | .187 | .825 | |
| PN | 3.759 | .919 | .638 | .211 | .112 | .192 | .312 | .799 |

Note: BE = Board Effectiveness, BC = Board Commitment, BI = Board Involvement, PI = Process Innovation, PN = Product/Service Innovation, AVEs = Average Variance Extracted, S.D = Standard Deviation

*The square root of the AVEs on the diagonal

Source: SmartPLS 3.2.9 Output, 2022.

thus proving acceptable discriminant validity as well as eliminating the possibility of multicollinearity problems (Bagozzi et al., 1991; Campbell & Fiske, 1959; Mikko & Eunseong, 2022).

Table 4 displays the variance inflation factor-based (VIF) collinearity data for the study’s variables. Based on a standard rule of thumb for evaluating VIFs, a value of 1 denotes that there is no association between the independent variables in the model. Values between 1 and 5 indicate a modest but not particularly significant correlation between a predictor variable and other predictor variables in the model. Any correlation between a specific predictor variable and other predictor variables in the model that is greater than 5 may be severe. In this study no predictor variable has a VIF value larger than 5, which suggests that multicollinearity will not be an issue in the regression model. Hence, no predictor variable could be predicted by other predictor factors.

4.2. Hypotheses testing

This study used partial least squares—structural equation modelling (PLS-SEM) to test the study’s hypotheses via the Smartpls 3.2.9 software. Validity and reliability of the instrument were examined using Cronbach alpha, composite reliability, AVEs as well as the square roots of AVEs. The hypothesis is accepted if the p-value is less than 0.05 or if the critical ratio is greater than 1.96. Further, the strength of the effect of the independent variable on the dependent variable is accessed using the r square (r^2). Tables 5a–5b show the results of hypotheses 1a and 1b.

4.2.1. Test of hypotheses one

H1a: Higher level of board effectiveness will lead to better level of process innovation.

H1b: Higher level of board effectiveness will lead to higher level of product/service innovation.

Table 5a shows the direct path model regarding the relationship between board effectiveness and innovation (process and product/service innovation). The first hypothesis stated that a higher level of board effectiveness will lead to a higher level of process innovation. The result supported this hypothesis ($\beta = 0.589$; $t = 7.237$; $p < 0.001$). Likewise, the result of the second hypothesis revealed that board effectiveness has significant positive effect on product/service innovation ($\beta = 0.637$; $t = 8.542$; $p < 0.001$), hence the hypothesis was supported. A further analysis was carried out to determine the contribution of board effectiveness to innovation using the effect size (f^2).

Based on the criteria given by Chin (1998) effect size (f^2) of .02 represents small, .15 represents a moderate effect, and .35 represents a “high” effect size. From the results, product/service innovation was influenced by board effectiveness with an f^2 value of .322. In addition, board

Table 4. Variance inflation factor (VIF)

| Model | Unstandardized Coefficients | | | Standardized Coefficients | t | Sig. | Collinearity Statistics | |
|-------|-----------------------------|------------|-------|---------------------------|--------|------|-------------------------|-------|
| | B | Std. Error | Beta | | | | Tolerance | VIF |
| 1 | | | | | | | | |
| | (Constant) | 18.437 | 2.119 | | 8.703 | .000 | | |
| | Board Effectiveness | -.482 | .119 | -.287 | -4.066 | .000 | .407 | 2.458 |
| | Board Commitment | 1.068 | .113 | .635 | 9.484 | .000 | .453 | 2.207 |
| | Board Involvement | .252 | .054 | .246 | 4.663 | .000 | .730 | 1.370 |

a. Dependent Variable: Organizational Innovation

Table 5a. Results of hypotheses (H1a—H1b)

| Hypotheses | Path Coefficient (β) | Standard Error | T. Value | P. Value | Decision |
|------------|------------------------------|----------------|----------|----------|-----------|
| BE -> PI | .589 | .026 | 7.237 | .000 | Supported |
| BE -> PN | .637 | .046 | 8.542 | .001 | Supported |

Note: BE = Board Effectiveness, PI = Process Innovation, PN = Product/Service Innovation, T-Statistics greater than 1.92 at .05 level of significance.

Source: SmartPLS 3.2.9 Output, 2022.

Table 5b. Effect sizes (f^2)

| Paths | f^2 | Effect Size |
|----------|-------|-------------|
| BE -> PI | 0.155 | Medium |
| BE -> PN | 0.322 | Medium |

Note: Note: BC = Board Effectiveness, PI = Process Innovation, PN = Product/Service Innovation. Effect size (f^2) of 0.02 = small; 0.15 = medium, while 0.35 = large effect (Cohen, 1988).

Source: SmartPLS 3.2.9 Output, 2022.

effectiveness has a moderate effect size on process innovation with f^2 value of .155. This means that board effectiveness contributes more to product/service innovation than it does to process innovation.

4.2.2. Test of hypotheses two

H2a: Higher board commitment leads to better process innovation.

H2b: Higher board commitment leads to better product/service innovation.

Table 6a shows the direct path model regarding the relationship between board commitment and innovation (process and product/service innovation). The path relationship as presented in Table 6a above demonstrates that there are positive and significant paths between board commitment and process innovation ($\beta = 0.616$; $t = 7.332$; $p < 0.001$), board commitment and product/service innovation ($\beta = 0.637$; $t = 7.561$; $p < 0.001$). Thus, stated hypotheses were all supported. Additionally, tests were conducted to ascertain the contribution of board commitment to innovation using the effect size (f^2).

From the results in Table 6b, board commitment has more effect on product/service innovation with an f^2 value of .312. In addition, board commitment has a moderate effect size on process innovation with f^2 value of .263. Thus, the result reveals that board commitment contributes more to process innovation than it contributes to product/service innovation.

4.2.3. Test of hypotheses three

H3a: Higher level of board involvement will lead to higher level of process innovation.

H3b: Higher level of board involvement will lead to higher level of product/service innovation.

Table 7a reveals the direct path model between board involvement and innovation (process and product/service innovation). It shows a positive and significant path between board involvement and process innovation ($\beta = 0.745$; $t = 7.434$; $p < 0.005$). There was also a positive and significant relationship between board involvement and product/service innovation ($\beta = 0.661$; $t = 7.615$;

Table 6a. Results of hypotheses testing (H2a and H2b)

| Hypotheses | Path Coefficient (β) | Standard Error | T. Value | P. Value | Decision |
|------------|------------------------------|----------------|----------|----------|-----------|
| BC -> PI | .616 | .066 | 7.332 | .000 | Supported |
| BC -> PN | .637 | .033 | 7.561 | .000 | Supported |

Note: BE = Board Effectiveness, PI = Process Innovation, PN = Product/Service Innovation, T-Statistics greater than 1.92 at .05 level of significance.

Source: SmartPLS 3.2.9 Output, 2022.

Table 6b. Effect sizes (f^2)

| Paths | f^2 | Effect Size |
|----------|-------|-------------|
| BC -> PI | 0.312 | Medium |
| BC -> PN | 0.263 | Medium |

Note: Note: BC = Board Commitment, PI = Process Innovation, PN = Product/Service Innovation. Effect size (f^2) of 0.02 = small; 0.15 = medium, while 0.35 = large effect (Cohen, 1988).

Source: SmartPLS 3.2.9 Output, 2022.

$p < 0.005$). The results imply that a higher level of board involvement will lead to a higher level innovation. Thus, the hypotheses were supported. Further tests were carried out to ascertain the effect sizes (f^2) as shown in Table 7b.

Table 7b demonstrated that board involvement has a greater effect on process innovation with a large f^2 value of .351, while board involvement has a moderate effect size on product/service innovation with a moderate f^2 value of .215. This implies that board involvement contributes more to process innovation than it does to product/service innovation.

5. Discussion

The study examined the influence of corporate governance on firm innovation among indigenous oil firms in Nigeria. It was hypothesized that corporate governance dimensions of board effectiveness, board commitment and board involvement significantly influence organizational innovation measures of process and product/service innovation. The tests of these hypotheses revealed that all dimensions of corporate governance (board effectiveness, board commitment and board involvement) positively influences the measures of innovation (process innovation, and product/service innovation). This implies that effectiveness, commitment and involvement of board members are crucial to the achievement of process and product/service innovation. The result shows that board members drive innovation through the use of their managerial competencies and experiences which supports the views of the resource and capabilities theory (Barney, 1991). Similarly, from agency theory perspective, the finding indicated that board members as agents of the firms serve the interest of all stakeholders by introducing innovative ideas, products and services (Fama & Jensen, 1983).

The finding that corporate governance dimensions positively affect measures of firm innovation corroborated several studies (Alabdullah et al., 2022; Arifin et al., 2022; Cutting & Kouzmin, 2002; Gu & Zhang, 2016; Molokwu et al., 2013; Olori & Sylva, 2017; Samlal, 2020; Sierra-Morán et al., 2021). Specifically, the finding that board effectiveness positively influenced firm innovation corroborates the submission of Jaskyte (2017), who studied the correlation between board effectiveness and innovation with interest in service organizations in Athens and found a positive correlation. In the same vein, Mason and Kim (2020) found that board knowledge and board effectiveness plays a significant role in the innovation of non-profit corporations. Likewise, the finding that board involvement positively influences innovation agrees with the finding of Zhu et al. (2016) that board members' involvement propels

Table 7a. Results of hypotheses testing (H2a and H2b)

| Hypotheses | Path Coefficient (β) | Standard Error | T. Value | P. Value | Decision |
|------------|------------------------------|----------------|----------|----------|-----------|
| BI -> PI | .745 | .039 | 7.434 | .001 | Supported |
| BI -> PN | .661 | .032 | 7.615 | .001 | Supported |

Note: BE = Board Involvement, PI = Process Innovation, PN = Product/Service Innovation, T-Statistics greater than 1.92 at .05 level of significance.

Source: SmartPLS 3.2.9 Output, 2022.

Table 7b. Effect sizes (f^2)

| Paths | f^2 | Effect Size |
|----------|-------|-------------|
| BI -> PI | 0.351 | Large |
| BI -> PN | 0.215 | Medium |

Note: Note: BI = Board Involvement, PI = Process Innovation, PN = Product/Service Innovation. Effect size (f^2) of 0.02 = small; 0.15 = medium, while 0.35 = large effect (Cohen, 1988).

Source: SmartPLS 3.2.9 Output, 2022.

corporate performance, competitiveness and innovation especially for nonprofit organizations. In a related study, Asensio-López et al. (2019) found that internal corporate governance mechanisms are a major determinant of business innovation. Additionally, the finding is consistent with that of Gonzales-Bustos et al. (2020) who found that board members' involvement plays a vital role in the level of innovation for family and non-family businesses. Also, Gabrielsson and Politis (2006) demonstrated that that process and organizational innovativeness can be spread through board involvement in strategic decision making.

The findings also affirm that board commitment has a positive influence on firm innovation (Chen et al., 2015; Sierra-Morán et al., 2021). This evidence is in accordance with the views of the board capital theory (Hillman & Dalziel, 2003). Board capital theory is of the opinion that innovation will be encouraged when board members have different views and visions (Hillman & Dalziel, 2003). The finding that board commitment positively influences innovation corroborates the position of Olori and Sylva (2017) that a high level of board commitment is needed to achieve high innovation in the Nigerian banking industry. Furthermore, Daellenbach et al. (1999) assert that “a high level of commitment to innovation will be promoted or impeded in many organizations because of the predispositions of the CEO and the management team.”

6. Conclusions and recommendations

The study focused on how corporate governance influences firm innovation of indigenous oil companies in Sub-Saharan. Board effectiveness, board commitment and board involvement were adopted as dimensions of corporate governance while firm innovation was studied using process and product/service innovation. The study hypotheses were tested using the PLS-SEM and the results revealed that effectiveness, commitment and involvement of the company boards positively influences process and product/service innovation. This outcome thus confirmed the study's hypotheses that higher levels of board effectiveness, board commitment and board involvement will lead to higher levels of process and product/service innovation. Meaning that to ensure a high level of firm innovation, there should be effective, committed and participatory boards.

Based on the findings and results, board members of indigenous oil companies in Sub-Saharan Africa should be more involved in the management of their companies rather than simply providing advice, while still upholding the principles of corporate governance, as this will allow the companies to make innovative decisions. Further, the current corporate governance structures should be modified to

encourage flexibility in business operations and processes, which will boost innovation. Additionally, when developing and enacting corporate policies, legislators and regulators need to give more thought to the effectiveness, commitment, and involvement aspects of corporate governance as well as process and product/service innovation.

Overall, this study reveals that innovation is a key strategy used by indigenous oil firms in Sub-Saharan Africa. Specifically, innovation makes production faster, cheaper and ensures effective usage of scarce resources as well as boost total output and increases production efficiency. However, innovation must be supported by an effective corporate governance system which involves having board members who are effective, committed and focus on the firm's wellbeing. Additionally, the study shows innovation as a key lever for business growth and critical to achieving sustained competitive advantage within indigenous oil firms. Therefore, to be more innovative, indigenous oil firms in Sub-Saharan Africa should complement their corporate strategies with a strong board in addition to the use of novel solutions, ideas, and technologies from partners such as suppliers and service providers.

6.1. Practical implications

This study adds to the body of research on corporate governance and firm innovation. The findings of this study have enormous implications to researchers and practitioners. Researchers might use this study to their advantage by examining the effects of corporate governance in other domains and comparing the findings. Practically, in order to strategically increase and encourage innovation within the indigenous oil services firms, corporate leaders, top management and other stakeholders should ensure that board members are effective and committed to the long term as well as short-term success of the firm. Also, for the purpose of fostering innovation, policies should be developed to encourage effectiveness, commitment and involvement among board members, particularly in indigenous oil companies. Also, corporate board members should monitor and support innovation in the firms.

6.2. Theoretical implications

This study made enormous theoretical contributions. First, the study shows the suitability of various theoretical frameworks such as agency theory, resource and capabilities theory and the theory of principal-agent framework in understanding the effects of corporate governance on firm innovation. Further, this study confirms that corporate governance has direct influence on the level of innovation among indigenous oil firms. Therefore, this study has paved the way for more scholarly inquiries into the role of corporate governance on firm innovation especially in Sub-Saharan Africa.

6.3. Limitations and further studies

This study is confined to corporate governance and firm innovation of indigenous oil firms in Nigeria, a Sub-Saharan country. Data for the study were collected only from workers from indigenous oil firms, hence the findings may not be generalized to other sectors of the economy or oil companies in developed countries. This appears to be the weakest point of this study. Therefore, further studies should be expanded to cover the influence of corporate governance on firm innovation in other sectors such as banking, real estate, health and education as well as in developed economies such as Britain, France or the United States of America. Also, future studies may introduce moderating variables such as firm size or age.

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Appendix

QUESTIONNAIRE ON CORPORATE GOVERNANCE AND FIRM INNOVATION

This questionnaire is intended to gather information to enable me carry out research on the topic “Corporate Governance and organizational Innovation in Indigenous Oil Services Firms”. Kindly, indicate the extent to which you agree or disagree that the statement reflects the situation in your organization.

Section A

The statements below describe corporate governance in your firm” in terms of board effectiveness, board commitment and board involvement. Please read each statement carefully, and then indicate the extent to which you agree or disagree by ticking in the box below each on a scale of 1 (Strongly disagree) to 5 (Strongly agree).

| | | CORPORATE GOVERNANCE | | | | |
|---|---|-----------------------------|----------|----------|----------|----------|
| S/N | Board Effectiveness—(Molokwu et al., 2013; Olori & Sylva, 2017). | 1 | 2 | 3 | 4 | 5 |
| 1 | The board sets clear organisational priority on innovative activities for the year ahead | | | | | |
| 2 | The governing board of my firm delays actions until issues become urgent and critical (R) | | | | | |
| 3 | Our governing board tends to focus more on current concerns than on preparing for technological changes that would enhance creative ideas and innovation (r) | | | | | |
| 4 | The board of directors often discusses and initiates where the organisation should be headed in three years or more on technological, product-market or administrative innovation | | | | | |
| 5 | The governing board converts unsuccessful novel ideas into more creative and innovative ones | | | | | |
| 6 | When faced with an important issue, the board often arrives at a solution by generating several creative and tested approaches through R&D | | | | | |
| Board Commitment—(Molokwu et al., 2013; Olori & Sylva, 2017). | | 1 | 2 | 3 | 4 | 5 |
| 1 | The Governing Board members of my firm attend meetings regularly | | | | | |
| 2 | The Governing Board members of my firm are always well prepared when they attend meetings | | | | | |
| 3 | The Governing Board members of my firm are always attuned to the concerns of a variety of stakeholders | | | | | |
| 4 | The Governing Board members of my firm actively provide insight, advice and support on key decisions | | | | | |
| 5 | The Governing Board members of my firm usually debate strategic decisions openly and constructively during meetings | | | | | |
| 6 | The Governing Board members of my firm commit themselves sufficiently to foster effective decisions and reverse failed initiatives and policies | | | | | |
| Board Involvement—(Molokwu et al., 2013; Olori & Sylva, 2017). | | 1 | 2 | 3 | 4 | 5 |
| 1 | The board is usually involved in formation and determining the firm’s vision and mission that guide novel decisions | | | | | |

(Continued)

(Continued)

| CORPORATE GOVERNANCE | | | | | | |
|-----------------------------|--|--|--|--|--|--|
| 2 | The board is usually involved in determining, reviewing and ratifying new ideas initiated by top management | | | | | |
| 3 | The board is usually involved in creative initiatives and pioneering new ideas | | | | | |
| 4 | The board is usually involved with top management in determining development systems that encourage initiatives and creativity amongst employees | | | | | |
| 5 | The board is usually involved with strategic innovative decisions with top management. | | | | | |

Scale: Strongly Disagree = 1, Disagree = 2, Neutral = 3, Agree = 4 and Strongly Agree = 5

Section B

(1 = strongly disagree, 2 = disagree, 3 = nor disagree nor agree, 4 = agree, 5 = strongly agree)

| Organizational Innovation | | | | | | |
|----------------------------------|--|----------|----------|----------|----------|----------|
| | Process Innovation—(Wang & Ahmed, 2004). | 1 | 2 | 3 | 4 | 5 |
| 1 | We constantly improves our business processes | | | | | |
| 2 | My organization has developed many new management approaches during the past five years | | | | | |
| 3 | We changes methods at a great speed in comparison with our competitors | | | | | |
| 4 | my organization improvise on new methods when we cannot solve a problem using conventional methods | | | | | |
| | Product/Service Innovation—(Ezenwakwelu et al., 2021). | 1 | 2 | 3 | 4 | 5 |
| 1 | The frequently improve our products/services quality | | | | | |
| 2 | Our products/services are more efficient compared to our competitors | | | | | |
| 3 | In new product/service introductions, our company is often first-to market | | | | | |
| 4 | Our new products/services are often perceived very novel by customers | | | | | |
| 5 | We are fast in bringing new products/services into the telecommunications market | | | | | |



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