INTANGIBLE ASSETS ANDPERFORMANCE OF QUOTED PHARMACEUTICAL FIRMS IN NIGERIA

BY

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BEING A DISSERTATIONPRESENTED TO THE SCHOOL OF POSTGRADUATE STUDIES, AHMADU BELLO UNIVERSITY ZARIA, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF SCIENCE DEGREE (M.Sc.) IN ACCOUNTING AND FINANCE

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DECLARATION

I declare that this MSc. Thesis titled "Intangible Assets and Performance of Quoted Pharmaceutical Firms in Nigeria" has been carried out by me in the Department of Accounting, Ahmadu Bello University, Zaria. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this thesis was previously presented for the award of another Degree or Diploma at this or any other institution.

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CERTIFICATION

This Thesis titled “Intangible Assets and Performance of QuotedPharmaceutical Firms in Nigeria” by Adejoh DAIKWO has meet the regulations governing the award of the degree of Master of Science (MSc) in Accounting and Finance, Ahmadu Bello University, Zaria. It is therefore approved for its contribution to knowledge and literary presentation.

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DEDICATION

This M.Sc. Thesis is dedicated to my parents, Mr and Mrs DAIKWO Emmanuel Muhammed.

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The completion of this M.Sc. Research process wouldn't have been possible without God's mercy and preservations. May his name alone be praised. I acknowledge the contributions of meaningful resource persons that made the work a success. I sincerely extend my profound appreciation especially to my supervisors; first and foremost, the Chairman Supervisory Committee, Dr. I. L Chechet who has supported me in all aspects of this research, with his patience and knowledge whilst aiming at bringing the best out of me. His encouragement and constructive criticisms, no doubt, made this study a reality. The Almighty God will reward him greatly for his contributions. Secondly, my sincere appreciation goes to Member of the Supervisory Committee, Dr. SalisuAbubakar, for his useful suggestions, as well as valuable hints toward improving the work logically. Thank you for tolerating my shortcomings. May the good God bless him richly. I acknowledge the contributions of all my lectures during the course work. The value you have added to me no doubt has brought out the best in me. The good God will continue to increase you in all sides.

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ABSTRACT

Conventional physical assets were initially presumed to be the main sources of value to corporate entities. Following the rapid growth and expansion of science, technology and globalization, particularly in the technological and chemical industries, both tangible and intangible assets are now accepted as potential strategic assets. This study which is underpinned by the Resource Base View Theory examines the impact of intangible asset on the performance of quoted pharmaceutical firms in Nigeria. The study employed correlation research design in a sample of six (6) quoted pharmaceutical firms for a period of ten (10) years. The study used Secondary data and Seemingly Unrelated Regression technique of data analysis was employed in the analysis of the data collected. The study found that intangible assets have significantly impacted on the financial performance of quoted pharmaceutical firms in Nigerian during the period covered by the study. This was as a result of adequate investment in the intangible assets and its proper management. Particularly, the study after controlling for physical capital intensity and assets turnover, found that capital employed efficiency has a significant negative impact on the performance of listed pharmaceutical firms in Nigeria; human capital efficiency has a significant positive effect on the performance of listed pharmaceutical firms in Nigeria; and, structural capital efficiency has a significant positive impact on the performance of listed pharmaceutical firms in Nigeria. The study recommends inter alia that, the management of pharmaceutical firms in Nigeria should emphasize investments in intangible assets as they pose great potentials of helping organizations to earn economic rent as posited by the Resource Base View theory. This can be done by setting aside a certain percentage of the firms' annual profit for intangible assets improvement.It is also recommended that, the management of pharmaceutical firms in Nigeria should strive hard to develop their human resources by way of training and retraining as well as professional and competency development of the employees in their various areas of specialisations. This can be done through Mandatory Continuing Professional Development (MCPD) seminar, workshops and attending short time course.

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CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Over time, conventional physical assets were considered to be the main determinants of the performance of any economic activity of a firm. Contrarily, the rapid growth and expansion of science, technology and globalization offer a modus operandi critical to the performance and economic growth of a firm.Both tangible and intangible assets are potential strategic assets. In the new economic system, which is popularly known as the knowledge economy, intangible or intellectual asset is eventually recognized as the prominent resources. Companies like software, finance and pharmaceutical depend largely on intangible assets (intellectual capital) for earning revenues.Intangible assets consist of the stock of immaterial resources that enters the production process and are necessary for the creation and sale of new or improved products and processes.These assets include designs, blueprints, patents, licences, trademarks as well as technology-related consulting services, and other immaterial resources (Izedonme, Odeyile, & Kingsley Kuegbe, 2013).Intangible assets do not appear on firms' conventional balance sheets, but they account for firms' higher market valuations. The importance of intangible assets, (otherwise referred to as intellectual capital), is the distinguishing feature of the new economy. Nowadays traditional sectors like the pharmaceutical industry, in order to increase competitiveness and survive in global economy, need to change from labor-intensive to knowledge-intensive production and focus on products with more value-added, therefore need to make constant investments in intangible resources (Owen, 2001).

Economies are becoming knowledge and technology-based.The intangible elements of firms are becoming fundamental determinants of firms' current and future competitiveness as well as firms' value and growth. Central to this perspective is the idea that firms differ in their resource positions and that such resources heterogeneity account for performance variability across firms.

Evidence from a number of countries suggests faster growth in investment in intangible assets than in tangibles. In the United Kingdom, for instance, investment in intangibles is estimated to have more than doubled as a share of market sector gross value added between 1970 and 2010 (UNIDO, 2011). Studies like Goldstein, Doorley& Turner(2011) estimated annual investment in intangibles in the United States of between $800 billion and $1 trillion, with a stock of intangibles of up to $5 trillion. In many countries, the proportion of off balance-sheet assets to on-balance-sheet assets (the price-to-book ratios of companies) has risen for decades. The World Bank estimates that, for countries, the preponderant form of wealth worldwide is intangible capital. In the United Kingdom, key business outcomes can be linked to investment in intangibles. For instance, in 2004, about half of export sales from winners of the Queens Award

for Exports could be directly attributed to investment in design (UNIDO, 2011) and this is an intangible asset.Nigeria is one of the most promising and rapidly growing pharmaceutical markets in West Africa with more than 150 pharma formulation manufacturing facilities. The Nigerian pharma industry is growing at 13 % annually. In 2011, the market size was about USD 1.8 Billion. About 60% of drug manufacturing in the ECOWAS (Economic Community of West African States) sub-region takes place in Nigeria, underlining the huge sub regional market. The pharmaceutical manufacturing sector of Nigeria contributes to nation building with aggregate investments in excess of N300 billion, paying taxes and other tariffs and employing over 600,000 persons(PMG-MAN, 2013).

Facing intense globalized competition, there is a widespread recognition that intangible assetis a critical force that drives economic growth (Huang & Lie, 2005). Organizations today are facing an increasingly elusive challenge as more value of the firms is becoming intangible. In the knowledge and technology-based economy of today, the intangible elements of firms are fundamental determinants of firms' current and future competitiveness as well as firm value and growth. Companies like software, finance, pharmaceutical, textile, food and beverages, among others, depend to a large extent, on intangible assets to earn economic rent. Intangible assets are nowadays the value driver of an enterprise and the most valuable stock of immaterial resources (Stewart, 1997; Wiig, 1997). They currently constitute between one-half and two-thirds of corporate market value of both "old" and "new economy" enterprises (Lev, 2001). But do intangible assets really contribute to better performance and can the lack of them explain firm's failure?

1.2 STATEMENT OF THE PROBLEM

The Resource-Based View theory of the firm view firms' resources as the main drive behind competiveness and performance. These resources include both tangible (physical) assets as well as intangible assets that have been internalized by the firm and used effectively and efficiently to implement specific competitive and profitable strategies. While the role of physical assets performance is well established in the literature and in practice, it is the role of intangible assets, as strategic resources, that needs and deserve investigation. According to Collis, (1996), though intellectual capital may be a source of competitive advantage, most organisations do not understand its nature and value and how it affects the value of the firm.

Although it is widely accepted that intangible assets are becoming a critical source of competitive advantage (Barney, 1991), dearth research works on its significance on firms' performance posed a great challenge thus a limited literature on intangible assets. While intangible assets are theoretically interesting and contributory to adding more value to firms, they suffer from being extremely hard to identify and measure hence, there are no adequate studies on the extent to which the components (human capital, structural capital and capital employed) of intangible assets affects firms' performance.

It is only very recently that researches started asking this question by focusing on the relationship between intangible assets and firm performance analyzing many different sectors, mostly being high-tech industries (Gleason &Klock, 2006; Firer & Williams, 2003; Delios& Beamish, 2001). Despite the relevance of all these works, more research is needed to test the

link between intangible assets and firm performance (Firer & Williams, 2003; Bontis, Keow& Richardson, 2000).

Studies have tried to establish a link between intellectual capital and business performance (Cater & Cater, 2009; Cohen &Kaimenakis, 2007; Ittner, 2008;Toustiga&Tulugurova, 2009; Wang & Chang, 2005). Specifically, Mauridis&Kyrmizoglous (2005), in their study of Greek banks, it was revealed that the most performing banks were those that use their intellectual capital most effectively. However, these studies do not identify the significance of the intangible assets to the performance of firms. The studies too do not identify which elements of the intellectual capital contributed most and how they were able to create values. From the point of view of both managers and policy makers, a clear understanding on what determines the firms' propensity to invest in intangible assets can be of crucial importance, especially if it helps identifying the variables that discriminate between high and low performance businesses. Moreover, such a perspective is interesting for the academic debate too, in that it may offer a test for alternative theories of the firm. For these reasons, this research workaims to fill the gap using the pharmaceutical industry as the study domain.

1.3 OBJECTIVES OF THE STUDY

The main objective of this study is to examine the impact of intangible assets on the performance of quoted pharmaceutical firms in Nigeria.The specific objectives of the study are:

i. To determine the effect of Human Capital Efficiency on the performance of quoted pharmaceutical firms in Nigeria.
ii. To evaluate the contribution of Structural Capital Efficiency on the performance of quoted pharmaceutical firms in Nigeria.

iii. To examine the impact of Capital Employed Efficiency on the performance of quoted pharmaceutical firms in Nigeria.

iv. To determine the influence of Physical Capital Intensity on the performance of quoted pharmaceutical firms in Nigeria.

v. To identify the influence of Asset Turnover Ratio on the performance of quoted pharmaceutical firms in Nigeria.

1.4 RESEARCH HYPOTHESES

The hypotheses used to testthis study areas below:

Ho_1: Human capital efficiencyhas no significant effect on the performance ofquoted pharmaceutical firms in Nigeria.

Ho_2: Structural capital efficiencyhas no significant effect on the performance of quoted pharmaceutical firms in Nigeria.

Ho_3: Capital employed efficiencyhas no significant effect on the performance of quoted pharmaceutical firms in Nigeria.

Ho_4: Physical Capital Intensity has no significant influence on the performance of quoted pharmaceutical firms in Nigeria.

Ho_5: Assets Turnover Ratio has no significant influence on the performance of quoted pharmaceutical firms in Nigeria.

1.5 SCOPE OF THE STUDY

This research covers Ten (10) years period (2004 – 2013). This period is chosen because it marked an era in the pharmaceutical sector of Nigerian economy, when it was reported by Pharmaceutical Manufacturing Group of Manufacturers' Association of Nigeria (PMG-MAN, 2010) that investment in intellectual capital and personnel development, stimulated by rigorous government policy on the promotion of local drugs and production, account for an average growth rate of between 10 and 15 per cent of the overall performance of the sector. The population of the study is the seven (7) Quoted Pharmaceutical firms in Nigeria out of which six (6) were sampled for the study.

The explanatory variables for this study areHuman Capital Efficiency, Structural Capital Efficiency and Capital Employed Efficiency.The control variables are Physical Capital Intensity and Asset Turnover Ratio while the explained variable is performance which is proxy by Return on Assets (ROA)and Employee Productivity (EP).

1.6 SIGNIFICANCE OF THE STUDY

One particular industry that is considered knowledge-intensive and a source of great intellectual capital is the pharmaceutical industry (Daum, 2005). In the same way, Wang, Chang, Huang, & Wang (2011) argued that pharmaceutical industry is making more investment consistently in order to acquire and protect their intellectual property rights. Pharmaceutical industry also makes investment in research and development (R&D) sector to take competitive advantages over rivals. This industry is considered as high research-intensive, high innovative, well balanced in respect of human intervention and technology, and most importantly it's based on intellectual capital for a source of renewal and business performance. These and many more makes for relevance of this study in this domain – pharmaceutical industry. Thus, the outcome of this study will help the Nigerian pharmaceutical industry to understand and manage their intangible assets effectively. This work is equally of immense benefit to the academia as it will add to the wealth of knowledge for researchers in the field of intangible asset to make reference to.

CHAPTER TWO
LITERATURE REVIEW

2.1 INTRODUCTION

The purpose of this chapter isto discuss the concepts of intangible assets and its components and performance and its components in relation tothe study. Literatures relevant to the study were reviewed so as to present proper perspectives and focus of the study as well as to analyse the Recourse-Base View (RBV) theory, the theory that under pin the study, which explains the special characteristics of intangible assets and why they aid firms to earn economic rent.

2.2 CONCEPTUALIZATION

The capability of existing concepts and definition in harmonious of the issue of this study, exploringviews of scholars and aligning them with the standard setting bodies, are discussed below:

2.2.1 The Concept of Intangible Asset

Early research on intangible assets focuses extensively on their definitions and classifications.Consequently, in the literature neither one unified definition of intangible assets nor onegeneral classification can be found. As intangible assets are intangible, they are also tricky to define and quantify. Encyclopedia Britannica defines “intangible” as something not tangible, and “incapable of being perceived by the sense of touch”. Further, they define “intangible assets” as something “existing only in connection with something else, or as the goodwill of a business”.

Stewart (1997) illustrated intangibles as “the sum of an organization’s patents, processes, employees’ skills, technologies, information about customers and suppliers, and old-fashioned experience”. It is seen as the ‘sum of knowledge’ of its members and practical translation of this knowledge into brands, trademarks and processes (Roos, Roos, Dragonetti&Edvinsson, 1997).Lev (2001) notes that ‘an intangible asset is a claim to future benefits that does not have physical or financial (a stock or a bond) embodiment’. He added that intangible assets are sources of value generated by innovation, unique organizational designs, or human resources practices. Intangibles often interact with tangible and financial assets to create corporate value and economic growth.

Intangible assets consist of the stock of immaterial resources that affects the production process and are necessary to the creation and sale of new or improved products and processes. They include both internally produced assets – e.g. designs, blueprints, brand equity, in-house software, and construction projects – and assets acquired through external market – e.g. technology licenses, patents and copyrights, and the economic competences acquired through purchases of management and consulting services (Corrado,Sichel&Hulten, 2006).Edvinsson& Malone (1997) define it as the possession of knowledge, applied experience, organizational technology, customer relations and professional skills that provide a company with a competitive edge in the market. Sullivan (2000) view intangible asset as ‘knowledge that canbe

converted into profits'.Intangible assets are developed as accounting proxy of the difference between the market and book values of firms (Edvinsson, 2000; Joia, 2000; Bontis, 2003). The very common view of these definitions is converged on the 'immateriality' aspect of these assets, they have neither physical substance nor specific monetary value, yet they significantly contribute to value creation for a business.

Regarding contemporary classification schemes of intangibles, Plakalo (2006) sums up the most common types of intangible assets in to three main groups, viz: structured capital, relation capital and human capital. As for the biotechnology industry, the structured capital group is said to be the most important (Plakalo, 2006), where product development, research and development, information systems etc., are located. However, also relation capital, were licensing, brands, and partnership should be of high importance for the biotechnology industry. The last group, human capital, is probably equally important, but by far the most difficult one to capitalize. Comparing Plakalo (2006) chart to the Encyclopedia Britannica definition, one can see that they "existing only in connection with something else" is a rather good way of looking at it. For example, the human capital of a business only worth something as long as the business is going and the same goes for licenses, partnerships, un-commercialized research projects, and so on.

Sveiby (1997) dividesintangibles into three groups: (1) employee competence i.e an individual's ability to act in a widevariety of situations to create both tangible and intangible assets; (2) internal structurewhich include patents, concepts, models, computer and administrative systems, ex-organizational structureor spirit; (3) external structure i.erelationships with customers, suppliers, brand names,trademarks, organizational reputation and image. From financial accounting point of viewintangibles can be classified into traditional intangibles and deferred charges (Hendriksen&Breda, 1992). Guilding& Pike (1990) divided intangibles into three groups takingmarketing view: value creators, marketing assets and value manifestations. Mortensen,Eustace &Lannoo (1997), from financial perspective, distinguished between innovationcapital, structural capital, executory contracts, market capital and goodwill. Anotherclassification scheme divides intangible resources into assets and skills (Hall, 1992). Thewidely accepted classification of intangible asset (intellectual capital) is the distinction between human capital,structural capital and relational (customer) capital (Stewart, 1997, Bontis, 1998). Thisclassification will be applied for the purposes of the research.

2.2.1.1 Human Capital

There is no precise definition of human capital, as it depends on the nature of job, situational factors and the nature of a firm. Ashton (2005) points out that human capital consists of personnel attributes, such as knowledge, skill, and experience. According to Bozbura (2004), human capital can be recognized as an accumulation of employees' general knowledge, leadership skills, risk taking abilities, and problem solving abilities. The human capital can be developed so as to enhance the efficiency of firms' tangible and intangible assets (Fitz-enz, 2001). Companies invest significant amounts of their money in human capital development in

order to achieve competitive advantages in the global market (Ulrich, 1997). Human capital represents the individual knowledge stock of an organization as represented byits employees (Bontis, Keow& Richardson, 2000). It is considered to be the most important intellectual asset as it is the source of innovation and renewal (Stewart, 1997). It compromises the competence, skillsand intellectual agility of the individual employees (Roos, Bainbridge & Jacobsen, 2001).These definitions are centered on the point that knowledge and intellectual capabilities of employees are cure in corporate investment decision-making and product delivery. It includes the collective knowledge, competency, experience, skills and talents of people within an organization. It also includes an organization's creative capacity and its ability to be innovative. This is due to the fact that every product of a firm is born out of the idea and intellectual creativity of employees.

Pertinent to note, however, is that human capital cannot be owned by the company (Bontis, 2001). The concept of Skandia Navigator (Bontis, 1999) described that human capital would disappear as employees leave the firm, since human capital depends on capabilities, such as competence, commitment, motivation, loyalty etc, of employees. The concept of mobility of laboursubstantiates this claim that human capital cannot be owned by a company. However, Bagudo (2009)opine that though human capital cannot be owned in person, his services can be owned in so far as he is working for the organization for the period his services is paid for to help add value to the organisations.

2.2.1.2 Structural Capital

Firms, in order to share and transport the knowledge, need structural assets, such asinformation systems, laboratories, competitive and market intelligence and management focus.On the contrary to human capital, structural capital belongs to organization as a whole and it can be reproduced and shared (Stewart, 1997). Structural capital consists of both internal value drivers of a firm, such as processes, routines, databases, customer files, software and manuals (Ashton, 2005). Structural capital is "everything that gets left behind at the office whenemployees go home" (Bontis, 2001). Structural capital is a critical link that allows intellectual capital to be measured at theorganizational level of analysis (Bontis, Keow& Richardson, 2000). Structural capital is the supportive infrastructure for human capital—it is the capital which consists of stock of knowledge that remains in the factory or office when the employees leave at the end of the day. It includes all of the non-human storehouses of knowledge contained in organizational ability, database, filing cabinets, processes, and patents. Unlike human capital, it is company's property and can be traded, reproduced and shared by, and within, the organization.

2.2.1.3 Relational Capital

Relational capital of the firm is "the value of its franchise, its ongoing relationships withpeople or organizations to which it sells" (Stewart, 1997). The main content of relationalcapital is the knowledge of marketing channels and customer relationships (Bontis, 1998).Theultimate form of relational capital is shared knowledge (Stewart, 1997). Relational capital, in sum, is a company's relationship with its customers and with its network of suppliers, strategic partners

and shareholders. The value of these assets is determined by the company's reputation or image as it is and presented to the public.

In summary, there are a variety of classification of intangible asset proposed, however, the distinction of humancapital, structural capital and relational (customer) capital are most common in the literature and were first evidenced in the mid-1990s (Bontis, 1996; Edvinsson&Sullivan, 1996; Petrash, 1996; Saint-Onge, 1996). Human capital, in a simplified way, is defined as the knowledge embedded in the minds of all employees. Structural capital consists of the stock of knowledge that stays in the organization when the employees go home. Finally, relational capital consists of the knowledge embedded in external networks which consists primarily of knowledge about customers. However, human capital is the intangible asset that presents the highest mobility (Teece, Pisano &Shuen, 1997). Once the organization has integrated human capital with other complementary resources, and it uses that integration to develop organisational competencies, the fact that one or more workers may leave the firm might not imply a loss in competitive advantage. On the contrary, the competitor who acquired that worker would need to access all other organisational resources and systems to fully use the knowledge resources the individual possesses (DeNisi, Hitt& Jackson, 2003). Structural capital is made up of explicit knowledge and can reflect the causal ambiguity of organisational resources (making it difficult for competitors to imitate). Furthermore, relational capital requires significant investment in market orientation and customer information in order to learn about client desires, tastes and needs. Each of these components on its own is useless. For instance, smart employees (human capital) who know nothing about what customers want (relational capital) cannot convert technology (structural capital) into sustainable advantage. Thus, a simultaneous coordination of human capital, structural capitaland relational capital is required to drive business performance as individual stocks ofknowledge, these subcomponents of intellectual capital, are of little value.

2.2.1.4 Capital Employed

Capital employed is a term that is used in both accounting and finance perspectives. The term has a number of different meanings along with different implementations. In general capital employed is regarded as the investment of the capital that is essential require for the business to function in a proper way. In more simple words, the capital employed can be described as the total amount of capital required by a firm to invest in order to gain profits. It can also be calculated as the value of all the assets that are employed by the firm in their current business. In business arena the term capital employed is the most difficult term to explain due to its multiple dimensions. The confusion in explaining the capital employed is because it can be used in a number of different contexts. However, in common most of the people refer it to the investment that is used for the proper functioning of the business. Another name given to the capital employed is the "funds Employed" as it involves the allocation of the funds to the business functions (Stewart, 1997).
If we want to explain the term capital employed in more specific words of accounting we can say it is the value of those assets that are invested by a company to generate revenue. Capital

employed is also measure of the efficiency of a company to generate revenue from its investment. There are different methods and options for a company to generate capital. It can be generated by the help of issuing bonds and shares of the company. It can also be generated by converting assets of a firm into cash and then investing that cash into the business. The choice and selection of capital generation methods depends upon the need of a company and the specific industry in which a company is operating its business. The final equation of the capital employed is that it equates to the money that is used by the business to expand its operations(Firer &Williams, 2003).

In sum, capital employed is the total capital harnessed in a firm's fixed and current assets. Viewed from the funding side, it equals to stockholders' funds (equity capital) plus long-term liabilities (loan capital). However, if it is viewed from the asset side, it equals to fixed assets plus working capital(Stewart, 1997).

2.2.2 The Concept of Performance

Organization's performance is a complex phenomenon(Corvellec, 1995).Often, performance is identified or equated with effectiveness and efficiency (Neely,Gregoryand Platts, 1995). Performance is a relative concept defined in terms of some referent employing a complex set of time-based measurements of generating future results (Corvellec, 1995).

Throughout history, performance measurement is used to assess the success of organizations across different industrial sectors. It is important to both the firm managers and the policy makers for a number of reasons. Firstly, performance assessment derive useful information which may help both the worst and the best performing firms to make improvements, and companies' managers to support their decisions. In addition, it allows for the analysis and hypotheses testing regarding the sources of performance differentials (Fried, Lovell and Schmidt, 2008). Furthermore, it is essential to policy making designed to improve performance over industries. In the broadest sense it is intended to secure control of an organization (Thanassoulis, 2001).

Ultimately, the performance of an organization is about achieving its goals (Hannula&Lonnqvist 2002). Laitinen (1998) performance can be defined as the measurement objects (e.g. company, team or employee) ability to generate output which has predetermined characteristics relative to predetermined goals. According to Laitinen (1998) performance is the organization's ability to maximize the owner's benefits while also sufficiently satisfying the needs of other interest groups. Other interest groups include stakeholders, employees, customers, authorities and so on. However, performance can be examined from different perspectives because of differences in organizational goals. In the Balanced Scorecard measurement system, organization's performance is usually examined from four perspectives: financial, customer, process and growth (Kaplan & Norton 1996). The Performance Prism framework consists of five perspectives on performance: stakeholder satisfaction, strategies, processes, capabilities and stakeholder contribution (Neely, Adams &Kennerley, 2002). When an organization's performance is examined from different perspectives with various objectives, also different types of performance measures are needed.

As a term, performance can be understood in several ways. First, performance refers to the actual results or outputs of certain activities. For example, a company's performance can be assessed based on its financial results. Second, performance refers to how an activity is carried out, i.e. how something is being performed. Third, performance may also refer to the ability to achieve results. In conclusion, performance may relate to actual results, activities or the potential for results (Edvinsson, 1997). Traditionally, the actualized results have been the main focus of attention (Asikainen&Nissinen 1990). The main reason for this is that actual results are often considered more important than the uncertain potential for achieving results. However, the balanced view of performance focuses attention also to the operational factors (e.g. efficiency and quality in production process) and factors affecting future results (e.g. R&D activities or developing employees' competencies). This suggests that the three interpretations of the term performance correspond to the different practical views of performance.

As described above, performance is a phenomenon that is not easy to define exactly. Performance may be different depending on the perspectives it is examined from. Therefore, a practical and versatile definition of performance is the measurement object's ability to achieve results in relation to goals. This definition does not take a stand on which perspectives performance is examined, what the goals are or what the measurement object is. This definition of performance is measurement-oriented, but in the context of measuring performance that seems acceptable.Measurement of performance is a difficult task due to multidimensionality of this construct. However, for the purpose of conducting this study, two measures of performance - profitabilityand employee productivity shall be taken into account. These three components of performance shall be examined because at present, there is no specific theoretical perspective or adequate empirical evidence that supports the superiority of any of these components of performance over each other.

2.2.2.1 Profitability

The word 'profitability' is composed of two words, namely; profit and ability. The term profit is an excess of revenues over associated expenses for an activity over a period of time whereas, the term ability indicates the power of a firm to earn profits(Firer & Williams, 2003). The ability of an enterprise also denotes its earning power or operating performance that is, the business

ability points towards the financial and operational ability of the business. On this basis therefore, profitability may be defined as —the ability of a given instrument to earn a return from its use. It is the ability to make profit from all the business activities of an organization, company, firm, or an enterprise. Profitability shows the degree to which a firm's revenues exceed over cost. According to Weston & Brigham (1977), profitability isthe net surplus of a large number of policies and decisions.It is the quality of affording gain, benefit or profit. It shows how efficiently the management can make profit by using all the resources available to it. According toHarward&Upto (1961), "profitability is the ability of a given investment to earn a return from its use."

However, the term 'Profitability' is not synonymous to the term 'Efficiency'. Profitability is an index of efficiency; and is regarded as a measure of efficiency and management guide to greater efficiency. Though, profitability is an important yardstick for measuring the efficiency, the extent of profitability cannot be taken as a final proof of efficiency. Sometimes satisfactory profits can mark inefficiency and conversely, a proper degree of efficiency can be accompanied by an absence of profit. The net profit figure simply reveals a satisfactory balance between the values receive and value given. The change in operational efficiency is merely one of the factors on which profitability of an enterprise largely depends. Moreover, there are many other factors besides efficiency, which affect the profitability (Harward&Upto, 1961).

2.2.2.2 Productivity

The concept of productivity, generally defined as the relation between output and input, has been available for over two centuries and applied in many different circumstances on various levels of aggregation in the economic system. It is argued that productivity is one of the basic variables governing economic production activities, perhaps the most important one. However, at the same time as productivity is seen as one of the most vital factors affecting company's competitiveness.Researchers argue that productivity is often relegated to second rank, and neglected or ignored by those who influence production processes (Sink & Tuttle, 1989; Kinnander&Grondahl, 1999; Singh, Motwanc& Kumar, 2000; Tangen, 2002). A major reason for this could be that many managers do not understand what the term productivity actually means. In fact, productivity is frequently discussed by managers but rarely defined, often misunderstood and confused with similar terms, and seldom measured in an appropriate way, leading to productivity being disregarded or even to that contra productive decisions are taken. According to Koss & Lewis (1993), remarkably, many managers who every day makes decisions about improving plant efficiency do not know how to answer the simple question: What do we really mean by productivity?

The term of productivity economically is defined as the ratio between output and input (Mohanty, 1998).On the one hand productivity is related to utilization of resources, on the other hand productivity is related to the creation of value. Therefore good productivity is achieved when activity of an organization and resources in the product creation process create value for getting product. Productivity can also be related to loss, which must be eliminated if

productivity increases (Sauian, 2002). A common mistake is to relate productivity to the amount of services offered. Therefore a common mistake is to think that the more products are made the more productivity increases. It is important to keep in mind the fact that productivity is a relative concept and it cannot be said to increase or decrease by making such comparisons. Productivity depends on variations from competitors or other standards at a certain point of time or on changes over time. According to Misterik (1992), an increase in productivity can be caused by five different relationships of input and output; output and input increases, the increase in input is proportionally less than increase in output, output increases while input stays the same, output increases while input is reduced, output stays the same while input decreases and output decreases while input decreases even more.

2.2.3 The Concept of Pharmaceutical Market in Nigeria

According to the 2006 National Census, the population of Nigeria was 140 million and thus constitutes potentially the largest domestic market in Africa. A large proportion of the populations suffer from both infectious and non-infectious diseases but their purchasing power is weak given the level of poverty. Estimates of the size of the pharmaceutical market in Nigeria vary significantly. In 2009, the Pharmaceutical Manufacturing Group of the Manufacturers' Association of Nigeria (PMGMAN) estimated the size of the total pharmaceuticals and healthcare products market to be in excess of US$2 billion annually. The estimated market for prescription ethical pharmaceuticals is US$500 million and that for over the counter (OTC) pharmaceuticals about US$900 million. Furthermore, PMG-MAN estimates the Nigerian market for biological products (including vaccines, insulin, interferon, etc.) to be worth about US$100 million. In addition, related healthcare and lifestyle products account for about US$500 million. Business intelligence services estimate the pharmaceutical market in Nigeria at US$600 million (Business Monitor International BMI, 2010) for 2009. Out of this figure, BMI attributes the largest share of US$418 million to generic medicines, US$121 million to over the counter (OTC) products and US$61 million to patented products. Frost & Sullivan (2010) estimated a pharmaceutical market value of US$740 million in 2009. Out of this figure, US$266.4 million were attributed to generic medicines, US$177.6 million to branded products and US$296 million to OTC products. Nigeria also provides 60 per cent of the health products consumed in the Economic Community of West African States (ECOWAS) by volume (PMG-MAN, 2010) and with an estimated population of about 600 million the ECOWAS sub-region represents a huge potential market.

2.3 The Emergence of Intangible Assets

Over time, there has been a growing disparity between market and book values in market indices across the globe. The S&P 500 for example experienced a growth in market-to-book ratio from 1.3 in the 1980s to 4.6 in 2004 (Salinas, 2009). Bond & Cummins (2000) find empirically significant evidence that equity values systematically deviate from firms' fundamental valuations in the US stock markets in the period 1980-2000. Economists formulate several reasons to explain the increase in this ratio, an important one being the increasing proportion of

intangible assets to market capitalization. A quote by Johnson and Kaplan (1987:202) describing this phenomenon is in its place:

> *"A company's economic value is not merely the sum of the values of its tangible assets, whether measurable at historic cost, replacement cost, or current market value prices. It also includes the value of intangible assets: the stock of innovative products, the knowledge of flexible and high-quality production processes, employee talent, and morals, customer loyalty and product awareness, reliable suppliers, efficient distribution networks and the like."*

The surge in intangible assets is partly caused by the fact that traditional tangible and financial assets are quickly turning into commodities, because they are easily accessible to competitors, and therefore are unlikely to yield 'abnormal profits' or sustainable competitive advantages (Hand & Lev, 2003). This change of focus from tangible to intangible assets is not only present in "New Economy" firms, such as the high-technology companies, but also in the "traditional" firms, such as pharmaceutical, Coca-Cola, Wal-Mart and General Electric. In reaction to this changing view of what constitutes company value Srivastava, Shervani& Fahey (1998) develop a framework in which the value driving characteristics of market-based intangible assets are conceptualized. Srivastava et al. (1998) acknowledge that relationships with customers, suppliers and other channel partners can create shareholder value by accelerating and enhancing cash flows and reducing the vulnerability and volatility of cash flows.

In addition to the importance of relationships with external stakeholders Morck& Yeung (1992) find that firms with information-based assets experience a significantly positive stock price reaction upon announcing a foreign acquisition. Their 'internalization theory' implies that firms possessing intangible assets and pursuing an international expansion strategy increase shareholders' wealth due to the increased scale over which such intangible assets are applied. Thus, many researchers and investors agree that the assets and skills that are the true critical drivers of competitive advantage and shareholder value in the current knowledge-based economy are largely intangible (Aaker & Jacobson, 1994; Haanes&Fjeldstad, (2001). Daniel & Titman (2005) investigate the market reactions to tangible and intangible information. They find no significant relation between past tangible information proxy by accounting-based performance measures and future returns, however they do find a significant relation between past intangible information and future returns. Many researchers render intangible information more important than tangible information, because intangibles are significant value drivers in today's economy.

However, one has to be cautious in only highlighting the positive effects of intangible assets. The demise of Enron and the Dot-com bubble, for example, have shown the vulnerability of intangible assets. This vulnerability can be explained by the fact that intangibles cannot always be fully protected from expropriation by competitors (partial excludability), that no market exists for the trading of intangibles and therefore no direct exit strategy exists for owners of

intangibles, and that accounting standards do not constitute early warning signals about a possible impairment of intangibles (Hand et al, 2003; Brown & Kimbrough, 2010).

2.4 Knowledge-Based Economy

Information economy, virtual economy, net economy, digital economy and recently, knowledge-based economy, are titles which refer to Organization for Economic Co-operation and Development (OECD). In any form and title, knowledge-based economy is an economy in which production and exploitation of knowledge plays a key role in economic growth and wealth creation. In other words, the agricultural economy, labor and natural resources, and in the industrial economy, capital, machinery and management are the main factors of economic growth. In knowledge-based economy, science and technology and entrepreneurship will be the key factors. Put in another way, knowledge-based economy is directly based on acquisition, creation, distribution and use of knowledge in all economic activities. Knowledge as data, processes, systems and output is considered to be a strategic resource that causes an increasing efficiency for the whole body of economics. Thus, success factors of economies and businesses depend on the aggregation of these factors and the exploitation of knowledge. This means that knowledge-based economy is based on human resources and manpower, and manpower is considered as the greatest wealth of any country (Alam, Hoque, Rout &Priyadarshani, 2010).

Although the traditional factors of production, such as labor, capital, raw materials and entrepreneurship still remains, knowledge is considered as the key driving growth and creates new values and the basis for maintaining competitive position. Though technology is the basic enabling tool, but the core of information based economy is human capital, especially the capacity of creation, innovation, production and exploitation of new ideas and also utilizing technology and performing entrepreneurship skills (Fard, 2007). These types of economies are manifested in economic trends of OECD and leads toward the investments of the high-level technologies, industries based on high technology, highly skilled workforce and associated productivity benefits. Although knowledge as important factors in economic growth has a long history, now, economists are trying to find a way to inject knowledge and technology directly to their theories and models. New growth theory shows the attempts to understand the role of knowledge and technology to promote productivity and economic growth (Alam, Hoque, Rout &Priyadarshani, 2010). In this view, investments in research and development, formal education and application and new management structures are key factors.

In addition to investing in knowledge, distributing knowledge through formal and informal networks for economic function is something essential (Alam&Khalifa, 2009). Knowledge is increasing, molding and transforming data from day to day through computers, and information networks in the information society. Implicit knowledge (including knowledge and application of skills used by molding) is essential in knowledge-based economy because it emphasizes on the importance of continuous learning by individuals and companies. In knowledge-based economy, innovation through the interaction between producers and users in the exchange of molded and implicit knowledge is achieved. This innovation model replaced the traditional linear model.

Formation of national innovation systems, which is the combination of flows and relationships among industry, government and academic centers in science and technology development, is an important economic factor in knowledge-based economies (Alam&Khalifa, 2009).

2.5 INTANGIBLE ASSETS AND PERFORMANCE

Although the important influence intangible assets has on business performance is greatly acknowledged, few studies have been devoted to demonstrating how the various intangible asset components influence performance and what specific performance dimensions are affected. Moreover, no single intangible asset component can create value on its own: interaction between components is necessary (Cohen &Kaimenakis 2007; Edvisson& Malone, 1999). As stated by Bontis (1998), isolated stocks of knowledge found in the employees' minds cannot positively affect performance if they are not codified into organizational knowledge. It is these efforts to codify organizational knowledge and thereby further develop the firm's structural capital that ultimately yield sustainable competitive advantages, which then translates into a higher performance.

To better understand this interaction, a few authors have attempted to identify the nature of the relationship that exists between intellectual capital components. Human capital may thus have a positive influence on relational capital and both components influence in turn structural capital (Bontis, Keow, WCC & Richardson, 2000). However, Choong, (2008) argued that the higher the level of employee competence, the better they can understand customers' needs and the better they are at developing sustainable relationship with them to meet their needs and insure loyalty. Structural capital contributes to the firm's ability to transform employee knowledge and their relationship with key stakeholders into routines and processes (Cohen &Kaimenakis 2007).The influence of human capital on other types of capital was also developed by Wang & Chang (2005) based on various multivariate models attempting to explain business performance. These authors observed that human capital is the most important intellectual asset but that its influence on performance is indirect. Human capital influences innovation capital, process capital and customer capital which in turn are the main determinants of business performance. These findings lead these authors to conclude that human capita is the most important component of a firm's intellectual capital, because of its energizing effect on the rest of the organisation.

Studies have established links between performance and both structural capital and relational. This influence is expressed by both a reduction in operation cost and the development of new products or services to meet client demand (Bontis 1998). More recent studies reveal the existence of a positive correlation between the scores of certain intellectual capital components and business performance. For instance, Tovstiga and Tulugurova (2009) demonstrated that a firm's financial performance is positively linked to intellectual and that a positive correlation exists between the intellectual capital's growth rate and business performance.

Chen, Cheng & Hwang (2005) investigated empirically the relationship between the value creation efficiency and firms' market valuation and financial performance, using Pulic's Value

Added Intellectual Coefficient (VAIC) as the efficiency measure of capital employed and intellectual capital, centered on data drawn from Taiwanese listed companies, the findings supports the hypothesis that firms' intellectual capital has a positive impact on market value and financial performance, and may be an indicator for future financial performance. Their study extends the understanding of the role of intangible assets in creating corporate value and building sustainable advantage for companies that manage their intellectual assets effectively.

Sharabati, Jawad &Bontis (2010) studied the relationship between intellectual capital and business performance within the Jordan pharmaceutical sector and with their 132 top and middle-level managers. They conducted a correlational and path analysis to ascertain the validity of the measure and models. Statistical support was found for the hypothesized relationships.

Appuhami (2007) evaluated the impact of intellectual capital on investors' capital gains on shares. The author used data collected from listed companies in Thailand's stock market and Pulic's Value Added Intellectual Coefficient (VAIC) as the measure of intellectual capital. The study found that firms' intellectual capital has a significant positive relationship with its investors' capital gains on shares. The findings enhanced the knowledge base of intellectual capital and develop a concept of intellectual capital in achieving competitive advantages in emerging economies such as Thailand.

Intangible assets show a set of characteristics – namely, high levels of risk and uncertainty, firm-specificity, human capital intensity, low observability and long-term nature - that make them markedly distinct from other categories of assets. These characteristics are likely to have substantial impact on the levels of agency costs of debt (asset-substitution and under-investment problems) and equity (hidden action and hidden information problems), information asymmetry, bankruptcy costs, transaction costs of debt and equity, and non-debt tax shields. Consequently, Alves & Martins (2010)analyzed the impact of the level and the type of the intangible assets on six major financial and governance policies: financial structure, dividend payouts, managerial share ownership, external ownership concentration, board of directors' structure and auditing. Using two UK cross-sectional samples (373 and 356 firms for the years 2000 and 2001, respectively), the results suggest that the level and type of intangible assets have a negative impact on leverage and no impact on dividend payout, managerial equity ownership, outside equity ownership, board structure and audit demand.

De & Dutta (2006) examined the impact of intangible capital, including human capital and organisational capabilities on the productivity of India's information technology software industry. The research breaks new ground in creating measures of intangible capital at the micro level. Besides conventional tangible capital (computers, furniture and fittings, buildings, etc.), intangible assets like human capital, brand capital and organisational capabilities are measured. The measures of tangible and intangible capital were used to estimate a 'new economy' production function with panel data, where both tangible and intangible inputs were used. An extended dynamic Cobb-Douglas production function is estimated using Generalized Method of

Moments (GMM) techniques to account for unobserved firm heterogeneity and endogenous explanatory variables (Villalonga, 2004). The econometric estimation also allows for an autoregressive productivity shock and serially uncorrelated measurement errors. The results indicate that intangible assets have a large and significant impact on output in India's software sector. The elasticity of output with respect to human capital and organisational capabilities are particularly high and significant. The results are robust to variations in measurement and estimation technique (Edvinsson, 1997).

Ming, Shu &Yuhchang (2005) examined the relationship between the value creation efficiency and firm's market valuation and financial performance. They have found that the intellectual capital has a positive influence on the market value and the financial performance. Kujansivu&Lonnqvist (2007) worked on the relationship between monetary value of Intellectual Capital and value creation efficiency of Intellectual Capital of Finnish companies. The study results show that the value of IC and efficiency of IC were somehow related. Maria &Vaz (2005) studied the inter relationships and the interaction effects among intellectual capital components and organisational performance, in the Portuguese banking context. The study results indicate the significant relationship between intellectual capital and organisational performance.Najibullah (2005) investigates empirically the value creation efficiency of intellectual capital and market valuation and financial performance of 22 Bangladesian Banks listed on Dhaka Stock Exchange. The study results support the positive role of intellectual Capital in creating corporate value. Kamath (2007), after analyzing the human capital and the physical capital of 98 scheduled commercial banks of India, has studied their impact on the value based performance during a period of five years from 2000 to 2004. The study confirms that the observed vast differences in performance of different segments of Indian banks are mainly due to the underlying differences in Human Capital.

Jona-Lasinio, Iommi&Manzocchi (2011) provided evidence about the diffusion of intangible investment across the European Union (EU) member countries and investigated the role of intangible capital as a source of growth to improve the understanding of the international differences in the mix of drivers of productivity growth across Europe. The study shows that the capitalization of intangible assets, allow identifying additional sources of long-run growth. They confirm that intangibles have been a relevant source of growth across European countries and that they cannot be omitted from national accounts. In particular, the "unexplained" component of macro-economic dynamics, the Total Factor Productivity, becomes less important, while physical capital turns out to be strongly complementary with intangible capital.

Using data from 75 publicly traded companies in South Africa, Firer and Williams (2003) adopted the VAIC method to examine the relationship between intellectual capital and traditional measures of corporate performance, including profitability (returns on assets), productivity (turnover of total assets) and market value (market-to-book value ratio of net assets). Except that the capital employed efficiency has a significantly positive effect on market value of firms, their empirical results failed to find any strong association between the three value-added efficiency components and the three dependent variables. Their empirical results, however,

merit more research on the role of intellectual capital in emerging economies, because different technological advances across areas of emerging economies may have different implications for intellectual capital in creating firm value and enhancing financial performance.

2.6 INTANGIBLE ASSETS AS VALUE DRIVER IN THE KNOWLEDGE ECONOMY

The phenomenon of a "new economy" seems to have become a topic of public conversation in 1997. During this year, three publications appeared internationally about the knowledgebased economy with the key word being "intellectual capital" (Stewart, 1997; Edvinsson&Malone, 1997;Sveiby, 1997). The focus was the same in all three publications, being that the source of the economic value added from investments in fixed assets had shifted to investment in intangible assets. In recent years, the value drivers have, almost unnoticed by the public, changed from finance capital to intangible assets such as human capital and knowledge, relationships with business partners and the capability of enterprises to be innovative. This becomes especially obvious with knowledge based enterprises.

As opined by Daum (2001), enterprises whose businesses are based on knowledge products such as software are governed by a different economic logic than the usual logic that applies to traditional industrial enterprises where the emphasis is on fixed assets. In traditional industries the economic rule of decreasing returns apply meaning that the marginal yield decreases after a certain investment amount has been reached. This, however, is often not the case in knowledge based enterprises.

2.7 INTANGIBLE ASSETS AS RESOURCES FOR COMPETITIVE ADVANTAGE

Firm resources can be divided into three categories: physical capital, human capital and organizational capital resources (Fernandez, Montes & Vasquez, 2000). Physical capital resources include tangible assets in a firm, such as its plant and equipment, technology, location and raw materials. Human capital resources consist of everything associated with the firm's employees, their training, experience, judgment, intelligence and relationships. Organizational capital resources include the internal framework of a firm, its controlling and coordinating systems, reporting structure and informal relations within the firm. Evidently, two out of three resource categories consist out of intangible assets. As a consequence, a firm has more possibilities to create a competitive advantage with the use of intangible assets. A firm has a competitive advantage when it is implementing a value creating strategy not simultaneously being implemented by any competitor, which is

sustained when competitors are not able to copy the strategy (Barney, 2001). Although this does not imply that the competitive advantage will be sustained indefinitely because changes in the macroeconomic and/or business environment will force firms to change its strategies accordingly to sustain a competitive advantage. Thus, intangible assets contribute in delivering company value by allowing the firm to stand out from its competitors.

Intangible assets are thus important drivers of competitive advantage. And in determining which firm resources have the potential of sustained competitive advantages, a resource has to comply with the following four characteristics: it has to be valuable, rare, imperfectly imitable and imperfectly substitutable. Intangible assets are more likely to exhibit these characteristics because those assets are more difficult to measure and to copy than physical assets (Brown & Kimbrough, 2010). Hall (1993) complements the resource based view by incorporating the value creating abilities of intangible assets. One of the distinctions made in the value creating abilities of intangible assets are intangibles protected by law as opposed to unprotected by law. Since intangible assets, which are legally protected, are less vulnerable to expropriation by competitors they should be more value creating than unprotected assets (Brown & Kimbrough,2010). Business professionals consider intangibles as most important value drivers, namely product and company reputation, human capital and company culture.

2.8 APPROACHES FOR MEASURING INTANGIBLE ASSETS

The suggested measuring approaches for intangibles fall into at least, four categories of measurement approaches. The categorizations by Sveiby (2007) in his study (as cited in Ahanger, 2011) are an extension of the classifications suggested by Luthy (1998) and Williams (2001). They are:

Direct Intellectual Capital Methods (DIC): Estimate the Naira-value of intangible assets by identifying its various components. Once these components are identified, they can be directly evaluated, either individually or as an aggregate. This method includes The Value Explorer, Intellectual Asset Valuation, Total Value Creation (TVC), Accounting for the future (AFTF) etc.

Market Capitalization Methods (MCM): Calculate the difference between a company's market capitalization and its book value as the value of its intellectual capital or intangible assets. Markets to Book Value, Tobin's Q are examples of this method.

Return on Assets Methods (ROA): It is the capitalization of industry above-average earnings by the company's average cost of capital. Industry above average earnings is the multiplication of company's excess ROA over industry ROA with its average tangible assets. This method includes Knowledge Capital Earnings, Economic Value Added (EVA), Calculated Intangible Value (CIV), Value Added Intellectual Coefficient (VAIC) etc.

Scorecard Methods (SC): The various components of intangible assets or intellectual capital are identified and indicators and indices are generated and reported in scorecards or as graphs. Examples of this method are National Intellectual Capital Index (NICI), Intellectual Capital Rating, Value Chain Scoreboard, etc.

2.9 THEORETICAL FRAMEWORK

The special characteristics of intangible assets with, on one hand, the value driving capabilities and on the other hand, the increased vulnerability raises the question on how the risk-return relationship of intangibles looks like. The Resource-Based View (RBV) substantiates the value driving capabilities by describing how and why intangible assets deliver superior market returns. The source of the importance of intangible assets lies in its distinctive characteristics to create a sustainable competitive advantage and earning economic rent.

This study is based on Resource-Base View Theory. According to the resource-based view of the firm, (henceforth referred to as RBV), firms gain competitive advantage and superior performance through the acquisition, holding and subsequent use of strategic assets - assets that are vital for competitive advantages and strong financial performance (Wernerfelt, 1984; Lev, 2001). Both tangible and intangible assets are perceived as potential strategic assets. Griliches, 1990; Aaker & Jacobson, 1994; Amir & Lev, 1996; Chauvin &Hirschey, 1996; Mouritsen, 1998; Jennings, Robinson, Thompson & Duvall, 1998; Ittner&Larcker, 1998; Michalisin, Kline & Smith, 2000; Canibano, Garcia-Ayuso& Sanchez, 2000 (as cited in Riahi-Belkaoui, 2003) found that the RBV of the firm, including the benefits of both tangible and intangible assets, is gaining acceptance in the accounting, economic and strategic management

literature, following positive results of linkages between firm resources and measures of performance.

While both tangible and intangible resources are considered as a source of heterogeneity of firm performance and above-normal returns, however, they are not of equal importance in terms of achieving competitive advantage and superior performance. Those differences are attributed mainly to how high the barriers of resource imitation are, or how durable resources are (Barney, 1991). Tangible assets are easy to duplicate by competitors and most RBV scholars claim that they are a relatively weak source of competitive advantage and economic benefit (Conner, 2002; Barney, 1991). On the contrary, intangible assets are considered to be a more important source of heterogeneity of performance than tangible assets because of relatively high barriers to duplication (Hall, 1993). In this way, RBV provides a theoretical explanation for intangibles as a source for firm exceptional performance.

The theory focuses on internal, firm-specific factors and their effect on performance; it sees organizations as bundles of resources which are combined to create organizational capabilities (Grant, 1991). RBV was categorized by Williamson (1991) as an efficiency perspective, which suggests that according to this theory, firms build sustainable competitive advantage only through efficiency and effectiveness. This is the creation and heterogeneity of resources which allow firm to develop and implement strategies that improve its efficiency and effectiveness (Majumdar, 1998, Gonzalez&Miller & Ross, 2003).

In the current economic environment where competition is ever-growing because of deregulation, globalization and lower entry barriers, it becomes more difficult for a company to stand out of the crowd. As a consequence, companies need to find innovative methods to differentiate themselves. Barney (1991) studied the relationship between firm's resources and sustained competitive advantage. He identifies two ways to create a sustained competitive advantage; first, internally by focusing on strengths and recognizing weaknesses, and secondly, externally by exploiting opportunities and neutralizing threats. With regard to intangible assets, the focus is on the internal strengths andweaknesses of the firm. The study assumes heterogeneity of firms within an industry group with respect to the strategic resources and immobility of these resources. These assumptions make the outcomes of the model more realistic and contribute to the sustainability of the competitive advantage. Furthermore, firm resources are defined as all assets, capabilities, organizational processes, firm attributes, information, knowledge and more, which can be controlled by a firm in order to develop strategies to improve a firm's efficiency and effectiveness.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter focuses on the procedures adopted by the researchers and logical steps that were followed in conducting this research. The adopted methodology was necessary so as to ensure verifiable and reliable result – answer to problems, solution, knowledge, insight, etc. These procedures covered research design, population and sampled population of the study, sources and methods of data collection, variable specification and model specification.

3.2 RESEARCH DESIGN

Correlational research design was employed for this study. The correlational research investigates one or more characteristics of a group to discover the extent to which the characteristics vary together. Correlational studies display the relationships among variables by such techniques as cross-tabulation and correlations. Correlational studies are also known as ex post facto studies. This literally means *from after the fact.* The term is used to identify that the research has been conducted after the phenomenon of interest has occurred naturally. The main purpose of a correlational study is to determine relationships between variables, and if a relationship exists, to determine a regression equation that could be used make predictions to a population. This design was adopted because the research is a valuation work aimed at measuring the impact of intangible assets on the performance of quoted pharmaceutical firms in Nigeria.

3.3 POPULATION AND SAMPLED POPULATION OF THE STUDY

Population of the study is the seven (7) Quoted Pharmaceutical firms in Nigeria out of which six (6) were sampled for the study. One of the firms, Parm-Deko Plc, was dropped due to non-availability or non-accessibility of their financial reports for the study period under study.

The Nigeria pharmaceutical industrywas selected for the study because activities of the industryare characterized with products of intellectual ideas. This sector is considered as highly research-intensive, highly innovative, well balanced in respect of human intervention, technology, and most importantly, its bases on intellectual capital for a source of renewal and business performance.

3.4 SOURCES OF DATA

Secondary source of data was employed for the study utilizing annual financial reports of the sampled firms.

3.5 TECHNIQUES OF ANALYSIS

Multiple Regressionwas employed as a tool of analyzing data that was obtained for this study.Multiple regression is an extension of simple linear regression. It is used when we want to predict the value of a variable based on the value of two or more other variables. The variable we want to predict is called the dependent variable (or sometimes, the outcome, target or criterion variable). The variables we are using to predict the value of the dependent variable are called the independent variables (or sometimes, the predictor, explanatory or regressor variables).Multiple regression also allows the determination of the overall fitness (variance explained) of the model and the relative contribution of each of the predictors to the total variance explained.The multiple regression was employed to analyse the panel data for this study.

3.6 VARIABLES MEASUREMENT

Dependent Variables

Two dependent variables were taken into account for the study, viz: profitability and employee productivity. At present, to the best of our knowledge, there is no specific theoretical perspective or adequate empirical evidence that supports the superiority of any specific proxy for these measures of performance over the others. It was, therefore, decided that for the purpose of this study, these two commonly used proxyof performance measurement will be adopted. Consequently,measurement of the proxy is defined as follows:

Profitability: Thisis proxied with return on assets (ROA). It is the ratio of the net income divided by book value of total assets as represented in the annual reports (Firer & Williams, 2003; Chen, Cheng & Hwang, 2005). It is given as

$$\boldsymbol{ROA} = \frac{\mathbf{N\,I}}{\mathbf{BVTA}}$$

Where: ROA = Return on Assets

NI = Net Income (Profit After Tax)

BVTA = Book Value of Total Assets

Employee Productivity (EP): Employee productivity is a measure for the net sales per employee, which reflects employees' productive capability (Chen, Cheng & Hwang, 2005; Najibullah, 2005). It is calculated as follows:

$$\boldsymbol{EP} = \frac{\mathbf{N\,S}}{\mathbf{N\,E}}$$

Where:

EP = Employee Productivity

NS = Net Sales for the period

NE= Numberof Employee of a firm

Independent Variables

The Value Added Intellectual Coefficient (VAIC) methodology developed by Pulic (1998) was the underlying measurement basis for the independent variables. Pulic (1998) opine that VAIC is an analytical procedure designed to enable management, shareholders and other relevant stakeholders to effectively monitor and evaluate the efficiency of Value Added (here after referred as VA) by firms' total resources and each major resource component. It is an equation that measures how much and how efficiently the value created based on the relationship among the components of VAIC influenced the performance of the firm. The components of VAIC can be viewed from firm's resource base theory with a composite sum of two indicators, viz (i) Capital Employed Efficiency (CEE) – indicator of Value Added efficiency of capital employed. (ii) Intellectual Capital Efficiency (ICE) – indicator of Value Added efficiency of firm's Intellectual Capital base. Intellectual Capital Efficiency is composed of Human Capital Efficiency (HCE) – indicator of Value Added efficiency of human capital and Structural Capital Efficiency (SCE) – indicator of Value Added efficiency of structural capital. Thesecomponents of VAIC formed the independent variables for this study. This is presented arithmetically as

VAIC= CEE + HCE + SCE ……*eqn 1*

Where:

VAIC = Value Added intellectual coefficient

CEE= Capital Employed Efficiency

HCE= Human Capital Efficiency

SCE = Structural Capital Efficiency

The higher the VAIC coefficient, the better the efficiency of VA by a firm's total resources (Pulic, 1998). Calculating for the VAIC, the value added (VA) by all the resources of the firm must first of all be determined. This is calculated thus:

VA= I+ DP+ D+T+ MI+ R+ SW……*eqn 2*

Where: VA for firm I at a time is computed as the sum of;

Interest Expense (I)

Depreciation Expense (DP)

Dividends (D)

Tax (T)

Equity of Minority Interest (MI)

Retained Profit for the year (R)

Salaries and Wages (SW)

Pulic (1998) stated that Capital Employed Efficiency (CEE) is the ratio of total Value Added (VA) divided by the total amount of Capital Employed (CE). Where capital employed is defined as the book value of a firm's net assets. CEE relationship is presented algebraically thus:

$$\boldsymbol{CEE} = \frac{\boldsymbol{VA}}{\boldsymbol{CE}}$$ ……*eqn 3*

Where:

CEE= Capital Employed Efficiency

VA= Value Added

CE= Book value of a firm's Net Assets

In agreement with theposition of Edvinsson(1997), Pulic (1998) argues that total salary and wages cost are indicators of a firm's Human Capital (HC). Sveiby, (2001) support this. Therefore, HCE is calculated as the ratio of total VA divided by the total salaries and wages spent by the firms on its employee. This is presented thus:

$$\boldsymbol{HCE} = \frac{\boldsymbol{VA}}{\boldsymbol{HC}}$$ ……*eqn 4*

Where:

HCE= Human Capital Efficiency

VA= Value Added

HC= Total Salaries and Wages Costs

In order to calculate SCE, it is first necessary to determine the value of a firm's structural capital (SC). Pulic (1998) proposes a firm's total VA less its human capital as an appropriate proxy of a firm's SC. That is:

SC= VA – HC ……*eqn5*

Where:

SC= Structural Capital

Based on prior empirical research findings, Pulic (1998) argued that there is a proportionate inverse relationship between HC and SC in the value creation process attributable to the entire IC base, the less Human Capital participates in value creation; the more Structural Capital is involved. This is because the firm spends less on social benefits of its employees training, motivations and promotion, it is expected that the firm will spend more on structural capital which includes advertisement, investment in new technologies, products and services, customers satisfaction, distributions, quality improvement and research and development.Consequently, Pulic (1998) opine that the formula for calculating SCE differed to that for HCE. Specifically, Pulic (1998) stated that SCE is the ratio of a firm's SC divided by the total VA. This relationship is shown thus:

SCE = SC / VA……*eqn6*

Where: SCE= Structural Capital Efficiency

Control Variables

In conducting the liner multiple regression analysis, Physical Capital Intensity (PCI) and Assets TurnoverRatio (ATR) wereemployedas control variables.

Physical Capital Intensity (PCI): Physical capital intensity as measured by a ratio of a company's fixed assets to its total assets (Firer& Williams, 2003) is used to control for the impact of fixed assets on corporate performance. The assumption is that company's fixed assets have significant impact on company's financial performance.

Assets Turnover Ratio (ATR): It is the ratio of total turnover to total assets. This ratio is used to control for the impact of total assets on corporate performance.

3.7 MODEL SPECIFICATION

To analyze the respective relationships defined in prior sections to achieve the proposed objectives, linear multiple regressions analysis wascarried out based on the models formulated below:

$$ROA_{it} = \beta_0 + \beta_1 CEE_{it} + \beta_1 HCE_{it} + \beta_2 SCE_{it} + \beta_3 PCI_{it} + \beta_4 ATR_{it} + \varepsilon_{it} \text{.....} eqn\ 1$$

$$EP_{it} = \beta_0 + \beta_1 CEE_{it} + \beta_1 HCE_{it} + \beta_2 SCE_{it} + \beta_3 PCI_{it} + \beta_4 ATR_{it} + \varepsilon_{it} \text{.....} eqn\ 2$$

Where:

ROA_{it}= Return on Assets for firm *i* at a period

EP_{it} = Employee Productivity for firm *i*ata period

β_0 = Intercept

$\beta_{1\text{-}2}$= Coefficient of the independent variables

$\beta_{3\text{-}4}$= Coefficient of the control variables

CEE_{it} = Capital Employed Efficiency for firm *i* at a period

HCE_{it}**=** Human Capital Efficiency for firm *i* at a period

SCE_{it}**=** Structural Capital Efficiency for firm *i*ata period

PCI_{it}= Physical Capital Intensity for firm *i*ata period

ATR_{it} = Assets Turnover Ratiofor firm *i*ata period

$\mathcal{E}_{it}$= Residual or error term

CHAPTER FOUR
RESULTS, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter presents and discusses the results obtained from the tests conducted on the data collected for the study. The chapter begins with the discussion of the descriptive statistics of the data collected, and then the correlation matrix of the variables of the study. The presentation of the regression results and the test of hypotheses are then conducted. The chapter ends with the discussions of the major findings from the analysis and the policy implications of the findings.

4.2 Descriptive Statistics

In this section, description of the data collected for the study is presented and discussed; the summary of the descriptive statistics of the data collected is presented in Table 4.1 as follows;

Table 4.1: Summary of Descriptive Statistics

VARIABLES	**Min**	**Max**	**Mean**	**SD**	**Skewness**	**Kurtosis**	**N**
ROA	-0.1600	0.5800	0.1160	0.1539	1.0294	4.0953	60
EP	1019.97	28253.31	6700.98	5991.76	1.9562	6.8985	60
CEE	0.0900	1.8700	0.5175	0.3497	2.2245	8.9814	60
HCE	0.4500	7.1700	2.9843	1.5256	1.0059	3.8523	60
SCE	-1.2200	0.8600	0.5473	0.3264	-3.0926	15.8714	60
PCI	0.0300	2.2600	0.4232	0.3571	3.0147	15.3047	60
ATR	0.3000	1.4200	0.8368	0.2665	0.3904	2.2152	60

Source: STATA Output (Appendix I)

The results in Table 4.1 show that our measure of performance (ROA) has an average value of 0.1160 with standard deviation of 0.1539, and minimum value of -0.16 and 0.58 as the maximum value. The standard deviation of 0.1539, signifying that the data deviate from the mean value from both sides by 0.1539, implying that there is a wide dispersion of the data from the mean because the standard deviation is higher than the mean. The value of the kurtosis (4.0953) on the other hand, supports that most of the values are higher than mean, hence the data does not meet a Gausian distribution assumption. Similarly, the coefficient of Skewness 1.0294 implies that the data is positively skewed (i.e most of the data are on the right side of the normal curve), thus, the data does not meet the symmetrical distribution.

The table also indicates that the other measure of performance (EP) has a minimum and maximum value of 1019.97 and 28253.31 respectively; the mean value of EP is 6700.98 with standard deviation of 5991.76. This shows that the data is widely dispersed from the mean in

the sample firms. Moreover, the kurtosis value of 6.8985 shows that most of the values are higher than mean, thus the data does not meet the Gausian distribution, on the other hand, the coefficient of Skewness 1.9562 implies that the data is positively skewed, and thus, the data does not meet the symmetrical distribution.

The summary descriptive statistics in Table 4.1 shows that CEE has a minimum and maximum value of 0.0900 and 1.8700 respectively. The average value of CEE in the sample firms is 0.5175 with standard deviation of 0.3497. This implies that the data in the sampled firms deviate from the mean by 0.3497. This deviation implied that the data is widely dispersed, as the standard deviation is close to the mean. The coefficient of Skewness 2.2245 implies that the data is positively skewed, and therefore does not conform to the symmetrical distribution requirement. Similarly, the coefficient of Kurtosis 8.9814 also indicates that the CEE variable does not meet the Gausian distribution criterion.

The table also indicates that HCE has an average value of 2.9843 with standard deviation of 1.5256. While the minimum and maximum values of HCE are 0.4500 and 7.1700 respectively. The value of skewness of 1.0059 indicates that the data is positively skewed, that is, the mean is less than the mode, and thus, the variable does not meet the symmetrical distribution requirement. This is also evidenced by the coefficient of kurtosis of 3.8523 which implies that the Gausian distribution is not met.

Table 4.1 also shows that, the minimum and maximum values of SCE variable are -1.2200 and 0.8600 respectively, with the mean value of 0.5473 and standard deviation of 0.3264. This implies that the data is widely dispersed from the mean value; the coefficient of Skewness -3.0926 implies that the data is negatively skewed, and therefore does not conform to the symmetrical distribution requirement. Moreover, the coefficient of Kurtosis 15.8714 also indicates that the SCE variable does not meet the Gausian distribution criterion.

The results from Table 4.1 also show that, the minimum and maximum values of PCI variable are 0.0300 and 2.2600 respectively, with the mean value of 0.4232 and standard deviation of 0.3571. This implies that there is wide dispersion from the mean value; the coefficient of Skewness 3.0147 implies that the data is positively skewed, and therefore does not conform to the symmetrical distribution requirement. Moreover, the coefficient of Kurtosis 15.3047 also indicates that the PCI variable does not meet the Gausiandistribution criterion. The table also indicates that, ATR has an average value of 0.8368 with standard deviation of 0.2665, implying that the data deviate from both side of the mean by 0.2665. The minimum and maximum values of ATR are 0.3000 and 1.4200 respectively; the coefficient of skewness 0.3904 on the other hand shows that the data is positively skewed, while the coefficient of kurtosis 2.2152 imply that the data does not meet the Gausian distribution assumption.

Therefore, the descriptive statistics of the data collected for the variables of the study shows the nature and the extent of the dispersion of the data, which to a large extent suggested that the data did not follow the normal curve. Therefore, the test of normality is conducted and the results of data normality test of the variables are presented in table 4.2 as follows;

Table 4.2 Results for Normal Data Test

VARIABLES	W	V	Z	P-Values	N
ROA	0.9189	0.9194	3.198	0.0007	60
EP	0.7784	0.9180	5.364	0.0000	60
CEE	0.7643	0.5574	5.497	0.0000	60
HCE	0.9142	0.9863	3.320	0.0005	60
SCE	0.6994	0.9619	6.021	0.0000	60
PCI	0.7102	15.754	5.943	0.0000	60
ATR	0.9546	2.467	1.947	0.0258	60

Source: STATA Output (Appendix I)

The study apply Shapiro-WIlk (W) test for normal data, under this technique, null hypothesis principle is used to check a variable that came from a normally distributed population. The null hypothesis of the test is that the data is normally distributed. In this study, table 4.2 indicates that data from all the variables of the models of the study are not normally distributed because the P-values are significant at 1% level of significance and 5% level for ATR. Thus, the null hypothesis (that, the data is normally distributed) is rejected. However, this suggests a more generalized tool for inferential analysis.Therefore, the inferential statistics of the data collected from which the hypotheses of the study are tested are presented and interpreted in the following section.

4.3 Correlation Results

In this section, the summary of the Pearson correlation Coefficients of the variables of the study are presented in Table 4.3 as follows;

Table 4.3 Summary of Coefficient of Correlation

Variables	ROA	EP	CEE	HCE	SCE	PCI	ATR
ROA	1						
EP	-0.0812	1					
CEE	0.2588*	0.1836	1				
HCE	0.4594**	0.2353	0.7802**	1			

SCE	0.5495**	0.3110*	0.5209**	0.7123**	1		
PCI	-0.4420**	0.0318	-0.2965*	-0.3218*	-0.2993*	1	
ATR	0.3581**	0.3673**	0.2490	0.2789*	0.2252	0.1188	1

**correlation is significant at the 1% level (2-tailed)
*correlation is significant at the 5% level (2-tailed)
Source: STATA Output (Appendix I)

The results in Table 4 show the Pearson correlation results of the intangible assets variables (CEE, HCE, SCE) and the performance (ROA and EP) in the listed pharmaceutical firms in Nigeria. The table indicates that there is a significant positive relationship between ROA and CEE from the correlation coefficient of 0.2588, at 5% level of significance, from the p-value of 0.0459. This result suggests that performance likely increases with increase in capital employed efficiency. The result from the table shows a significant positive relationship between performance (ROA) and human capital efficiency (HCE) from the correlation coefficient of 0.4594 which is significant at 1% level of significance (p-value of 0.002). This implies that human capital efficiency is positively associated with high performance of listed pharmaceutical firms in Nigeria.

The results of correlation from the table also show a significant statistical positive relationship between structural capital efficiency (SCE) and performance (ROA), from the correlation coefficient of 0.5495 which is significant at 1% level of significance, from the p-value of 0.0000. This implies that the performance (ROA) increases with the increase in structural capital in the listed pharmaceutical firms in Nigeria. On the other hand, the table shows that there is a negative relationship between physical capital intensity (PCI) and performance (ROA), correlation coefficient of -0.5080 which is significant at 1% level of significance, from the p-value of 0.0004. Moreover, the table shows that there is a positive relationship between assets turnover ratio (ATR) and performance (ROA), correlation coefficient of 0.3581 which is significant at 1% level of significance, from the p-value of 0.0050.

On the other measure of performance, employee performance, the table shows that there is a positive relationship between performance and capital employed efficiency (CEE) while the correlation coefficient of 0.1836 indicates that there it is not significant at all levels of significance (from the p-value of 0.1603). Moreover, the results from the table show a significant positive relationship between performance (EP) and human capital efficiency (HCE) from the coefficient of 0.2353, with p-value of 0.0703 implies 10% level of significance.

The results from table 4.3 also show a significant statistical positive relationship between structural capital efficiency (SCE) and performance (EP), from the correlation coefficient of 0.3110 which is significant at 5% level of significance, from the p-value of 0.0156. This implies that the performance (EP) increases with the increase in structural capital in the listed pharmaceutical firms in Nigeria. On the other hand, the table shows that there is a positive relationship between physical capital intensity (PCI) and performance (EP), whereas, the correlation coefficient of 0.0318 indicates that it is not significant at all levels of significance, from the p-value of 0.8092. Moreover, the table shows that there is a significant positive

relationship between assets turnover ratio (ATR) and performance (EP), from the correlation coefficient of 0.3673 which is significant at 1% level of significance, from the p-value of 0.0039.

Following the analysis of the relationships between the intangible assets and the performance of listed pharmaceutical firms in Nigeria, the study can now proceed with the analysis of the regression results of the models of the study. From which the hypotheses of the study are tested and the relevant conclusions are drawn about the impact of intangible assets on the performance of listed pharmaceutical firms in Nigeria.

4.4 Presentation of Regression Results and Hypotheses Testing

This section presents and analyzes the regression results of the models of the study. The hypotheses formulated for the study are also tested in this section based on the results, as presented in table 4.4 below;

Table 4.4 Summary of Seemingly Unrelated Regression Results

Model One (SUR-OLS)		**Model Two (SUR-Random)**	
Variables	**Statistics**	**Variables**	**Statistics**
R^2	0.5135	**R^2**	0.2185
Chi2(F-Stat)	63.32	**Chi2(F-Stat)**	16.77
P-Value	0.0000	**P-Value**	0.0049
Hausman Test	Suest	**Hausman Test**	Suest
Random Effect Test: Chi2	0.95	**Random Effect Test: Chi2**	41.06
Prob>Chi2	0.3302	**Prob>Chi2**	0.0000

Source: STATA Output (Appendix I)

Due to the panel data used in this study, the models of the study are subjected to other regression models (Fixed and Random Effects) in addition to OLS, because of the uncertainty as to the conformity with the classical assumptions of the OLS regression model, as indicated by the normality test in Table 4.2. The results in table 4.4 present the regression results of the Seemingly Unrelated Regression (SUR) model in both models. The used of SUR in this study is suggested by the relevant tests conducted on the data.

That is, the study applied the usual fixed and random effects regression models, and the Hausman Specification tests to choose the most appropriate model for the study. However, the Hausman tests suggested the SUR (SUEST or Generalized model), because of the failure to of the data to meet the asymptotic assumptions of the Hausman (as earlier revealed by the skewness, kurtosis and the Shapiro-wilk test for normal data). However, in arriving at the model to apply the SUR, the Breusch and Pagan Lagrangian Multiplier Test for Random Effects was used. The

Breusch and Pagan Lagrangian Multiplier Test for Random Effects for model one, indicated that there is no statistical significant variance among the units in the panel (from the Chi2 of 0.95 with p-value of 0.3302), implying that OLS technique can be used for the study with respect to model one. For model two, the Breusch and Pagan Lagrangian Multiplier Test for Random Effects, indicated that there is statistical significant variance among the units in the panel (from the Chi2 of 41.06 with p-value of 0.0000), implying that random effect regression technique is the most appropriate to be used for the study with respect to model two. On this bases, the SUR is applied to OLS for model one, and Random effect for model two.

The results from table 4.4 indicate that the independent variables of the study (capital employed efficiency, human capital efficiency, and structural capital efficiency, together with the two control variables; physical capital intensity and asset turnover ratio) explained 51.35% of the variations in the performance (ROA) of listed pharmaceutical firms in Nigeria, from the coefficient of determinations (R^2 value of 0.5135). The table also shows that the model is fitted as evident by the Wald Chi2 of 63.32 which is significant at 1% level of significance (as indicated by the P-value of 0.0000).

The table on the other hand shows the independent variables of the study (capital employed efficiency, human capital efficiency, and structural capital efficiency, together with the two control variables; physical capital intensity and asset turnover ratio) explained 21.85% of the variations in the performance (EP) of listed pharmaceutical firms in Nigeria, from the coefficient of determinations (R^2 value of 0.2185). The table also shows that the model is fitted as evident by the Wald Chi2 of 16.77 which is significant at 1% level of significance (as indicated by the P-value of 0.0049).

4.4.1 Results of Robustness Test

This section presents and discusses the results of multicollinearity test and heteroskedasticity tests, as shown by table 4.5 as follows;

Table 4.5 Result of the Robustness Test of the Model of the Study

Model One			**Model Two**		
Multicolinearity Test			**Multicolinearity Test**		
Variables	**VIF**	**TV**	**Variables**	**VIF**	**TV**
HCE	3.86	0.2589	**HCE**	3.86	0.2589
CEE	2.61	0.3836	**CEE**	2.61	0.3836
SCE	2.08	0.4809	**SCE**	2.08	0.4809
PCI	1.21	0.8288	**PCI**	1.21	0.8288
ATR	1.16	0.8646	**ATR**	1.16	0.8646

Hettest: Chi2	13.52	**Hettest: Chi2**	0.32
Prob>Chi2	0.0002	**Prob>Chi2**	0.5715

Source: STATA Output (Appendix 1)

Some of the major classical assumptions of OLS regression model are that the error terms are normally distributed and independence (that is the error terms are uncorrelated); the explanatory variables are not perfectly correlated (absence of multicollinearity); the variance of the error terms is constant (Homoskedastic). When these assumption are not been met, the estimators are biased and cannot be use in drawing any inference. However, the results from table 4.5 proved the absent of perfect multicollinearity among the independent variables, because the smallest tolerance value (TV) is 0.2589 for model one and two, while the highest variance inflation factor (VIF) is 3.86 for both model one and two. The decision criteria for the Tolerance Value is that any value of 0.1 and below implies the presence of perfect multicollinearity in the estimates, while for the Variance Inflation Factor a value of 10 and above is an indication of perfect multicollinearity. The evidence from Breuch Pagan/Cook-Weisberg test for heteroskedasticity coefficient of 13.52 with p-value of 0.0002 confirms the presence of the effects of heteroskedasticity, that is, the variance of the error terms is not constant in the model one but applying SUR addressed the problem. While, the test in the model two shows an absence of heteroskedasticity, as indicated by the p-value of 0.5715 and Chi2 value of 0.32.

In view of the robustness of the results, the SUR estimators are used in the test of hypotheses formulated in this study.

4.4.2 Hypotheses Testing

In this section of the chapter, the study tests the hypotheses formulated for the study using univariate analysis (one of the two models), Table 4.6 presents the coefficients of the variables of the study from which the hypotheses were tested.

Table 4.6 Seemingly Unrelated Regression Estimators (Coefficients)

Model One (SUR-OLS)			**Model Two (SUR-Random)**		
Variables	**Coefficients**	**P-Values**	**Variables**	**Coefficients**	**P-Values**
CEE	-0.1303	0.042	**CEE**	-0.0007	0.997
HCE	0.0218	0.223	**HCE**	0.0630	0.081
SCE	0.1679	0.006	**SCE**	0.5719	0.000
PCI	-0.1699	0.000	**PCI**	0.1754	0.247
ATR	0.1955	0.000	**ATR**	0.4596	0.000
CONSTANT	-0.0651	0.211	**CONSTANT**	7.3638	0.000

Source: STATA Output (Appendix)

The results in Table 4.6 shows that capital employed efficiency (CEE) has a significant negative impact on the performance (ROA) of listed pharmaceutical firms in Nigeria as indicated by the coefficient of -0.1303 which is significant at 5% level of significance (from the P-value of 0.042). Based on this, the study rejects the null hypothesis one (H_{01}) which state that, capital employed efficiency has no significant impact on performance of listed pharmaceutical firms in Nigeria. Therefore, the study infers capital employed efficiency has significant negative impact on

performance of listed pharmaceutical firms in Nigeria. However, the results from the table did not provide significant statistical evidence with respect to performance in terms of employee efficiency (EP) and CEE, from the coefficient of -0.0007 which is not significant at all levels of significance (from the p-value of 0.997).

The table also indicates that human capital efficiency (HCE) has a positive effect on the performance (ROA) of listed pharmaceutical firms in Nigeria, from the coefficient of 0.0218 which is not significant at all levels of significance (from the p-value of 0.223). However, the table shows that HCE has significant impact on the performance (EP) of listed pharmaceutical firms in Nigeria, from the coefficient of 0.0630 which is significant at 10% level of significance (from the p-value of 0.081). Based on this, the study therefore rejects the second null hypothesis (H_{02}) which states that, human capital efficiency has no significant impact on the performance of listed pharmaceutical firms in Nigeria. The study infers that human capital efficiency has significant positive impact on the performance of listed pharmaceutical firms in Nigeria.

Moreover, Table 4.6 shows that structural capital efficiency (SCE) has a significant positive impact on the performance (ROA and EP) of listed pharmaceutical firms in Nigeria as indicated by the coefficient of 0.1679 which is significant at 1% level of significance (from the P-value of 0.006) from model one; and the coefficient of 0.5719 which is significant at 1% level of significance (from the P-value of 0.000). Based on this, the study rejects the null hypothesis three (H_{03}) which state that, structural capital efficiency has no significant impact on the performance of listed pharmaceutical firms in Nigeria. Therefore, the study infers that structural capital efficiency has significant positive impact on the performance of listed pharmaceutical firms in Nigeria.

On the other hand, the results from the table indicates that physical capital intensity (PCI) has a negative effect on the performance (ROA) of listed pharmaceutical firms in Nigeria, from the coefficient of -0.1699 with p-value of 0.000, implying significance at 1% level of significance. Moreover, PCI is found to be positively impacted on the performance (EP), from the coefficient of 0.1754 which is not significant at all levels of significance (from the p-value of 0.247). Similarly, the results show that assets turnover ratio (ATR) has a significant positive impact on the performance (ROA) of listed pharmaceutical firms in Nigeria, from the coefficient of 0.1955 with p-value of 0.000, implying significance at 1% level of significance. On the other, this is the same with the performance in terms of employee productivity (EP), from the coefficient of 0.4596 with p-value of 0.000, implying significance at 1% level of significance.

4.5 Discussion of Major Findings

In general, it has been discovered that possession of the components of value added intellectual capital –capital employed efficiency, human capital efficiency and structural capital efficiency- by an organisation and their effective management and well application will give an organisation competitive advantages. This finding is in consistence with the works of Chen, Cheng & Hwang, (2005) and Teece, (2000). Their separate works finds that intangibles assets of a firm and its

intellectual components are key to achieving sustainable competitive advantage and derive economic growth. This finding also substantiate the theory that under pin this study – the Resource Based View Theory – which states that firms gain competitive advantages and superior performance through the acquisition , holding and subsequent use of strategic assets.

The study also established a positive relationship between human capital (as one of the explanatory variables) and the performance of the pharmaceutical firms in Nigeria even though the association is more pronounced via employee productivity as performance proxy. This finding reassert the position of Bontis et al, (2000) which investigate the three elements of intangible asset namely the human, structural and customer elements as well as their interrelationship.

The research equally revealed that the structural capital of a firm contributes significantly to the performance of the study domain. This finding is in agreement with Edvisson, (1997) which posit that structural capital hold a high percentage of firm's value thus, contributing significantly to the performance of firms.

The variables of the employee productivity have stronger correlation than that of profitability (ROA). This may be as a result of established facts that human resources are critical to the performance of firms because the human resource coordinate the other components of the intangible asset. Per employee productivity can enhanced through efficient management of human capital.The place of capital employed as one of the components was well established though it failed to prove significantly with respect to performance.

4.6 Policy Implication of the Research Findings

The findings from this study imply that, in order for listed pharmaceutical firms in Nigeria to achieve higher profitability and sustainability, policies that will improve and upgrade their employees' skill and competence in the area of training and development are needed. In essence, the findings provide evidences on the significance of intangible assets on performance, suggesting that the listed pharmaceutical firms need sufficient intangible assets for them to achieve the desirable performance and enhance the value of their firms. Specifically, the findings implied that the investments of listed pharmaceutical firms in Nigeria in structural capital drivers are worthwhile. As such, it is

important for firms to put more emphasis on policy (ies) that will promote and improve the process, structure, culture and norms of their companies with regard to intangible assets.

4.7 Summary

This chapter presented, analysed and discussed the data for this study. The chapter started with the presentation of the descriptive statistics of the data for the study and the correlation between the explained and explanatory variables were discussed. The result from the stata output shows that the contributory variables were significant at different levels of significance. The contribution and the policy implication of the study were also presented.

CHAPTER FIVE
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

The study measured the relationship between intangible asset and the performance of quoted pharmaceutical firms in Nigeria using the components of VAIC (Capital Employed, Human Capital and Structural Capital) as proposed by Pulic, (1998). The study employed correlation research design using panel multiple regression technique of data analysis. The finding shows that the components of intangible assets have significantly impacted on the performance of quoted pharmaceutical firms in Nigerian.

Specifically, the findings show that the intangible assets variables of the study (capital employed efficiency, human capital efficiency, and structural capital efficiency, together with the two control variables; physical capital intensity and asset turnover ratio) on one hand, explained 51.35% of the variations in the performance (ROA) of listed pharmaceutical firms in Nigeria, and on the other hand, the variables of the study explained around 21.85% of the variations in the performance (EP).

Moreover, the study found that capital employed efficiency (CEE) has a significant negative impact on the performance (ROA) of listed pharmaceutical firms in Nigeria. However, the results did not provide significant statistical evidence with respect to performance in terms of employee efficiency (EP) and CEE. Similarly, the study found that human capital efficiency (HCE) has an insignificant positive effect on the performance (ROA) of listed pharmaceutical firms in Nigeria, but a significant positive impact on the performance (EP) of listed pharmaceutical firms in Nigeria. Moreover, the study found that structural capital efficiency (SCE) has a significant positive impact on the performance (ROA and EP) of listed pharmaceutical firms in Nigeria. The results from the analysis indicates that physical capital intensity (PCI) has a significant negative effect on the performance (ROA) of listed pharmaceutical firms in Nigeria, on the contrary, PCI is found to be positively impacted on the performance (EP).

5.2 Conclusion

Based on the data collected, tested, analyzed and the hypotheses testing conducted in this study, the study concludes that possession of the components of value added intellectual capital –capital employed efficiency, human capital efficiency and structural capital efficiency- by an organization and their effective management and well application will give an organization competitive advantage. Particularly, the study after controlling for physical capital intensity and assets turnover to absorbs their possible effects on the over all results,concludes that capital employed efficiency has a significant negative impact on the performance of listed pharmaceutical firms in Nigeria. The study also concludes that human capital efficiency has a significant positive effect on the performance of listed pharmaceutical firms in Nigeria. Similarly, the study concludes that structural capital efficiency has a significant positive impact on the performance of listed pharmaceutical firms in Nigeria.

5.3 Limitations of the Study

The following were the limitations of the study:

This study is based on six quoted pharmaceutical firms in Nigeria. The data used in this study were only based on the voluntary disclosure in the annual report of the sampled companies which might be different from disclosure and listing requirement of other countries around the world. These differences can also affect the results of VAIC model in other regions, as Pulic's VAIC model used in this study takes data from public listed annual reports of specific country's accounting framework. Since the data used in this study only related to quoted pharmaceutical firms in Nigeria, the generalization of the findings may be limited to only Nigerian firms.

Secondly, the study was to be carried out on all the listed pharmaceutical firms in Nigeria but one of them (Parm-Deko Plc) was dropped due to non-accessibility of its financial reports for some years under study.

Thirdly, the proxy variables used by the study have different definitions among researchers and thus the result of the study should be interpreted based on the definition we adopted in the work.

Finally, the secondary data used for the study are basically historical accounting data drawn from the financial reports of the selected firms under study and thus the asset values are not market values. Based on this, the result of the study might probably be little bit different when current prices of the assets were used.

5.4 Recommendations

Based on the findings of the study, it is recommended that:

i. The management of pharmaceutical firms in Nigeria arehereby encouraged to invest significantly in intangible assets as they pose the great potentials of earning the organisation economic rent as posited by the Resource Base View Theory.

ii. The managements of the pharmaceutical firms should strive hard to develop their human resources by way of training and retraining as well as professional and competency development of the employees in their various areas of specialisations. This will equip the employee with new knowledge as may be required for more competitive advantage to the organisation. Equally, employees' remuneration and other incentives that may boost their moral must be handled with utmost important. The resultant effect of employee motivation, all things being equal, is the correspondence performance.

iii. Management of the pharmaceutical firms in Nigeria are hereby strongly advised to invest heavily in the structural asset of the organisation. Investments in structural capital drivers are worthwhile. This may include investment in infrastructures like information technology, processes/system, gadgets and other working equipment that may aid effective and efficient performance of the employees.

iv. It is important for pharmaceutical firms in Nigeria to put more emphasis on policy that will promote and improve their process, structure, culture and norms of their companies as it may relate to the effective management of their intangible assets.

5.5 Area of Further Research

Giving the fact that findings and generalizations of this research is limited by some factors; this study suggests future researches in the following areas:

(i) We recommend a further research that will accommodate more variables and wider scope for possible enhanced/robust findings that may allow wider generalisation.

(ii) This study focuses only on quoted pharmaceutical firms in Nigeria, future researches in this area should incorporate other sectors of the economy.

(iii) We recommend a further study that will apply other methods of measuring intangible assets.

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APPENDIX

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. xtset id year, yearly
       panel variable:  id (strongly balanced)
        time variable:  year, 2003 to 2012
                delta:  1 year

. su roa ep cee hce sce pci atr, detail
```

roa

Percentiles		Smallest		
1%	-.16	-.16		
5%	-.09	-.15		
10%	-.045	-.11	Obs	60
25%	.03	-.07	Sum of Wgt.	60
50%	.065		Mean	.116
		Largest	Std. Dev.	.1539668
75%	.17	.41		
90%	.375	.45	Variance	.0237058
95%	.43	.54	Skewness	1.02935
99%	.58	.58	Kurtosis	4.095298

ep

Percentiles		Smallest		
1%	1019.97	1019.97		
5%	1488.88	1272.64		
10%	1673.245	1482.52	Obs	60
25%	2861.28	1495.24	Sum of Wgt.	60
50%	4670.765		Mean	6700.984
		Largest	Std. Dev.	5991.762
75%	8435.3	18332.81		
90%	14143.73	21450.27	Variance	3.59e+07
95%	19891.54	27912.63	Skewness	1.956158
99%	28253.31	28253.31	Kurtosis	6.898478

cee

Percentiles		Smallest		
1%	.09	.09		
5%	.105	.1		
10%	.165	.1	Obs	60
25%	.34	.11	Sum of Wgt.	60
50%	.46		Mean	.5175
		Largest	Std. Dev.	.3497196
75%	.63	1.23		
90%	.72	1.42	Variance	.1223038
95%	1.325	1.86	Skewness	2.224528
99%	1.87	1.87	Kurtosis	8.981436

hce

Percentiles		Smallest		
1%	.45	.45		
5%	.93	.86		
10%	1.26	.92	Obs	60
25%	2.01	.94	Sum of Wgt.	60
50%	2.78		Mean	2.984333
		Largest	Std. Dev.	1.525551
75%	3.53	6.3		
90%	5.54	6.77	Variance	2.327306
95%	6.535	6.9	Skewness	1.005876
99%	7.17	7.17	Kurtosis	3.852292

sce

Percentiles		Smallest		
1%	-1.22	-1.22		
5%	-.075	-.16		
10%	.2	-.09	Obs	60
25%	.5	-.06	Sum of Wgt.	60
50%	.64		Mean	.5473333
		Largest	Std. Dev.	.3264128
75%	.715	.84		
90%	.82	.85	Variance	.1065453
95%	.845	.85	Skewness	-3.092559
99%	.86	.86	Kurtosis	15.87144

pci

Percentiles		Smallest		
1%	.03	.03		
5%	.04	.04		
10%	.075	.04	Obs	60
25%	.215	.04	Sum of Wgt.	60
50%	.375		Mean	.4231667
		Largest	Std. Dev.	.3570524
75%	.585	.71		
90%	.67	.74	Variance	.1274864
95%	.725	1.72	Skewness	3.014661
99%	2.26	2.26	Kurtosis	15.30466

atr

Percentiles		Smallest		
1%	.3	.3		
5%	.47	.46		
10%	.525	.47	Obs	60
25%	.65	.47	Sum of Wgt.	60
50%	.75		Mean	.8368333
		Largest	Std. Dev.	.2665123
75%	1.035	1.24		
90%	1.205	1.31	Variance	.0710288
95%	1.275	1.4	Skewness	.390375
99%	1.42	1.42	Kurtosis	2.215177

```
. swilk roa ep cee hce sce pci atr
```

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
roa	60	0.91889	4.409	3.198	0.00069
ep	60	0.77842	12.045	5.364	0.00000
cee	60	0.76431	12.812	5.497	0.00000
hce	60	0.91415	4.667	3.320	0.00045
sce	60	0.69941	16.339	6.021	0.00000
pci	60	0.71018	15.754	5.943	0.00000
atr	60	0.95461	2.467	1.947	0.02579

```
. pwcorr roa ep cee hce sce pci atr, star (0.05) sig
```

	roa	ep	cee	hce	sce	pci	atr
roa	1.0000						
ep	-0.0182 0.8902	1.0000					
cee	0.2588* 0.0459	0.1836 0.1603	1.0000				
hce	0.4594* 0.0002	0.2353 0.0703	0.7802* 0.0000	1.0000			
sce	0.5495* 0.0000	0.3110* 0.0156	0.5209* 0.0000	0.7123* 0.0000	1.0000		
pci	-0.4420* 0.0004	0.0318 0.8092	-0.2965* 0.0214	-0.3218* 0.0122	-0.2993* 0.0202	1.0000	
atr	0.3581* 0.0050	0.3673* 0.0039	0.2490 0.0550	0.2789* 0.0310	0.2252 0.0836	0.1188 0.3660	1.0000

```
.
. reg roa cee hce sce pci atr
```

Source	SS	df	MS
Model	.718153298	5	.14363066
Residual	.680486694	54	.012601605
Total	1.39863999	59	.023705763

```
Number of obs =      60
F(  5,    54) =   11.40
Prob > F      =  0.0000
R-squared     =  0.5135
Adj R-squared =  0.4684
Root MSE      =  .11226
```

roa	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cee	-.1303332	.0674714	-1.93	0.059	-.2656053	.0049389
hce	.0217671	.018828	1.16	0.253	-.0159807	.059515
sce	.1679201	.064565	2.60	0.012	.038475	.2973652
pci	-.1699209	.0449602	-3.78	0.000	-.2600607	-.0797812
atr	.1954564	.0589742	3.31	0.002	.0772203	.3136925
_cons	-.0650808	.0548713	-1.19	0.241	-.1750911	.0449294

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of roa

         chi2(1)      =    13.52
         Prob > chi2  =   0.0002
```

```
. vif

    Variable |       VIF       1/VIF
-------------+----------------------
         hce |      3.86    0.258888
         cee |      2.61    0.383614
         sce |      2.08    0.480889
         pci |      1.21    0.828808
         atr |      1.16    0.864601
-------------+----------------------
    Mean VIF |      2.18
```

```
. xtreg roa cee hce sce pci atr, fe

Fixed-effects (within) regression               Number of obs      =        60
Group variable: id                              Number of groups   =         6

R-sq:  within  = 0.4573                         Obs per group: min =        10
       between = 0.5795                                        avg =      10.0
       overall = 0.4810                                        max =        10

                                                F(5,49)            =      8.26
corr(u_i, Xb)  = -0.2681                        Prob > F           =    0.0000

------------------------------------------------------------------------------
         roa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cee |  -.0533551   .0705169    -0.76   0.453     -.195064    .0883539
         hce |    .023186    .023767     0.98   0.334    -.0245756    .0709476
         sce |   .1694448   .0662798     2.56   0.014     .0362505    .3026391
         pci |  -.1341239   .0514887    -2.60   0.012    -.2375943   -.0306535
         atr |   .2283778   .0837754     2.73   0.009     .0600249    .3967308
       _cons |  -.1526837   .0755349    -2.02   0.049    -.3044769   -.0008906
-------------+----------------------------------------------------------------
     sigma_u |  .06261818
     sigma_e |  .10535491
         rho |  .26104234   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(5, 49) =     2.46                 Prob > F = 0.0456
```

```
. est store fixed

.
```

```
. xtreg roa cee hce sce pci atr, re

Random-effects GLS regression                   Number of obs      =        60
Group variable: id                              Number of groups   =         6

R-sq:  within  = 0.4252                         Obs per group: min =        10
       between = 0.7372                                        avg =      10.0
       overall = 0.5135                                        max =        10

Random effects u_i ~ Gaussian                   Wald chi2(5)       =     56.99
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
         roa |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cee |  -.1303332   .0674714    -1.93   0.053    -.2625748    .0019084
         hce |   .0217671    .018828     1.16   0.248     -.015135    .0586693
         sce |   .1679201    .064565     2.60   0.009      .041375    .2944653
         pci |  -.1699209   .0449602    -3.78   0.000    -.2580413   -.0818006
         atr |   .1954564   .0589742     3.31   0.001     .0798692    .3110437
       _cons |  -.0650808   .0548713    -1.19   0.236    -.1726266    .0424649
-------------+----------------------------------------------------------------
     sigma_u |           0
     sigma_e |  .10535491
         rho |           0   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. est store random

.

. hausman fixed random

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |    fixed       random       Difference          S.E.
-------------+------------------------------------------------------------
         cee |  -.0533551    -.1303332        .0769781        .0204996
         hce |    .023186     .0217671        .0014189        .0145044
         sce |   .1694448     .1679201        .0015246         .014979
         pci |  -.1341239    -.1699209         .035797        .0250932
         atr |   .2283778     .1954564        .0329214         .059501
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =   -46.04    chi2<0 ==> model fitted on these
                                        data fails to meet the asymptotic
                                        assumptions of the Hausman test;
                                        see suest for a generalized test
```

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        roa[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                     |       Var     sd = sqrt(Var)
             ---------+-----------------------------
                 roa |    .0237058       .1539668
                   e |    .0110997       .1053549
                   u |           0              0

        Test:   Var(u) = 0
                            chi2(1) =     0.95
                        Prob > chi2 =     0.3302


. sureg roa cee hce sce pci atr

Seemingly unrelated regression
------------------------------------------------------------------------------
Equation           Obs   Parms        RMSE    "R-sq"       chi2         P
------------------------------------------------------------------------------
roa                 60       5    .1064962    0.5135      63.32    0.0000
------------------------------------------------------------------------------

------------------------------------------------------------------------------
         roa |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
roa          |
         cee |  -.1303332    .064009    -2.04   0.042    -.2557886   -.0048778
         hce |   .0217671   .0178618     1.22   0.223    -.0132413    .0567756
         sce |   .1679201   .0612518     2.74   0.006     .0478689    .2879714
         pci |  -.1699209    .042653    -3.98   0.000    -.2535192   -.0863227
         atr |   .1954564   .0559478     3.49   0.000     .0858007    .3051121
       _cons |  -.0650808   .0520555    -1.25   0.211    -.1671077     .036946
------------------------------------------------------------------------------


. xtgls roa cee hce sce pci atr, p(c)

Cross-sectional time-series FGLS regression

Coefficients:  generalized least squares
Panels:        heteroskedastic with cross-sectional correlation
Correlation:   no autocorrelation

Estimated covariances      =        21          Number of obs      =        60
Estimated autocorrelations =         0          Number of groups   =         6
Estimated coefficients     =         6          Time periods       =        10
                                                Wald chi2(5)       =    903.24
                                                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
         roa |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cee |  -.0825698   .0321682    -2.57   0.010    -.1456183   -.0195213
         hce |   .0007639   .0076152     0.10   0.920    -.0141617    .0156894
         sce |   .1838904   .0241628     7.61   0.000     .1365322    .2312487
         pci |  -.1591639   .0099878   -15.94   0.000    -.1787397   -.1395882
         atr |   .1908303   .0197596     9.66   0.000     .1521023    .2295583
       _cons |  -.0513201   .0168276    -3.05   0.002    -.0843016   -.0183386
------------------------------------------------------------------------------

.
```

```
. xtgls roa cee hce sce pci atr

Cross-sectional time-series FGLS regression

Coefficients:  generalized least squares
Panels:        homoskedastic
Correlation:   no autocorrelation

Estimated covariances      =         1          Number of obs      =        60
Estimated autocorrelations =         0          Number of groups   =         6
Estimated coefficients     =         6          Time periods       =        10
                                                Wald chi2(5)       =     63.32
Log likelihood             =  49.24244          Prob > chi2        =    0.0000
```

roa	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
cee	-.1303332	.064009	-2.04	0.042	-.2557886	-.0048778
hce	.0217671	.0178618	1.22	0.223	-.0132413	.0567756
sce	.1679201	.0612518	2.74	0.006	.0478689	.2879714
pci	-.1699209	.042653	-3.98	0.000	-.2535192	-.0863227
atr	.1954564	.0559478	3.49	0.000	.0858007	.3051121
_cons	-.0650808	.0520555	-1.25	0.211	-.1671077	.036946

```
.

. reg ep cee hce sce pci atr
```

Source	SS	df	MS		
Model	8.19289676	5	1.63857935	Prob > F	0.0178
Residual	29.3056569	54	.54269735	R-squared	0.2185
				Adj R-squared	0.1461
Total	37.4985537	59	.635568706	Root MSE	.73668

```
Number of obs =      60
F(  5,    54) =    3.02
```

ep	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cee	.0034922	.4427779	0.01	0.994	-.884224	.8912084
hce	.0732207	.1235577	0.59	0.556	-.1744976	.320939
sce	.7752822	.4237047	1.83	0.073	-.0741947	1.624759
pci	.1966844	.2950488	0.67	0.508	-.3948528	.7882216
atr	.4031694	.387015	1.04	0.302	-.372749	1.179088
_cons	7.426316	.3600899	20.62	0.000	6.70438	8.148253

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of ep

         chi2(1)      =     0.32
         Prob > chi2  =   0.5715
```

```
. vif
```

Variable	VIF	1/VIF
hce	3.86	0.258888
cee	2.61	0.383614
sce	2.08	0.480889
pci	1.21	0.828808
atr	1.16	0.864601
Mean VIF	2.18	

```
. xtreg ep cee hce sce pci atr, fe

Fixed-effects (within) regression               Number of obs      =        60
Group variable: id                              Number of groups   =         6

R-sq:  within  = 0.1574                         Obs per group: min =        10
       between = 0.3547                                        avg =      10.0
       overall = 0.0374                                        max =        10

                                                F(5,49)            =      1.83
corr(u_i, Xb)  = -0.5028                        Prob > F           =    0.1242
```

ep	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cee	-.1413904	.2910436	-0.49	0.629	-.7262644	.4434835
hce	-.1293413	.0980934	-1.32	0.193	-.3264673	.0677847
sce	.2858122	.2735561	1.04	0.301	-.2639193	.8355437
pci	.3109643	.2125088	1.46	0.150	-.1160881	.7380167
atr	.1023314	.3457654	0.30	0.769	-.5925101	.797173
_cons	8.577101	.3117546	27.51	0.000	7.950606	9.203595
sigma_u	.84745808					
sigma_e	.43483026					
rho	.79159577	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(5, 49) =    21.20                 Prob > F = 0.0000

. est store fixed
```

```
. xtreg ep cee hce sce pci atr, re

Random-effects GLS regression                   Number of obs      =        60
Group variable: id                              Number of groups   =         6

R-sq:  within  = 0.0074                         Obs per group: min =        10
       between = 0.6842                                        avg =      10.0
       overall = 0.2185                                        max =        10

Random effects u_i ~ Gaussian                   Wald chi2(5)       =     15.10
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0100

------------------------------------------------------------------------------
          ep |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cee |   .0034922   .4427779     0.01   0.994    -.8643365    .8713209
         hce |   .0732207   .1235577     0.59   0.553    -.1689479    .3153893
         sce |   .7752822   .4237047     1.83   0.067    -.0551638    1.605728
         pci |   .1966844   .2950488     0.67   0.505    -.3816006    .7749694
         atr |   .4031694    .387015     1.04   0.298    -.3553661    1.161705
       _cons |   7.426316   .3600899    20.62   0.000     6.720553     8.13208
-------------+----------------------------------------------------------------
     sigma_u |           0
     sigma_e |  .43483026
         rho |           0   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. est store random

.

. hausman fixed random

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |    fixed       random       Difference          S.E.
-------------+------------------------------------------------------------
         cee |  -.1413904     .0034922      -.1448827                .
         hce |  -.1293413     .0732207       -.202562                .
         sce |   .2858122     .7752822        -.48947                .
         pci |   .3109643     .1966844       .1142799                .
         atr |   .1023314     .4031694       -.3008379               .
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          = -4739.27    chi2<0 ==> model fitted on these
                                        data fails to meet the asymptotic
                                        assumptions of the Hausman test;
                                        see suest for a generalized test
```

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        ep[id,t] = Xb + u[id] + e[id,t]

        Estimated results:
                     |       Var     sd = sqrt(Var)
             ep      |    .6355687       .7972256
             e       |    .1890774       .4348303
             u       |           0              0

        Test:   Var(u) = 0
                            chi2(1) =    41.06
                        Prob > chi2 =     0.0000


. sureg (random: ep = cee hce sce pci atr)

Seemingly unrelated regression
------------------------------------------------------------------------------
Equation           Obs   Parms        RMSE    "R-sq"       chi2         P
------------------------------------------------------------------------------
random              60       5     .698876    0.2185      16.77    0.0049
------------------------------------------------------------------------------

------------------------------------------------------------------------------
          ep |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
random       |
         cee |   .0034922    .420056     0.01   0.993    -.8198023    .8267868
         hce |   .0732207   .1172171     0.62   0.532    -.1565206     .302962
         sce |   .7752822   .4019616     1.93   0.054    -.0125481    1.563112
         pci |   .1966844   .2799079     0.70   0.482    -.3519249    .7452938
         atr |   .4031694   .3671547     1.10   0.272    -.3164405    1.122779
       _cons |   7.426316   .3416113    21.74   0.000     6.756771    8.095862
------------------------------------------------------------------------------

.

. xtgls ep cee hce sce pci atr

Cross-sectional time-series FGLS regression

Coefficients:  generalized least squares
Panels:        homoskedastic
Correlation:   no autocorrelation

Estimated covariances      =         1          Number of obs      =        60
Estimated autocorrelations =         0          Number of groups   =         6
Estimated coefficients     =         6          Time periods       =        10
                                                Wald chi2(5)       =     16.77
Log likelihood             = -63.63939          Prob > chi2        =    0.0049

------------------------------------------------------------------------------
          ep |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cee |   .0034922    .420056     0.01   0.993    -.8198023    .8267868
         hce |   .0732207   .1172171     0.62   0.532    -.1565206     .302962
         sce |   .7752822   .4019616     1.93   0.054    -.0125481    1.563112
         pci |   .1966844   .2799079     0.70   0.482    -.3519249    .7452938
         atr |   .4031694   .3671547     1.10   0.272    -.3164405    1.122779
       _cons |   7.426316   .3416113    21.74   0.000     6.756771    8.095862
------------------------------------------------------------------------------

.
```

```
. xtgls ep cee hce sce pci atr, p(c)

Cross-sectional time-series FGLS regression

Coefficients:  generalized least squares
Panels:        heteroskedastic with cross-sectional correlation
Correlation:   no autocorrelation

Estimated covariances      =        21          Number of obs      =        60
Estimated autocorrelations =         0          Number of groups   =         6
Estimated coefficients     =         6          Time periods       =        10
                                                Wald chi2(5)       =    117.00
                                                Prob > chi2        =    0.0000
```

ep	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
cee	-.0006642	.1644012	-0.00	0.997	-.3228845	.3215561
hce	.0630019	.036063	1.75	0.081	-.0076802	.133684
sce	.5719314	.1473057	3.88	0.000	.2832176	.8606453
pci	.1753568	.1513305	1.16	0.247	-.1212455	.4719591
atr	.4596266	.1130837	4.06	0.000	.2379867	.6812665
_cons	7.363799	.1324	55.62	0.000	7.1043	7.623298

```
.
```