EFFECT OF INTANGIBLE ASSETS ON VALUE REL EVANCE: EVIDENCE FROM LISTED MANUFACTURING FIRMS IN NIGERIA

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

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OCTOBER, 2018

DECLARATION

I hereby declare that the dissertation titled "Effect of Intangible Assets on Value Relevance: Evidence from Listed Manufacturing Firms in Nigeria" has been done by me under the supervision of Dr. H.M. Sabari and Mal. S. Salami of 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 dissertation was previously presented for the award of any certificate at this or any other institution.

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CERTIFICATION

This is to certify that the dissertation titled "Effect of Intangible Assets on Value Relevance: Evidence from Listed Manufacturing Firms in Nigeria" by Ephraim Oryina MUE meets the regulations governing the award of the degree of Masters of Science (M.sc) in Accounting and Finance in Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This dissertation is dedicated to God Almighty and to my late parents, Mr. and Mrs. Joseph Mue for their love, encouragement, support and making me who I am today.

ACKNOWLEDGEMENTS

My profound gratitude goes to God Almighty for His protection and provision throughout the course of this programme.

I would like to appreciate the invaluable support of members of my supervisory committee, Dr. H.M Sabari and Mal. Suleiman Salami for their valid contributions, constructive criticisms and guidance towards the output and completion of this dissertation.

My gratitude goes to the Head of Department, Dr. Salisu Abubakar for his moral support and encouragement which contributed to bringing this work to conclusion.

I would also like to acknowledge the contributions of the following notable lecturers; Dr. M. S. Tijjani, Dr. M.I. Bagudo, Dr. A. Bello, Dr. S. Mamman, Dr. A. Haruna, Dr L. Mailafiya, Prof. I. L. Chechet, Dr. M. D. Tahir, Malam Lawal Muhammad, and many other lecturers whose name are not mentioned here for their commitment and for being a source of inspiration to me.

Finally, I wish to sincerely appreciate my late parents, Mr. Joseph and Mrs. Cecilia Mue Mkper for their love and care; my wife, Bridget Mue for her encouragement and support, and my children, who in their prayers stood there for me. My thanks also goes to my brothers, sisters, friends and course-mates for their moral support and understanding throughout my academic programme. I greatly appreciate you all and may God Almighty bless you.

ABSTRACT

The increasing importance and role of intangible assets in today's economic environment is a source for concern for scholars and accounting practitioners. As an attempt to explore the relevance of reported intangible assets, the study investigates the market value relevance of different intangible asset (intellectual properties, computer software cost and goodwill) reported by listed manufacturing firms in Nigeria. To achieve this, the study adopted a correlational research design and made use of panel data extracted from the annual reports and accounts of nine (9) sampled manufacturing firms out of the thirty-four (34) listed firms that reported components of intangible assets for the 6- year (2011-2016). The model was estimated using the random effect regression technique. The findings revealed intellectual properties to be positive and significantly associated with market value of listed manufacturing firms in Nigeria, while goodwill have negative and significant relationship with market value. Based on the findings, the study recommended amongst others, that management of manufacturing firms can bring their expertise to develop innovative technologies and business adaptations, as well as, direct policies that will improve brands names and trademarks, protect patents and other intellectual properties as this will impact on market price.

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CHAPTER ONE
INTRODUCTION

1.1 Background to the Study

The objective of accounting is to report an entity's economic activities in a manner that can serve the needs of diverse users and assist them in taking useful and informed decisions. The impact of such financial information can only be beneficial to the stakeholders if it is reliable and relevant. This implies that financial reports can only be regarded as useful if it represents the economic substance of an organization in terms of its relevance, reliability and comparability (IASB Conceptual Framework, 2014:2).

Intangible asset is changing the face of business in developed economies than in the developing economies. This is largely associated with the transformative phase of business towards the area of innovation, information and telecommunications technology, which the developing world is yet to fully integrate. This era of innovative and information technology in business is what Abubakar and Abubakar (2015) and Abubakar (2014) referred to as the "new economy". This phase is characterised by continuous innovation and customer-centric businesses caused by competitive global markets and information technology. These have compelled firms to invest in two aspect of intangibles, which are innovation and adaptive capabilities (computer software, intellectual properties, human resources and Research and Development (R & D), as well as, customer attraction (advertising, marketing, distribution and promotional activities) which are needed in order to strengthen the firm's strategic position in the open market and ensure their future viability (Lev & Daum, 2004).

Intangibles like computer software are becoming more relevant than ever before especially as they aid the computerisation of inventory management and production process in the manufacturing sector. Another intangible asset relating to manufacturing firms is intellectual properties. The growth in the information age was borne out of the interplay of intellectual properties which Greenhalgh and Rogers (2007) opined as a policy tool for encouraging innovation. One other intangible asset relating to manufacturing firms is the purchased goodwill. The changing economic environment of the 1980s aligned to a large merger wave, thereby increasing the amount of goodwill on company's audited financial statements. Therefore, there is growing need by firms to evaluate their investment in intangible assets in order to gauge their effect on the market value.

With the growth in intangible assets and their effect on the market value, intangible assets is beginning to receive a renewed vigor amongst scholars and practitioners. Investigation by Barnes (2010), asserts that intangible assets are likely to be more important in some industries than in others. They further opined that the amount of intangibles is growing bigger in manufacturing sectors than in services sector. This was corroborated by the latest economic report by Renaissance Capital (Oladunjoye, 2016). The report reveals that the Nigerian manufacturing sector is now the major driver of economic growth in Nigeria. According to the report, with Nigeria's rebased Gross Domestic Product (GDP), the manufacturing sector is currently growing faster than the telecommunications, oil & gas and agricultural sectors. The report further states that recent figures by the Manufacturers Association of Nigeria showed that there was an increase in manufacturing capacity utilisation from 46.3 percent recorded in the first half of 2013 to 52.7 percent in the second half of the same year.

In spite of the economic recession, the Purchasing Manager's Index (PMI) reading for the month of July 2017 has shown that Nigeria's manufacturing sector expanded from a headline index of 55.9 in June 2017, to 56.3 index points in July 2017 as reported by the FBN Quest (Mbah,2017). According to this report, the improvements in the sector follows better access to imported raw materials as the CBN's stepped up its foreign exchange interventions over the past months which boosted foreign exchange liquidity and strengthened the naira significantly. This invariably may increase the volume of trading of the stocks in the manufacturing sector thereby influencing the share price of these firms. Consequently, the study of the effect of intangible assets on the market value of these firms is certainly paramount.

Finally, with the issuance of the Statement of Accounting Standard on intangible assets (SAS 17) by the Nigerian Accounting Standard Board (NASB) in February 2010 (NASB, 2010) and the subsequent adoption of the International Financial Reporting Standard (IFRS) in 2012, the disclosure of intangible assets in the statement of financial position took a renewed attention in the manufacturing sector of the Nigerian economy. This implies that intangible assets now possess one of the criteria (value relevance) for assets recognition in the financial statements

1.2 Statement of the Problem

In Nigeria, capitalised intangible assets is growing in value (Oladunjoye, 2016), hence constituting one of the major part of non-current assets of manufacturing firms. Few literature (Nnado & Ozouli, 2016; Abubakar & Abubakar, 2015) examines the value relevance of such aspect of intangibles in the market valuation of companies in Nigeria. These studies have shown that there is a relationship between intangible asset and firm value. However none of them have

fully exposed how the categories of intangibles such as computer software, intellectual property and goodwill can serve as a signaling device to changes in share price. This study will thus examine the effect that comprehensive disclosure of intangible assets will have on the share price of manufacturing firms in Nigeria.

Most studies on value relevance tow the position that interprets value relevance as the association between financial statement information and firm value (Chang *et al*, 2008). These interpretations are in line with the Ohlson model (1995) which has been employed in many studies to explore the associations between market value of equities and main financial information disclosed variables (Mohammed & Lode, 2015). Consequently, the inclusion of intangible assets in the modified Ohlson Model which this study claims to adopt, is justifiable.

The new economy era with its paraphernalia of innovations and ideas has transformed the conventional way of doing business by strengthening firms' competitive position (Canibano, Coversi & Sanches, 2000). The value created by intangibles may become paramount in assessing the quality of firms' financial statements. However, current accounting standards especially in the developing economies mainly focus on tangible assets due to their physical substance, while not sufficiently reflecting the impact of intangible assets on firm value. This could be attributed to the inherent uncertainties regarding the future economic benefit and economic life of intangible assets and difficulties in their valuation (Barth et al., 2001). However, with the study of the impact of intangible assets in market valuation, greater attention will be given to financial reporting of intangible assets.

Qualitative accounting information reduces information asymmetries and hence, facilitates capital allocation in the stock market. The information era coupled with the growth in innovation and technology made manufacturing firms to increase their operations in intangible assets such as software assets and intellectual properties (Nakamura, 1999). The implication is that reporting these assets will improve the information quality and investors' perception on their market price. However, many firms still prefer to expense their intangible assets rather than capitalise them even when some of the intangibles have met the recognition criteria set out in the IAS 38 (Abubakar and Abubakar, 2015). Refusal to capitalize intangibles is likely to shrink the earnings of firms in the short term which may reduce a rational investor's perception of the firms' value. Thus, the objective of financial reporting in providing relevant information to investors and other users become deficient. Therefore, this study exposes the need for comprehensive recognition of intangible assets in the statement of financial position.

Academicians, regulators and practitioners have argued in favour of the inclusion of some of these intangibles in the statement of financial position as their non-inclusion may lead to the deterioration of the quality of accounting information as evident in the increasing gap between book values and market values of firms (Abubakar, 2014; Lev & Daum, 2004). Furthermore, related studies in Nigeria (Omoye, 2013; Dogara, 2013; Abubakar, 2014; and Abubakar & Abubakar, 2015) concentrated on determinants of intangible assets disclosure and the effect of expensed intangibles (branding cost) on market value. Researchers in Nigeria have failed to study the distinct elements of the intangible assets (computer software, intellectual properties and goodwill) which this study intends to investigate.

1.3 Research Questions

The following research questions are raised to guide the study:

(i) What is the effect of computer software assets on market value of listed manufacturing firms in Nigeria?

(ii) What is the effect of intellectual properties on the market value of listed manufacturing firms in Nigeria?

(iii) What is the effect of goodwill on market value of listed manufacturing firms in Nigeria?

1.4 Objectives of the Study

The broad objective of this study is to assess the value relevance of intangible assets of manufacturing firms in Nigeria. Thus, the specific objectives include:

i. To evaluate the effect of computer software assets on the market value of listed manufacturing firms in Nigeria.

ii. To investigate the effect of intellectual properties on the market value of listed manufacturing firms in Nigeria.

iii. To examine the effect of goodwill on the market value of listed manufacturing firms in Nigeria.

1.5 Research Hypotheses

From the objectives of this study, the following hypotheses are formulated in null forms:

HO_1**:** Computer software assets have no significant effect on the market value of listed manufacturing firms in Nigeria.

HO_2**:** Intellectual properties have no significant effect on the market value of listed manufacturing firms in Nigeria.

HO_3**:** Goodwill has no significant effect on the market value of listed manufacturing firms in Nigeria.

1.6 Scope of the Study

The study is restricted to intangible assets reported on the financial statements of listed manufacturing firms in Nigeria. The components used in this study include computer software assets, intellectual properties and goodwill. This is because the manufacturing sector is more exposed to these type of intangible assets. The study covers the period 2011 - 2016. The period of the study is justified because 2011 marks the onset of preparation of IFRS compliant financial statement in Nigeria. With Nigeria's adoption of IFRS, the requirement of IAS 38 is more exposed.

1.7 Significance of the Study

The study on the effect of intangible assets on value relevance will assist shareholders and managers to evaluate and appraise how intangible assets investment by manufacturing firms will have on their share price. Zhang and Wiersema (2009) opined that firms signal their unobservable quality to potential investors through the observable quality of their financial statements. Therefore, the study of the effect of intangible assets like goodwill, trademarks and patents, can serve as a signaling device in driving changes in the volume of stock trading which will have effect on the share price of these firms.

More so, the adoption of IFRS especially in developing countries like Nigeria came with a lot of adjustment on the financial statements. This did not come with its consequences. The study will assist standard setters like the Financial Reporting Council of Nigeria (FRCN) to assess the effect of IAS 38 adoption on market value of manufacturing firms. Managers and proprietors of manufacturing firms in Nigeria will find this research useful in evaluating the firms' value through adequate management, development and recognition of their intangible assets.

Furthermore, professionals have express concerns over the inconsistency in reporting intangible assets in historical traditional accounting due to the fast changes in the economic and technological environment. Recognizing the intangibles will improve transparency and communication with the stakeholders which can go a long way to enhance the confidence of investors. Therefore, the study of the components of the intangible assets will expose their effect on firm value and assist professionals to better appreciate the practice and reporting of intangible asset accounting.

The research may also be of benefit to students and scholars who wish to undertake further research in the field of intangible assets and value relevance. This will assist in providing them with additional empirical and conceptual literature that will be of value in this area.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This research work focuses on the value relevance of intangible asset of listed manufacturing firms in Nigeria. In this chapter, diverse literatures on the subject, as well as, the theoretical and conceptual framework of the study are reviewed and presented.

2.2 Concept of Value Relevance

The concept of value relevance has been popular amongst academicians and researchers. According to Barth, Beaver and Landsman (2001), the main objective of studies in the field of value relevance is to increase the awareness level of the users of financial statements in terms of qualitative features of "relevance" and "reliability" of reflected accounting information in the market value of the owner's equity. This is supported by Takacs (2012), who opined that value relevance is proof of the quality and usefulness of accounting numbers for decision making process of investors; and its existence is usually by a positive correlation between market and book values.

Value relevance is an aspect of a firm valuation process. Nilsson (2003) stated that the value relevance literature deals with the usefulness of financial statement information in equity valuation. It is the ability of information contained in the financial statements to help determine the value of a firm. It is on this basis that Beisland (2009) stated that one objective of financial reporting is to assist investors in valuing equity. He further argued that if there is no relationship between accounting numbers and company value, accounting information cannot be termed value relevant and, hence, financial reports are unable to fulfill one of their primary objectives.

Kargin (2013) described value relevance as the ability of information presented by financial statements to capture and summarize firm value; while Suadiye (2012) looked at value relevance to be a measure of the statistical relations between information that financial statements present and the stock market value. The term as used in various literature considers value relevance from the angles of the statements of comprehensive income and the financial position. Others still looked at it from the perspective of security market values or stock prices (Ames, 2013; Ball & Brown, 1968).

The concept of value relevance is based on the four interpretations as offered by Francis and Schipper (1999). These interpretations include the fundamental analysis view, the prediction view, the information view and the measurement view. In their fundamental analysis interpretation, accounting information is said to be value relevant if it trigger changes in the share price trends through its inherent value in a similar way and in the same direction as market prices. The prediction view on the other hand, considers accounting information to be relevant if it has those values that are considered relevant for the upcoming value evaluation of firms and foreseeing the returns of the coming years. In the information and measurement views, accounting information is relevant if there exists a statistical association between financial information and prices or returns. The third and fourth interpretations inform the views of Ames (2013), Abubakar & Abubakar (2015), Kargin (2013), Barth, Beaver & Landsman (2001). These scholars see value relevance as the statistical relationship between the accounting information as disclosed in the financial statements and the market prices or returns of the firm's shares.

The statistical relationship between share price and accounting information as suggested by the definitions above can be further explained in terms of the extent or volume of share or share price change following the release of financial information. This study identifies with this perspective as the value relevance of intangible assets is expected to assist investors in their investment decisions.

In furtherance of this, Oshodin and Mgbame (2014) define the concept of value relevance as the usefulness of financial accounting information and the relationship between the financial statements and share prices. Oyerinde (2011) in her work defines value relevance as the ability of accounting numbers to summarize information that affects the firm's value which can be measured by the aggregate market reaction to accounting information.

Most studies on value relevance tow the position of the third and fourth interpretations (association between financial statement information and firm value or market prices) (Chang *et al*, 2008). Similarly, these interpretations are also in tandem with the Ohlson model (1995) which has been employed in many studies to explore the associations between market value of equities and main financial information disclosed variables, such as book value per share, earnings per share and cash flows (Mohammed & Lode, 2015). It is on this note, that Ohlson (1995) depicts that the value of a firm can be expressed as a linear function of book value, earnings and other value relevant information.

This study considers value relevance as the association of market price and other accounting variables such as book value, earnings, dividend and intangible assets. It is used as a proxy for market value.

2.3 Components of Value Relevance (Ohlson Model)

The study proceeded to briefly discuss the basic components of the Ohlson model as used in many value relevance literature. These include market value, book value, earnings and dividend.

2.3.1 Market Value per Shares

Market value, is defined as the highest estimated price a buyer would pay and a seller would accept for an item in an open and competitive market (Businessdictionary, *n.d*). Market value of equity is the firm's amount of total shares outstanding multiplied by stock market price of each share. A firm's market value reflects the value of all its net assets, including both tangible and intangible assets. The book value of equity may actually be lower because some intangible assets which may be of immense value to a firm are not capitalised under IFRS. The investment in intangible assets should be accepted only if it renders future economic benefits. These benefits can be realised from internal profit or from market appreciation of company. Thus, goodwill and other intangible assets will increase the market value of the company (Istrate, 2013).

The market value of shares is the stock value or share price of firms listed on the stock exchange. The share price is determined by market forces based on prevailing economic circumstances. The share price of a publicly traded company which is determined by the forces of market supply and demand is highly volatile due to its dependent on the expectations of the buyers and sellers (Menaje, 2012). Information plays a pivotal role in determining the market direction of securities. The movement in share price of quoted companies is dictated by changes in the fundamental factors such a firm’s financial performance and the macro economic variables (Kehinde, 2012). Ohlson (1995) and Feltham and Ohlson (1995) show that market value of a

firm can be expressed as the weighted average of book value and earnings. This was the bases of the Ohlson Model on studies conducted on the value relevance of accounting numbers. Studies in this area of research have shown that the book value of equity in addition to earnings is associated with the market value of firms (Ames, 2013; Outa, 2011; Kargin, 2013).

2.3.2 Book Value Per Share

The book value of a firm represents the value of the stock of resources that can be used to generate future earnings. Therefore, the book value of equity plays anchoring roles in valuation by representing the net stock of resources which the future earnings of firms depend (Penman, 1992; Oshodin & Mgbame, 2014). Book value of equity per share is a ratio that divides common equity value by the number of common shares outstanding. Book Value per Share (BVPS) measures valuation of shares in the books of account as it relates to shareholders investment. BVPS is one factor that investors can use to determine whether a stock price is under-valued. It approximates the net benefit that the stockholders have received from investing their capital in the books of account. Together with earnings, the book value forms the basis of association with the market value of a firm as posited in the Ohlson equation (Oyerinde, 2011).

2.3.3 Earnings per Share

Earnings or profit determination is one of the central focus of accounting as it determines the wealth position between businesses (Bello, 2010). It is considered as a fundamental and prominent accounting variable when it comes to the investigation of the value relevance of accounting information (Oshodin & Mgbame, 2014). Earnings is the result of the statement of profit or loss and other comprehensive income. Earnings per share is applied by entities whose

ordinary shares are publicly traded and by entities that are in the process of issuing ordinary shares in public markets.

According to IAS 33 (Earnings per Share), an entity shall present in the statement of comprehensive income basic and diluted earnings per share for profit or loss from continuing operations attributable to the ordinary equity holders of the parent entity. The standard further states that basic earnings per share shall be calculated by dividing profit or loss attributable to ordinary equity holders of the parent entity (the numerator) by the number of ordinary shares outstanding (the denominator) during the period.

2.3.4 Dividend Per Shares

Adaramola and Oyerinde (2014) describes at dividend as proportion of corporate profits paid to its ordinary shareholders or stockholders. Dividend per Share (DPS) is the sum of declared dividends issued by a company for every ordinary share outstanding (Masum, 2014). It is the total dividends paid out by a business, including interim dividends, divided by the number of outstanding ordinary shares issued. The major objective of a company is to return value to its shareholders. Ultimately, investors receive value through dividend payment and the price of shares itself which are a reflection of the company's value. Therefore, a company's profit and the amount of dividend paid to investors, drives shareholder's value.

2.4 Concept of Intangible Assets

Traditionally, firms identify two types of assets: tangible assets and intangible assets. Although the valuation methods of tangible assets such as land, buildings, equipment, are well developed, intangible assets like computer software and licenses, brands, trademark, goodwill, R&D are

difficult but not impossible to measure and recognise. This is because most intangible assets are non-monetary in nature and in most instances without physical substance. An asset is defined as a resource that is controlled by the entity as a result of past events (for example, purchase or self-creation) and from which future economic benefits (inflows of cash or other assets) are expected (IAS 38:8).

From this definition, it can be observed that for any item to be called an asset, it must meet the three attributes of identifiability, control and future economic benefits. Min (2012), Belkaoui (1992), Stickney and Weil (1994) argue that whenever those probable future economic benefits lack physical form, they should be recognised as intangible assets. This is has similar elements to those presented by Canibano, Coversi and Sanches (2000). IAS 38 defines intangible assets as non-monetary assets without physical substance held for use in the production or supply of goods or services for rental to others, or for administrative purposes, that (a) are identifiable; (b) are controlled by an enterprise as a result of past events; and (c) from which future economic benefits are expected to flow to the enterprises. Most definitions of intangible assets seem to draw from the definition as given by the International Accounting Standard Board (Omoye, 2013).

Other scholars like Lev (2001) and Basu and Waymire (2008) went a step further to define intangible assets from the perspective of knowledge and innovation. Lev (2001) posits that intangible assets are claims to future benefits that do not have a physical or financial (such as a stock or a bond) embodiment that are generated by innovation or discovery, unique organizational designs, or human resource practices. Basu and Waymire (2008), on their part

adopted a wider view by defining intangibles as ideas or knowledge about the natural and socio-cultural worlds that enable people to better accomplish their goals. They considered the concept of intangible assets to be founded on the ideals of the 'new economy'. The new economy, according to Meritum (2001), is the result of revolutionary changes, particularly in globalisation, information technology and financial innovation.

The manufacturing sector has adapted to the changes in the new economy as evidenced in increased productivity, creation of employment and increase in quality of its product. While Basu and Waymire's (2008) views on intangible asset are consistent with the growth in modernisation, one cannot conclusively ascribe intangible assets to innovation alone as the human capital and trademarks were there even before the era of industrialization.

Another issue of equal attention that is the classification of intangible assets. Canibano, Coversi and Sanches (2000) argue that the classification of intangible assets has not been much of a focus and received less attention from academic researchers until relatively recently. They further stated that many attempts have been made to develop theoretically consistent classifications of intangible assets. One such classification is by Alfredson et al (2009) who in their study, categorised intangible assets as marketing-related intangible assets (trademarks or trade names), customer related intangible assets (customer lists), artistic-related intangible assets (plays), contract-based intangible assets (licensing or franchise agreements), and technology-based intangible assets (patented technology or computer software). This study considers marketing-related intangible assets, contract-based intangible assets and technology-based intangible assets since they constitute the categories of intangibles capitalised by manufacturing firms in Nigeria.

A broad classification is that provided by Wyatt and Abernethy (2003). These scholars focus on the classification system based on specific accounting regulations proposed by standard setting organisations which tend to concentrate on four broad classifications of intangible assets. These include; acquired intangible assets, internally generated intangible assets, Research and Development (R & D) and intellectual property. Acquired intangible assets include acquired identifiable intangible assets (for example, trademarks and patents, licences) and unidentifiable intangible assets (generally referred to as purchased goodwill).

On the other hand, internally generated intangible assets include identifiable intangible assets developed or produced by the firm and internal goodwill that is not easily attributable as to its source of value. Identifiable intangible assets and internal goodwill relate to such things as the firm's information systems, administrative structures and processes, market and technology knowledge, and customer and supplier networks (Wyatt and Abernethy, 2003).

More so, R&D cost include expenditures associated with R&D activities performed within the firm. Expenditures for exploration, evaluation and development costs in mining and other resource-based firms are usually accounted for separately because of the specific risk profile of these expenditures. Intellectual property is a sub-set of acquired and internally generated intangible asset classifications that have legal or contractual rights such as patents, trademarks, designs, licenses and copyrights.

Other than the classification of intangible assets as categorised by Wyatt and Abenethy (2003) which are specific to IAS 38, the standard goes further to classify intangible assets as those with finite useful life and those with infinite useful life. Intangible assets with indefinite life have no

foreseeable limit to the period over which the asset is expected to generate net cash inflows for the entity. Such assets according to the standard should not be amortised. On the other hand, intangible assets having a finite life have a limited period of benefit to the entity. The standard further stated that the cost less residual value of an intangible asset with a finite useful life should be amortised on a systematic basis over that life. The intangible assets of most manufacturing firms in Nigeria are the acquired intangible assets having a finite useful life and are either market related, contract or technology- based. The defination by Wyatt and Abenethy (2003) is more wholistic and all-embracing as specifically differentiates between intangible assets that are internally generated from those that are externally generated.

The concept and classification of intangible assets greatly varied from industry to industry due majorly to diverse firm specific attributes. It is on this basis that Walker (2009) concludes that it is difficult to find any stated purpose for classification in many papers that do classify intangibles. Canibano, Coversi and Sanches (2000) went further to state that there seems to be no agreement on issues concerning the definition and classification of intangible assets, the criteria that should be adopted for their measurement and reporting; or their value relevance.

Furthermore, standard setters and practitioners should encourage manufacturing firms to recognise and disclose intangible assets in their balance sheets irrespective of their firm specific attributes, as capitalisation of intangible assets can enhance their market value (Omoye, 2013).

2.4.1 Computer Software Per Share

Computer software per share as used in this study, is measured as the cost of capitalised computer software divided by the number of ordinary shares (Min, 2012; Aboody and Lev,

1998). Computer Software is a generic term for organized collections of computer data and instructions, often broken into two major categories: system software that provides the basic non-task-specific functions of the computer, and application software which is used by users to accomplish specific tasks. Alfredson et al (2009) categorise these intangible assets as technology-based intangible assets (patented technology or computer software). The importance of computer software in the manufacturing sector is that it aids the computerisation of inventory management and production process. More specifically, these software include development costs that are directly attributable to the design and testing of identifiable and unique software products such as "Oracle ERP Application" that are used for inventory management and in running the production process. According to IAS 38, cost on computer software are expenditure which can be recognised as an intangible asset in the statement of financial position. This has improved the value relevance of computer software which has been established in some studies. Specifically, Aboody and Lev (1998) find that the software asset reported on the balance sheet is associated with share prices.

2.4.2 Intellectual Property Per Share

Intellectual property is a sub-set of acquired and internally generated intangible asset classifications that have legal or contractual rights such as patents, trademarks, designs, licenses and copyrights (Wyatt & Abernethy, 2003). It is measured as the cost of intellectual properties (patents, trademarks, designs, licenses and copyrights) divided the number of ordinary shares (Min, 2012). Intangible assets that fall under the intellectual property category as classified by Alfredson *et al* (2009), are the marketing-related intangible assets (trademarks or trade names); and contract-based intangible assets (licensing or franchise agreements). Greenhalgh and Rogers

(2007) opined that intellectual property is a policy tool for encouraging innovation. It is an asset that gives an edge to a firm in the competitive environment and contributes to the wealth creation of a nation.

The growth in the information and technology age was borne out of the interplay of intellectual properties. Today, investment in this asset is increasing in the manufacturing sector of the economy. Other than Abubakar and Abubakar (2015), not many studies have addressed issues relate to internally generated intangibles such as some brands and licences that are nearly impossible to measure. However, IAS 38 made it clear that acquired intellectual property or internally generated ones that meet the criteria for recognition such as patents, trademarks, designs, licenses and copyrights should be capitalised. This has provided an opportunity to investigate the value relevance of those intangibles.

2.4.3 Goodwill Per Share

According to IFRS 3, goodwill is the difference between the aggregate of the fair value of the consideration in a business combination at the acquisition date and the net amounts of the identifiable assets acquired and the liabilities assumed at the acquisition date. The changing economic environment of the 1980s resulted in a large merger wave, thereby increasing the amount of goodwill on company's audited financial statements. As a result, the goodwill gained increased attention with the growing importance of intangibles in company operating assets (Nnado & Ozouli, 2016).

The global financial crises also gave impetus to a series of merger and acquisition; and flight by companies to countries of profitable investment. This gave rise to business combinations and purchased goodwill. Recognising these intangible assets in the books of manufacturing firms will increase the quality of financial reporting, promote transparency and deliver high quality annual report through comprehensive disclosure (Shehu, 2012).

2.5 Intangible Assets Accounting

The objective of IAS 38 is to prescribe the accounting treatment for intangible assets that are not dealt with in another IAS/IFRS. These include intangibles held for sale (IFRS 5-*Non-current Assets Held for Sale and Discontinued Operations*), deferred tax assets (IAS 12-*Income Taxes*), lease assets (IAS 17-*Leases*), financial assets (IAS 32-*Financial Instruments: Presentation*) and exploration and evaluation assets (IFRS 6-*Exploration for and Evaluation of Mineral Resources*). IAS 38 specifies how to measure the carrying amount of intangible assets and requires specific disclosures about intangible assets. The Standard also requires an entity to recognise an intangible asset if, and only if, specified criteria are met. These criteria include: (a) the definition of an intangible asset; and (b) the recognition criteria.

IAS 38 requires an entity to recognise an intangible asset, whether purchased or self-created if, and only if it is probable that the future economic benefits that are attributable to the asset will flow to the entity, and the cost of the asset can be measured reliably. However, Lonergan (2009) argued that even the intangible assets possible to identify are difficult to measure reliably. He supported his argument by stating the following reasons: (a) that intangible assets are not frequently traded on a stand-alone basis and therefore no active market is created for them that

can be used to assess their value in the balance sheet; (b) many of them are unique and thus difficult to determine their value; (c) appropriate valuation methods are not generally understood; (d) since many of them overlap there is the tendency of capturing them twice or thrice in the financial statement; (e) since they are mutually interdependent one may not have a value if another fails; (f) values may be attributed to the wrong asset because of confusion about where the profit comes from; and (g) historical cost is not a reliable indicator of value.

IAS 38 further states that if an intangible asset (either acquired externally or generated internally) does not meet both the definition of and the criteria for recognition as an intangible asset, the expenditure on this item should be recognised as an expense when it is incurred. The standard goes further to state that internally generated brands, mastheads, publishing titles, customer lists and items similar in substance that are internally generated should not be recognised as assets while purchased computer software should.

As regards the treatment of R&D expenditure, IAS 38 stipulates charging all research cost to expense and capitalising development costs only after technical and commercial feasibility of the asset for sale or use have been established. This means that the entity must intend and be able to complete the intangible asset and either use it or sell it and be able to demonstrate how the asset will generate future economic benefits. The Standard however, prohibits an entity from subsequently reinstating as an intangible asset, at a later date, an expenditure that was originally charged to expense.

For intangible assets to be recognised, IAS 38 admits carrying such intangible assets at cost or fair value. According to IFRS 13 (*Fair Value Measurement)*, fair value is summarily defined as

the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. Intangible assets will therefore subscribe to this specification before they can be disclosed in the financials of firms since it is uncommon that an active market for intangible assets exists (Wyatt and Abernethy, 2003)

Accounting for intangible assets cannot be complete without a brief history of IAS 38. The first exposure draft on intangible asset was on Accounting for Research and Development Activities released in February 1977 by IASC (the predecessor of IASB). After analysing the exposure drafts, the board approved IAS 9 (Accounting for Research and Development Activities) in July 1978. Work on developing a standard specifically on intangible assets started in 1989, and in June 1995, the exposure draft on intangible asset was published. The exposure draft was later modified and re-exposed in August 1997. After analyzing hundreds of comment letters on the exposure drafts from over 20 countries, the board approved IAS 38 (Intangible Assets) in July 1998. But in 2004, IASB did some revisions to IAS 38, which applies to intangible assets acquired in business combinations. Thereafter, several amendments were done on IAS 38 in May 2008, in April 2009, in December 2013 and with the latest amendment done in May 2014. This last amendment was aimed at clarifying the acceptable methods of depreciation and amortisation of intangible assets with its effective date of 1 January, 2016 (IASB, 2014).

Due to the need for global harmonization of standards, Nigeria also adopted the IFRS. The adoption of IFRS was launched in September 2010, by the Honorable Minister, Federal Ministry of Commerce and Industry, Senator Jubril Martins-kuye (OFR) (Madawaki, 2012). The adoption was organized such that all stakeholders will use the IFRS by January 2014. The

roadmap for the adoption was scheduled to commence with publicly listed companies in 2012 and by end of 2014, it was expected that all stakeholders would have complied (NASB, 2010b). As at today, the manufacturing sector in Nigeria has fully implemented the IFRS.

2.6 Review of Empirical Literature

The effect of intangible assets on the value relevance of accounting information has been studied widely. While researches in this area abound mostly in Europe and the United States, studies in Nigeria are just beginning to extend their interest to this area. This could be due to developments in the new economy which lay emphasis on innovation and technological advancement; and the adoption of a global accounting standard which highlights the importance of intangible assets disclosure and its value relevance.

Empirical studies have shown that there is need for a greater transparency and comparability of reporting on firms' intangible expenses and assets. Wyatt and Abernethy (2003) developed a coherent framework for the classification, recognition and reporting of intangible assets that is based on sound economic principles. Their framework addressed some inconsistencies between elements of existing asset definition and recognition principles and the observed role on intangible investment in production. This framework will expand the scope of scholars and practitioners on studies relating to the value relevance of intangible assets disclosure. In the succeeding paragraphs, various studies relating to the independent variables and the dependent variable are discussed.

2.6.1 Computer Software and Market Value

In their study of the relationship between computer software and the market value of a sample of 128 metals companies that are listed on the Tehran Stock Exchange for the period 2001 to 2011, Behname, Pajoohi and Ghahramanizady (2012) reported that computer software assets have significant positive relation with market value. By employing the pooled/panel regression method and F-Limer, they concluded that an increase in computer software assets leads to an increase in market value of companies in this industry. The use of a large sample size of 128 firms is considered appropriate, however, its focus on foreign firms. This is because firms listed on the Tehran Stock Exchange operate in a different economic, social and political environment as compared to manufacturing firms in Nigeria. For this reason, the findings arrived at might not be applicable to the Nigerian firms in general and the manufacturing firms in particular.

Min (2012) explored the value relevance of capitalized software expenditure reported by 5242 firm-years of firms listed on the Korean Stock Exchange during the period of 2001-2010, using the popular Ohlson (1995) framework. The result indicated that software expenditure have positive associations with the market value of firms. When this analysis was extended to the different industries, some intangible assets in the technology firms were found to be more value relevant than in other industries. Although the study is relatively recent and a good number of variables of intangible assets were captured, the socio-economic characteristics of the domain is quite distinct from the Nigerian environment and thus findings might not be applicable to Nigerian firms in general and the manufacturing firms in particular.

Oliviera, Rodrigues and Craig (2010) assessed the value relevance of computer software cost using a sample of non-financial firms listed on Portuguese Stock Exchange from 1998 to 2008. They used panel data to study the impact on value relevance of Portugal's formal adoption of IAS/IFRS in 2005 and found that reported intangibles such as computer software cost are highly significantly associated with stock prices. However, the change to IAS/IFRS had no significant impact on the value relevance of computer software after the post-adoption era.

Chalmers, Clinch, and Godfrey (2008) evaluated a sample of 599 firms listed on the Australian Stock Exchange in 2006 using regression analysis. They compared the Australian GAAP and IFRS balances for computer software intangible assets reported in the annual reports. The results provided no support that IFRS measures of computer software assets reflect value-relevant information incremental to that conveyed under Australian GAAP. Even though the sample size for this study is large, it is a pre-and post-IFRS adoption in Australia and only the post-IFRS adoption will be used to present a clear comparison of the findings in this work. Moreover, the two years used in this study is too narrow for a meaningful result to be reached.

Aboody and Lev (1998) evaluated the value relevance of intangibles (software development cost) on a sample of 163 software firms in the United States during the period 1987-1995 using regression analysis. They found that the cumulative software assets reported on the balance sheet is associated with stock prices but does not support the view that software capitalisation decreases the quality of reported earnings. They also concluded that there is a significant association between software development cost and subsequent stock returns.

2.6.2 Intellectual Property and Market Value

Abubakar and Abubakar (2015) in their study on the value relevance of intangible assets of listed High-Tech firms in Nigeria, explored the contribution of these assets in improving the information contents of financial statements and the reliability of reporting brand assets in the financial statements. They used a sample of nine high-technology firms during the period of seven years (2005-2011) and the Ordinary Least Square Regression technique for data analysis with the aid of Edward, Bells and Ohlson Price model. They found that, there is joint incremental value relevance of recognizing intangible assets in the statement of financial positions of High-Technology firms in Nigeria at 99% confidence level. In other words, recognizing brands in the statement of financial position of listed high-technology firms in Nigeria will increase the quality of accounting information of the firms. The study also found that intangible assets are value relevance and reliable in taking investment decisions. They therefore recommended that IAS 38 should be broadened to include brand assets and that the standard should recognize intangible assets in the statement of financial position of listed high-technology firms as this will increase the quality of accounting information of the firms. The work by Abubakar and Abubakar (2015) restricted their study to brand names alone and did not included other intellectual properties like trademark, licenses and patents.

Using a sample of 2,042 and 2,289 firm-years in Malaysia public-listed firms in pre-IFRS (2002 to 2005) and post-IFRS (2008 to 2011) period, Jaafar & Halim (2013) examined the relationship between accounting choice for intangible assets (brand names, patents and trademarks, licences, copyrights, designs) and their value relevance as well as the moderating effect of firm life cycle on this relationship. Using regressing analysis, the findings indicated that during the pre-IFRS

period, capitalized identifiable intangible assets were value relevant. A comparison between the pre- and post-IFRS period suggested that the market attaches higher value relevance to identifiable intangible assets after the adoption of IFRS. The study classified the sampled firms into three life cycle stages; Growth, Mature and Decline. This suggests that a firm, at different stages of its life cycle, can be valued differently depending on the relative proportion of its assets and growth opportunities. The pitfall in the study is mostly attributable to the difficulties in operationalising the life cycle concept which is closely related to the lack of specific measures used to classify firms into life cycle stages. The varying number of stages also means that studies have to deal with issues such as the model or number of stages that best reflect the development of a firm since not all firms evolve through the same life-cycle stages.

A similar study by Jaafar (2011) examined the moderation effect of firm life cycle on the relationship between accounting choice for intangible assets (brand names, patents and trademarks, licences, copyrights, designs) and their value relevance in the pre- and post-Australian Equivalents to International Financial Reporting Standards (AIFRS) periods. The sample consists of 900 and 1,225 firm-years observations for the pre-and post-AIFRS period, respectively with sample firms classified into three life cycle stages; Growth, Mature and Decline, based on Anthony and Ramesh's (1992) classification method. Four regression models based on the Ohlson (1995) valuation model in the tests of value relevance were used. The findings indicated that during the pre-AIFRS period, intellectual property assets are value relevant. A comparison between the pre- and post-AIFRS period suggests that the market attaches higher value to identifiable intangible assets after the adoption of AIFRS. This study

though relevant, has findings too specific to different stages of firms' life-cycle, hence may be difficult to apply to manufacturing firms in Nigeria.

Studies by Ritter and Wells (2006) investigated the relation between voluntarily recognized and disclosed identifiable intellectual properties and stock prices, and future earnings for Australian firms over the period 1979-1997. Their result demonstrated a positive association between stock prices and voluntarily recognised and disclosed identifiable intellectual properties; and a positive association between identifiable intellectual properties and income in the future periods. Their findings are in tandem with the works by Greenhalgh and Rogers (2007) who focused on patents, trademarks and copyrights. They concluded that these intellectual properties, as policy tools for encouraging innovation, were also found to be generally value relevant. Although the period of the study is large (1979-1997), their studies is not current and hence raises serious concerns in line with current economic realities.

In their study of the relationship between intellectual property and the market value of a sample of 128 metals companies that are listed on the Tehran Stock Exchange from year 2001 to 2011, Behname, Pajoohi and Ghahramanizady (2012) reported that intellectual property have significant positive relation with market value. By employing the pooled/panel regression method and F-Limer, Hausman and Levin Lin Chu tests to analyze their data, they concluded that an increase in intellectual property leads to an increase in market value of companies in this industry.

Min (2012) explored the value relevance of different intellectual properties reported by firms listed Korea during the period of 2001-2010. The result indicated that intellectual properties have positive associations with the market value of firms.

Istrate (2013) examined the value relevance of intellectual properties in the pre and post adoption periods of IFRS by using a sample of 350 UK companies over the period 2002 to 2007 using the regression model. The findings showed that intellectual properties like copyright, trademarks and designs are significantly related to market value but the relevance of intellectual properties does not increase in the post adoption period.

Chalmers, Clinch and Godfrey (2008) compared the Australian GAAP and IFRS balances for intellectual property reported in the annual reports. The results provided no support that IFRS measures of intellectual property assets reflect value-relevant information incremental to that conveyed under Australian GAAP. Even though the sample size for this study is large, the number of years (one year) used in this study is too narrow for a meaningful result to be reached.

Oliviera, Rodrigues and Craig (2010) used panel data to explore the impact on value relevance of Portugal's formal adoption of IAS/IFRS in 2005 and found that net earnings and intellectual property are highly significantly associated with stock prices. Although the change to IAS/IFRS had no significant impact on the value relevance of intellectual property as a whole after the post-adoption era.

2.6.3 Goodwill and Market Value

Min (2012) explored the value relevance of goodwill by Korean firms. The result indicated that goodwill is negatively associated with stock prices. When this analysis is extended to the different industries, some intangible assets are found to be more value relevant for information technology firms and some to be less value relevant.

Oliviera, Rodrigues and Craig (2010) used panel data to explore the impact on value relevance of Portugal's formal adoption of IAS/IFRS in 2005 and found that net earnings and reported goodwill are highly significantly associated with stock prices.

Studies conducted by Istrate (2013) that the amount of goodwill is significantly related with market value, but the relevance of goodwill does not increase in the post adoption period. These were in confirmation to similar studies conducted.

Chalmers, Clinch and Godfrey (2008) compared the Australian GAAP and IFRS balances for goodwill reported in the annual reports. The results provided partial support for IFRS-measured goodwill being incrementally value relevant to that conveyed under Australian GAAP.

2.6 Theoretical Framework

The theory that that can be considered relevant in explaining how investment in intangible assets influences market price is the Signaling Theory. According to Spence (2002), Signaling Theory originated out of the idea of information asymmetry. He further opined that firms can get around the problem of asymmetric information by sending signals that would reveal pieces of relevant information to the investor. Comprehensive disclosure of intangible assets in the financial

statement can enhance the information quality of the financial statement. This can also boost the book value and other accounting measures of a firm. Investor can thus interpret the signal and make decisions by offering a higher price than when the signal has not been received.

Khanagha (2011) opined that the value investors placed on the quality of accounting information is determined by how well it meets their needs. Published information will signal to investors the type of investment decision to make. The market reacts either positively or negatively when the information content impacts on accounting measures. Intangible assets such as goodwill, trademarks and patents can serve as a signaling device by changing the volume of stock trading which can in turn impact on the share price.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methodology employed for examining the value relevance of intangible assets of the Nigerian manufacturing firms. The chapter covers the research design, sources and method of data collection used for the study and the techniques of data analysis. The population and sample of manufacturing firms used for the study, the model specification and variable measurement is also discussed.

3.2 Research Design

This study adopted the correlational research design. This is consistent with the main objective of the correlation design which is to investigate the relationship among the variables of a study. In other words, correlational design is associated with scientific, experimental, quantitative and deductive frameworks where researchers seek specific quantifiable observations, by the use of statistics and experiments to test hypotheses (Habbash, 2010). In this study, accounting variables and identifiable intangible assets shall be regressed against market price in order to understand their value relevance on accounting information. Therefore, this design assists to evaluate whether or not an accounting variable is deemed value relevant if its coefficients is statistically significant, thus reflecting information that is relevant to investors (Barth, 2000; Barth *et al*, 2001). Moreover, this design is consistent with other value relevance studies of accounting information (Jafar and Halim, 2013; Istrate, 2013).

3.3 Population and Sample Design

The population of this study comprises the manufacturing firms that reported intangible assets in their financial statements within the study period. These are firms listed on the floor of the Nigerian Stock Exchange as at 31st December 2016 (see appendix A). Therefore, in arriving at the population of the study, only the thirty four (34) firms that reported components of intangibles to include computer software, intellectual property and goodwill in their financial statement during the period under study (2011 - 2016) were considered. As a result, a total of nine (9) manufacturing firms that consistently report components of intangible assets on their financial statement were covered by the study. These firms are presented in Table 3.1.

Table 3.1

List of Sampled manufacturing Firms on the Nigerian Stock Exchange

S/N	COMPANIES	TICKER
1	7-UP BOTTLING COMP. PLC.	7UP
2	GUINNESS NIG PLC	GUINNESS
3	UNILEVER NIGERIA PLC.	UNILEVER
4	A.G. LEVENTIS NIGERIA PLC.[BMF]	AGLEVENT
5	TRANSNATIONAL CORPORATION OF NIGERIA PLC	TRANSCORP
6	U A C N PLC.	UACN
7	FLOUR MILLS NIG. PLC.	FLOURMILL
8	HONEYWELL FLOUR MILL PLC	HONYFLOUR
9	NIGERIAN BREW. PLC.	NB

SOURCE: Compiled by Researcher, 2017

3.4 Sources and Method of Data Collection

The data for this study was obtained from secondary sources because the estimation of the model adopted in the study requires the use of quantitative data. Consequently, data on computer software, intellectual property, goodwill, book value, earnings and dividend were extracted from the annual reports and accounts of companies retrieved from the official website of the studied firms and from the website of the NSE.

3.5 Techniques of Data Analysis

In order to examine the effect of value relevance on intangible assets of manufacturing firms in Nigeria, multiple regression analysis is used as the major technique of data analysis. Multiple regression analysis is adopted for the study because of its ability to predict and explain expected variation in value relevance as a result of intangible assets. The choice of the appropriate multiple regression technique is however dependent on the nature of data to be analysed. Consequently, the analysis is carried out within a panel data estimation framework. Panel data estimation allows for the control of individual-specific effects usually unobservable which may be correlated with other explanatory variables included in the specification of the relationship between dependent and explanatory variables (Hausman & Taylor, 1981). The preference of this estimation method is not only because it enables a cross-sectional time series analysis which usually makes provision for broader set of data points, but also because of its ability to control for heterogeneity issues.

In addition, various robustness tests ranging from test for multi-colinearity and heteroscedasticity are also conducted. The tolerance value (TV) and the variance inflation factor (VIF) are two

advanced measures for justifying the presence or existence of multicolinearity problems among the independent variables under study.

Furthermore, to test for heteroscedasticity, an important assumption of the classical linear regression model (Assumption 4) need to be heeded to. This assumption states that the disturbances μ appearing in the population regression function are homoscedastic. That means they all have the same variance. When the probability of the chi square value is significant either at 1%, 5% or 10% level of significance, it can be concluded that there is presence of heteroscedasticity and if otherwise, it shows that heteroscedasticity is absent which showed the presence of homoscedasticity. In order to select the more efficient model between the Fixed Effect (FE) and the Random Effect (RE), Hausman specification test was conducted. If $p<0.05$ the null hypothesis is rejected hence rejecting the RE model in favour of the FE. On the other hand, where $p>0.05$, it implies that the RE is to be preferred over the FE. The descriptive statistics of all the variables are also studied, as well as, the correlation analysis to explain the relationship between the dependent and the independent variables of the study. Consequently, the analysis was conducted using Statistics Analysis Software.

3.6 Model Specification and Variable Measurement

In this segment, the model specified for the study and the variables adopted are defined and measured.

3.6.1 Model Specification

The model of the study is expressed in line with the modified Ohlson (1995) framework. This is because the use of the Ohlson model is in tandem with the objectives of value relevance which

assumes that market value of equity reflects all publicly available and relevant information (Jaafar & Clift, 2009). The clean surplus accounting theory presents the elements of a model that predicts the market prices as a function of earnings and book value (Behname, Pajoohi & Ghahramanizady, 2012). The regression model is employed to test the hypothesis which states that, intangible asset components have no significant effect on the market value of manufacturing firms in Nigeria. This study is consistent with related studies on the value relevance of intangible assets which used earnings, book values and dividend as control variables. Therefore, the value relevance of intangible assets is presented in form of regression equation. Specifically, the model of the study is written as follows:

$$MVS_{it} = \alpha + \beta_1 BVS_{it} + \beta_2 EPS_{it} + \beta_3 DPS_{it} + \beta_4 CSS_{it} + \beta_5 IPS_{it} + \beta_6 GPS_{it} + \varepsilon_{it}$$

Where: MVS_{it} = market value per share of firm *i* in year *t*, 120 days after the accounting date. The 120 days window is necessary because of the weak form of the Nigerian capital market and for the need to ensure that all available information are reflected in the stock price. Moreover, most firms in Nigeria release their end of year financial statements by March or April of the following year. This implies that by 120 days, all available information must have been fully reflected in the stock price.

BVS_{it} = book value of equity per share of firm *i* at the end of year *t;*

EPS_{it} = earnings per share of firm *i* at the end of year *t;*

DPS_{it} = dividend per share of firm *i* at the end of year *t*;

CSS_{it} = computer software cost per share of firm *i* at the end of year *t*;

IPS_{it} = intellectual property cost per share of firm *i* at the end of year *t*;

GPS_{it} = goodwill per share of firm *i* at the end of year *t;*

e_{it} is the error term used as surrogate for all other variables not included;

α is the intercept or constant;

$\beta_{1,}$ to β_6 are the coefficient of the parameter estimates.

3.6.2 Variable Measurement

The variable of the study consists of dependent variable which is market value per share and independent variables represented by computer software assets per share, intellectual properties per share, goodwill per share, book value per share, earnings per share and dividend per share. All variables are scaled by the number of outstanding ordinary shares as applied in many of previous studies such as Abubakar and Abubakar (2015), Oliveira *et al.* (2010), Ritter and Wells (2006) and Zhao (2002). If these variables are scaled by total assets, the output for computer software, intellectual property and goodwill will be zero, hence having a negative statistical consequence on the outcome of the result. The measurement of the variables used in the study is presented in Table 3.2.

Table 3.2 Variables Definition and Measurement

Variables	Definition and Measurement
Market Value Per Share (MVS)	Measured as the stock price of the firm's shares 120 days after the accounting date (Mackinlay,1997). This is because the weak form of the Nigeria's capital market is in its semi strong or even weak form and that after the 120 days window, all available information must have been fully reflected in the stock price.
Book Value Per Share (BVS)	Measured as the value of common equity divided by the number of ordinary shares (Aboody & Lev, 1998).
Earnings Per Share (EPS)	Measured by dividing profit or loss attributable to ordinary equity holders by the number of ordinary shares (Oshodin & Mgbame, 2014; Aboody & Lev, 1998).
Dividend Per Share (DPS)	Measured by dividing the total dividend attributable to ordinary equity holders by the number of ordinary shares (Masum, 2014).
Computer Software Cost Per Share (CSS)	Measured as the cost of computer software divided by the number of ordinary shares (Min, 2012; Aboody & Lev, 1998).
Intellectual Properties Cost Per Share (IPS)	Measured as the cost of intellectual properties (patents, trademarks, designs, licenses, brands and copyrights) divided the number of ordinary shares (Min, 2012).
Goodwill Per Share (GPS)	Measured as the value of goodwill divided by the number of ordinary shares (Istrate, 2013; Min, 2012).

Source: Generated by the author, 2017

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter deals with presentation, analysis and interpretation of data extracted from the annual reports and accounts of the sampled firms for the purpose of testing the hypotheses formulated. Descriptive statistics is used to explain basic features of the data collected. Multiple regressions is used to estimate the relation between the independent variables and the dependent variable. Discussion on the various robustness tests for multicolinearity and heteroskedasticity conducted for the variables under study, as well as, discussion of findings and the policy implications are captured in this chapter.

4.2 Descriptive Statistics

The descriptive statistics for each of the variables showing the minimum, maximum, mean, standard deviation, skewness and kurtosis are presented in Table 4.1.

Table 4.1: Descriptive Statistics

Variables	Mean	Std. Div	Min	Max	Skewness	Kurtosis	N
MVS	58.7507	66.0764	0.5200	265.2800	1.2611	3.9053	54
CSS	0.1538	0.1796	0.0002	0.6992	1.1490	3.4803	54
IPS	0.8095	1.2582	0.0004	4.9754	1.7644	4.9741	54
GDS	1.5619	2.7374	0.0017	10.6850	2.3952	7.8251	54
BVS	16.3084	14.2352	0.0019	39.8079	0.2897	1.4319	54
EPS	5.2942	6.5446	-2.2900	31.0000	2.2146	8.4178	54
DPS	1.7977	2.2968	0.0500	10.0000	1.9071	6.2383	54

Source: STATA Output of Descriptive Statistics, 2017

Table 4.1 presents the descriptive statistics for the dependent variable (Market Value per Share=MVS) and the independent variables (Computer Software per Share=CSS, Intellectual Property per Share=IPS, Goodwill per Share=GPS, Book Value per Share=BVS, Earnings per Share= EPS and Dividend per Share =DPS). From the table, the mean of Market Value per Share (MVS) is 58.7507, with standard deviation of 60.0764 implies that on average, for each share issued by the firms, the market price is N58.75 during the period of the study. There is also a wide dispersion of data from the mean because of the high standard deviation over the mean. The result also shows a relatively impressive high share price of N265.28 and a minimum of N0.52 during the study period. The results of the skewness and kurtosis indicate that the data (MVS) is not normally distributed.

Table 4.1also show a minimum CSS and IPS of 0.0002 and 0.0004 respectively while their maximum being 0.6992 and 4.9754 respectively. This implies that investment or recognition of computer software assets and intellectual properties by manufacturing is very low relative to the number of outstanding shares. The mean of CSS and IPS are 0.1538 and 0.8095 respectively indicating that on average the computer software and intellectual properties to share ratio are N0.15 and N0.80 respectively while their standard deviation of 0.1796 and 1.2582 imply high dispersion of the data from their respective mean.

The table also shows the mean and standard deviation of GPS to be 1.5619 and 2.7374 respectively while the minimum and maximum values stood at 0.0017 and 10.685 respectively. BVS, EPS and DPS returned a mean of 16.3084, 5.2942 and 1.7977 respectively with standard deviation of 14.2352, 6.5446 and 2.2968 respectively which show high volatility of the dataset.

The minimum value of EPS is -2.29, which suggest that some manufacturing firms made losses during the period of the study. On the other hand, the maximum DPS is 10. This suggest that one of the manufacturing firms paid a dividend of N10 per share during the study period. This is not unlikely especially for big manufacturing firms like Guinness.

The returned result of skewness and kurtosis showed to a large extend that the dataset is not normally distributed as the values are greater than zero. The variables of the study are further subjected to Shapiro-Wilk (W) test for data normality. The technique tests the null hypothesis that the variables are a normally distributed. The result of the normality test of the variables is presented in table 4.2

Table 4.2: Result of Shapiro Wilk Normality Test

Variables	W	V	Z	Prob>Z	Observation
MVS	0.83006	8.493	4.583	0.0000	54
CSS	0.81899	9.047	4.718	0.0000	54
IPS	0.67585	16.201	5.966	0.0000	54
GPS	0.59911	20.036	6.422	0.0000	54
BVS	0.83588	8.202	4.508	0.0000	54
EPS	0.76361	11.814	5.29	0.0000	54
DPS	0.74683	12.653	5.437	0.0000	54

Source: STATA Output of Descriptive Statistics, 2017

Table 4.2 indicates that the P-values are all significant at 1%. Thus the hypothesis that the data is normally distributed is rejected. This confirms the hypothesis that the data for all the variables of the study are not normally distributed. The non-normality of data is generally associated with panel data and will not in any way affect the reliability of the result estimates.

4.3 Correlation Matrix

The Correlation Matrix explains the relationship between dependent and independent variables and also the relationship between the independent variables themselves. Table 4.3 presents the correlation matrix of the study. The detail result of the correlation matrix is contained in Appendix C.

Table 4.3: Correlation Matrix

Variables	MVS	CSS	IPS	GPS	BVS	EPS	DPS
MVS	1.0000						
CSS	0.4877	1.0000					
IPS	0.4256	0.0990	1.0000				
GPS	0.3672	-0.0236	0.6910	1.0000			
BVS	0.4586	0.3427	0.2372	-0.0648	1.0000		
EPS	0.1033	-0.1217	-0.1001	-0.1081	-0.0297	1.0000	
DPS	0.9089	0.4684	0.3354	0.3404	0.4398	0.1262	1.0000

Source: STATA Output of Correlation Matrix, 2017

The correlation matrix shows that market value is positively correlated with all the independent variables of the study. This implies that an increase in the market price per share, will result to an increase in the value of computer software, intellectual property, goodwill, book value, earnings and dividend of listed manufacturing firms in Nigerian, as the association is positive. However, the relation between market value per share and dividend is the highest (0.909). This goes to show the extent to which market price are explained by dividend payment.

The table also reveals the relationship between the independent variables themselves. Computer software is negatively correlated with goodwill and earnings at -0.0236 and -0.1217 respectively. This showed that as the values of computer software decreases, the value of firms' goodwill and earnings increase. More so, there is a negative association between earnings with computer

software, intellectual properties, goodwill and book values. This indicates that as earnings decreases, all these other variables increase in a corresponding manner.

Apart from the association between intellectual properties and goodwill that is 0.6910, all the other correlation coefficients of the independent variables do not exceed 0.50 which suggests that multi-collinearity among the explanatory variables is not harmful. It is however not safe to conclude on the threat to multi-collinearity issues unless the variance inflation factor (VIF) and tolerance values are tested.

4.4 Robustness Test

This section presents and discusses the result of robustness test conducted in order to improve the reliability and validity of all statistical inferences to be drawn from the findings of the study. The test includes multicolinearity test, Breusch-Pagan/Cook-Weisberg test for heteroskedasticity, Hausman specification test for fixed and random effects and Langrangian Multiplier.

4.4.1 Multicolinearity Test

The test for multicolinearity was carried out to check whether there was correlation between and among the explanatory variables which may end up misleading the result of the study. High correlation between explanatory variables normally indicates either wrong selection or redundancy of some independent variables relative to the dependent variable. The correlation matrix presented in Table 4.3 that indicates that apart from the correlation of intellectual properties and goodwill (0.6910), none of the correlation coefficients between the explanatory variables is up to 0.5. The low level of correlation among the independent variables suggests that the threat of multi-collinearity is not very grievous or intimidating for the sampled firms under

study. However, to further substantiate the absence of multicollinearity between the independent variables, colinearity diagnostic test for tolerance values and the variance inflation factors (VIF) were done on the data collected. The variance inflation factor (VIF) and the tolerance values indicate absence of multicollinearity because the smallest tolerance value is 0.3914 corresponding with the highest variance inflation factor of 2.55. Where the result obtained from the tolerance value and VIF was above the expected limits and inconsistent with the rule of thumb of 1 and 10 respectively, then the problems of multicolinearity exist among the independent variables (Singh and Masuku, 2014).

4.4.2 Heteroscedastcity Test: Breusch-Pagan/Cook-Weisberg

The Breusch-pagan / Cook-Weisberg test for heteroscedasticity was carried out to check whether the variability of the error term is constant or not. The existence of heteroscedasticity signifies that the variation of the residuals or error term is not constant which will affect inferences in respect of the beta coefficient, F statistics, and coefficient of determination (R^2) of the study.

The result of the test reveals that the probability of chi-square (0.0000) is less than 5% with a chi-square value of 17.95 indicating the presence of heteroscedasticity in the data estimates. This result implies that there is violation of assumption four of the classical linear regression model which states that there must be constant variance in the error term. This assumption states that the disturbances μ appearing in the population regression function are homoscedastic. The Hausman specification and the Langrangian test were further conducted.

4.4.3 Hausman Specification Test

The result obtained from the Hausman specification test conducted shows a probability chi^2 value of 0.7025 which is statistically insignificant. This shows that the dataset does not meet the asymptotic assumption of the Hausman specification test. As a result, the random effect model was preferred.

4.4.4 Lagrangian Multiplier Test

The Lagrangian Multiplier test helps in deciding between random effects regression and pooled OLS regression. The test is conducted after running the random effects model to see if there is presence or absence of cross sectional effect in the panel dataset. The criterion is that if it is significant, random effect is the preferred model otherwise the OLS regression model is adopted. Based on the result of the langrangian multiplier test that returned a probability of less than 5% (prob>chi2= 0.000.), the null hypothesis was rejected and it was concluded that a random effect model is appropriate. Therefore, the study interpreted the robust random effect regression result.

4.5 Presentation and Interpretation of Regression Results

This section deals with the presentation and interpretation of regression results obtained from the regression model. Table 4.4 below presents the summary of the regression results as captured in the model of the study ($MVS_{it} = \alpha + \beta_1 BVS_{it} + \beta_2 EPS_{it} + \beta_3 DPS_{it} + \beta_4 CSS_{it} + \beta_5 IPS_{it} + \beta_6 GPS_{it} + \varepsilon_{it}$)

Table 4.4: Summary of Regression Result

Variables	Coefficient	z-statistics	z-sig.	VIF	TV
Constant	0.6399	0.07	0.943		
CSS	43.1449	1.28	0.199	2.55	0.391445
IPS	14.3214	2.59	0.010	2.27	0.439880
GPS	-4.7457	-3.58	0.000	1.99	0.502668
BVS	0.5058	0.58	0.563	1.57	0.637915
EPS	0.6993	0.84	0.402	1.45	0.687709
DPS	19.6614	12.20	0.000	1.13	0.885384
R^2 Overall			0.8073		
Wald Chi2			1340.93		
Prob>Chi2			0.000		

Source: STATA Output of Regression Result, 2017

The results of multiple coefficient of determination (R^2) in Table 4.4 indicates that the independent variables (Computer software, Intellectual property, Goodwill, Book Values, Earnings and Dividend) jointly explained about 80.73% of the total variation in the dependent variable (Market Value per Share) of listed manufacturing firms in Nigeria and other factors not captured in the model account for the remaining 19.29%. Similarly, the result of the Wald Chi2 (1340.93) shows that the model is fit at 1% significance (Prob>Chi2=0.0000) meaning that there is a 99.9% probability that the relationship among the variables of the study was not just due to mere chance.

The coefficient of intellectual properties per share is 14.321 while the Z statistics is significant at 1% (0.010). On the other hand, the coefficient of dividend per share is 19.665 while the Z statistics is also significant at 1% (0.000). This indicates positive relationship between intellectual properties and market value on the one hand and dividend and market value on the other hand. The significant negative relationship between intellectual property and market value implies that as investment in intellectual properties increases, the market value per share also

increases. For every one point increase in intellectual properties, share price increases by 14.32 points. Also, the significant positive relationship between dividend and market value indicates that higher dividend increases market value of shares. This implies that for every 1 point increase in dividend, share price increases by 19.66 points.

Goodwill per share is negatively related with market value per share as indicated by the coefficient of -4.746 which is statistically significant at 1% level of significance (0.000). This indicates negative relationship between goodwill and market value. The significant negative relationship between goodwill and market value implies that increase in the value of goodwill decreases market price. This implies that for every 1 point increase in goodwill, market price per share decreases by 4.75 points.

Computer software per share has a coefficient of 43.145 indicates that it has positive association with market price per share as the p-significance value is 0.199 which is not statistically significant. The coefficients of book value per share and earnings per share are 0.50577 and 0.699 respectively which confirms their positive relationship with market value per share. The association is however not statistically significant as the p-significance values are 0.563 and 0.402 respectively which are statistically not significant.

4.6 Hypotheses Testing and Discussions of Results

This section deals with the test of hypotheses and discussion of results.

Hypothesis 1

HO_1**:** Computer software assets have no significant effect on the market value of manufacturing firms in Nigeria.

Computer software per share is found to have positive and statistically insignificant association with market value. Therefore, the above result which indicates that the computer software per share has no significant impact on market value of Listed manufacturing firms in Nigeria, has therefore provided evidence of failing to reject hypothesis 1 of the study.

The statistically insignificant association of firms' investment in computer software and market value of listed manufacturing firms in Nigeria is contrary to expectation. This could be that the value of the firm's investment in computer software is not significant as to have a positive influence on their share prices. In addition, due to the emergence of IAS 38, the reporting of certain categories of intangibles on the balance sheet has now been omitted (Jaafar, 2011). The result is consistent with the findings of Oliviera, Rodrigues and Craig (2010) and Chalmers, et al. (2008). However, it contradicts the findings of Min (2012), Behname, et al. (2012), Aboody and Lev (1998) who found strong positive relationship between computer software cost and market value.

Hypothesis Two

HO_2**:** Intellectual properties have no significant effect on the market value of manufacturing firms in Nigeria.

Intellectual property per share is found to have positive and significantly associated with market value at 1% level of significance. Therefore, intellectual property significantly influence the

market value of manufacturing firms in Nigeria. This therefore, provides justification for rejecting hypothesis 2 of the study.

This to explains that recognising intellectual property on the statement of financial position of listed manufacturing firms in Nigeria may result in increase in the share prices of the firms. The result also supports the findings of Behname, et al. (2012), Ritter and Wells (2006), Min (2012), Jaafar (2011), Greenhalgh and Rogers (2007) that reported a significant positive association between intellectual property and market value, but contradicts the findings of Istrate (2013) and Chalmers, et al. (2008) who found no significant relationship between intellectual property and market value.

Hypothesis Three

HO_3**:** Goodwill has no significant effect on the market value of manufacturing firms in Nigeria.

Goodwill per share is found to have negative and statistically significant association with market value. Therefore, goodwill significantly influenced the market value of manufacturing firms in Nigeria. This therefore, provides justification for rejecting hypothesis 3 of the study. The result shows that recognising goodwill on the statement of financial position of listed manufacturing firms in Nigeria drives the share price of the firms. The significant value relevance of goodwill is supported by the findings of Min (2012), Istrate (2013), Oliviera, et al. (2010) and Chalmers, et al (2008) who found significant relationship between goodwill and stock prices.

4.7 Implication of Findings

The study has several practical and theoretical implications. First, management of manufacturing firms can bring their expertise to develop innovative technologies and business adaptions, as well as, direct policies that will improve brands names and trademarks, protect patents and other intellectual properties as this will impact on market price.

Secondly, the findings implied that potential and existing investors are to consider manufacturing firms with high investment in intangible assets in making their investment decisions as this will maximize their share price.

Furthermore, regulators should develop a better framework in accounting for goodwill that will provide other accounting choices which may have serious negative consequences on future earnings; which in turn will affect the market value of the firm's shares.

CHAPTER FIVE
SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

This study examined the value relevance of intangible assets of manufacturing firms in Nigeria.

Correlational research design was employed using a sample size of nine (9) out of the population of thirty- four (34) listed manufacturing firms that reported components of intangible assets was covered by the study. Panel dataset was extracted from the published annual reports and accounts of the sampled firms for a period of six (6) years from 2011 – 2016. Analysis of data was done using descriptive statistics, pearson correlation and multiple regressions analysis. Both fixed and the random effects regressions were run and Hausman specification test was used in selecting the more efficient model.

The results of the robust Random effect model used for analysis shows that the relationships between market value and intellectual properties as well as between market value and dividend were positive and statistically significant at 1%, while the association between market value and goodwill was found to be negative and also significant at 1%. On the other hand, the relationships between computer software, book value, earnings and market value were all found to be insignificant.

5.2 Conclusion

The study draws its conclusions based on the empirical and statistical evidence arrived at after analysing and discussing the result using the independent variables to explain and predict the market value per share of the sampled manufacturing firms.

Computer software is positive and statistically insignificantly association with market value. Investment in computer software is not significant as to have a positive influence on share price. It could be that manufacturing firms do not comprehensively report intangible assets on their balance sheet as stated in IAS 38.

Intellectual property has significant impact on market price per share. Thus, when the level of intellectual property is high, the share price of manufacturing firms will also go up. This may be as a result of the signaling effect that intellectual property plays in influencing investors' behavior. As the positive signal created by trademarks, patents, copyrights, designs and licenses had a positive effect on the share price of manufacturing firms.

Goodwill is negatively associated with share price. One probable way to explain the negative association of goodwill is to assume that the signaling effect such business combinations or acquisitions might have on the stock prices may only be for a short term. Subsequent amortization of goodwill might not have a substantial impact on the association with market price as information may have douse down with a systematic decrease in the amount of reported goodwill.

5.3 Recommendations

In line with the findings of the study, the following recommendations are made:

i. Management of manufacturing firms can bring their expertise to develop innovative technologies and business adaptations, as well as, direct policies that will improve brands names and trademarks, protect patents and other intellectual properties as this will impact on market price.

ii. Managers and accountants of listed manufacturing firms in Nigeria should ensure comprehensive reporting of intangible assets as this influences their firms' share price. Reporting intangible assets such as trademarks and patents can serve as a signaling device to investors which will affect the share price.

iii. Moreover, the fact that the value relevance of intangibles varies according to the level of recognition; and according to the different types of firms and sectors confirmed that IAS 38 accounting rules for intangible assets has not yet resolved the problems in how to measure and report intangible assets. Therefore a comprehensive reporting framework for intangible assets is needed; the new framework will expand the scope of scholars and practitioners on studies relating to the value relevance of intangible assets reporting.

iv. Currently, IAS 38 does not capture brands and internally generated goodwill. Standard setters should ensure that these categories of intangible assets are captured in the revised IAS as these can influence firms' share price.

5.4 Limitations of the Study

Hardly is any study conducted without some research limitations. The result of this research work is subjected to some limitations as follows.

Firstly, there is the dearth of local literature regarding the individual components of intangible assets. This makes comparison of this study to others within our local setting difficult.

Secondly, the findings of this study may not be generalizable to the excluded sectors (banks and insurance). The study is limited by small sample size and short time period. The sample size might be a limitation because of the non-availability of data for all the companies. Moreover, some firms were deleted because they failed to pass the sample size selection criteria.

5.5 Suggestions for Further Research

The dearth of empirical research on the value relevance of intangible assets of listed firms in Nigeria suggests that more studies are needed to provide additional insights into this issue.

More so, the findings provided in this study are inconsistent with most of the scholars in the developed economies. This is possibly due to difference in socio-economic environment, the quality of reporting and accessibility to huge volume of data. Thus, future research is open to other sectors and longer time periods as this may assist to ascertain the trends in the change of value relevance of the intangible assets.

Finally, future research could be conducted to evaluate the impact of intangible assets on other accounting measures such as earnings, voluntary disclosure and dividend payment.

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Appendix A

List of Manufacturing Firms that Reported Intangibles for the Period

S/N	COMPANIES	TICKER
1	LIVESTOCK FEEDS PLC.	LIVESTOCK
2	PRESCO PLC	PRESCO
3	A.G. LEVENTIS NIGERIA PLC.[BMF]	AGLEVENT
4	CHELLARAMS PLC.[BLS]	CHELLARAM
5	TRANSNATIONAL CORPORATION OF NIGERIA PLC	TRANSCORP
6	U A C N PLC.	UACN
7	7-UP BOTTLING COMP. PLC.	7UP
8	CADBURY NIGERIA PLC.	CADBURY
9	CHAMPION BREW. PLC.	CHAMPION
10	DANGOTE SUGAR REFINERY PLC	DANGSUGAR
11	FLOUR MILLS NIG. PLC.	FLOURMILL
12	GUINNESS NIG PLC	GUINNESS
13	HONEYWELL FLOUR MILL PLC	HONYFLOUR
14	INTERNATIONAL BREWERIES PLC.	INTBREW
15	N NIG. FLOUR MILLS PLC.	NNFM
16	NASCON ALLIED INDUSTRIES PLC	NASCON
17	NESTLE NIGERIA PLC.	NESTLE
18	NIGERIAN BREW. PLC.	NB
19	U T C NIG. PLC.[MRS]	UTC
20	UNILEVER NIGERIA PLC.	UNILEVER
21	VITAFOAM NIG PLC.	VITAFOAM
22	FIDSON HEALTHCARE PLC	FIDSON
23	MAY & BAKER NIGERIA PLC.	MAYBAKER
24	PHARMA-DEKO PLC.	PHARMDEKO
25	ASHAKA CEM PLC	ASHAKACEM
26	AUSTIN LAZ & COMPANY PLC[MRF]	AUSTINLAZ
27	BETA GLASS PLC.	BETAGLAS
28	CEMENT CO. OF NORTH.NIG. PLC	CCNN
29	CHEMICAL AND ALLIED PRODUCT CO.PLC	CAP
30	DANGOTE CEMENT PLC	DANGCEM
31	LAFARGE AFRICA PLC.	WAPCO
32	PAINTS AND COATINGS MANUFACTURES PLC	PAINTCOM
33	PORTLAND PAINTS & PRODUCTS NIGERIA PLC	PORTPAINT
34	ALUMINIUM EXTRUSION IND. PLC.	ALEX

SOURCE: NSE 2016; website: http://www.nigeriastockexchange.com.

APPENDIX B: STATA Regression Output

```
  ___  ____  ____  ____  ____ (R)
 /__    /   ____/   /   ____/
___/   /   /___/   /   /___/   13.0   Copyright 1985-2013 StataCorp LP
  Statistics/Data Analysis            StataCorp
                                      4905 Lakeway Drive
     MP - Parallel Edition            College Station, Texas 77845 USA
                                      800-STATA-PC        http://www.stata.com
                                      979-696-4600        stata@stata.com
                                      979-696-4601 (fax)



Notes:
      1.  (/v# option or -set maxvar-) 5000 maximum variables


. use "C:\Program Files\STATA13\report of regression 9 firms 011217.dta", clear


. xtset id year, yearly
       panel variable:  id (strongly balanced)
        time variable:  year, 2011 to 2016
                delta:  1 year
```

```
. summarize mvs css ips gps bvs eps dps, detail
```

mvs

Percentiles		Smallest		
1%	.52	.52		
5%	.88	.72		
10%	1.17	.88	Obs	54
25%	2.9	.94	Sum of Wgt.	54
50%	38.745		Mean	58.75074
		Largest	Std. Dev.	66.07642
75%	91.28	170		
90%	162	176	Variance	4366.094
95%	176	237.03	Skewness	1.261065
99%	265.28	265.28	Kurtosis	3.905349

css

Percentiles		Smallest		
1%	.0002	.0002		
5%	.0015	.0004		
10%	.0017	.0015	Obs	54
25%	.006	.0015	Sum of Wgt.	54
50%	.0749		Mean	.1537833
		Largest	Std. Dev.	.1795507
75%	.277	.4514		
90%	.4038	.5186	Variance	.0322385
95%	.5186	.6103	Skewness	1.148978
99%	.6992	.6992	Kurtosis	3.480273

ips

Percentiles		Smallest		
1%	.0004	.0004		
5%	.0008	.0004		
10%	.0016	.0008	Obs	54
25%	.0058	.0009	Sum of Wgt.	54
50%	.3243		Mean	.8095037
		Largest	Std. Dev.	1.258191
75%	.678	3.115		
90%	3.0156	3.8361	Variance	1.583044
95%	3.8361	4.1442	Skewness	1.764394
99%	4.9754	4.9754	Kurtosis	4.974097

gps

Percentiles		Smallest		
1%	.0017	.0017		
5%	.0027	.0017		
10%	.0027	.0027	Obs	54
25%	.1135	.0027	Sum of Wgt.	54
50%	.5234		Mean	1.561967
		Largest	Std. Dev.	2.737374
75%	1.5807	6.6142		
90%	6.6142	10.6802	Variance	7.493215
95%	10.6802	10.685	Skewness	2.395179
99%	10.685	10.685	Kurtosis	7.825104

bvs

	Percentiles	Smallest		
1%	.0019	.0019		
5%	1.0701	1.0313		
10%	2.0633	1.0701	Obs	54
25%	2.4708	1.5867	Sum of Wgt.	54
50%	13.6067		Mean	16.30837
		Largest	Std. Dev.	14.23522
75%	30.5727	38.5983		
90%	37.2767	38.6824	Variance	202.6415
95%	38.6824	38.7593	Skewness	.2897119
99%	39.8079	39.8079	Kurtosis	1.431931

eps

	Percentiles	Smallest		
1%	-2.29	-2.29		
5%	-.94	-1.3387		
10%	.31	-.94	Obs	54
25%	.95	-.38	Sum of Wgt.	54
50%	4.42		Mean	5.294163
		Largest	Std. Dev.	6.544631
75%	6	17		
90%	12.16	21	Variance	42.8322
95%	21	28	Skewness	2.214639
99%	31	31	Kurtosis	8.417847

dps

	Percentiles	Smallest		
1%	.05	.05		
5%	.06	.05		
10%	.1	.06	Obs	54
25%	.142	.085	Sum of Wgt.	54
50%	1.1585		Mean	1.79768
		Largest	Std. Dev.	2.296756
75%	2.2	7		
90%	4.7	8	Variance	5.275088
95%	8	8.25	Skewness	1.907108
99%	10	10	Kurtosis	6.238343

.

```
. summarize mvs css ips gps bvs eps dps
```

Variable	Obs	Mean	Std. Dev.	Min	Max
mvs	54	58.75074	66.07642	.52	265.28
css	54	.1537833	.1795507	.0002	.6992
ips	54	.8095037	1.258191	.0004	4.9754
gps	54	1.561967	2.737374	.0017	10.685
bvs	54	16.30837	14.23522	.0019	39.8079
eps	54	5.294163	6.544631	-2.29	31
dps	54	1.79768	2.296756	.05	10

```
. sktest mvs css ips gps bvs eps dps
```

Skewness/Kurtosis tests for Normality

				joint	
Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	Prob>chi2
mvs	54	0.0005	0.1148	11.88	0.0026
css	54	0.0011	0.2686	9.90	0.0071
ips	54	0.0000	0.0155	19.05	0.0001
gps	54	0.0000	0.0003	29.69	0.0000
bvs	54	0.3423	0.0000	49.85	0.0000
eps	54	0.0000	0.0001	28.92	0.0000
dps	54	0.0000	0.0021	22.79	0.0000

```
. swilk mvs css ips gps bvs eps dps

                    Shapiro-Wilk W test for normal data

    Variable |   Obs        W           V         z       Prob>z
-------------+--------------------------------------------------
         mvs |    54    0.83006      8.493     4.583    0.00000
         css |    54    0.81899      9.047     4.718    0.00000
         ips |    54    0.67585     16.201     5.966    0.00000
         gps |    54    0.59911     20.036     6.422    0.00000
         bvs |    54    0.83588      8.202     4.508    0.00000
         eps |    54    0.76361     11.814     5.290    0.00000
         dps |    54    0.74683     12.653     5.437    0.00000

. correlate mvs css ips gps bvs eps dps
(obs=54)

             |      mvs      css      ips      gps      bvs      eps      dps
-------------+---------------------------------------------------------------
         mvs |   1.0000
         css |   0.4877   1.0000
         ips |   0.4256   0.0990   1.0000
         gps |   0.3672  -0.0236   0.6910   1.0000
         bvs |   0.4586   0.3427   0.2372  -0.0648   1.0000
         eps |   0.1033  -0.1217  -0.1001  -0.1081  -0.0297   1.0000
         dps |   0.9089   0.4684   0.3354   0.3404   0.4398   0.1262   1.0000
```

```
. regress mvs css ips gps bvs eps dps
```

Source	SS	df	MS	Number of obs =	54
				F(6, 47) =	44.77
Model	196947.157	6	32824.5262	Prob > F =	0.0000
Residual	34455.7988	47	733.102102	R-squared =	0.8511
				Adj R-squared =	0.8321
Total	231402.956	53	4366.09351	Root MSE =	27.076

mvs	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
css	33.61129	24.97784	1.35	0.185	-16.63764	83.86021
ips	6.904117	4.456878	1.55	0.128	-2.061965	15.8702
gps	.3886145	2.171574	0.18	0.859	-3.980029	4.757258
bvs	.2340751	.3271136	0.72	0.478	-.4239927	.8921428
eps	.3136881	.6039391	0.52	0.606	-.9012807	1.528657
dps	22.73944	2.283961	9.96	0.000	18.1447	27.33418
_cons	1.029647	7.617256	0.14	0.893	-14.2943	16.35359

```
. estat hettest

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

         chi2(1)      =     2.21
         Prob > chi2  =   0.1370
```

```
. estat vif
```

Variable	VIF	1/VIF
gps	2.55	0.391445
ips	2.27	0.439880
dps	1.99	0.502668
bvs	1.57	0.637915
css	1.45	0.687709
eps	1.13	0.885384
Mean VIF	1.83	

```
. xtreg mvs css ips gps bvs eps dps, fe

Fixed-effects (within) regression               Number of obs      =        54
Group variable: id                              Number of groups   =         9

R-sq:  within  = 0.7606                         Obs per group: min =         6
       between = 0.5770                                        avg =       6.0
       overall = 0.6146                                        max =         6

                                                F(6,39)           =     20.65
corr(u_i, Xb)  = -0.1930                        Prob > F          =    0.0000
```

mvs	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
css	41.39195	29.53071	1.40	0.169	-18.33955	101.1234
ips	10.70726	5.809511	1.84	0.073	-1.043583	22.45811
gps	-11.11082	4.077332	-2.73	0.010	-19.358	-2.863637
bvs	.9414608	.6113357	1.54	0.132	-.2950824	2.178004
eps	.6401886	.5697494	1.12	0.268	-.5122383	1.792616
dps	19.98282	2.323494	8.60	0.000	15.28311	24.68253
_cons	6.406848	13.70158	0.47	0.643	-21.30722	34.12092
sigma_u	40.766456					
sigma_e	17.818231					
rho	.8396027	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(8, 39) =     8.69              Prob > F = 0.0000
```

```
. estimates store Fixed

. xtreg mvs css ips gps bvs eps dps, re

Random-effects GLS regression                   Number of obs      =        54
Group variable: id                              Number of groups   =         9

R-sq:  within  = 0.7426                         Obs per group: min =         6
       between = 0.8266                                        avg =       6.0
       overall = 0.8073                                        max =         6

                                                Wald chi2(6)       =    148.57
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

mvs	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
css	43.14485	27.58246	1.56	0.118	-10.91578	97.20548
ips	14.32144	4.537192	3.16	0.002	5.42871	23.21417
gps	-4.74574	2.709857	-1.75	0.080	-10.05696	.5654823
bvs	.5057752	.4585262	1.10	0.270	-.3929197	1.40447
eps	.6992504	.5528096	1.26	0.206	-.3842366	1.782737
dps	19.66145	2.222594	8.85	0.000	15.30525	24.01766
_cons	.6399007	13.11537	0.05	0.961	-25.06576	26.34556
sigma_u	25.364273					
sigma_e	17.818231					
rho	.66956957	(fraction of variance due to u_i)				

```
. estimates store Random

. hausman Fixed .
```

	Coefficients			
	(b) Fixed	(B) Random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
css	41.39195	43.14485	-1.752898	10.54849
ips	10.70726	14.32144	-3.61418	3.628265
gps	-11.11082	-4.74574	-6.36508	3.046524
bvs	.9414608	.5057752	.4356856	.4043328
eps	.6401886	.6992504	-.0590617	.1378982
dps	19.98282	19.66145	.3213667	.6772736

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(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 3.81
Prob>chi2 = 0.7025
(V_b-V_B is not positive definite)

```
. xttest0
```

Breusch and Pagan Lagrangian multiplier test for random effects

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

Estimated results:

	Var	sd = sqrt(Var)
mvs	4366.094	66.07642
e	317.4893	17.81823
u	643.3463	25.36427

Test: Var(u) = 0
chibar2(01) = 17.95
Prob > chibar2 = 0.0000

```
. xtreg mvs css ips gps bvs eps dps, re vce(robust)

Random-effects GLS regression                   Number of obs      =        54
Group variable: id                              Number of groups   =         9

R-sq:  within  = 0.7426                         Obs per group: min =         6
       between = 0.8266                                        avg =       6.0
       overall = 0.8073                                        max =         6

                                                Wald chi2(6)       =   1340.93
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

                                  (Std. Err. adjusted for 9 clusters in id)
------------------------------------------------------------------------------
             |               Robust
         mvs |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         css |   43.14485   33.59091     1.28   0.199    -22.69213    108.9818
         ips |   14.32144   5.532531     2.59   0.010     3.477881      25.165
         gps |   -4.74574   1.326688    -3.58   0.000       -7.346   -2.145481
         bvs |   .5057752   .8747914     0.58   0.563    -1.208784    2.220335
         eps |   .6992504   .8349402     0.84   0.402    -.9372024    2.335703
         dps |   19.66145   1.611722    12.20   0.000     16.50254    22.82037
       _cons |   .6399007   8.897793     0.07   0.943    -16.79945    18.07925
-------------+----------------------------------------------------------------
     sigma_u |  25.364273
     sigma_e |  17.818231
         rho |  .66956957   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```