LONG -TERM PERFORMANCE OF MERGERS AND ACQUISITIONS OF NON-FINANCIAL HORIZONTAL VOLUNTARY COMPANIES IN NIGERIA

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By

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AMT Advanced Manufacturing Technology

BCC Banker, Charnes and Cooper

CAAR Cumulative Average Abnormal Returns

CAC Corporate Affairs Commission

CAD Computer-Aided Design

CAP Computer-Aided Production

CAPM Capital Asset Pricing Model

CAR Cumulative Abnormal Returns

CBN Central Bank of Nigeria

CCR Charnes, Cooper and Rhodes

CEO Chief Executive Officer

CIM Computer Integrated Manufacturing

CMO Capital Market Operators

CP Cleaner Production

CRS Constant Return to Scale

CSD Central Securities Depositories

CSR Corporate Social Responsibility

DDM Dividend Discount Model

DDM Dividend Discount Model

DEA Data Envelopment Analysis

DEC Digital Equipment Corporation

DFA Distribution Free Approach

DMU Decision Making Units

DSA Distribution Free Approach

EBIT Earnings before Interest and Tax

EC European Commission

EPS Earnings Per Share

EU European Union

EVA Economic Value Added

FCCPC Federal Competition and Consumer Protection Commission

FCF Free-Cash flow

FDH Free Disposal Hull

FIRS Federal Inland Revenue Services

FMI Financial Market Infrastructures

FMS Flexible Manufacturing System

GDP Gross Domestic Product

IMAA Institute of Mergers, Acquisitions and Alliance

IOS Investment Opportunity Set

ISA Investment and Securities Act 2007

IT Information Technology

JIT Just in Time

KM Knowledge Management

KS Kolmogorov- Smirnov

KWT Kruskal Wallis test

M&A Mergers and Acquisitions

MCR Meta-Cost Frontier

MFP Multifactor Productivity

MPSS Most Productive Scale Size

MWU Mann Whitney U-test

NAICOM National Insurance Commission

NCM Nigerian Capital Market

NOPAT Net Operating Profit after Tax

NPM Net Profit Margin

NPV Net Present Value

NSE Nigerian Stock Exchange

OPM Operating Profit Margin

PC Personal Computers

PER Profitability Earnings Ratios

PLS Panel Least Square

QI Quality Improvement

R&D Research and Development

RFID Radio-Frequency Identification

RIA Residual Income Approach

RIV Residual Income Valuations

RMS Reconfigurable Manufacturing System

ROA Return on Asset

ROE Return on Equity

ROIC Return on Invested Capital

RTS Return to Scale

SBM Slacked-Based Measure

SCM Supply Chain Management

SE Scale Efficiency

SEC Security and Exchange Commission

SFA Stochastic Frontier Analysis

SFP Single Factor Productivity

SME Small and Medium Enterprise

TCI Technological Change Index

TE Technical Efficiency

TECI Technical Efficiency Change Index

TFA Thick Frontier Approach

TFP Total Factor Productivity

TGR Technological Gap Ratio

TUMS Tehran University of Medical Sciences

U. K United Kingdom

U. S United States

USD United States Dollars

VAPMM Value-Added Productivity Measurement Method

VPMM Value Productivity Measurement Method

VRS Variable Return to Scale

WACC Weighted Average Cost of Capital

WOS Windows Operating System

Publications

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Akpan, M., Wanke, P., Chen, Z., & Antunes, J. M. (2020). Unveiling the Endogenous Relationship Between Technical Efficiency and Value Creation in Mergers and Acquisitions in Nigeria. *South African Journal of Economics*, *88*(1), 40-70.

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ABSTRACT

LONG-TERM PERFORMANCE OF MERGERS AND ACQUISITIONS OF NON-FINANCIAL HORIZONTAL VOLUNTARY COMPANIES IN NIGERIA

MFON NATHANIEL UDO AKPAN

This study primarily examined the long-term performance of Nigerian non-financial horizontal voluntary (NHV) mergers and acquisitions (M&As), because of the dearth of empirical studies on this topic in Nigeria. Voluntary M&As are observed within the non-financial sector of the economy, while involuntary M&As are mostly noticed in the financial sector. Nigeria witnessed both voluntary and involuntary M&As for over 25 years (1991-2016), followed by involuntary M&As from 2017 to 2020. Therefore, M&As companies' performance data estimation period in this study covered the 30-year period between 1991 and 2020. The four performance measures applied in the study were: 1) operating performance (OP) using the Residual Income Valuation Approach (RIV); 2) technical efficiency (TE) and 3) cost efficiency (CE) using both the Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA); and 4) productivity efficiency (PE) using the Malmquist Productivity Index (MPI). The results showed that the selected 30 bidder NHV M&A companies showed a significant positive improvement in CE and significant declines in OP, TE, and PE. Next, the selected 30 target NHV M&As companies also exhibited significant CE improvement, significant TE decline, and no significant change in OP and PE over the 30-year period. Finally, for the selected 30 non-merging companies, NHV M&As revealed a significant positive effect on CE and TE while the effect on OP and PE both were negative but insignificant. It was concluded that NHV M&A companies did not realize the expected synergy between OP, TE, and PE after M&As, but did so in terms of CE. The policy

implication is that NHV M&As should be encouraged due to their positive impact on CE. The lack

of positive implications for OP, TE and PE suggest that Nigerian NHV M&As' should improve

on technological changes before achieving any meaningful expected synergy.

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APPROVAL SHEET

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I hereby declare that the dissertation is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UTAR or other institutions.

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CHAPTER 1

INTRODUCTION

This chapter presents the background of Mergers and Acquisitions (M&As), the current situation of M&A activities in Nigeria, the problem statement, research objectives, and questions. It then continues to present the significance of the study, the organization of the thesis, and the conclusion of the chapter.

1.1 Background of Mergers and Acquisitions (M&As)

In 2017, USD 3.5 trillion was spent acquiring 1000 companies in the United States of America, and this sum surpassed USD three trillion in four successive years (Andriuskevicius, 2019). Andriuskevicius (2019) highlighted that M&As, organized by foreign direct investment (FDI), have become the main motivating force of global economic integration, which can be categorized by substantial financial backing and the signing of bilateral and multilateral treaties. That explains why factors that affect FDIs and M&As are similar.

To remain competitive, many enterprises around the world have merged with each other for certain strategic or long-term motives. These long-term motives can be financial or non-financial. Financial motives include the creation

of shareholder values, the revival of unproductive units, increased earnings per share (EPS), tax planning, tax benefits, higher market capitalization, and the investment of surplus funds (Bernile & Lyandres, 2019; Coccorese & Ferri, 2020). On the other hand, non-financial motives include increased lobbying power, the formation of a conglomerate, improvement in the quality of management, removal of inefficient management, and the retention of management talents (Bernile & Lyandres, 2019; Coccorese & Ferri, 2020). Other motives include risk reduction, balancing the product cycle, diversification, stronger core competence, synergy, forward and backward integration, greater size and market share, and increase in the scale of operation and growth (Gupta, 2012).

Today, M&As play an important role in shaping industry activities worldwide and have become a key corporate strategy to improve organizational performance. M&As are undertaken on the assumption that the combined companies will have a greater value compared to two individual companies. Shareholders want to witness organizations' development and are not satisfied with anything less than an increased return on investment. Such demands imply that the organization must continue to grow, because growth is considered a key factor for successful M&A enterprises that produce better results and therefore, higher profits (Elliasson, 2011). On the other hand, an unsuccessful M&A activity is said to be when the buying company does not increase shareholder value or fails to achieve the commercial, financial, or strategic goals set when buying the enterprise (Elliasson, 2011).

According to Teti and Tului (2020), a merger occurs when two establishments willingly agree to collaborate with each other by joining their available assets, liabilities, and cultural values on an equal basis, across different businesses and industries. A merger is thus more of a voluntary corporate action than an acquisition. An acquisition, in turn, happens when one organization purchases the majority shares in another and takes over its operations, which may not be to the mutual agreement of all parties involved (Teti & Tului, 2020).

Junni and Teerikangas (2019) stated that the terms 'merger' and 'acquisition' are used interchangeably, though distinguishing their different definitions is important for regulatory and accounting purposes. Korican, Barac, and Jelavic (2014) stated that M&As are strategically planned transactions whereby the bidder and target companies jointly create a new entity to gain a competitive advantage in the marketplace. Target companies are those organizations that are bought over by another company called the bidder, also referred to as the buying organization. Non-merging (also called control or matching) companies are those not involved in M&A transactions but are used as a benchmark to evaluate the performance of the bidder company as if there was no merger (Humphery-Jenner, Lisic, Nanda, & Silveri, 2016). Since non-merging companies face the same systematic risk, using the Capital Asset Pricing Model (CAPM) eradicates company-specific risk through an investor's well-diversified portfolio.

The above argument brings to fore the significant concept of cost of equity, an important component of the Capital Asset Pricing Model (CAPM) as well as residual income valuation (RIV) when assessing a company's

fundamental value. For any valuation after an M&A, if the post-merger value is not greater than the pre-merger value, then the M&A activities have worsened the company's value. However, if the post-merger value is greater than that of the pre-merger, value is implied to have been created for shareholders after the deal. This is because the positive difference gives the fundamental companies greater value after an M&A, having accounted for both the cost of equity and cost of debt.

According to Mackenzie (2017), mergers are formed by combining more than one company. The offering company assumes complete accountability for the losses and profits of the purchased company in such a combination. The purchase, however, involves altering shareholders as bidders absorb the shares of the target company. When a bidder company supersedes the management of the target company, the ensuing acquisition can be friendly or hostile. It is friendly when the target company's management and the board of directors are agreed to be absorbed by the bidder company; otherwise, it is a hostile takeover. This implies that mutual agreement is necessary between the bidder company's management/board and the target company's management/board for the M&A transaction to take place (Cui & Leung, 2020).

Companies can achieve profitability and competitiveness via internal or external growth (Gaughan, 2012). An M&A is an external growth strategy. External growth, also known as inorganic growth, is the ability of a company to increase its business reach by using resources and capabilities that are not internally developed by the company itself, but are obtained through acquiring, merging with, or collaborating with other companies. An example is the

experience of giant companies like Intel and Microsoft (Gaughan, 2012). Internal growth, also known as organic growth, is a company's expansion of its business operations by relying on and developing its own internal resources and capabilities for competitive advantage. It can be a result of developing new products, increasing the capacity of existing products, maintaining sales growth, developing new markets such as exporting into other economies, or growing a customer base through marketing.

Learning from the Nokia crisis and the demise of the Digital Equipment Corporation (DEC) acquired by Compaq in 1998, Intel and Microsoft went into a strategic alliance and built strategic resilience to deter competitors from market dominance. Both companies successfully created co-ownership of the industry standard for personal computers (PCs), which is now the Windows operating system (WOS). Such an alliance forces switching costs on competitors and creates an incomparable competitive advantage in the business of microprocessors for PCs. This way, even though competitors can create better microprocessors, they still have to make the costly switch to WOS, which has been made the industry's standard operating system to run microprocessors, in order to survive in the market (He, 2012). From this example, it is clear that an M&A transaction is an important external growth strategy which has become a necessary tool for companies to attain external growth (e.g., Cameron & Green, 2015; Golubov, Petmezas, & Travlos, 2012; Klimek, 2016; Vazirani, 2012).

A long-term M&A takes between three to five years after the activity, while a medium-term takes two years and a short–term takes one year (Sudarsanam, 2010; Zollo & Meier, 2007). The benchmarking issue in an M&A

activity is the determination of a suitable timescale to evaluate company value to decide if any benefit has been created for stakeholders' investment. In this regard, Ramakrishnan (2008) investigated long-term post-merger companies in India in terms of operating performance and efficiency three years before and after mergers. Others that utilized the three-year period before and after M&As in investigating operating performance include Ghosh (2001) in the United States and Sharma and Ho (2002) in Australia. Therefore, three years appears to be the appropriate time interval in evaluating long-term companies' performance.

The impact of M&A efficiency needs a sufficient long-term interval preceding evaluation because efficiency improves over a longer time horizon (Rahman & Limmack, 2004; Rahman, Lambkin, & Hussain, 2016). The long-term M&A evaluation period is also necessary when considering the cost of equity and risk of investment, as investors' funds are tied-down. Erasmus (2008) stated that taking the cost of equity into account in the calculation of pre- and post-M&A operating performance is a better approach as it would determine whether value is created or not after the transaction.

In addition, longer years create other problems. Longer time periods increase the likelihood that other events (e.g., financial, operational, and strategic changes) of the bidder company will affect their valuation. Second, longer intervals raise queries about the effectiveness of statistical test procedures and decrease the dependability of test results (Sudarsanam, 2010). Accordingly, Cosh, Guest, and Hughes (2006), Antoniou, Petmezas, and Zhao (2007), Krishnakumar and Sethi (2012), Shams and Gunasekarage (2016a), Navio-

Marco, Solorzano-Garcia, and Matilla-Garcia (2016), and Mager and Meyer-Fackler (2017) are among the scholars who have applied the three-year post M&A as the long-term evaluation period in their studies. Therefore, applying a three-year interval is suitable for pre- and post- M&A evaluation in research.

The justification for this study on the long-term performance and efficiency of M&As follows that of Ramakrishnan (2008), who noted that "studies on the post-merger long-term performance of companies in both the developed and the developing markets have not been able to come to a definite and convincing conclusion about whether mergers have helped or hindered company performance." He posited that M&As can have a long-term effect on operating performance through enhanced efficiency. The author used cash flow accounting measures to investigate this claim in an attempt to know whether there is long-term performance improvement following 87 domestic merger deals.

Ramakrishnan (2008) found that efficiency improved post-merger, lending synergistic gains to the merged entities. Synergistic gain occurred due to the transformation of previously uncompetitive, fragmented companies into consolidated and operationally more viable business units after merging. The observed improvement in operating cash flow return is considered to have come from the improvements in the post-merger operating margins of the companies, though not from the efficient utilization of the assets to generate higher sales. As a result of this analysis, mergers are concluded to be financially beneficial for enterprises in India in the long run. It also restores faith in Indian management's ability to use M&As as effective tools for corporate growth

strategy. Despite the author's contribution, his findings still suggest a probabilistic position rather than a definite position on the issue of the long-term performance and efficiency of M&As.

Like the study of Ramakrishnan (2008), a growing number of studies are now seeking to assess companies' long-term performance over a few years' post-merger, since longer-term research may offer us greater insights on whether mergers are accomplishing their intended goal. They focused on long-term performance (DeLong, 2003), horizontal acquisition performance (Capron, 1999), financial performance (Rani, Yadav, & Jain, 2015) and even customer satisfaction and efficiency (Swaminathan, Groening, Mittal, & Thomaz, 2013), among others. Overall, most argue for the evaluation of a longer time horizon post-merger, rather than simply the immediate period following a merger announcement. This is probably because stock price swings during the initial period are simply indicative of the capital market's expectations of the merger's success. As such, they are likely to be hypothetical in nature and may not represent the actual performance of the merger. 'Real' or actual performance is reflected, among other things, in the merged company's financial reports for a few years after the merger.

A close examination of these financial documents reveals the genuine degree of post-merger performance. The phrase "post-merger" refers to the period following the completion of the previously announced merger. The de-listing date of the merged entity from public markets, or the announcement in the business press of board/management approval of the merger, has traditionally been treated as the effective date for the post-merger. Different methods of

analyzing merger success may result in divergent and contradictory conclusions about whether an M&A has resulted in the businesses being better off in the long term. In keeping with the present thesis on the priority of financial performance, the researcher focused on the use of accounting data to measure the success of merging businesses in this study.

To evaluate cost efficiency, Coccorese and Ferri (2019) used a stochastic frontier approach (SFA) on M&As among Italian mutual cooperative banks using bank-level cost efficiency scores from 1993 to 2013. The authors tried a set of dummies to proxy the merger banks' status (never merged, before the first merger, merged once, merged twice, etc.) and a vector of control variables. Their findings showed that mergers boost mutual banks' cost efficiency in just five percent of cases, namely those in which a bank has merged at least three times. Furthermore, the authors hypothesized that the serial mergers caused those banks to become extraordinarily large, which hurt marginal borrowers (i.e. those likely served by smaller banks but ignored by larger ones), not only severely weakening development and inequality but also breaching the ethics and mission of those banks. In their conclusion, the authors averred emphatically that "even if sizeable mergers could deliver cost efficiency benefits, they would probably imply a loss of identity for mutual cooperative banks."

Corroborating these findings, Beccalli and Frantz (2009) found a marked rise in cost efficiency (especially for domestic deals) against a slight drop in return on equity (ROE), cash flow return, and profit efficiency. Amin and Ibn Boamah (2020) also found that an M&A has the potential financial benefits of enhancing both technical and cost efficiencies when efficiency-seeking banks

evolve into larger and more complex organizations through growth, mergers, and acquisitions in a financial environment driven by reforms and technological innovation. The cost efficiency results demonstrate that small and big merging banks maintained greater cost efficiencies over their peers the whole time, prompted by greater technical efficiency scores. This implies that large acquirers have the best capacity to optimize their outputs given constant inputs in comparison to merging and non-merging banks of various sizes (Al-Khasawneh, Essaddam, & Hussain, 2020). The use of terms like 'potential' indicates that the actual cost efficiency effect of M&As in the long term is still conjectural. Again, that the attainment of cost efficiency could have unintended consequences makes the cost efficiency effect of M&A a subject of debate, especially outside the financial sector which is not voluntary. This calls for further investigation in this area, as done in the present study.

Regarding the technical efficiency of M&As, the argument advanced by Amin and Ibn Boamah (2020) is pertinent. Skevas and Grashuis (2020) addressed the technical efficiency of farmer cooperatives by employing a two-stage approach. First, the authors measured cooperatives' technical efficiency using a Data Envelopment Analysis (DEA) model and then used a bootstrap truncated regression to identify technical efficiency, which may not reflect the 'long-term' effect of M&As. The scholars found technical efficiency to be influenced by several cooperative company-level characteristics including age, liquidity, differentiation, and membership size. Nevertheless, there is scant literature on the technical efficiency effect of M&As.

Research on productivity and cost efficiency was done by Al-Khasawneh, Essaddam, and Hussain (2020). The authors particularly studied the productivity characteristics and cost efficiency dynamics of US acquiring banks over the period from 1992 to 2003. According to their research, major merging banks are likely to have the same productivity rankings as their peer banks. Small merging banks, on the other hand, are less productive than their counterparts. The source of the acquirers' production appears to be a change in efficiency rather than a move in the frontier.

Likewise, Halkos and Tzeremes (2013) estimated the operating or productivity efficiency gains of M&A of 45 potential bank M&As in the Greek banking industry in the short run from 2007 to 2011. The findings showed that a year before and a year after the start of the Greek economic crisis, the majority of the possible bank M&As under consideration were unable to deliver short-run operating efficiency advantages. However, their result for 2011 reveals that the majority of bank M&As can result in short-run operational efficiency advantages. Their empirical data supports the idea that a merger or acquisition between efficient banks does not guarantee an efficient bank merger and acquisition. This study implies that though M&As cannot guarantee productivity improvement in the short run and in the financial (banking) sector, it could guarantee such progress in the long run in non-financial sectors. Hence, the inclusion of productivity efficiency in the present investigation is warranted.

Synergy value is generated when the gains for synergy surpasses the costs incurred to generate that synergy. The synergy motive proposes that dealings should take place in expectation of economic improvements and only if

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benefits will accrue to shareholders of the acquiring companies. However, anticipated synergy is fundamentally difficult to realize and becomes more substantial when the long-term effects of M&As on the company's value and performance are negative (see, for example, Chen, Kao, & Lin, 2011; Fatemi, Fooladi, &, Garehkoolchian, 2017; Huh, 2015; Sharma, Mukherjee, & Gupta, 2016). Shah and Khan (2017) investigated the impact of M&As on bidder companies' performance in Pakistan and reported a decline in the performance of bidders in the post-merger period in the long-term. Numerous reasons have been put forward concerning these negative results, including self-confidence under the hubris hypothesis and self-interest under the agency motive. These explanations could be understood to mean synergy was not generated through the conclusion of the The literature on long-term performance before and after M&As of non-financial horizontal voluntary (NHV) companies in Nigeria is scant, with the very few existing ones focusing on the financial sector. For instance, studies (Fabinu, Munby, & Agbatogun, 2018; Oloyede & Sulaiman, 2012; Okaro, Ashara & Ugwu, 2019) on M&A in the financial sector only mention voluntary as a type of M&A but have not investigated it empirically in the non-financial sector, let alone considered long-term performance of before and after M&As of NHV companies. It appears that this area of study is yet to attract the attention of researchers in Nigeria, probably because of the voluntary nature of the exercise. However, statistics indicate that NHV M&A activities have been increasing in value and volume since the 1990s. Between 1994 to 2004, the Nigerian Stock Exchange (NSE) identified a total of 14 NHV M&As in all the sectors, but only one financial (involuntary) M&A. Subsequently, between 2005 to 2016, non-financial M&As activities increased to 16, reaching

a total of 30, while financial-related M&As reached 209, as non-financial voluntary M&As did not occur between 2017 and 2020. This is one of the reasons for this study, especially as there have been increasing cases of NHV M&As in the country. However, only Rita and Ogbulu (2017) have attempted to investigate voluntary M&As in Nigeria, that too in the financial (banking sector).

The value creation of an M&A for the merging companies' shareholders' benefit occurs through operating efficiency. This should be visible in any of the four measures of performance. Through the increase in profitability from enhancements in cost efficiency, technical efficiency, and total factor productivity (TFP), M&As could upsurge operating performance. M&As could increase the technical efficiency of the merging companies by realizing the minimization of inputs in the production of given outputs (in an input-oriented measure) or the maximization of outputs given its collections of inputs (for an output-oriented measure). M&As advance the cost efficiency of merging companies by improving technical efficiency and cost savings, which is distributed onto customers by means of lower cost. Through comparative efficiency or technological improvements that consist of a higher combination of inputs and output, M&As also boost total factor productivity (TFP).

Because of limited resources in both public and private companies and pressure on the efficient management of resources, tightening budgets call for technical improvement (productivity or cost efficiency). Efficiency is important in an organization because it leads to higher profitability. Since it relates output to a given level of inputs, technical efficiency is determined by the difference between the observed ratio of combined quantities of output to input and the ratio

achieved by the best practice decision-making units (DMU). The main aim of efficiency is to have the ability to produce the maximum output or utilize the minimum inputs compared to what is technically feasible (Cooper, Seiford, Tone & Zhu, 2007). In evaluating technical efficiency of a DMU involving multiple outputs and inputs, the ratio method is not sufficient because most efficient DMU according to a specific ratio is not necessarily efficient according to another ratio (Cooper et al., 2007). Consequently, the data envelopment analysis (DEA) and SFA models are better known for evaluating technical efficiency and cost efficiency respectively.

The most important benefit of the DEA model is its consideration of multiple inputs and outputs. DEA functions on the selected inputs and outputs of companies called DMUs and identifies possible efficiency improvements for inefficient DMUs. Technical efficiency examines the amount of inputs or outputs, which means that entries at a specified output are minimized or outputs are maximized at a certain input rate. The DEA model can include external variables that influence the outputs but are not controlled by DMU executives (Cooper et al., 2007). Also important to note is that the labor productivity cost in an organization affects its profits. Therefore, measuring the productivity efficiency of a company is essential and can be done in many ways, though current methods may rely on software tracking and monitoring depending on the companies' affordability. An example of a productivity efficiency evaluation method is the Malmquist Productivity Index (MPI).

1.1.1 Types of Mergers and Acquisitions (M&As)

Different types of mergers are classified and grouped based on economic activity and the level of similarity of companies (Andriuskevicius, 2019). There are three major types of M&As, namely horizontal, vertical, and conglomerate (Bolbanabad, Mosadeghrad, Arab, & Majdzadeh, 2017). M&As permit companies to advantageously gain efficiencies and accomplish synergies by integration with horizontal peers or with vertical ones (customers and suppliers). Conglomerate comprises the coming together of two companies in different industries that are not related to each other. This implies that there is no common factor in the conglomeration between companies in terms of production, marketing, research and development (R&D), or technology. Notably, a leading company always sets an M&A in motion.

1.1.2 Horizontal Mergers and Acquisitions (M&As)

Horizontal M&As occur between competing yet analogous companies in the same sector that produce similar products or services (Khanal, Mishra, & Mottaleb, 2015). The 2004 to 2005 recapitalization exercise in the banking and insurance industry in Nigeria is an example of horizontal M&As. The merger of larger companies with similar business activities may have the benefit of economies of scale that reduce costs. Being a market leader, the need to create monopoly power, efficiency gains, or greater market power may give rise to horizontal M&As (Chen, Su, & Hiele, 2017).

A horizontal M&A deal without efficiency gains could lead to higher prices and reduced consumer welfare. However, when merging reduces marginal costs and prices, it can raise or improve consumer welfare. The merits of horizontal M&As include the achievement of economies of scope and scale, reduction in production cost, increase in market share, and increase in synergies. When a company achieves these advantages, it can diversify its services and products, sell those products and services to a larger market, and reduce external competitors. On the other hand, the disadvantages include issues of antitrust and legalities, flexibility reduction, and the potential of destroying value rather than creating it.

1.1.3 Vertical Mergers and Acquisitions (M&As)

An M&A deal is vertical when one of the companies is a current or prospective supplier of goods and services to the other, such that both companies are involved in a similar kind of business. This may occur when a company expands its business operations into different areas but remains on the same production path (Chen, Xu, & Zou, 2017). The mergers of parts and component makers with their customers like compressors and automobile manufacturers are good examples of vertical mergers. Similarly, a manufacturer can act as both supplier and distributor; that is, vertical integration in companies can be either backward or forward. Backward vertical integration forms upstream vertical integration, where the downstream company looks to guarantee its supply contents and acquires the upstream company that produces content. When a manufacturer assumes control of the supplies needed for the production of its

goods or services, it is called backward vertical integration. Forward vertical integration arises when the company assumes control further onward in their production cycle.

The assets and incentives of vertical mergers in a supply series with three types of organizations, namely suppliers, manufacturers, and integrated companies, was studied by Chen et al. (2017) . They attempted to determine whether combined companies could sell both middle and finishing goods, while suppliers and manufacturers could trade only middle or final goods. Correspondingly, they aimed to know whether marketing middle goods to other manufacturers was presented as the combined companies' endogenous choices. The results showed that a vertical M&A deal continuously reduces the price of the final products, while the production quantity and profits of each un-integrated manufacturer and integrated company decreased as well, leading to a reduction in the total profit of the supply chain. However, it may have also resulted in a rise in the number of final products and social welfare. Therefore, market foreclosure only happens when rivalry among integrated companies is weak, while vertical mergers occur only when rivalry among non-integrated industrialists is weak. In addition, Chen et al. (2017) stated that companies come into vertical integration in client-supplier or buyer-seller relationships to minimize uncertainty in business.

Another reason for vertical forward and backward integration in the production chain is the economies of scale benefits. The merit of a vertical M&A is that it creates positive differentiation and improves efficiency while reducing

cost. In this M&A type, specialization is applied to asset investment. It increases brands' local market share and reduces the transaction cost throughout the supply chain, giving rise to new market openings. However, one of the demerits of vertical M&As is that it brings about a reduction in the level of diversification that an organization can venture into, forcing a company to operate within an economy of scale. In addition, misperception is generated easily and frequently. Besides, there is the likelihood of unforeseen obstacles when entering a new market.

1.1.4 Conglomerate Mergers and Acquisitions (M&As)

Buono and Wiggins (2010) stated that conglomerate M&As are profitable if they bring about efficiency or create market power through the portfolio effect. Calzolari and Scarpa (2016) found that conglomerate M&As are lawfully self-governing companies that are operating in multiple, often unconnected, industries tied together by definite formal (such as equity) and informal (such as family) linkages. The members of the group are used to taking coordinated actions. M&As in a conglomerate take place among companies that are unrelated by value chain, where the merger could be vertical or horizontal for reduced business risk.

Cheng (2017) indicated that conglomerate M&As could exist due to the small size of an economy and deliberate government policy. Its benefits include improved internal capital and factor markets, resolution of missing institutions, economies of scale, and risk sharing. Conversely, the shortcomings of

conglomerates include excluding industrialists and small and medium enterprises (SMEs), a high level of agency cost, access to financial market distortion, political-economic issues, competition distortion, and overall undesired welfare consequences. The two ways of sorting out these challenges are to follow the guideline of conglomerates through merger reviews and to enforce competition law (Cheng, 2017). As indicated in the literature, whether an M&A is horizontal, vertical, conglomerates, voluntary, or involuntary, the growth potential of this business strategy cannot be underestimated.

1.1.5 Voluntary and Involuntary M&As

Voluntary M&As occur when two or more companies, driven by market forces, intentionally decide to merge for the purpose of best mutual benefits. Voluntary M&As are observed within the non-financial sector of the economy, while involuntary M&As are mostly noticed in finance-related sectors.

The NSE classifies the following companies as NHVs: services (SV). healthcare (HC), industrial (IND), oil and gas (O&G) and consumer goods (CG). Thus, M&As involving these companies are called NHV M&As, which is the focus of this study. On the other hand, the NSE classifies banking institutions, insurance companies, mortgage banks, investment trust, and discount houses as financial (involuntary) companies; these are not the concern of this study. Involuntary M&As are often driven by law and regulated agencies; often times, the parties involved and their decision to get involved are not by choice. An example of an involuntary M&A activity is the recapitalization exercise of banks and related financial institutions in Nigeria in 2004 (Akpan, Aik, & Wong,

2019). This study primarily examines the long-term performance of NHV M&As in Nigeria because there is a dearth of empirical studies in Nigeria on this topic.

1.1.6 Motives of Mergers and Acquisitions (M&As)

This study's take off-point assumes that M&As are initiated for growth expected by the merging company through its realization of expected synergies. This will eventually lead to improvements in the performance of those companies involved in the transaction. Kishore's (2009) study in the U.S. listed 12 motives for an M&A deal in order of significance, following which Raghunandan (2010) classified these motives into three forms, namely strategic, financial, and organizational. Strategic motives include growth, scale operation, competitive market share, acquiring size, backward and forward integration, synergy, diversification, management of recession, entry into a new market, balancing of the product cycle, and the reduction of risk. Financial motives are an investment of surplus funds, the creation of shareholder value, higher market capitalization, the revival of unhealthy units, increase of EPS, and reduction of cost. Finally, organizational motives include the formation of a conglomerate, removal of inefficient management, superior lobbying power, and retention of management talent.

In a related study, Wu, Zhou, and Brige (2011) stated that the motive for an M&A transaction should always be the improvement of the group's performance, though this is not as simple as it appears. Positive synergies are the net expected improvement effect after M&As, which implies the relationship

between both synergy and growth in an M&A transaction. Nguyen, Yung, and Sun (2012) investigated the motives behind M&A activity in the United States using 3520 domestic acquisitions. The results showed that 73 percent is related to market timing, 59 percent is related to agency motives and/or hubris, and three percent are responses to industry and economic shocks. Furthermore, about 80 percent of the mergers in the sample involved multiple motives. Therefore, it is difficult to have a clear picture of mergers' motivation because value-increasing and value-decreasing motives may coexist.

Onikoyi and Awolusi (2014) noted that M&A activity motive is designed to increase shareholder's wealth and to provide strong and reliable banking institutions capable of competing favorably with foreign financial institutions. They also noted that these gains are expected for non-bank or non-financial entities as well. In a related study, Brahma, Boateng, and Ahmad (2018) investigated the motivation and post-merger operating performance (OP) of European utility sectors following M&As. The results showed that synergy is the primary motive for M&A and that post-merger OP is negative and significant across all five accounting indicators by size and market-to-book ratio, suggesting that utility mergers underperform in the long term. The findings indicate that gains accruing to utilities involved in acquisitions are short term in nature. The practical implication, according to them, is that negative post-merger OP bears important policy implications and as such, future antitrust/competition authorities should be more vigilant before approving utility mergers.

In the same line of study, Xu, Liang, and Song (2018) investigated what drives M&As of listed companies on the CHINET market, i.e., initial public offer

(IPO) over-financing or stock overvaluation. They found that both factors account for companies' M&As. This is because they have far-reaching influences on acquisition probability, the size of the transaction, transaction frequency, M&A payment method, and market reaction. Because of IPO over-financing, enterprises tend to carry out M&A deals through cash payments or cash and stock mixed-payment. Higher IPO over-financing increases the chance of M&A transactions and leads to a larger transaction size and frequency. Market value overvaluation leads to more uses of stock or cash and stock mixed-payment in M&A deals. As the company's stock is overvalued, the company will use the overvalued equity to acquire other companies. Therefore, IPO over-financing in China rather than market over-valuation is the major driving factor in China's corporate M&As. Further results found that the market reaction to different payment methods in M&A varies; it has a minimum reaction to cash, a larger reaction to stock payment, and a maximum reaction to mixed payment. Meanwhile, the mixed payment method has the highest cumulative abnormal returns. This result, according to Xu, Liang, and Song (2018), is empirically different from what has been obtained in the United States and Europe.

1.1.7 The Need for Regulations in Mergers and Acquisitions (M&As)

M&As can provide many gains to an economy and increase market size, but can concurrently diminish market competition. A decline in market competition is a serious issue because it leads to a situation where the market leader fixes higher prices for consumers. This, in turn, causes a reduction in market confidence in the company by establishing and promoting key players

that now monopolize the market. The monopolistic tendencies of the market leader and its consequences can be averted by establishing an effective and efficient statutory antitrust and regulatory body to oversee all the activities of M&As (Odeck, 2008). By doing so, illegitimate activities in M&As could be reduced, which protects the investing public. This will also bring about a justified and authorized process of merging as well as a better and healthier economy via the proper monitoring and approval of M&A activities.

1.1.8 Regulations of Mergers and Acquisitions (M&As) in Nigeria

The law that controls M&A activities in Nigeria is predominantly the Investment and Securities Act 2007 (ISA), in collaboration with the rules and regulations of the Security and Exchange Commission (SEC) and now the Federal Competition and Consumer Protection Commission (FCCPC). With respect to all operations, all companies are subject to experts' opinion under the Corporate Affairs Commission (CAC) and the Federal Inland Revenue Services (FIRS) for taxations. Any failure by merging companies to hold meetings before the transaction is completed attracts the sanction of the Federal High Court. Additional laws may apply, depending on the industry in which the merging companies operate.

In several sectors, Acts have been passed. For example, the Insurance Act of 2003 and the Electric Power Sector Reform Act of 2005 were enacted to control operations in these sectors accordingly. Electricity, broadcasting, insurance, banking, oil and gas and telecommunications businesses all have industry-specific legislations and applicable regulatory authorities. The FCCPC

rules define mergers in Nigeria by three thresholds, namely those below 250 million Naira, those between 250 million and five billion Naira, and those above five billion Naira. These thresholds are determined either by the separate value of assets/turnover or the combined assets and turnover of the merging companies.

1.1.9 Regulators of Mergers and Acquisitions (M&As) in Nigeria

Nigeria's M&A activities, like other countries with a sound financial system, must be directed with guiding principles, recommended procedures, and statutory bodies' regulations to ensure that all M&As take place in an informed, competitive, and efficient market. As in the United States and Europe, all M&A activities must adhere to SEC requirements. In Nigeria, before May 2019, the SEC was the main supervising and regulatory body for all M&A activities, but effective May 2019, the federal government ruled that the SEC's role be taken over by the FCCPC. Consequently, the FCCPC now reviews, monitors, and approves all M&As in Nigeria.

1.2 The Current Situation of Mergers and Acquisitions (M&As) Process in Nigeria

The procedure of M&As in Nigeria, shown in Figure 1.1, begins with the issuance of letters of consent by the participating companies as a notification to the CAC for review. A no-objection letter, endorsed by the notary public, must

be obtained before an M&A transaction and the CAC must be duly notified before the transaction is validated. The regulation implies that an acquisition is the taking over of at least 60 percent and above of the shares of the target company. This means that any transaction involving a lower share may not follow the strict requirements of the deal.

The buyer is expected to put in a letter of interest in the transaction with the regulatory authority. This is regardless of whether the acquiring company is a corporate body or a single organization. This communication of intent must be sent through a licensed capital market operator, with the attachment of the following itemized documents: Comprehensive information of the company's memorandum with background information about the offer, the offer itself, the acquiring entity and the target, and the consequence of the intending takeover. The board's resolution of the interested company, acceptance of the transaction, and due certification by the company secretary and director is also among the required documents. Other papers include most recent certified copies of the article of memorandum and article of association of both the acquirer and target, duly endorsed by a secretary and director. A comprehensive legal issues and entitlements summary of the acquired company must be submitted as well, along with a no-difference letter from the concerned organization and the appointment letters of the financial advisors of the transaction. The record of the company having the CAC forms, which indicates the directors' information on both companies involved in the transaction, and the directors of both the acquirer and target companies' consent letter from a notary public, are also required.

In addition to the above, the two enterprises involved in the transaction, the financial services agreement and their various financial experts, and all pertinent share purchase agreements executed between the acquirer and target are provided along with confirmation of payment of a 50,000 Naira application fee. A handling fee in place of the amount involved in the transaction is required, with the yearly reports and financial statements of the two companies for five years or three years for individual companies and those that have operated for less than five years.

The source of financing to carry out the required transaction must be confirmed by the enclosed documents along with information on the assets of the company. The settlement of the merger must be made public and should appear in two national dailies. It has to specify the number of paid-up ordinary shares in the intended acquired company. This should specify the percentage and the total number of shares as well as the unit price of the shares. In addition to this is the provision of detailed information about those that have acquired the shares, with potential strategies for the future in the target company. The two nationwide daily news advertisements are evidence of fairness and openness in the transaction.

Furthermore, comprehensive facts about the merged companies must be placed with the regulatory body post-transaction, including the number of stocks involved, a no-disparity letter of business, concern payment, acquisition contract, and provision for disbursement of out-of-job privileges of personnel that may not be retained following the acquisition. The SEC has to carry out a

post-transaction assessment in three months upon the application submission to

strictly monitor the agreement of the enterprise (Sodipo & Okonkwo, 2011).

Figure 1.1: M&A Process in Nigeria
Source: Developed for this study

M&As are seen as major forces of progress that are moving fast because

of rivalry, new product demands, developing markets, consumers, and

technology improvements (Awan, AliShah, & Hassan, 2016). Gupta (2012)

remarked that companies can not only grow internally to the top of the league

but can also merge to grow externally, which is made possible by M&A

transactions. More explanations such as faster growth and synergy are put

forward for most M&As. However, Gaughan (2012) opined that internal growth

might be slow under an M&A deal, making it an unacceptable alternative,

especially when the company has an opportunity to operate in the short term.

Irrespective of a firm's own uncertainties, growth through M&A is faster. Gaughan (2012) added that it lowers the risk process and provides companies with the alternative of growing within their own industry and expanding outside their business category. Furthermore, managers of corporate companies are usually under pressure to confirm growth as the mergers are supposed to increase shareholders' prosperity and success with horizontal M&As. Mergers with vertical operations also lead to higher market share. There are other financial advantages as well, including effective administration and fiscal benefits, which are both a stimulus for the agreement and synergy. According to Gaughan (2012), synergy can be produced as operational synergy and economic/financial synergy. Operating synergy includes increasing revenues and reducing costs while financial synergy is increasing effectiveness and economic activity. More so, financial synergy refers to the likelihood that the cost of capital may be lowered by the merging of one or more companies.

As an external growth strategy, M&As have increasingly become a predominant feature of global business growth strategies. It is an all-embracing occurrence globally as a natural process of business restructuring (Han, Nanda, & Silveri, 2016). The executives of merging companies mostly engage in an M&A activity because of continuous pressure from shareholders for consistent improvement in expected investment results (Elliason, 2011). Evidence of M&As' worldwide activities in Figure 1.2 attests to the growing global phenomenon of M&As.

Figure 1.2: M&A Worldwide Transaction Activities
Source: Institute of Mergers, Acquisitions and Alliance (IMAA, 2020)

Figure 1.2 shows that the global integration of M&As covers all sectors. So, whether it is evenly spread across financial (involuntary) and non-financial (voluntary) sectors cannot be established. Golubov, Petmezas, and Travlos (2012) stated that M&A activities come in different waves, where the peak wave of 2007 witnessed a significant increase in corporate spending. More than USD$4 trillion or 7.5 percent of the world's gross domestic product (GDP) was invested in M&As. IMAA (2019) reported that by 2018, the value of global M&As exceeded USD $3900 billion and the number of transactions was higher than 50,000. There is a consistent increase in the volume and value of M&As worldwide from 1985 to 2019 (refer to Figure 1.2). This suggests that M&A activities are rising steadily and that the wave is anticipated to grow further.

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Despite this growing trend, the literature (Chen, Kao, & Lin, 2011; Moeller, Schliemann, & Stulz, 2005b), shows that the return on investment for bidder companies is low, close to zero, and mostly negative. Brown, Chappel, da Silva Rosa, and Walter (2006) argued that most M&A transactions are in non-listed target companies and that acquirers of these companies obtain significant positive abnormal returns, contrary to bidders of listed targets who receive negative returns on investment.

M&As are considered as having the potential to achieve synergies by creating new growth opportunities, capabilities, resources, products, and markets, if properly consummated (Sudarsanam, 2010). Thus, firm management in many economies frequently require synergistic improvements from an M&A deal to increase the prosperity of the shareholders of merging companies. The creation of the anticipated synergy is predominantly in the horizontal acquisition of rivals (Gupta, 2012). This could be a result of improved production efficiency, the elimination of overlapping facilities, the realization of economies of scale, and the exploitation of market power. M&As involving bigger companies seek to increase their concentration in the corresponding industry, as it would show considerable market power in the larger company that could meaningfully hinder strong competition. In developing nations, M&As help their economies grow and develop quickly (Khanal, Mishra, & Mottaleb, 2015).

1.2.1 Relevance of M&A Activities in Nigeria

Between 1995 and 2016, the SEC recorded 270 M&A activities which involved both the financial and non-financial sectors. On the other hand, from

2017 to 2020 there were only involuntary M&A transactions. None were NHV M&As, even though they have been in existence and increasing in volume and value since the 1990s. Out of the 270 M&A activities, involuntary bidder and target companies numbered 240 each, based on differences between bidder and target companies' in terms of involuntary activity, unlisted numbers on the stock exchange, and incomplete accounting records. In addition, maintaining a separate accounting record at least three years before and after the M&A transaction, excluding the year of the merger, was the criteria for being included in the sample of NHV businesses in the NSE. The 30 non-merging companies' selection criteria were being in the same related business, having similar years of establishment with market capitalizations (Song, Alli, & Pillay 2005b; Guo, Lin, & Song, 2008), and being one of the 170 listed companies on the NSE.

M&As are implemented in developing countries as a means of combining resources and strengths to optimally create revenues and ensure survival, profitable growth, financial rationalization, and economies of scale. Nigeria is no exception to countries that have adopted M&As. The official records in Nigeria indicate that no significant M&A activities took place before 1982. The only effort at mergers worthy of note was between United Insurance Company Limited and United Life Insurance Company Limited and was not completed. The SEC was established and started its operations in 1982, which then shaped the commencement of controlled business combinations in Nigeria. The SEC supervised 13 mergers between 1982 and 1988 (Omoye & Aniefor, 2016). Since then, the understanding of M&As has continued to grow with different legislations and acts passed to control M&As. Official statistics reveal

that from 1988 onwards, there has been a series of M&As transaction activities

in Nigeria as captured in Figure 1.3 (IMAA, 2020).

Figure 1.3: M&A Transaction Activities in Nigeria
Source: Institute of Mergers, Acquisitions and Alliance (IMAA, 2020)

Nigeria's M&A transaction activities are consistent with the global M&A

trend, wherein from around three M&As in 1989 with insignificant value, M&As

increased to about 50 at a value of USD$2 billion in 2018. About 50 activities

were worth USD$1 billion by 2019. A closer look at Nigeria's M&A activities

from 2004 to 2019 revealed that most of the undertakings were in the involuntary

sectors rather than in the voluntary sectors. On the other hand, global M&As grew

in different sectors but cannot be said to be evenly spread between involuntary or

voluntary sectors. In Nigeria, the voluntary sectors' M&As could be described as

being evenly spread within the period while both voluntary and involuntary M&A

activities increased in volume and values within these periods, consistent with the

world's growing M&A trend. Thus, there exists a discrepancy in terms of the balance between voluntary and involuntary M&A activities worldwide.

The FCCPC's official M&A activity record supports the mostly involuntary M&As in Nigeria from 2017 to 2020, as there was no voluntary horizontal integration during this time. On the other hand, external environmental effects and other economic shocks, such as inflation differences from country to country, likely caused Nigeria's M&A to vary from global M&A activities in terms of volume and value volatility. This observed discrepancy within the period raises important research issues. In the M&A literatures, Chen, Kao, and Lin (2011) and Moeller, Schlinemann, and Stulz (2005b) reported low, almost zero, and mostly negative returns on investment to bidder companies undergoing M&A activities, on the one hand. On the other hand, the NSE (2017) reported that 49 percent of voluntary and involuntary listed companies' do not render returns on investment five years or more for investors. This raises serious practical concerns about these companies' empirical performance issues. Furthermore, considering the uneven distribution of voluntary and involuntary horizontal M&As in Nigeria, this study was motivated to examine the operating performance, technical efficiency, cost efficiency and productivity efficiency of the long-term performance of NHV M&As in Nigeria.

By considering companies' before and after M&A performance from 1991 to 2020, this study can gain better empirical results and a deeper understanding of the phenomenon. It can also identify if Nigeria's M&As companies' performance is similar to the trend of low, zero, or negative returns on investment reported in the literature. This concern further inspired the

direction of the study to consider interval and industry analysis within the period, even though it was not the main objective of the study. Both are of interest to reveal the empirical performance differences, if any, within these intervals and according to industry.

Concerns exist as to whether M&As are the most appropriate growth strategy in terms of its potential in generating expected gains. M&As in Nigeria have been an ongoing process as a result of economic judgements justified by market forces. This has been reinforced and stimulated by both governments as well as the controlling authorities like the Central Bank of Nigeria (CBN), the Nigerian Capital Market (NCM), and the National Insurance Commission (NAICOM).

Conglomerate M&As occurred between 1993 and 1994 while an astonishing wave of M&As in the involuntary financial sector took place from 1995 to 2009. These were because of controlling directives issued by the CBN to reinforce the capital base of Nigerian banks. The Nigerian capital market's M&As occurred in the last quarter of 2013, following new capitalization prerequisites announced by the SEC for Capital Market Operators (CMOs). Likewise, the year 2007 heralded the insurance sector wave when NAICOM gave out a ruling for re-capitalization in the sector.

M&As in Nigeria comprise either purchase of the possessions and obligations of another entity or the purchase of stocks in an existing Nigerian company. With 2002 came the unification between Agip Nigeria PLC and Unipetrol PLC that gave rise to the body known as Onado PLC. The most

outstanding M&A activities in Nigeria were undeniably the 2005 unifications that took place in the banking sector. These mergers were motivated by the CBN's 2004 ruling that all Nigerian banks raise their shareholders' fund for a minimum of 25 billion Naira from the previous two billion Naira. The terminating date for this increase was December 31, 2005. Limited Nigerian banks had this new low capital base; as a result, numerous M&As occurred, with only 25 out of 89 banks surviving the situation and remaining operational after 2005. A number of other unresolved research issues discussed in the following section bring about the justification for the empirical examination in Nigeria.

1.3 Problem Statement

The assessment of companies' performances after M&As, whether successful or not, needs to be considered and evaluated based on the shareholders' time-value of money and risk of investment. This brings to fore the significance of the cost of equity, present in the residual income value of the shareholder's fund, as an important variable applied in a company's post-merger evaluation. This is because investors could have invested in the Treasury bill, a risk-free investment at a lower rate of return plus the risk premium, according to the Capital Asset Pricing Model (CAPM). In a study applying the RIV method, Uzik (2017) stated that conventional financial statements reflect a return on investment without determining whether the returns are sufficient to meet the cost of equity. However, "the concept of time value of money is utilized in making decisions regarding investment in different projects where multiple

options for cash outlays and cash inflows are available" (Shrotriya, 2019). The multiple options for cash outlays refer to the costs associated with an investment. These include cost of debt and cost of equity, the latter of which is considered by the RIV model. Thus, the time value of money and risk of investment are important considerations in pre and post M&A performance evaluation.

The evaluation method raises another fundamental issue of the merging company's appropriate benchmark, as these merging companies are two separate companies before the merger. On the basis that a merged company is composed of two separate companies, Sudarsanam (2010) emphasized the need for the use of an appropriate external benchmark of non-merging companies in evaluating the effectiveness of M&As. Since non-merging companies are not involved in M&As, it is argued that a merged company should be not only better than a non-merged company but also a determinant of shareholder return. This follows the assumption that companies sharing the same characteristics would produce similar performance, thus yielding same returns to the shareholders. Therefore, non-merging companies are the most suitable external benchmark for bidder companies before and after M&A evaluation.

In Nigeria's M&A context, studies have primarily focused on how M&A operations influence bidder and target businesses' share price performance, primarily in the short-term performance assessment (e.g., Onikoyi & Awolusi, 2014; Omoye & Aniefor, 2016). It does appear that little attention has been paid to the long-term effect of M&As and the non-merging competing companies in Nigeria, particularly among NHV M&As. Short-term performance studies, according to Ramakrishnan (2008), are incapable of determining whether M&As

lead to long-term economic benefits. One such short-term measure used in Nigeria is the accounting-based measure, which has been criticized for three reasons. First, accounting profits represent the narrowest measure of performance as they measure only economic performance of the company; second, accounting measures have been accused of representing only a company's past performance; and third, accounting data fails to evaluate the success of a specific acquisition as it provides aggregated data on the performance of the whole organization (Papadakis & Thanos, 2010)

Furthermore, using an accounting measure for post-M&As performance evaluation involves a short-term economic measure that is characteristically imperfect, as it is affected by the M&A deal's accounting methods (pooling or purchase) as well as the payment method (cash, debt or equity, or a combination of both). Accounting data is thus inappropriate for assessing long-term economic performance. Therefore, findings obtained from such data for a merged company may be incomparable with other companies' over time (Ramakrishnan, 2008).

On the other hand, Peyrache (2013) stated that the realization of the efficiency impact of an M&A activity is not a short-term evaluation, because it takes a longer time for efficiency to be realized. These postulations highlight the importance of NHV M&As research on a long-term basis. Based on these positions, it is argued in the present study that the outcome of a merger can be better determined by investigating NHV M&As over a relatively long period. The M&A literature reveals that studies in Nigeria have focused mostly on the involuntary sector and have found mixed results on returns on investment (e.g.,

Ebimbowei & Sophia, 2011; Achua & Ola, 2013; Aluko & Oyebode, 2014; Eferakeya & Alagba, 2015; Omoye & Aniefor, 2016).

For instance, in the involuntary sector, Onikoyi and Awolusi (2014) found a direct positive impact of M&As on shareholders' wealth. In a related study, Achua and Ola (2013) indicated no significant improvement in all areas of earnings (volatility, profitability, leverage and liquidity) in Nigeria after M&As. Yaghoubi, Yaghoubi, Locke, and Gibb (2016) found that M&As have both positive impacts on the stock price of bidder companies as well as negative impacts on the stock price of target companies. These findings show the inconsistency in empirical outcomes on M&As in Nigeria, thus, supporting the statement of mixed performance results in the literature.

The knowledge gap on inconsistent M&A performance results also underscores the different methods applied in the involuntary evaluation studies, of which little is known. Though NHV M&As have been increasing in volume and value since the 1990s, they seem to have been unnoticed, despite their significant stock trading value that contributes to businesses and the Nigerian economy. Put differently, studies on involuntary M&As that used different methods to derive different findings cannot be generalized to NHVs. Consequently, an investigation into voluntary M&As using different methods and comparisons with non-merging companies is appropriate and important in this era where companies are seamlessly re-strategizing for sustainable and profitable operations.

Concerning past studies, Olusola and Olusola (2012) applied profitability in their operating performance, measured by earnings per share, net

profit, market-adjusted returns of securities, return on capital employed and sales/turnovers in their involuntary M&A study. Again, Achua and Ola (2013), in their involuntary M&As performance study, applied eight financial ratios while Onikoyi and Awolusi (2014) applied exploratory and correlation research designs in their financial M&A performance study in Nigeria.

Elumilade (2010) used a combination of models and financial variables to evaluate M&As efficiencies in his study. Of these efficiency methods, none considered frontier analysis, but only employed accounting ratios. Frontier analysis employs input and output variables in a model, which is an important benefit over the accounting ratios in evaluating before and after M&A efficiency performance in the long-term. In addition, none consider the cost of equity in the model, to justify the time-value of money and risk of investment by investors. Therefore, the present investigation sought to uncover the long-term effect of voluntary M&A activity based on the tenets of frontier analysis, anchored in the belief that the much-desired empirical evidence on the potential of NHV M&As can be achieved.

Furthermore, since the concept of time-value of money is mentioned in M&A studies, using the frontier approach could produce more accurate results that serve as a yardstick for ascertaining that, in NHV M&As, the value of money is a function of the time it is invested. Resolving this puzzle on the time-value of money under voluntary M&As could be crucial because investors always need their returns on investment rate to be above the cost of equity to justify good returns.

Voluntary M&A activities are important for Nigerian companies for a number of reasons. It has been reported that voluntary and involuntary listed companies in the NSE have not disbursed returns to investors for many years (NSE, 2017). This calls for companies to re-strategize for performance improvement. One way could be to consider voluntary M&As, which have been looked upon as a growth strategy for organizations. As studies on the effectiveness of this strategy to drive growth are limited, Nigerian companies opting for the strategy would be at a disadvantaged pace as there is little empirical evidence to support and guide their quest for growth via M&As.

Second, for comparative analysis, studies on voluntary M&A are scarce in the literature compared to those on involuntary M&As. This hinders an adequate understanding of which M&A activity is better for Nigerian companies. Therefore, a study on voluntary M&A performance is also important for Nigerian companies to know if they could do better by inviting regulators to standardize their operations and formulate policies that force them to go into M&As involuntarily, like financial institutions.

Furthermore, voluntary M&A companies are among most capitalized in the NSE compared to non-merger companies. The M&A stock trading activity's value in the NSE justifies another source of voluntary M&As' importance. For example, from January to December 2018, NSE (2018) reported a total non-financial trading value of 318.34 billion Naira. Out of this total value, the NHV M&As' trading value contribution was 282.58 billion Naira.

Involuntary M&As are equally important in Nigeria because of their role in stimulating the economic growth of any nation. This is because the financial sector acts as an intermediary by utilizing funds from surplus sectors and using a percentage, guided by the central bank rules, as loans in deficit sectors. In addition, from the NSE (2018) report, the trading activity from January to December in the financial sector was 448 billion Naira compared to 318 billion in the non-financial sector.

However, financial M&As require special accounting treatment, and as such should be treated separately. Moreover, most M&A research in Nigeria is finance-related, while non-financial studies are scarce despite the sectors' growth. The aforementioned gaps in M&A research, accompanied by the practical issues in Nigeria, have highlighted the urgent need for further research on M&A companies' performance before and after merger activities. Particularly, a comparative study of NHV companies' performance pre- and post-M&A is more important and necessary now.

1.4 Research Questions

Based on the research gaps and practical issues delineated above, the research questions formulated for the research were: -

1. What is the level of operational performance, technical efficiency, cost efficiency, productivity efficiency, and long-term performance of the before and after M&A periods of NHV merging companies?

2. What are the relevant methodologies to appropriately measure each performance aspect of NHV M&A companies?

3. Are there significant differences in the before and after M&A performances of merging companies against an external benchmark of non-merging companies?

1.5 Research Objectives

The main objective of this study was to examine the long-term performance of M&As of NHV companies registered on the NSE. The specific objectives were:

1. To measure the operational performance, technical efficiency, cost efficiency, productivity efficiency, and long-term performance of the before and after M&A periods of 30 NHV merging companies.

2. To apply multiple relevant methodologies to measure performance, namely the RIV for operating performance, the DEA and SFA for efficiency, and the MPI for productivity.

3. To compare the significant differences in the before and after M&A performances of the 30 merging companies against an external benchmark of 30 non-merging companies.

1.6 Significance of the Study

There have been a number of empirical studies on involuntary financial M&As (e.g., Umoren & Olokoyo, 2007; Sodipo & Okonkwo, 2011; Ebimobowei & Sophia, 2011; Achua & Ola, 2013; Aluko & Oyebode, 2014; Eferakeya & Alagba, 2015). These involuntary M&As are a result of government interventions and mandatory orders placed upon these financial institutions to increase their share capital base. However, little is known about market–driven NHV M&As in Nigeria, even though they are increasing in volume and value.

In this study, several elements are done differently compared to past empirical M&A studies. In Nigeria, M&A activities have been conducted mostly on a short-term basis, in the predominant financial sector, and with a focus on returns on investment as performance measures. This is among the first studies on long-term NHV M&As in Nigeria with an emphasis on operating performance, efficiency, and productivity as measures of performance of bidder, target, and non-merging companies.

In terms of methodology, past empirical studies employed methods like accounting ratios, event research, exploratory and correlation research, and profitability to evaluate the performance of financial M&As. In this study, multiple methods were adopted based on more relevant measures of performance in the literature, which are RIV for operating performance, DEA and SFA models for efficiency, and MPI for productivity.

For operating performance, the RIV approach was arrived at after a pilot study analysis with the economic value added (EVA) approach. The EVA is

criticized as it cannot be applied to high inflation rates and has many assumptions. Nigeria had a high inflation rate average of 12.47 percent from 1995 to 2017. This study considers inflation as an important external factor that affects M&A activities, as it takes place over a long period of time. Thus, the RIV was deemed more suitable. For productivity, MIP decomposition method by Färe, Grosskpof, Lindgren, and Roos (1992) and Ray and Delsi (1997) was recommended. The novel use of these techniques are a significance of this study.

Moreover, this study advances the research from the traditional analysis of accounting ratios by investigating before and after M&A information using frontier analysis. Frontier analysis employs inputs and outputs in the model, which is an important benefit over accounting ratios in evaluating before and after M&A performance. Besides, this study offers an empirical comparison of the performance of non-merging companies' competitors against bidder companies by evaluating the competitive effect, which is not recorded in any past Nigeria M&A research.

It can be said that the study's findings would provide future investors, bidder companies, regulators, and other stakeholders with reasonable empirical evidence for sound decision-making. For instance, the findings of this study would benefit future investors in the area of investment decision making. It would also assist prospective investors in making decisions concerning companies that involve in M&As upon knowing their operating performance, technical efficiency, cost efficiency, and productivity efficiency levels, which has not been made available before. With these facts, their expected investment

in a company will be more productive as they can make more informed investment decisions.

For future potential bidder and target companies, the study findings provide management with the right strategies and mechanisms to maximize the gains of M&As while minimizing negative outcomes. This would include decisions on the timing and form of voluntary M&As (that is, to merge or be acquired), with the internal workings needed by the organization. This is possible because the non-merging competitors' performance is compared with the bidder companies as if there was no merger, which an uncommon significance in the literature.

To the regulators in Nigeria, such as the FCCPC, the findings of this study will be of great value in terms of policy formulation and implementation, being part of their oversight functions. Thus, directives and policies can be established based on the results and their implications to guide the practice of voluntary M&As in Nigeria. On a deeper note, regulators would be able to realign existing M&A policy and guidelines with new policy directives that emerge from this study. In other words, policy agencies like FCCPC can use the findings in re-appraising or conducting a total review of M&A guidelines for continuous and stable result-oriented effective M&As. Overall, this study adds to the M&A practice in Nigeria as well the existing body of literature on M&As, particularly NHV M&As, which are not so common.

1.7 Organization of the Study

There are five chapters in this research dissertation. The background of M&As in Nigeria is discussed in the first chapter, along with the problem statement, research objectives and research questions. The significance of the research is also presented in Chapter 1.

Chapter 2 reviews Nigerian M&A experiences, as well as the theoretical and empirical M&A literature. It then presents the study's conceptual framework and hypothesis development.

In Chapter 3, the research methodology is explained in measuring before and after M&A companies' performance between 1991 and 2020. The four (4) measures applied in the study are: operating performance using RIV; technical efficiency and cost efficiency using both the DEA and SFA; and productivity efficiency using the MPI. The data and variables used are also discussed.

Chapter 4 presents the empirical findings and hypothesis testing results. It also interprets the results and reviews if the results support those of past studies.

Chapter 5 is the conclusion of the study, which discusses the overall findings, policy implications, limitations, and suggestions for future studies.

1.8 Chapter Conclusion

This chapter has discussed the background of M&As, including their long-term and short-term performance, non-financial and financial sectors, horizontal and vertical nature, and voluntary and non-voluntary companies. The current situation of M&As in Nigeria were also presented, followed by the problem statement, research objectives, and research questions. It continued to explain the significance and organization of the study. Next, Chapter 2 will discuss the theoretical and empirical reviews of previous research relevant to this study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter presents mergers and acquisitions (M&As) relevant theories such as efficiency theory, agency theory, hubris hypothesis, the related empirical literature reviews of Nigeria's M&As, long-term performance of M&As in operating performance (OP), technical efficiency (TE), cost efficiency (CE), and productivity efficiency (CE), followed by frontier vs non-frontier, methodology literatures, conceptual framework, and conclusion of this chapter. Some literature reviews are on the M&A activities in Nigeria.

2.2 Theoretical Review of Mergers and Acquisitions (M&As)

M&As have three generally accepted theories based on the type of M&A transactions. These theories include efficiency theory (synergy), agency theory (managerial), and the hubris hypothesis. These theories describe three key aims behind M&A activities. Efficiency theory view M&As as value maximizing decisions, while agency and hubris theories view M&As from the perspective of non-value maximization decision. From the viewpoint of value maximization, M&As are motivated by efficiency or synergistic gains. It is expected that both the shareholder of the bidder and target companies should benefit from the M&A activities.

From the viewpoint of non-value maximization agency theory, the management of the bidder companies or managerial motives can drive the M&A activities by value extraction from the bidder companies that are shared with the target companies. The target shareholders are expected to gain positive, while the shareholders of the bidder companies expected a negative gain as a result of management value extraction (Akpan, Aik, Wong, & Peter, 2019). The hubris theory leads the bidder companies' management to overpay target companies probably due to pride, which yielded similar results as explained by the agency theory.

Based on these recognized M&As theories, this study intended to examine the empirically measured variables of operating performance, technical efficiency, cost efficiency, and productivity before and after M&As. According to the efficiency theory, merged companies' value maximization activity is justified.

The gains from M&As to the bidder and target companies according to each theory are presented in Table 2.1.

Table 2.1: Relationship Between Total Gain, Target Gains, and the Bidder Company Gains

Hypothesis	Bidder's Gain	Target's Gain	Total Gains
Efficiency	+(positive)	+(positive)	+(positive)
Agency theory	-(Non-positive)	+(positive)	-(negative)
Hubris theory	-(Non-positive)	(+positive)	0 (zero)

Source: Kamarudin (2011)

The gains stated in Table 2.1 are from economies of scale, cost reduction, including the cost of production, borrowing, and research and development (R&D). In summary, the economies of scale can be achieved at various stages: (a) the organizational level, where rationalization is applied in eliminating redundant position in the organization, and (b) when the personnel management is centralized (Aggoud & Bourgeois, 2012). In the subsequent phases, M&A results are in a more direct or unique distribution path, which could reflect a geographic region where M&A deal was not examined. Another source of financial or economic synergy after M&A activity is the reduction in borrowing costs (Cameron & Green, 2015). The subsequent section presents the discussion of all the theories and their basic tenets as presented in Table 2.2.

Table 2.2: The Mergers and Acquisitions Theories

Theories of M&A	Basic tenets
	Differential managerial efficiency
	Inefficient management
Efficiency theory	Synergies: operating & financial
	Diversification motive
	Informational and signaling
Agency theory	Managerialism
	Free cash flow hypothesis
Hubris theory	None

Source: Jaaman (2007)

From another theoretical point of view, Letaifa (2017) noted that merger takes place in distinct waves. The theories are neoclassical in nature, where companies in specific industries respond to economics vibrations, such as substitute products and services and the advent of new technologies or deregulation. In addition, market estimates cause merger waves. In other words, a company's estimates differ from market/economic fundamental activities with stock market performance through the overvaluation theory. Besides that, company executives utilize the overvalued stock as money to buy properties of undervalued or less valued businesses. According to Letaifa (2017), the correlation of merger acquisitions will occur in the period of bubbles. This is the reason that some M&A and performance studies use stock market indices to measure company performance to gauge the effect of M&A activities.

2.2.1 Efficiency Theory

Efficiency theory explains that in any M&A deal on competence or synergy, both the target and acquiring shareholders are assumed to benefit positively from the expected performance improvement after the activity. In this case, there is a positive long-term difference among target gain, bidder gain, and total gain. In a related efficiency study, Jaaman (2007) indicated that efficiency theory could be categorized into six parts: diversification, data and signaling, synergies of operations, financial or economic synergies, inadequacy management, and leadership effectiveness differentials. DeLong (2003) stated that companies should be purchased if they are not successful in providing the acquirer and the acquired shareholders with efficiency advantages. Besides,

buyers who are skilled and have more objectives would have a greater opportunity to refine their effectiveness in terms of better-quality effectiveness theory. The higher the difference in skill ratios, the higher the abnormal income for the merged companies.

In their empirical research, Nguyen and Ollinger (2006) stated that synergistic merger and disciplinary merger are two theories of effectiveness. Disciplinary mergers demand that a merger involves disciplined managers of target companies to pursue targets besides maximizing profit and the prosperity of shareholders. Meanwhile, synergistic mergers emphasize bidders to target excellent companies in improving their effectiveness.

Gaughan (2012) noted that M&A costs could be reduced by economies of scale that can be accomplished by a decrease in unit costs. In the same line of argument, procurement can improve effectiveness by reducing transaction costs. Nguyen, Yung, and Sun (2012) indicated that M&A activity synergy is driven by enhanced market power, economy of scale, or financial synergies in the value-enhancing strategy to market effectively. Besides that, Al-Khasawneh (2013) suggested that an effective basis of assessment following an M&A deal is a better way to evaluate improvements in price, benefit, and other performance analysis during the M&As era.

In investigating mergers, acquisitions, and bank effectiveness, Du and Sim (2015) used the panel data methodology in six emerging economies. The findings revealed that after M&As, target banks were more effective. The outcome also indicated that M&As could lead to efficiency improvements for

the merged organizations in developing nations. However, Yao and Zhou (2015) noted that exogenous items could drive the economy from 'no merger state' into the 'merger feasible state', which can counteract the shock. In addition, companies are looking for syndication partners to make the best use of value; thus, the probability of mergers is determined by the cost of the search and the appropriate partner. When a suitable merger is established, improvements in the division between partners are determined by negotiating power, and the economy may revert to 'no merger state'.

A study on the theory of efficiency by Leepsa and Mishra (2016) opined that limited company resources can be efficiently used to achieve a more profitable company. In another opinion about the theory, Huang, Chiang, and Chao (2017) stated that efficiency advancement can be achieved by merging, which is the main reason for M&As.

2.2.1.1 Differential (Managerial) Efficiency Theory

In the management synergy or also known as differential efficiency theory, Wang and Xie (2008) affirmed that the combination of a manager's uneven management capacity team would produce different efficiency benefits. In this regard, Chernykh (2013) examined the business model and viability of small business banks that merge in emerging markets. Using a sample of 141 Russian banks with an asset value of less than 10 million dollars, the results showed that, on average, small banks are low-risk financial intermediaries with easy transactions and substantially greater local market survival rates, but bad

economic and banking features. The results also showed that small banks are surprisingly exposed to regulatory capital shock by obtaining a fresh injection of capital, followed by a double increase of asset size.This outcome contributed to the literature on the connection between small banking business models, local banking marking, and long-term sustainability, besides supporting the hypothesis of difference in efficiency.

For the hypothesis of difference effectiveness, Moatti, Ren, Anand, and Dussauge (2015) indicated that companies that are more effective would gain lower effectiveness and benefit from further improvement of effectiveness. The study showed positive, beneficial relationships between strict procedural combinations and higher outcomes. More efficient and competent organizations could manage synergy for inefficient goals to improve their skills and efficiency.

2.2.1.2 Inefficient Management Proposition

The inefficient leadership thesis is comparable to the theory of corporate control, whereby incompetent executives who are driven by values are generally discontinued during takeovers. However, Butler, Perryman, and Ranft (2012) stated that target leaders are valuable resources, but retaining them could reduce M&As performance. Krug Wright and Kroll (2014) argued that retaining managers, especially those of higher durability can lead to higher post-acquisition performance based on the resource theory. In relation to this argument, Guerras, Navas, and Sáez (2015) stated that merging is a practice for eliminating incompetent leadership that prevents efficiency gains. In this regard,

external businesses regulate the company and enhance efficiency if the control management of target businesses does not provide the solution to replace incompetent managers (Zhang, Li, Shanghai, & Broumi, 2017). The adoption of the objective is motivated by the reality that bidders can manage the resources and profits of the inefficient target.

2.2.1.3 Synergies

Though merging companies work together, true synergies can only create value for shareholders that earn higher returns from merging rather than by their individual investments or earnings (Bruner, 2004). Bruner (2004) added that synergy measurement is the toughest and most suitable parameter. The benefit for the fusion companies can be either enhanced profit (improving income) or decreased costs. Improvements in income may occur when the company has an extended product line after M&As, while the costs are reduced by removing duplicate costs for the fused company. The synergy impact is accomplished by making the combined company more effective than what two companies could accomplished separately (Girija, 2004).

Christofferson, McNish, and Sias (2004) stated that the M&As synergy estimate is often difficult. This is because many businesses overestimate and underestimate synergies in an acquisition. The use of experienced external advisers like investment bankers, valuation experts, and insurance or employee benefits is recommended at different stages of the transaction (Sherma & Hart, 2006). Lovallo, Viguerie, Uhlaner, and Horn (2007) remarked that using a

reference class before the M&A transaction in estimating synergies can reduce the unevenness in overestimation. However, a human resource expert is significant in the evaluation of the organizational and cultural fits for the two companies (Harding & Rouse, 2007).

Erasmus (2008) remarked that the calculation of operating profit considered the cost of capital in determining whether it created value if the return results exceeded the capital cost of the shareholder value. Besides that, the expected synergistic gains are necessary since they can be achieved and improved when due diligence and systematic approach is applied before, during, and after the M&A deal.

Current studies cannot offer unquestionable assistance to the fact that the anticipated economies of scale and scope in the fusion of companies could be achieved through the M&A transaction in generating value for the owners of the combined companies. For instance, Martynova and Renneboog (2008) noted that target companies generally receive M&A benefits, and the acquisition companies significantly decrease in benefits after the transaction in the long term. This finding suggested that the anticipated synergistic benefits after M&A deals for the acquiring companies are on average non-existent or exaggerated.

Therefore, there is a need for the investigation of the fundamental value of these companies after M&A transactions. When there is a positive fundamental value creation after M&As, net value is generated in the economy, which is beneficial to the shareholders and executives of the merging companies, as well as the country as a whole.

The statement that the total is larger than the amount of two autonomous working components is affirmative. In other words, the worth of the combined company (P_{cb}) should be higher than the sum values of the bidder (P_{bd}) and the target company (P_{tg}) operating independently for the occurrence of synergies (Kishore, 2009); thus, (P_{cb}) > (P_{bd}) + (P_{tg}). The value of M&A synergy is only meaningful when it surpasses the cost incurred in creating the synergy. Furthermore, M&A synergy recommends that the agreement should only take place if the financial progress of the expansion is accumulated for the owners of the acquired companies.

In a different take on M&As, Cameron and Green (2015) noted that growth and synergies can lead to the purchase of trademarks, techniques, new customers, new equipment, and skilled staff as the primary purposes of most mergers. When two companies merge, their combined synergies may make the resulting entity more successful and efficient than two separate units; thus, bringing about the purpose of merging, which can be for the growth in sales by new products or services in the market. As the main reasons for M&A transactions, synergistic gains and maximization of shareholder earnings were applied.

Sudarsanam (2010) indicated that it is adequate for M&A value to be created concurrently with the development of value. In addition, the presence of anticipated synergy makes it possible to make a favorable net purchase value for the merging businesses. Synergies are the prevalent goals of acquisition as the significant means of improving or strengthening the value of merging

companies. Synergy can be split into the operational and economic synergies of two organizations.

Faulkner, Teerikangas, and Joseph (2012) described M&A activities as a process of consolidation that begins with the determination of acquisition purposes and objectives. It then moves to methodological search and screening, monetary assessment, dialogue, tactical evaluation, purchase, and lastly, deal integration. Due to the significance of these stages, issues relating to team combination, procedure leader, integration manager, human resource function, and external assets need to be properly addressed as a systematic on-going process. This implies that the acquisitions team should include people with different training and expertise in processing and negotiations, valuing, business issues, human resource matters, integration planning, implementation, and security relating to post-transactions. The group front-runner has to harmonize the analytical challenges holistically with good facts that flow for other members. It is necessary to know the reason for deal, being dedicated to it, and being capable of using the abilities and knowledge of other team members to achieve the synergy.

In M&As, the development of value is one of the major problems in the transactions with target companies. This is mainly due to the notion of $1 + 1 = 3$ synergy (Golubov, Petmezas, & Travlos, 2012). On the other hand, Golubo et al. (2012) defined synergy benefits as the difference between the value of the combined company and the two stand-alone values of companies (bidder and target). Hence, there is the need to investigate the establishment of true advantages for long-term shareholders of companies engaged in M&A transactions. Meanwhile, Godbole (2013) remarked that there are five main

types of synergies, namely manufacturing synergy, marketing synergy, financial synergy, tax synergy, and operations synergy. Manufacturing synergy combines the core competencies of the bidder and target companies in manufacturing, design and development, technology, and procurement.

Marketing synergy is linked to the distribution channels or media in pushing the products and brands of the target and bidder companies at a lower cost than the total that would incur independently. Tax synergy combines the loss-making company with the profit-making company so that the profit-making companies can benefit by writing off the accrued losses of the loss-making company. Financial synergy is the combination of bidder and target balance sheets to achieve either reduction in the cost of capital, such as weighted average cost of capital (WACC) or better gearing ratios. Lastly, operating synergy involves rationalizing the combined operations by sharing the facilities, such as software, accounts and finance, human resource, and administration.

Aamir, Kousser, and Chaudhary (2014) reported positive yet abnormal stock price returns in the pursuit of companies' strategic motives days before and after an M&A deal announcement date. This signifies that the M&A transaction is a possible indication of value creation. Synergy through M&As is attractive when well-consummated because it creates additional value to the merging companies through successful integration. Most of the time, however, it is difficult to realize. The literature shows that the returns for the bidder company are low, close to zero, or mostly negative (Chen, Kao, & Lin, 2011; Martynova & Renneboog, 2008; Moeller, Schliermann, & Stulz, 2005b). Many reasons have been put forward for these negative outcomes, among which are self-confidence

of the hubris hypothesis and self-interest of agency motives, which imply that the acquiring companies do not generate synergy after an M&A transaction.

Dutordoir, Roosenboom, and Vasconcelos (2014) mentioned that synergy disclosure can obtain a more favorable market reception for deals that would otherwise induce highly negative bidder announcement returns. Furthermore, there were no accurate data on the accessible value of synergy tender management and the shareholder litigation risk as the primary deterrents of disclosure of synergy values. Jansen, Sanning, and Stuart (2015) argued that purchases from smaller companies yield more synergies than bigger companies, and the effect on the size is stronger for the former. Similarly, Rao, Yu, and Umashankar (2015) discovered that expected sub-industry synergies could not be achieved. They also indicated that technical expertise and comparable domestic culture have a good impact on innovation following the merging.

Synergistic impacts may manifest themselves after long-term transactions in the bidder companies' operational results, effectiveness, or productivity (Aik, Hassan, Hassan, & Mohamed, 2015a). Some synergistic gain factors arising from M&As are often debated as the main motive for any benefit after the transaction from eliminating inefficiencies, economies of scale and scope, and accounting effects. The acquiring companies' synergy produce advantages through improvement in operating efficiency because of the economies of scope or scale. In addition, M&As that create synergy could cause shareholders to respond positively to the transaction because they could not achieve this through portfolio diversification.

According to Cortes, Agudelo, and Mongrut (2017), the integration manager increases the likelihood of more efficiency in the integration stage as this stage is an essential part of the whole transaction in managing the new business. Letaifa (2017) viewed synergies as competitiveness expansions that lead to money flow above the level of individual achievement of two companies. The idea of synergy is to create benefit after M&As by sharing resources and profit that would be at a high price if not attained or made possible. The net benefits following M&As are the net benefits derived from the post-transaction synergy impact. The author also categorized synergy into costs, income, finances, and markets that generate benefits after M&As for the merging companies and stated that synergies are overlapping because they are not entirely autonomous. It is suggested that more overlap between synergies would lead to increased synergies in the merging companies.

Chalencon, Colovic, Lamotte, and Mayrhofer (2017) explained a good evaluation can reduce overestimation via the due diligence process, which involves carefully distinguishing the different types of synergies, estimating their potential value and the probability of realization, and assessing the speed at which synergies can be realized to define the investment needed. They further explained that it is necessary to think about synergies as a series of concentric circles, whereby those that lie close to the center tend to be cost saving and can quickly be realized. In contrast, those outside the circle are revenue-generating synergies, requiring more time and management but less likely to be realized and succeed.

2.2.1.3.1 Operating Synergies

Operating synergy has two types, namely improving revenues and reduced costs (Gaughan, 2012). He further said that both horizontal and vertical fusions would improve the revenues and effectiveness. The anticipated synergies enable the merging companies to pay the premium price of the target company and the costs of the fusion agreements. Financial synergy involves the probability that the combination of mergers will reduce the costs of debt and equity.

The synergies of price decrease can be achieved compared to income improvements. Due to mergers through cross-marketing, enhancement may be possible for revenues, while cost savings may result in cost reductions (Gaughan, 2012). Damodaran (2012) remarked that operating synergies of post-merger allow the companies to increase their operating earnings and growth by the cost savings obtained from the economies of scale. The four types of operating synergies by Damodaran (2012) are as follows: (a) the economies of scale that permits the combined companies to become more cost-efficient and profitable; (b) the higher pricing power resulting in higher margins and operating income arising from competition reduction with an increase in market share; (c) the functional synergy by the combined companies with different functional strengths; and (d) the higher growth combinations of the two companies in a new or existing market that gain improved marketing and increase operating earnings. Mooney and Shim (2015) stated that operational synergies are economies of scale; before a merger, businesses that have not achieved their potential for economies of scale have been working at specific rates of activity.

2.2.1.3.2 Financial Synergies

It is argued that financial markets have unequal data for the theory of financial synergy. A company that has little or no financial support may not take all precious investment choices or explore all accessible investment possibilities. In addition, a company with equal or unequal information faces little financial difficulty in selecting investment options that can only be established off the records. Financial synergy can reduce both debt and equity costs by combining the companies. Furthermore, acquirers often make unrealistic assumptions relating to the period of realizing these synergies (Christofferson, McNish, & Sias, 2004).

In contrast, Cummins and Xie (2008) discussed the possibility of merging poor and weak businesses in the financial markets by improving information inequality and creating financial synergies. The prediction of this hypothesis implies that companies with less cash flow that have better venture openings will be involved in an M&A transaction as either acquirers or targets.

Faulkner, Teerikangas, and Joseph (2012) opined that when estimating and quantifying synergies, it is necessary and useful to divide them into two groups: cost and revenue synergies. Furthermore, cost synergies are divided into six groups based on their sources, namely research and development, manufacturing, procurement, marketing and sales, administration, and distribution. They stated that revenue synergies involved acquiring a specific technology or product. Furthermore, synergies would come from one or more sources: (a) increasing each product's peak sales, getting the increased peak sales faster, and extending each product's life; and (b) adding new products or features that could not be developed if the merging company is separated.

Meanwhile, Damodaran (2012) presented the potential for financial synergy as either less equity and debt costs or more cash flows in two ways: (a) a merger can borrow more from stable incomes and negotiate a better rate for required funds; and (b) a merger company uses the tax advantage to generate more revenue. In India, Aruna and Nirmala (2013) researched the pre- and post-M&A financial performance of selected information technology (IT) companies using distinct profitability ratios. The results of the acquiring companies after M&As showed no significant improvement.

Aruna and Nirmala (2013) also mentioned that when the benefits exceed the costs incurred in creating synergy through M&As, the synergy value is created in the real sense. The synergies' intentions behind an M&A activity imply that mergers should be performed only for financial benefits, and only when the shareholders of an acquisition company gain from these benefits. The expected synergy in M&A deal is not an easy task; so, the challenge of evaluating M&As on the value and performance of the company, which is often found to be a negative in the literature, is enormous (Khan, Kayani, & Javid, 2011).

In Malaysia, Aik, Hassan, and Mohamed (2015a) examined horizontal mergers and acquisitions using economic value added (EVA) and stochastic frontier analysis (SFA). The result showed that bidder companies had no significant improvement in the financial and operating efficiency in the long term. This indicates that long-term horizontal mergers and acquisitions in Malaysia are driven by motives besides synergistic benefits.

In a related study, Pandit and Srivastava (2016) stated that most knowledgeable acquirers sometimes do not evaluate implementation costs, leading to the realization of these synergies. Some synergies may be negative, arising from a potential disagreement between the components of the merging companies. Finally, they posited that revenue synergies could also come from higher prices due to competition reduction.

Vieira, Brito, and Santana (2017) investigated whether there were differences in the liquidity, lucrativeness, and leverage ratios of Brazilian publicly operated companies that underwent M&As between 2010 and 2014. The M&A processes were considered an instrument for corporate reorganization to obtain operational and financial synergies. The study examined the financial reports of four quarters *ex-ante* and *ex-post* of the buying and resulting companies for 23 M&As. Data were treated under qualitative (Fleuriet and DuPont models) and numerical (Test de Wilcoxon) approaches.

The financial ratios were working capital need, cash balance, and return on equity. Return on equity was categorized into profit margin, asset turnover, and leverage. The result revealed that in a short term, there was a deterioration of liquidity due to an increase in working capital that offered statistically significant differences. For profitability and leverage, the statistically significant variance was not established. In addition, the decline occurred after the M&A transaction. Furthermore, the financial situation and profitability can be restored in the succeeding times if the operational and financial synergies are attained.

2.2.1.4 Diversification Motive

The simple knowledge in diversification reduces the joint risk and disaster rates by combining two companies. If the companies' cash flow is not fully linked, an impact called coinsurance effect will be achieved. The merger will improve the value for partners, who have a different income mix price structure (Delong, 2003). In relation to this, Rizvi (2008) remarked that mergers and acquisitions are what the top 100 of the fortune 500 dealt with in 2007. It was implemented as tactical growth by Vodafone, Mittal steel, Wal-Mart Stores, Exxon Mobil, ING Group, Royal Dutch Shell, Barclays, AT&T, and Procter and Gamble. On the other hand, Kim and Finkelstein (2009) examined the impact of the strategic market complementary on the acquisition performance of U.S. commercial banking. Overall, the results supported the idea that complementary aspects were an important indication for the acquisition performance with a related horizontal acquisition.

Using data from 2006 to 2008, Arvantis and Stucki (2015) examined the performing impacts of M&As in small and average Swiss small and medium-sized enterprises. The outcome showed a favorable significant impact on the performance of small and medium M&As for the three out of five key factors used to support M&As advantages. In the United States, Koerniadi, Krishnamurti, and Rad (2015) examined the effect of transnational M&As on the bidders' avoidance risk after a merger using 375 U.S. buying companies' data from 1997 to 2011. Their results revealed that M&A transactions reduced the danger of default in buying enterprises after adapting to the geographical, cultural, and institutional variations among U.S and target companies' countries. They also found that in discontinuing the post-merger default, geographic

distance and industry links play an important role, while executives use mergers to handle their companies' large risk.

2.2.1.5 Information and the Signaling

A study by Coakley and Iliopoulou (2006) found that a bigger company's participation in the merger revealed no inner development or project opportunity on the market. Consequently, a non-positive return to companies of purchasers may be seen in the agreement, regardless of whether the transactions benefit the shareholders. Table 2.3 summarizes the theories on effectiveness (inefficient management, working synergy, management effectiveness differentials, economic synergy, data and signs, and diversification motives) and its fundamental descriptions.

Table 2.3: Tenets of Efficiency Theory and the Descriptions

Tenets of Efficiency Theory	Descriptions
Operational synergy	This efficiency enables merged companies to profit from efficient operation (high-income) or economies of scale or both activities (Akhavein, Berger, & Humphrey, 1997).
Financial synergy	The amalgamation of companies with enormous opportunities, but without free money flow, with companies with free money flow and few channels of investment (Weston, Chung, & Houg, 1990).
Informational & signaling	In revealing the company's general performance, single information and signal is helpful (Gopalaswamy, Acharya, & Malik, 2008).
Diversification motive	The reduction in risk stabilizes the bidder's returns by purchasing another profitable and more efficient company (Chandler, 1977).
Differential managerial efficiency	Unequal leadership and efficiency-enhancing capacities are combined (Weston, Siu, & Johnson, 2001).
Inefficient management	Replacing ineffective managers of the target company with effective executives of the offering company following the M&A (Copeland & Weston, 1988).

Source: Kamarudin (2011)

Table 2.3 provides a benchmark in which efficiency or M&As can be assessed by providing the researcher both empirical and theoretical evidence to support or refute findings. A study by Jaaman (2007) stated that the information signaling data of M&A may include share buy-backs in various respects. Therefore, allowing the management to maintain a big share quantity shows that the share is undervalued, implying the company's prospects and growth in the future. Horja and Vancea (2016) revealed that the signaling hypothesis suggested

that strategic transactions such as M&As could pass indicators to the parties besides investors and personnel.

2.2.2 Agency Theory

Agency motive in an M&A activity arises when managers undertake mergers and acquisitions compared to the interest of the shareholders. The perspective of the theory of agencies is based on a merger, which is a consequence of the managerial purpose to remove or extract the value of shareholders from the acquirer management team. It allocates the affairs of the management of acquirers between acquired shareholders and those who manage them. In terms of the value-management idea, the complete profit decreases, leading to an increase in the target profit and a decline in the bidder's enhancement. Sudarsanam (2010) stated that returns from purchasers should be useful if the M&A deal is intended to maximize value. This statement supports the shareholder's wealth maximization goal of the company by the traditional financial theory.

Le Breton-Miller, Miller, and Lester (2011) remarked that agency problem arises when executives possessed an insignificant share capital. Weitzel and McCarthy (2011) postulated that the takeover transaction often arises from the management of the self-interest law of the purchaser's organization and not from the stakeholders' advantages. Managerialism and the hypothesis of free cash flow are further discussed in Section 2.2.2.1 In their study, Bhaumik and Slarka (2012) stated that the concentration of ownership could reduce the conflict between the

manager and agency owners. Nevertheless, there might be conflict in other organization types that may not increase the concentration of property after M&A activities.

This theory overlooks the agency problem between the managers and shareholders that could lead to M&A activities arising from the self-interest of managers. Besides, it results in the maximization of shareholders' value. Therefore, combining these issues, the conflict-of-interest hypothesis was highlighted by Higgins (2013) to propose a non-beneficial or at least a non-positive acquirer return arising from a merger between the acquirer's executives and the social security of the bidder's shareholders. The executives who achieve such returns regard it as dignified by spreading risk to non-profitable M&As to the shareholders' detriment, which increases their salaries. In relation to the above study, Rahman, Lambkin, and Hussain (2016) defined a merger as a value-improved transaction for target companies when the acquirer's management launches the takeover; however, the merger does not improve the deals for the bidding companies.

2.2.2.1 Managerialism

Past research by Delbridge and Keenoy (2010) mentioned that value-driven agents who are not stakeholders might be looking for personal interests, such as increased advantage by raising the size of a company through unprofitable merger operations. Trautwein (2013) highlighted the idea of 'managerialism' by stating that agents need to increase their earnings

proportional to the size of the company. He said that in the course of the process, they created a territory by merger to filter the accompanying profits, although the fusions are unfavorable to the company.

Related to the above studies, Han, Nanda, and Silveri (2016) stated that managers buy companies because of greater power over the market, and the consideration of size is a fundamental problem in terms of being too big to fail after the purchase. So, companies may merge to become much larger, not because of stakeholders' advantages but due to management's self-interest. However, executives' remunerations relate proportionately to the magnitude and recognition of their supervising organization and its asset scope. Furthermore, standard territory construction places the agencies' egoism in effect. The larger the size of the organization, the higher its rewards. However, Vieira, Brito, and Santana (2017) reported that the hypotheses of managerialism suggests that directors may overpay the target company because managerial compensation is linked to the quantity of asset under the credit control of the manager.

2.2.2.2 The Hypothesis of Free-Cash Flow (FCF)

Davis, Ehrhardt, and Shrieves (2004) defined free-cash flow (FCF) as a company's net operating profit after tax (NOPAT) after deducting its investment in operating capital. In another related study, Richardson (2006) interpreted the positive relationship between investment spending and the company's FCF positive relationship as the presence or existence of agency problems. Managers with FCF were involved in inefficient spending. His second interpretation is a

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reflection on the impact of capital markets, where expensive external financing caused the potential of the internally generated FCF in expanding the available venture opportunities. However, Denis and Sibilkov (2009) found a positive relationship between investment spending and the company's FCF.

The agency costs of FCF are related to real estate dealings and are more severe when the companies have lower Tobin's Q. Similarly, Giriati, (2015) investigated the investment opportunity set (IOS), FCF, dividend policy, opportunistic behavior, and company's value on the predictions of agency theory. The data was collected from 29 companies listed on the Bursa Efek Indonesia, from 2009 to 2013, and was analyzed using least squares regression. The results indicated that FCF does not affect the dividend payout ratio or the IOS. Furthermore, dividend payout ratio, IOS, and opportunistic behavior of managers affect the value of companies.

However, he explained that FCF as a cash flow is reduced by mandatory investment with a positive value and a significant cost. FCF is represented by its ratio to the total asset; thus, a larger value shows that FCF is greater when compared with the total assets. Furthermore, when the value is larger, the company has a higher tendency to pay dividend. In reference to the agency theory, company managers with acceptable FCF are most likely to be under pressure by stakeholders to pay dividend. This action intended to prevent the FCF from being used by managers for negative projects instead of dividend.

In Iran, Mansourlakoraj and Sepasi (2015) examined the relationship between FCF and capital structure for the value of listed companies in Tehran

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stock exchange involving 80 companies from 2009 to 2013. They used Lehn, Poulsen, and debt leverage models to measure the FCF and capital structure. The result showed that FCF and capital structure have significant and positive effects on the company's value.

Another study by Zhang, Cao, Dickinson, and Kutan (2016) pointed out that Jensen in the year 1968 argued against a merger's ability to solve the agency problem. However, they revealed that when FCF is deducted at an appropriate debt and equity expense, it is interpreted as an amount above the funding required for all non-negative net current value (NCV) ventures. The proof of this is interpreted as an amount exceeding the funding required for all non-negative NCV companies, where the FCF is deducted at an appropriate debt and equity expense. However, sharing reduces resources for the funding of future projects. The author suggested that when a new financing for a project is required, the capital market should be used. He further explained that agents should manage non-profitable M&A rather than return the cash to financiers to avoid major monitoring in increasing their dividend for returns on investments.

The FCF theory posited executives invest free cash in undesirable ventures, and under this assumption, Chu and Liu (2016) conducted their study. The data were obtained from the co-star commercial real estate database from January 2004 to December 31, 2011. The study used Hedonic regression and regression residual methodologies, and the results showed that companies with either greater FCF or cash reserve pay more for real estate, which is consistent with the FCF hypothesis.

In Pakistan, the FCF and capital expenditure relationship for 27 sugar mills was listed on the Karachi stock exchange from 2000 to 2011, which was examined by Qandhari, Khan, and Rizvi (2016). The linear regression result showed a relationship between FCF and capital expenditure. In addition, the free money streams were used in the sugar industries among other things; it can be used as stock returns among shareholders or held back as retained earnings.

Maksy (2016) investigated whether FCF in value is relevant for the information technology industry besides determining which FCF is the most valuable for the period from 1998 to 2012 using 18,399 observations. The result indicated that FCF, defined as cash flow from operations, with fewer capital expenditures and less preferred stock dividend, is the most relevant value to the IT sector. In China, Zhang, Cao, Dickinson, and Kutan (2016) inspected whether Chinese energy companies tend to misallocate resources. Due to the growth of FCF and some sub-optimal investment decision, it could be a well-established FCF problem. Jensen identified this issue in 1986 for the U.S. oil sector. They focused on the study period from 2001 to 2012. The result supported the FCF hypothesis, suggesting over-investment problems in the Chinese energy sector. Furthermore, the results showed that company size and corporate governance structure were important determinants of the Chinese energy companies' investment decisions.

Fernandes, Coelho, and Peixinho (2017) investigated the determinants of cash holdings of publicly traded Portuguese companies, consisting of 76 companies from 2005 to 2009. The result indicated that the companies hold less cash than similar companies, where both shareholders' and creditors' rights are

protected by the law. Their regression suggested that leverage, other liquid assets, and company growth were negatively correlated with the sample companies' cash holdings, whereas long-term debt and financial distress were positively correlated. Hence, their result could not settle with one of the existing theories (trade-off, pecking order, and free cash flow theory) but emphasize the importance of country's legal, institutional, and economic environment in explaining the company's cash holdings decisions.

Gregory and Wang (2013) investigated Jensen's FCF hypothesis in the UK cash acquisitions. Under Jensen's hypothesis, financial loss induces managers to acquire targets for cash if the behavior generates either pecuniary or non-pecuniary rewards, giving rise to a potential agency problem on cash takeovers. The result showed low leverage and high FCF might be provided if shareholders monitoring is adequate. Besides, acquirers with high levels of FCF are superior performers, and any long-term under-performance of cash acquirers is associated with low cash resources and low institutional ownership. Rahma, Lambkinb, and Hussain (2016) cited Manne in the year 1965 on an advocated company merger as the solution of the complex issues in the organization. According to Kadioglu and Yilmaz (2017), Modigliani and Miller in the year 1958 about FCF hypothesis indicated that the prospect of a company's level of an asset in the presence of cash flows should not be related to the internally generated cash flows

The free cash flow hypothesis was examined for its validity in Turkey by Kadioglu and Yilmaz (2017), using data from 227 listed companies in Borsa Istanbul Anonim Sirketi from 2008 to 2014. Using the panel regression, the result indicated that dividend per share and FCF was negatively related.

Furthermore, the significant converse relationship between leverage and FCF was found, which supported the free cash flow hypothesis.

Yeo (2018) examined how FCF influences the levels of investment and dividends in the shipping industry by applying generalized least squares (GLS) method. The result indicated that the FCF of shipping companies with different sizes influences their investment and dividends. On the other hand, it showed the role of debt in financing investment and supported FCF as the determinant of investment and dividends, with used debt alleviating over-investment. In Vietnam, Nguyen and Nguyen (2018) investigated the relationship between FCF and corporate profitability in emerging economies. The empirical evidence was obtained using 208 Vietnamese listed non-financial companies from 2012 to 2016. The result indicated that FCF had a positive effect on the corporate profitability of Vietnamese listed companies.

2.2.3 Hubris Hypothesis

The Hubris hypothesis, also known as managers' over-confidence, posits that M&As are the result of a high level of pride, involving the assumption that agents do not make any mistakes and they transfer value from acquirers' shareholders to the shareholders of their target company by increasing their premiums. Cummins and Xie (2008) revealed that it is precise when agents unintentionally pursue M&A market volatility; thus, altering the tactics of agreements according to distinct buyers who offer the same objective supports

this hypothesis. The M&A deal is a miserable strategic choice when profit is inflated for the M&A-winning transaction.

Picone, Dagnino, and Mina (2014) posited that the over-confidence of management is one of the determinants of CEO judgement, strategy, and corporate performance; the hubris effect has both good and bad sides. They recognized the effects on schedule development, execution, and suggestions for the management of hubris symptoms. Hubris theory is related to the agency hypothesis for not emphasizing valued maximization for both the bidder and target companies, but arises due to the self-interest and pride of the bidder management leading them to overpay for the target companies.

Jansen, Sanning, and Stuart (2015) examined the relationship between returns of the acquisition announcement with the size of the acquiring company. They asserted that the hubris impacts the merging deals of the acquirers of big companies which explain how much their returns on purchases are affected. Besides that, the acquisitions of major companies are considered to reflect the hubris effect more than small companies.

Leepsa and Mishra (2016) stated that Roll in year 1986 was the first to introduce hubris hypothesis and he explained that the mediators of bidder companies may have undisclosed plans for effectiveness to increase the value of the companies. However, the purchases of financial companies are more likely to overpay because they overstate their own ability to monitor the companies if their evaluation of the present market value can be done.

Hubris hypothesis as explained by Leepsa and Mishra (2016) stated that Roll in year 1986 predicted that M&As increase the value of the company. Although the theory is silent on which company, whether it is bidder, target, or controlled, the application of this theory is to test if the result of value creation would be supported by this theory. In other words, the hubris theory is used to make an argument for the value creation benefit of M&As in Nigeria. Based on the results after the analysis, it will be known whether M&As are beneficial in Nigeria after evaluating the operational, technical, cost, and productivity efficiency components of the companies. When M&As are value maximizing, they are beneficial to the shareholders of the bidder and target companies, which supports the efficiency theory. However, if there is no value maximization, it could be due to hubris or agency influence.

2.3 Empirical Reviews of Nigeria's Mergers and Acquisitions

Ogundari, Ojo, and Ajibefun (2006) investigated the cost efficiency and economics of scale in small-scale maize production in the Ondo State of Nigeria using the farm level data collected from 200 farms. The result indicated a comparative presence of economics of scale, signifying that average farm produce at a minimum cost after considering the farm's size. Thus, they are operating in Stage 11 of production (the stage of efficient utilization of resources). According to the author, the result corroborated with the mean cost efficiency index of 1.161. Thus, indicating the relative efficiency in allocating scarce resources by the maize farmers.

In a related study, Ogundari and Ojo (2006) investigated the economic and allocative efficiency and technical efficiency of the cassava farms in the Osun State in Nigeria. Their study was generated using the farm level data and a cross-sectional survey of 200 cassava farmers using a structured questionnaire. It adopted the stochastic efficiency decomposition frontier analysis. The result indicated that cassava farms exhibited decreasing progressive return-to-scale giving the value of return to scale (RTS) of 0.84, indicating that cassava farmer is efficient in scarce resource allocation.

In a previous technical efficiency study by Adewuyi (2006) on the manufacturing sector, he employed the panel regression analysis and found a declining trend. Umoren and Olokoyo (2007) investigated the post banks M&As by assessing their performance for four years after the merger activity in Nigeria. They tested if there had been any significant improvements on their liquidity, profitability, and solvency. It used the performance ratio of a sample of 13 banks for the descriptive analysis of the performance ratios. A correlation analysis was applied to test the impact of the merger on the performance measurement parameters. The result showed that on an average, bank mergers have better performance. The study further suggested that bank management should hold broad product strategies that could help in generating more income for the banks. Furthermore, this article suggested to embrace modification and financial revolution to produce new products and services.

A cost efficiency study in Nigeria's small-scale maize production in Adamawa state was investigated by Dia, Zalkuwi, and Gwandi (2010). The study used a multiple sampling technique for selecting 180 farmers and applied

stochastic frontier analysis (SFA). The result showed the economics of scale of 1.252 (ES > 1), indicating the existence of economics of scale. The stochastic frontier cost function indicated that variance parameter gamma and the sigma are both significant at one per cent. The mean cost efficiency index was 1.04, which is slightly above the frontier cost, indicating that the small-scale maize producers in Nigeria are efficient in allocating their resources.

According to Anyanwu (2000), the non-merging companies' productivity in Nigeria revealed declining results. The production dimension can be used to assess the competence of an economy in relation to others, which is beneficial in determining the comparative efficiency of companies, sub-sectors, and sectors. The information on the comparative efficiency of industries and their lucrativeness could aid the government in planning its programs and policies, particularly in determining which industries should be significant. Furthermore, it will benefit the government in determining the pay level as the input and output of labor will be well computed. When considering in the micro level, productivity dimension will help production planning and sales, particularly in checking cost, comprising wages, replacement of factors of production, and the decline of wastes in Nigeria.

He stated that the significant pathway to economic improvement and growth may require increasing production inputs, such as labor, land, capital, and technology with increasing productivity. Cumulative productivity would be the focus because other countries with the same difficulties overcame them through productivity improvement schemes. For example, Japan during the end of World War II and the United States of America in 1970s have made great

production, where the center point of their economic preparation and their significance have been flamboyant. Similarly, middle-income nations like South Korea, Hong Kong, Singapore, India, the Philippines, Mexico, and Brazil are improving their productivity arrangements as an essential part of their national planning and they are currently making significant inroads into the global industrial markets.

The post horizontal voluntary M&A investigations on a long-term operating performance, technical, cost, and productivity efficiency of merging companies with the non-merging companies remained scarce or not recorded in Nigeria's M&A literature. For instance, Muritala (2012) examined the capital structure effect on the company operating performance of ten Nigerian manufacturing companies, from 2000 to 2010, using Im, Pesaran and Shin's unit root test. The result indicated a negative relationship between capital structure and operational company performance. However, the panel least squares (PLS) result confirmed that the size, asset turnover, and company's age and asset tangibility were positively related to the company's performance. In addition, the result revealed an undesirable and significant association between asset tangibility and return on asset as a measure of performance in the model. This result implies that tested companies were not able to apply the fixed asset configuration of their total assets to impact their company's operating performance.

Uadiale and Fagbemi (2012) investigated financial performance and corporate social responsibility (CSR). Their study used 40 quoted companies in examining the impact of CSR activities on the financial performance. It was measured by return on equity (ROE) and return on assets (ROA). The result

revealed that CSR has an affirmative and significant connection with financial performance processes. Hence, the evidence supports the positive influence of CSR on financial performance.

Uwuigbe and Egbide (2012) examined the relationship between CSR and corporate financial performance of financial and non-financial listed companies on the Nigerian stock exchange. Their study investigated 41 companies in year 2008 using multiple regression analysis. The result revealed that business financial performance and the scope of review companies have a noteworthy positive connection with the level of CSR revelations among the designated companies. Furthermore, the study revealed that a noteworthy undesirable relationship between the companies' financial influence and the level of CSR revelations.

The productivity of the Nigerian shipping industry was investigated by Stephens, Stephens, Nose, Ibe, and Ukpere (2012). They selected twenty-two companies based on market share operating within the country as well as the main seaport at Apapa port complex in Lagos. The period of investigation was from March to August and from September to February during this study. The first period being peak and the second being low periods, then applying Saari production model that is based on input/output analysis. The result indicated that consignment rate and capability to control the cost of inputs was significant in the determination of a company's productivity over a period of time. In addition, the kind and manner of operations of shipping as well as the use of objective marketing matters a lot in its ability to be resourceful.

Onikoyi and Awolusi (2014) examined the impact of M&As operating performance on the shareholders' wealth of 25 Nigerian banks. The result showed that mergers and acquisitions have a direct impact on the wealth of the shareholders. The authors stated that the new capital generated by merging bank's shareholders could increase the total assets of the bank and modernize the way banks conducted their operations. Umoh and Wokocha (2014) investigated the corporate productivity and production control. The sample consists of 80 Nigerian manufacturing companies with the stock exchange by year 2009 using stratified random sampling method. The outcome revealed that the production control significantly impacted the corporate production performance of the Nigerian manufacturing industry.

In the insurance sector, Babatunde and Haron (2015) investigated the total factor productivity (TFP) from 2008 to 2012 using latent growth cure modelling approach with DEA. The result showed a decline in TFP caused by both technical efficiency and technological change for the non-significant improvement in the sector. Osamwonyi and Imafidon (2016) investigated the Nigeria stock exchange technical efficiency of manufacturing companies from 2004 and 2010 using output-oriented DEA. The result showed that quoted the manufacturing companies were efficient with an average variable return to scale mean score of 85 percent and scale efficiency mean score of 76 percent.

On productivity, Pius, Nwaogbe, Akerele, and Masuku (2017) investigated Murtala Mohammed International Airport (MMIA) terminal productivity performance. This study was test by means of multiple regression analysis of panel data from 2006 to 2014. The outcome showed that total asset,

wages, total cost and the number of staff employed are main factors of estimated aircraft passenger and cargo movements. These input variables contributed for R-square of 99.8 percent of the aircraft movement, though passenger movement being 93.3 percent and the cargo movement 88.5 percent. These are the comparative total production of the MMIA terminal post investment. This result implies, terminal improvement assisted MMIA in coping with the increased number of passenger traffic and aircraft movement, better than before project period, in terms of operational performance. Also, increase the airport productivity, thereby generating more revenue to be used in improving the quality of service for the better service user.

Of all these operating performance, efficiency (technical and cost) and productivity investigations, none is on merged and non-merging companies' valuation itself with methodology, let alone in long-term horizontal non-financial market-driven mergers in Nigeria. Thus, highlighting the lapses in Nigeria's M&As literature.

2.4 Empirical Review of Long-term Performance of Mergers and Acquisitions

The long-term performance of companies before and after M&As is the dependent variable of this study. It is the ultimate fundamental value analysis of companies involved in M&A activities which justifies if any positive or negative synergy was realized. The next section is a review of further empirical studies on M&As as a whole and on specific types of performance, namely operating performance (OP), technical efficiency (TE), cost efficiency (CE), and

productivity efficiency (PE). Profit efficiency was not investigated because the data on production cost price and unit selling price were unavailable after several efforts.

2.4.1 Operating Performance (OP)

Operational performance focuses on accounting measurement of profitability, such as return on investments and operating margin. This action helps to identify sources of profits resulting from fusions and assesses whether the expected profits and synergistic benefits are realized. In a related study, Mantravadi and Reddy (2008) applied operational performance as an independent variable in evaluating India's three years of pre- and post-long-term M&A activities with minor changes.

In the UK, Ismail (2009) examined the operating performance efficiency of 35 UK listed government and banks after their merger from 1992 to 1997.The result showed that the output quality of a loan improved after merging. For the abnormality, industry-adjusted returns for loan losses with regard to the gross loan ratio following merging decreased significantly by 0.47 percent. Similarly, Sinha, Kaushik, and Chaudhary (2010) investigated selected India's financial post-merger performance.

The findings showed that over half revealed improved financial performance during the post-merger period compared to before the merger. This result revealed that the debt-equity ratio and earnings were made available to equity shareholders among the companies after the improvement of M&As after

the deal. Chen, Kao, and Lin (2011) applied input and output variables: total asset, labor expenses, cost of replacement or depreciation, and income before interest and taxation (IBIT) as the output in efficiency (operating performance) for their measures.

In the U.S., Chang and Tsai (2012) examined the long-term operating performance of merged companies from 1990 to 2007 with 4288 deals. The results showed a drop in the operating performance of the acquiring companies. On the further analysis of the superior stock performance of the merging companies, they found that investors could have anticipated better performance earlier and the long-term benefits corrected the earlier high price as the merger decision was announced.

Leepsa and Mishra (2013) examined the economic value analysis (EVA) and the post-M&A operating performance of manufacturing companies in India to analyze the adjustable returns of the merged companies. There were 6 non-positive EVA companies and 23 positive EVA companies before the acquisition performance, but 9 non-positive EVA companies and 20 positive companies were established during the post-acquisition period. This result revealed that post-amalgamated companies were less successful than before.

Similarly, Alexandrou, Gounopoulos, and Thomas (2014) studied all M&As operating performance in the U.S. shipping industry from 1984 to 2011. The results demonstrated that both the acquirer's shareholders and the aims achieved an average of 1.2 percent and 3.3 percent of abnormal profit in operating performance after the merger. The diversification rather than focusing

on the transactions has benefited both sides. Acquirers increased their profits by making payments in the inventory of transactions and taking over government objectives, while objectives benefited from trans-boundary and targeted operations.

On the other hand, Azhagaiah and Sathishkumar (2014) investigated the long-term operating performance of manufacturing companies in India that embarked on M&As. They focused on the financial crisis period from 2006 to 2008 on 39 companies. Using correlation matrix, factor analysis, chow test, and multiple regressions, the results indicated a significant positive improvement in India's manufacturing companies.

Banerjee, Banerjee, Desoumen, Jindra, and Mukhopadhyay (2014) conducted an event methodology study in India from years 1995 to 2011, The study revealed significant positive operating performance returns to Indian bidders. Cole, Yan, and Hemley (2015) focused on the U.S company's operating performance measures of the manufacturing, healthcare, oil and gas, consumer and services sectors using input and output variables. Total asset, labor expenses, cost of replacement or depreciation, and income before interest and taxation (IBIT) were the output in efficiency measures. The results showed that a company operating performance and capital structure differed for different sectors from variable to variable.

For the ASEAN countries, a long-term study of post-M&A operating performance was conducted by Rao-Nichlson, Salaber, and Cao (2015) from years 2001 to 2012. They combined both domestic and cross-border deals with

the data from the SDC platinum of Thomson Financial Securities Worldwide M&A database. The result indicated that industry-adjusted operating performance dropped three years after M&As, but all M&As were completed during the ASEAN financial crisis that obtained more profit than those before and after the crisis. They added that the synergies created between the company's resources within the crisis period contributed well to economic performance.

Huh (2015) investigated the operating performance of steel companies after M&As from years 1992 to 2011. The study focused on technical efficiency and profitability earnings ratios (PER) of the bidder companies. The result showed that the operating performance of the steel companies, financed by financial institutions, dropped insignificantly, while PER improved significantly.

In the context of the Czech Republic, Achim (2015) assessed the success of mergers and acquisition operating performance by reviewing the current approaches to assess the success rates. The author used a method of acquisition value analysis. The acquisition value analysis could be used for evaluating the financial results of participating companies in the medium term. He measured the changing aspects of profits/losses regarding individual stakeholders: owners, creditors, and employees. By the application of this method, the mergers and acquisitions in the Czech Republic from years 2007 to 2010 were analyzed. The result indicated that owners of target companies prospered the most, whereas other investors like creditors and employees experienced losses. Furthermore, results of all interest groups as shareholders, employees, and creditors were reported as prospering in the medium term, especially the acquirers.

Cummins, Klumpes, and Weiss (2015) examined whether the global insurance M&As operating performance produced value for shareholders by conducting an event study of M&A transactions from years 1990 to 2006. The result indicated that insurance acquirers realized small positive cumulative average abnormal returns (CAARs), while acquired realized substantial positive CAARs. The results from cross-border and within-border transactions have led to substantial value creation for targets. The market value benefits for acquirers were centered in the US and Europe, while the acquirers' CAARs for Asian M&As were mostly insignificant. The target companies realized the significant market value gains in the US, Europe, and Asia with the prime gains for the U.S. transactions. The bidders from the insurance industry realized small market value gains from within-industry transactions, but cross-industry M&As were neutral valued. The targets gathered significant market value gains in both cross- and within-industry transactions, but the within-industry gains were significantly larger. The outcomes submitted that insurers should concentrate on focusing rather than diversifying transactions.

Andriosopoulos, Yang, and Li (2016) investigated the short-term operating performance market reaction on the announcement of domestic and foreign mergers and acquisitions by the U.K. acquirers from years 2000 to 2010 using univariate and multivariate analyses. They focused on the impact of institutional ownership on value and glamour acquirers. The findings indicated that value acquirers consistently outperformed glamour acquirers in the short run during and after M&A announcements.

They defined glamour acquirers as companies that have high growth opportunities and high price valuations, which reflected their past earnings, cash flow performance, and the expectation of sustainable future growth. On the other hand, value acquirers were more judicious when embarking on takeover decisions and were more likely to create value for shareholders. The result showed a positive relationship between domestic institutional ownership and post-announcement performance. It signifies that domestic institutional investors helped to keep a cheerful share performance for glamour acquirers following the M&As announcement. In general, glamour bidders underperformed compared to their counterparts, but glamour bidders with a greater concentration of domestic institutional investors had better post-operating performance.

In Australia, long-run operating performance of public and private target acquirers were compared, and the differences in a short run market performance were obtained by Shams and Gunasekarage (2016a) using a section of Australian M&As for 11 years bfrom January 2000 to December 2010. The data were drawn from the SDC platinum database and analyzed using the event methodology on 143 acquisitions of public targets and 1035 private targets. The result revealed that private target acquirers had significant affirmative abnormal revenues, while the public target acquirers only had normal revenues.

When the long-run operating performance of the two sets was examined, the performance of the former group was statistically indifferent from the public acquirer's group. With the exemption of relative size, none of the acquisition features had a significant effect on the operating performance of acquirers. The result showed the influence of the relative size on operating performance. In

addition, important performance enhancements were only established when private target acquirers have high comparative size acquisitions and public target acquirers have low relative size acquisitions. The purchase of relatively small targets by private target acquirers and relatively large targets by public target acquirers appeared to obtained zero net profit value.

Yaghoubi, Yaghoubi, Locke, and Gibb (2016) reviewed the M&As literature to unlock the puzzle of M&As operating performance. Their outcomes showed that M&As pull industries together over time because of business and economy-level surprise trends, missed assessments, as well as managerial motivation. In addition, they found that the marketplace response to the pronouncement of acquisitions was negative for acquirers' stocks and positive for target stocks. In addition, the joined irregular return was positive and the outcomes were stable over several decades of investigations.

Bernal, Garrido, and Rios (2016) investigated long-term mobile telecommunications mergers' operating performance in the European markets from years 2000 to 2015. Their study involved 43 countries with 26 domestic mergers. The result indicated that they have an operating performance immediate effect on the market power of acquiring companies. Besides, the mergers also influenced the evolution of competitors in the long term. Furthermore, domestic mergers in the telecommunication industry slowed down the competition from 2000 to 2015, which was attributed to the entry of new competitors and regulatory intervention associated with M&As.

German long-term acquiring companies' post-M&As operating performance from years 1981 to 2010 was investigated by Mager and Meyer-Fackler (2017). This interval was divided into three: 1981 to 1990, 1991 to 2000, and 2001 to 2010. The interval from 1981 to 1990 revealed positive abnormal long-term returns compared to their industry peers. In addition, other intervals result showed no significant negative abnormal long-term performance in the acquiring company's post-merger operation.

Nagasha, Bananuka, Musimenta, and Lulu (2017) examined the impact of mergers and acquisitions to evaluate cumulative abnormal returns to assess M&As performance and shareholders' wealth in East Africa. They focused on the period from years 2005 to 2015, consisting of 234 M&A deals of listed companies from various East African states regarding their stock exchange markets. The results showed that M&As were significantly associated with company performance. Besides, the M&A announcement generated significant abnormal returns to the companies' shareholders, and there was also a positive relationship between the domestic M&A activities and company performance. In addition, a positive relationship was found between cross-border M&A transactions and company performance, with domestic M&A deals performing better than the cross-border M&A transactions.

In Pakistan, Rashid and Naeem (2017) analyzed the long-term effect of mergers and acquisitions on operating performance from years 1995 to 2012 using ordinary least squares (OLS) and the Bayesian estimation. The results indicated that M&As did not have any significant effect on the liquidity, leverage, and profitability of the merging companies. In addition, M&A had a negative and significant effect

on the quick ratio of the acquirers. Similarly, Michal (2017) investigated the impact of takeovers of the acquiring companies operating performance in the pharmaceutical market in the US. Using the event studies and accounting studies from years 1998 to 2011, the result indicated a lack of significant improvement in the bidder company's operating performance or the impact was negative. The author concluded that the result is in line with existing literature, which supported that merging did not improve the operating performance of the acquiring companies.

On M&As value creation, Alexandridis, Antypas, and Travlos (2017) studied value creation from M&As operating performance deals among the U.S. companies from years 1990 to 2015 using data from Thomson SDC. The results revealed that M&A transactions created more values for stakeholders of the bidder company after year 2009. The acquisitions by public improved the abnormal returns significantly for the bidder companies, while the stock-for-stock transaction had destroyed the value. The mega M&A transaction, priced at a minimum amount of about 500 million dollars, was affected by agency problems. The bidder shareholders obtained 62 million dollars within the announcement period of the M&A deals. Overall, the synergistic benefits increased to more than 542 million dollars' worth of value creation from M&A transactions. These improvements were because of the improvement in corporate governance practices among the merging companies after the financial crises of 2008.

Kishimoto, Goto, and Inoue (2017) focused on the merger of electric utility companies operating performance that took place in Canada, the United Kingdom, the United States, Germany, and France between years 1998 and

2013. A study by Andrade, Michell, and Stanford (2001) indicated no evidence of positive operating performance improvement on the bidder companies. However, their results indicated an improvement in the acquiring company's share value and operating performance after M&As.

Barbieri, Huang, Pi, and Tassinari (2017) examined the operating performance of the pharmaceutical sector with other sectors that have undergone restructuring through M&As in China from years 2005 to 2013. The study was prompted by the fact that China was one of the largest global producers of pharmaceutical ingredients in the early 2000s. The results indicated a positive effect on the operating performance of the M&As restructuring of the pharmaceutical sector in China.

A study by Fatemi, Fooladi, and Garehkoochain (2017) investigated both the short- and long-term M&As' operating performance impact from the perspective of shareholders, both the bidder and the target companies in Japan from January 2000 to December 2014. The results indicated that the shareholders of the bidder companies experienced no significant wealth effects or operating performance, but the target companies' shareholders gained significant benefits. Due to the current data used in their study, they concluded that Japan's market for corporate control has become more competitive and behaves like the United States and other western nations. During the long-term operating performance for the evaluation of 60 months after M&A, the result showed no noticeable pattern of long-term gains. By analyzing the long-term effects of mergers on the bidder company's environmental, social, and governance performance, they found no noticeable improvement.

In China, the associations among mergers, acquisitions, and companies' performance were examined by Zhang, Wang, Li, Chen, and Wang (2018) using PLS regression on the Chinese pharmaceutical companies from years 2008 to 2016. The outcome indicated that when other conditions were constant, value-chain-extension M&As and technology-seeking M&As were positively related to company operating performance. Furthermore, company exclusive assets, company growth ability, companies' size and age positively affected companies' operating performance. Finally, following M&As, corporate governance, company property rights, and company solvency impacted the company's operating performance.

2.4.1.1 Horizontal Operating Performance

On the operating performance of banks, Liargovas and Repousis (2011) investigated the horizontal M&As impact on the operating performance of banks in Greeks from years 1996 to 2009 using the event methodology. The result showed no improvement in the operating performance and wealth creation after M&A. Cosh, Guest, and Hughes (2006) opined that it would only improve the basic value of the acquiring company after M&A to create value for the acquirers and investors; if the accounting value result of the purchase is higher than the current value of the costs. Concerning the profitability measurements of M&As, researchers had examined whether M&As improved the profitability of both buyer and target combined assets compared to control companies, the industry's benchmark, and the size of the deal. In addition, both asset expenses and

profitability measures' equal weight for each post-acquisition year have to be considered in altering the earnings of the acquirer.

Sharma, Mukherjee, and Gupta (2016) researched the post-merging operating efficiency of Indian metal companies from years 2009 to 2010. After the merger, findings showed insignificant improvement. The profitability is reduced significantly in terms of ROA and return on net wealth (RONW). They concluded that in the long term, M&A could generate synergy through efficient resource utilization. In the information and technology sector, Bi (2016) investigated the difference in post-merger performance to the pre-merger period in India in terms of profitability, liquidity, and solvency. The author used descriptive statistics and paired sample test from years 2007 to 2010, comprising 18 companies that underwent both domestic and cross-border M&As. The result showed no significant change in the financial performance of the companies in the post-merger period for domestic merger and overseas merger. The improvement in post-merger financial performance of domestic merger companies was better than the companies that underwent overseas merger.

Along a similar study line, Bolbanabad, Mosadeghrad, Arab, and Majdzadeh (2017) investigated the impact of horizontal mergers and acquisitions on three Tehran Universities of Medical Sciences (TUMS) in Iran that were merged in year 2010. The aim of the merger was to improve the position of TUMS worldwide and increase its efficiency. The result indicated a significant improvement in the operating performance of both the organizations and their management, as well as improved academic position and market recognition. It can be concluded that a well-planned M&As provide an outstanding edge in

higher education. This was attributed to the expectation of value creation after M&As as one of the main motives with the involvement of the practitioners and investment bankers.

Shah and Khan (2017) evaluated the impact of M&As on bidder companies' bank performance, consisting of 18 transactions listed companies on the Karachi Stock Exchange in Pakistan from years 2002 to 2011. They used financial ration analysis to test the significant change in performance through a paired sample t-test. The result showed a decline in the performances of the acquirers in the post-merger period. In Portugal, Cruz and Sarmento (2017) examined the horizontal M&As focusing on state-owned companies in the same transport sector for road and railway infrastructures from years 2014 to 2015. The merger's aim was to enhance the use of roads and railway networks and increase efficiency due to the large investment. The result indicated increased revenue, better service, and reduction of cost. The issue of horizontal M&As strategy on bidder company's operating performance was investigated by Korican, Barac, and Jelavic (2014) on the EU member countries.

Their study involved 49 mergers from January 1st to December 2008. Using the accounting methods with a two-year period before and after M&As, the authors introduced the controlling effect of pre-merger bidder lucrativeness on the performance of the merger. The result showed a positive connection with the operating performance of bidder companies after M&As. Based on the 49 unifications completed by 2008 in the EU associate republics and Switzerland, associated unifications had better merger scores than the unconnected unifications. In addition, the outcome forecast influence of the connected

acquisition became more positive as the bidder pre-merger performance declined.

2.4.1.2 Vertical Operating Performance

In the US, Forbes and Lederman (2010) examined the effects of vertical integration on the operational performance of large U.S. airlines using regional partners to operate some of their flights. The results showed that integrated airlines performed systematically better than non-integrated airlines at the same airport on the same day. Besides, the performance advantage increased during bad weather when airports were more congested. Hence, they suggested that vertical integration might facilitate real-time adaptation decisions for this setting.

Aid, Chemla, Porchet, and Nclose (2011) indicated that vertical mergers removed the asymmetric risk structure between production and the retail group. Kedia, Ravid, and Pons (2011) examined the market reaction to vertical mergers from years 1979 to 2002 in the US. The outcome showed that the abnormal return was positive until the late 1990s and became negative afterwards, with acquirers suffering most of the losses. The result also indicated that vertical mergers produced the greatest benefit when undertaken in competitive markets when the exchange is difficult.

Fan, Huang, Morck, and Yeung (2014) investigated the same issue in China and assumed that it may improve returns to political rent-seeking aimed at securing and extending workforce, where the legal system and market forces

impose contracts inadequately. The result showed that vertical integration was more common, where legal institutions were weaker and regional governments have lower quality. Additionally, companies led by insiders with political connection were more likely to be vertically integrated. Furthermore, the vertical integration between politically unconnected companies is associated with elevated per capita GDP level and growth, while vertical integration between politically connected companies is unrelated to local economic performance. These vertical M&A investigations are necessary for this study since they are among the different types of mergers mentioned in literature.

On vertical mergers, Wan and Sanders (2017) stated that it introduces opportunities for information sharing and lowering the unexpected risks that may contribute to forecast bias. Chen, Xu, and Zou (2017) investigated the effects and incentives of vertical mergers on three types of companies (suppliers, manufactures, and integrated companies). The result indicated that integrated companies enter the intermediate goods market when the competition was strong, while the non-integrated companies have incentives to vertically combine when the number of manufacturers is below a threshold. Furthermore, vertical mergers benefited customers and improved the social welfare. In addition, vertical mergers caused distressed to other manufacturers and integrated companies.

Regarding vertical integration and company productivity, Li, Lu, and Tao (2017) used three cross-industry datasets from China and other developing countries to study the effect. The result suggested that vertical integration had a negative impact on productivity in contrast to studies on U.S. companies.

Therefore, the authors contended that vertical integration reduces company productivity because it enables inefficient rent seeking by insiders in the settings with poor corporate governance.

Biancini and Ettinger (2017) examined the consequence of vertical mergers on downstream companies' ability to collaborate in a repeated game framework. The result revealed that vertical mergers had two main effects: it increases the total collusion profits as well as increasing the stakes of collisions; and it creates an asymmetry between the integrated companies and the unintegrated rivals. The integrated company, which accessed the input at marginal cost, faces higher profits in the deviation phase and in the non-cooperative equilibrium, which potentially harms the collusion.

2.4.1.3 Conglomerate Operating Performance

Conglomerate diversification can be explained from the perspective of mergers in the light of strategic base, economics, finance theoretical, and structural policies. The creation of values under conglomerates can stem from increasing market power and operating an efficient internal capital market (Sudarsanam, 2010). The market power becomes effective with the ability of the company to undertake an anti-competitive approach against its competitors or potential newcomers.

This is not coming from a monopoly position in the market, but rather a result of the range of activities and the size of the company because

conglomerate allocates funds for investment to other individual businesses. If these companies were independent, the collection of funds would have to come from the capital markets or banks and equity markets. By performing this duty more efficiently than the external capital market, the value can be created while the operating performance can be improved.

The three ways that conglomerates can exercise their powers in an anti-competitive means are cross-subsidizing, mutual forbearance, and reciprocal buying (Sudarsanam, 2010). The cross-subsidization occurs during the initial loss from the pricing policy in a product market, before financing this strategy using profits generated from other markets. The single-business company involved in the business would become disadvantaged. After seeing this competitor, it is now consolidating its market power and shifting to more monopolist pricing to recover the initial losses, re-coup its reserves, and apply this strategy at a different place (Sudarsanam, 2010).

The issue occurred when a conglomerate integrated production in different regulated and unregulated sectors. It may benefit from scope economies while the precise size of the synergies remained unknown to rival companies and regulators. Calzolari and Scarpa (2016) examined this issue. The result revealed that the conglomerate private information on scope economies might negatively affect both the regulated and unregulated sectors depending on the precise nature of competition of either strategic substitutes or complements.

2.4.2 Technical Efficiency (TE)

The measurement of performance concerns the assessment of the difference between the actual and optimal performance at the relevant frontier. The real frontier is unknown, and it is necessary to estimate what is known as the best practice (Tauer, Fried, & Fry, 2007). Foreign studies investigated companies that applied DEA model in evaluating the efficiency of manufacturing companies (Nordin & Siad, 2010; Tektas & Tosun, 2010). The basis in which efficiency and productivity is measured and compared is the separation of their impacts from the operating environment; so, the hypotheses concerning sources of effectiveness or productivity differential can be explored (Gomes, Angwin, Weber, & Yedidia Tarba, 2013). In private organizations with government policies, it is essential to identify and separate controllable and uncontrollable sources of performance variation in terms of performance enhancement (Gomes et al., 2013). They stated that the success parameters used to assess manufacturers and service companies are productivity and effectiveness measures, while economic performance is the final achievement measure for companies and manufacturers.

In investigating the impact of companies after M&As, a study used DU Pont with 14 major ratios for 305 companies from years 2003 to 2008. Rani, Yadav, and Jain (2015) reported that the profitability and efficiency of bidder companies improved after the merger in India. They further stated that the improvement was because of higher profit made per unit of net sales by the bidder companies, which improved the operating cash flow due to efficient utilization of asset turnover to earn higher sales. In a related study, Jin, Leem, and Lee (2016) reported that efficiencies in size and scope of a company

indicated that several input variables, including price, became indications of the company's ability to work at an optimum plant and product mixture level.

On the other hand, Jin et al. (2016) advanced that the efficiency insight is different from prior scales and from the alternate linked efficiency notion called X-efficiency by Leibenstein (1966). This is related to technology oversight and improvement as a particular aim. It addresses efficiency scale instead of size, and the product mix addresses the efficiency scope. Li (2016) examined the impact of mergers and acquisitions on efficiency and shareholders' wealth in the China banking industry using literature analysis and CAPM model to calculate their CAR that reflected the change of shareholder values (positive CAR means shareholders gained positive returns from mergers and acquisitions and vice versa). The result showed that mergers and acquisitions created shareholders' wealth for the target acquired. Besides that, the acquiring companies' shareholders tend to lose out because their ownership in the newly formed bank is severely diluted and the same applied with efficiency. When considering the financial crisis, mergers are considered a safe haven. Furthermore, senior management must be skilled in corporate restructuring within the newly merged banks for the merging banks to survive post-merger activity.

Along the same line of study, the cost functions and determinants of unit cost effects for the 19 horizontal airlines' M&As in the international airline industry were examined by Gudmundsson, Merkert, and Redond (2017). They used translog cost function and linear quadratic on the data from years 1980 to 2012. The result indicated that M&As did not affect the unit cost significantly,

with the exception of bigger mergers, whereby there was an increase of unit cost. Schmitt (2017) examined whether mergers in hospitals reduce the costs in the US from years 2000 to 2010. The result showed the evidence of economically and statistically significant cost efficiency at the acquired hospitals. Averagely, the acquired hospitals could obtain cost savings between 4–7 percent after the acquisition activity.

2.4.2.1 Horizontal Technical Efficiency

Frontier efficiency methodologies can be used to measure efficiency and productivity. Moreover, both mathematical and econometric techniques of frontier applied these methodologies. It should also be noted that cost reduction and efficiency enhancement are two separate ideas, which should not be applied interchangeably. Consequently, these two concepts are different economic concepts, which need to be examined separately for efficiency gains from M&As. Besides, distinguishing productivity from efficiency is useful when dealing with cost reductions in the efficiency research, but each has different economic meaning and effects. Thus, efficiency is significant for cost saving, productivity, and effectiveness, but not for synonymous economic ideas.

The significance of the DEA model, which is a mathematical and non-parametric technique in the technical efficiency analysis, is to identify the target values for input and output of inefficient companies besides conducting an efficiency analysis on the companies (Vincova, 2005). Furthermore, efficiency is also the amount of achieving a default target or setting a target with the greatest

results or best practices. This demonstrates that productivity is exceptional, but efficiency is not because efficiency depends on the decision maker's results. The link between input and output is called manufacturing function. The accomplishment of efficiency is one of the major problems in most M&As. Other researchers (for example, Ramakrishnan, 2008; Aruna & Nirmala, 2013; Maharaj & Reddy, 2013; Alexandrou, Gounopoulos, & Thomas, 2014) remarked that efficiency is part of the synergistic gains that are expected from horizontal mergers and acquisitions.

Studies by various authors indicated that mergers have the potential to achieve efficiencies (for example, Bhagat, Malhotra, & Zhu, 2011; Halkos & Tzeremes, 2013; Peyrache, 2013), whereas others failed to detect efficiency gains (for example, Choi & Harmatuk, 2006; Chow & Fung, 2012). In relation to the current technologies in the sector, efficiency is how well companies perform their operation, whereas productivity refers to technological developments over time (Sav, 2012).

2.4.2.2 Vertical Technical Efficiency

A study by Lin, Parlaktürk, and Swaminathan (2014) examined the companies' vertical merger strategies (forward integration, backward integration, and no integration) in binary compete for supply chains–dual rival supply chains, each of which consists of a supplier, a manufacturer, and a retailer. The dealers improve product quality, and the retailers sell products competitively. Every manufacturer selects one of the three strategies: forward

integration, backward integration, or no vertical integration. The authors argued that when manufacturers only considered forward integration, they might choose not to vertically integrate it into the equilibrium. Their findings indicated that when both forward and backward integration options are considered, fragmentation could be an equilibrium outcome. In either forward or backward vertical integration, the degree of product death ability cost and purchaser's worth are critical factors in choosing the direction of merging.

In addition, competition increases the attractiveness of backward integration that is relative to forwarding integration. Although backward integration is always beneficial, forward integration can affect the manufacturer's lucrativeness. Lastly, vertical integration could result in a better-quality product sold at a lower price. Wan and Sanders (2017) investigated how companies can manufacture various goods while maintaining good or economic inventory level. The study used data from 283 delivery midpoints for 26 uninterrupted four-week periods and applied a moderating mediation model. The results indicated that vertical merging creates opportunities for information sharing and eradicates the doubt that contributed to forecast bias.

2.4.2.3 Conglomerate Technical Efficiency

The literature reviewed the efficiency of conglomerate M&As and found that it is mostly in the financial sector. A study conducted by Vennet (2002) found that conglomerates M&As were more efficient than other specialized competitors. Referring to a study by Hanclova and Stannikova (2012), their

overall result was total increased efficiency. This is not surprising as most post-M&As operator performance evaluations are in the banking sector (Beccalli & Frantz, 2013; Rahman, Lambkin, & Hussain, 2016).

In a related study, Mooney and Shim (2015) investigated coinsurance effect and asset liquidity, which are two sources of financial synergies in mergers, to test whether financial synergy is greater in conglomerates than in horizontal mergers. The results showed a reduction in cash flow volatility for consolidated companies that improve shareholder value. They also indicated that a merger can increase shareholder value when the cash flow volatility of the consolidated company is less than the current cash flow volatility of the acquiring company. Furthermore, the source of financial synergies in conglomerate mergers comes mainly from higher asset liquidity. In addition, other tests revealed that liquidation values are higher in conglomerate mergers than in horizontal mergers when holding coinsurance effect constant, especially when the target company is financially constrained.

The efficiency change in the financial sectors of the group of vise grad countries was investigated by Palečková (2017). The countries under vise grad and banks were the Czech Republic (13 banks), Hungary (23 banks), Poland (38 banks), and Slovakia (11 banks). The period covered was from 2009 to 2013, and the author aimed to decide whether banks that belong to a financial conglomerate are more or less efficient than other banks in the sector. DEA and Malmquist index (MI) methods were applied, and the data from the Bank Scope database and the annual reports of selected banks for the period covered were analyzed.

The findings showed differences across the banks in the vise grad countries. The outcomes also revealed that the positive/negative efficiency changes in the vise grad countries were primarily due to technological changes and the catch-up effect. In addition, average efficiency reduced from 2009 to 2011. The catch-up had a positive average annual growth of 4 percent, while technological change indicated a positive average annual growth of 1 percent. This result was similar to Anayiotos, Toroyan, and Vamvakidis (2010) who concluded that bank efficiency decreased in the financial crisis period.

2.4.3 Cost Efficiency (CE)

In a cost efficiency research by Amel, Barnes, Panetta and Salleo (2004), acquisitions by big banks did not improve the cost efficiency of big banks but improve the profitability instead. Similarly, a study of Polish banks between 1997 and 2001 by Havrylyshyn (2006a) pointed out that amalgamated banks experienced no cost efficiency improvements. In a related study, Maudos and De Guevara (2007) examined the cost of market power in the banking sector on social welfare loss against cost inefficiency. The study considered 15 EU countries from 1993 to 2002 using a database of Bank Scope (Bureau Van Dijk). By applying the Lerner index of the market power model, the result showed a positive association between market power and cost X-efficiency. In addition, the result showed that the welfare gained related to a decrease in market power was larger than the loss of bank cost efficiency.

Kamarudin (2011) stated that the efficiency theory could be used to evaluate M&As effectiveness, which summarized operational performance, engineering, productivity, and cost effectiveness. Cost efficiency is one of the ways that mergers could improve companies' performance by producing a certain level of output with least cost amount. The cost efficiency phenomenon is mostly tested in the financial sector (for example, Awan, Alishah, & Hassan, 2016).

2.4.3.1 Horizontal Cost Efficiency

In New Zealand, cost efficiency was analyzed by Filippini and Wetzel (2014) involving 28 electricity distribution companies from 1996 to 2011 using a stochastic frontier panel data model. The result indicated a positive effect of ownership separation on the cost efficiency of distribution companies. On the other hand, Bilotkach, Gitto, Jovanovic, Mueller, and Pels (2015) investigated the productivity and cost efficiency of individual national providers of air navigation services (ANS) within the European airspace from 2002 to 2011. They employed data envelopment analysis, and the results showed productivity improvement caused by the improvement in the technical efficiency than cost efficiency.

On the structure of global reinsurance market performance analysis, Biener, Eling, and Jia (2016) examined cost efficiency, revenue, scale, and scope from 2002 to 2013 on 116 professional reinsurers. The result of insurers with total asset of less than USD 2.9 billion showed scale economies, while those with

greater total assets above USD 15.5 billion did not. The result also showed that cost efficiency benefitted large insurers more, while smaller insurers showed superior efficiency only when operating both life and non-life reinsurance. The largest insurer is benefiting from revenue scope economies. The authors concluded that profitability is not sacrificed by lower prices for the cost-efficient insurers.

Awan, Alishah, and Hassan (2016) examined the impact of the acquisitions on cost efficiency using DEA for the acquiring financial and non-financial companies in Pakistan. The period of study was from 2004 to 2012. The result showed a statistically significant improvement in cost efficiency of both financial and non-financial acquiring companies. In addition, Chortareas, Kapetanios, and Ventouri (2016) investigated the undercurrents between the credit marketplace liberty equivalents of the economic liberty index taken from the Fraser Institute databank and bank cost efficiency levels crosswise in the US. The study period was from 1987 to 2012, constituting 3809 commercial banks using the DEA methodology. The result indicated that banks functioning in states that appreciated a higher degree of monetary freedom were more cost-efficient, and larger individuality in financial and banking markets from government panels could result in higher bank efficiency. This consequence arises besides the efficiency-attractive effects of interstate banking and intrastate splitting deregulation.

The objective of Ray (2016) study was to define the optimum figure of branches within a mailing district that could provide the realistic sum of banking facilities to the customers in Calcutta at the lowest operating cost. He found an

indication of over-branching for the whole system using a DEA model for the year 2012, in which reducing the number of offices was deemed more cost-efficient.

2.4.3.2 Vertical Cost Efficiency

Leea and Huang (2017) investigated the technological gap and cost efficiency of the Western European banks from 1996 to 2010 by separating the intervals into two: 1996 to 2000 and 2007 to 2010. They used stochastic meta-frontier flexible cost functions, the results of which indicated that the technological gap ratio (TGR) among the countries was similar, which means that the banks working in this combined marketplace used similar technology. In addition, the banks' cost efficiency with respect to the meta-cost frontier (MCE) showed a gradual increase trend from 1996 to 2000 and a downward trend after 2008 to 2010. They concluded that the decision-making incapability was the primary source of inefficiencies.

Concerning the factors that drive economies of scale and cost efficiency in the financial market infrastructures (FMI), Li and Marinc (2017) stated that the FMI in 36 countries is critical for the financial markets. The authors defined FMI as exchanges, clearinghouses, and central securities depositories (CSDs) that are responsible for listing, trading, information dissemination, clearing, and settlement of companies in stock markets. A panel data of 30 stock exchanges, 20 CSDs, and 29 clearinghouses were analyzed using the general functional form

of the multiple-product translog cost function. The result showed that the efficiency of FMI providers increased with vertical but not horizontal mergers.

2.4.3.3 Conglomerates Cost Efficiency

Alsaleh and Abdul-Rahim (2018) investigated the impact of country-specific and macroeconomic contributing factors of cost efficiency rate in the bioenergy industry in the EU28 zone. The study was motivated by how earlier bioenergy industry research focused on how to achieve a precise level of production, but there was a lack of focus on the cost, allocative, and technical efficiency approaches to achieve rational resource utilization. They analyzed the fixed effects and random effect models using uneven data panel analysis to examine the effect of EU28 region countries' development status and external economic factors on the level of cost efficiency in the bioenergy industry in EU28. The result showed that the cost efficiency rate of the bioenergy industry amongst the developing members was equal to developed members. The results suggested that cost efficiency had a diverse influence on the technical and allocative efficiency levels. It was found that inflation and interest rate, GDP, capital cost, and labor cost affected the cost efficiency of the bioenergy industry in EU28 emerging and advanced members during the period of this study.

In a related study, Makieła and Osiewalski (2018) examined the cost efficiency of the electricity distribution sector under model doubt in Polish. They applied the Bayesian method to examine the cost efficiency of distribution system operators when it is difficult to determine the model requirement and

variable choice. The Bayesian model choice and inference pooling procedures were accepted in a stochastic frontier analysis to reduce the problem of model doubt. The suitability of a given description is refereed by its subsequent likelihood, which marks the benchmarking process, not only more clearly but also much more impartially. The projected methodology was applied to one of the Polish Distribution System Operators. The result showed that variable choice played a significant role and models are somewhat parsimonious. They relied on several variables to determine the observed cost. However, these models obtained moderately higher average efficiency marks among the analyzed objects.

The cost efficiency of European air navigation providers was investigated by Dempsey-Brench and Volta (2018). The Air Navigation Service Providers (ANSPs) are the third main section of the flying manufacturing, but are less highlighted in research than their carrier and airport colleagues. They used the means of a stochastic frontier analysis method inside a Bayesian assessment basis to combine orderliness conditions. The results displayed that proprietorship was not directly impacting neither the ANSPs cost configurations nor their cost efficiencies. The European ANSPs are functioning on the growing return to scale portion of the technology.

Alshammari, Alhabshi, and Saiti (2019) examined the impact of competition on the cost efficiency of conservative insurance and takaful sectors in Gulf Cooperation Council (GCC) countries from 2009 to 2016. The study applied stochastic frontier analysis (SFA), and the results revealed a positive connection between rivalry and competence that supported the Quiet Life (QL)

hypothesis; the administrators in a less viable market may utilize the market power of their companies and reduce their efforts. Nevertheless, there were differences between takaful operatives and conservative insurers in this respect. The connection between rivalry and efficiency was undesirable, where conventional insurance is positive only for takaful. The encouraging connection between competition and cost efficiency could motivate policymakers and controllers to support the competitive insurance industry. However, they should be conscious of the amount of competition and use limits and condition for market entry wisely.

Al-Khasawneh, Essaddam, and Hussain (2020) investigated the cost efficiency, dynamic forces, and productivity of the U.S. merging banks from 1992 to 2003. They used the SFA model for cost efficiency evaluation and MPI for productivity. The results indicated that large merging banks have similar productivity scores related to their peers, while smaller merging banks experienced lower productivity than their peers. The source of the bidder productivity comes from technical efficiency change, not frontier shifts.

The cost results indicated that small and large merging banks sustained higher cost efficiency over their peers during the period inspired by higher technical efficiency scores. Thus, this signified large bidders can maximize their output by a given fixed input being most relative to the merging and non-merging banks of different sizes. The main cost efficiency components indicated that the merging banks and major cost efficiency constituents were mainly pure technical efficiency. After M&A, the allocative efficiency improved significantly at the expense of technical and pure technical efficiencies. However, the peer banks

cost efficiency continued to be reliant on pure technical efficiencies and technical.

2.4.4 Productivity Efficiency (PE)

Coelli, Rao, O'Donnel, and Battes (2005) stated that productivity refers to the total factor productivity that measures the productivity concerning all factors of production. This embraces all outputs in a multiple-output situation. Cooper, Seiford, Tone, and Zhu (2007) remarked that Malmquist productivity index appraises the productivity change of DMU between two points, which are the example of comparative statics, this being defined as the product of catch-up and frontier shift terms. In addition, they stated that stochastic frontier analysis (SFA) and data envelopment analysis (DEA) are two methods to calculate total factor productivity. Catch–up is related to the degree of which the DMU improves or worsens its efficiency and frontier-shift or innovation that reflects the change in the efficiency frontiers between the two-time intervals.

Raphael (2013) applied the Malmquist productivity index approach as an independent variable in evaluating the productivity of long-term performance of M&As in Tanzania. These independent variables are linked to dependent variables because there are used in assessing the long-term performance after the M&A activity that has to be evaluated for synergy. The result indicated that the greatest commercial banks improved in efficiency change by 67 percent. In addition, there was a technical change improvement of 83 percent, scale efficiency change of 50 percent, and pure technical change improvement of 67 percent.

Jin, Leem, and Lee (2016) investigated the main concerns and prospective megatrends in the manufacturing production or productivity over the past 44 years beginning from the 1970s until year 2013. The researchers found that studies focusing on productivity could be described as follows. The 1970s productivity study stemmed from the study of human resource productivity, productivity-related external factors, regional characteristics, the necessity to computerize and achieve mass the manufacture, and the relationship between labor productivity and employment change.

In the 1980s, the focus was on the investment in R&D, production, and IT, the association among R&D, the total factor productivity, and employment factor productivity, and manufacturing technology evolution. Others focused on automatic design and computer-aided design (CAD), computer-aided production (CAP), flexible manufacturing system (FMS), skill policy, and manufacturing productivity. The 1990s emphasized the training in the introduction and development of equipment, just in time (JIT), advanced manufacturing technology (AMT), computer integrated manufacturing (CIM), FMS, hypermedia technology, progressive manufacturing, and clean production technology. The period from years 2000 to 2013 presented the trainings on the connection between manufacturing technology and IT, management systems, constant improvement, knowledge management (KM), quality improvement (QI), innovation, trim production, reconfigurable manufacturing system (RMS), cellular manufacturing, improvement in performance evaluation model, properties of environment-related regulation, and energy-saving manufacturing technology.

Others examined areas such as cleaner production (CP), CO_2 clean technology, effectiveness and performance measurement of green IT and green innovation, green supply chain management (SCM), the use of radio-frequency identification (RFID) technology, and hybrid reconfigurable systems. From the analysis of productivity trends, a preliminary framework of 16 productivity issues was created, and it later formed the productivity issue framework involving 9 and later 6 productivity issues as presented in Table 2.4.

Table 2.4: Categories of Core Productivity-Related Issues

S/N	16 greatest production factors	9 greatest production factors	6 greatest core production factors
1	Global regulation	Global regulation	Labor
2	Trade	Trade	Automation
3	Business performance	Business performance	Quality
4	Management system	Labor	Process
5	Strategy	Process	Information
6	Domestic policy	Technology	Innovation
7	Capital	Tool & method	
8	Infrastructure	Operation performance	
9	Labor	IT system	
10	HRM		
11	Internal process		
12	External process		
13	Technology		
14	Tool & method		
15	Operation performance		
16	IT system		

Source: Jin, Leem and Lee (2016)

Table 2.4 shows that labor has the greatest importance as a core production input factor. Labor is necessary for several preparation and management systems as they affect productivity in terms of labor input quality. Automation implies the

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use of the machine or factory equipment for manufacturing operations and a manufacturing system following the development of computer and machine industry technology. Through mechanizing the equipment, the output may be creatively increased and production can be improved. Concerning the quality, a company can stimulate productivity and business competition if it seeks to guarantee the quality of its goods by managing the unique characteristics and ensuring the reliability of products.

On the process, a company's interior and exterior processes can be improved through the development of various techniques and technologies. Improved processes may result in enhanced productivity and business competition. Information expertise enables company-wide integrated management of the manufacturing production process. Due to the progress of IT and industry, industrial production processes can be completed more quickly. About the innovation, a maintainable enterprise is dependent on strategic R&D and the creation of an innovative cooperative network system with the company's various interested parties besides the planned connection of manufacturing systems using innovative and advanced technology.

Furthermore, corporate sustainability is safeguarded through innovative responses, such as the introduction of green technology policies and regulations to rapidly address the growing environmental problems. In enumerating the 6 major issues within the highlighted period, the major productivity issues suggested that labor, automation, quality, process, information, and innovation established the megatrends in the early 1980s until 2000s. Production as efficiency in pre-1980s was evaluated based on the efficiency of the outputs

versus inputs. The main issue was increasing productivity by focusing on the inputs of labor and capital.

The important factor with respect to increasing productivity was the quantity of labor and the capital input. Quality of labor was a company's most important resource, while capital input was required to build product-based facilities and infrastructure. This era's illustrative essay included studies on the relationship between changes in labor and economic growth (for example, Sloman & Wride 2015). They measured the expansion of labor input and integration of capital, the association between productivity and population density, and the association between labor productivity and changes in local employment.

Production as performance was emphasized in the 1980s until 1990s, which saw the advancement of various techniques and technologies to attain corporate performance. The important issue of this period was increasing productivity using automation technology, integrating management of advanced production, and improving quality. Consequently, it specifically comprised the introduction of production technology and production systems to improve quality. An additional important issue was developing techniques to effectively manage a company's internal and external processes and facilitate productivity by applying the IT systems. Productivity as competitiveness came in the post-2000 era in identifying the integration of various internal and external company factors and the spread of inter-company cooperation.

This period focused on how productivity was affected by a company's various interested parties and network of management, the creation of an innovative cooperation network system, and what affected the introduction of green technology and green management innovation in relation to productivity. Green productivity became the main concern for addressing environmental issues. Alternatively, the key issues were technology innovation and management for sustainability and productivity improvement. The illustrative article revealed that innovation would take place through the creation of knowledge. In addition, companies conducting knowledge management could use their resources more efficiently, maximize the value of their knowledge resources, and improve productivity (Darroch, 2005).

A company's green innovation efforts in response to the deterioration of production conditions with environmental regulations that could have a positive impact on labor productivity (Woo, Chung, Chun, Han, & Lee, 2014). In summary, the industrial industry has a sizeable task of creating new benefit for sustainability while addressing a decline in productivity related to various regulations targeting environmental pollution. In dealing with this environmental situation, companies have been actively proceeding with productivity-related studies using green growth strategies, including the development of green technology related to goods production. This is assisted by the reduction of whole carbon emissions and the introduction of green technology and energy, such as green IT and clean production in production processes to enhance green productivity and government support.

In the interim, a huge effort has been made to lead the rising combination of industrial markets and create significant added value. Thus, companies, academia, and governments have been actively proceeding with studies to improve productivity through a fusion of technologies between different industries. Furthermore, the idea of a 'win-win' management suggested the coexistence of corporate ecosystem members that extended beyond individual company competition has risen along with intensive research.

Calegario, Carvalho, Campos, and Dos-Santos (2017) investigated the effects of M&As on the productivity of different industries in Brazil, which were based on Malmquist productivity index (MPI), efficiency change (EC), and technological change (TC). The result showed a positive relationship between TC and M&As by the Brazilian majority capital, acquiring foreign-held capital from companies established abroad. This is consistent with the reverse spill over hypothesis. In addition, the inverse relationship between TC and M&A operations of companies with foreign majority capital acquired both Brazilian-held capital and foreign-held capital from a company established in Brazil was not found.

2.4.4.1 Horizontal Productivity

Fee and Thomas (2004) studied the sources of horizontal merger profits and showed their results as a source of benefit from horizontal mergers that enhanced productivity and purchasing power. Sung and Gort (2006) posited that there was no positive increase in total factor productivity (TFP) in the

amalgamated companies for the pre- and post-merger experience. Furthermore, no systematic difference existed in TFP between the amalgamated company and those that were not involved. On the other hand, Nguyen and Ollinger (2006) stated that the relationship between the amalgamated companies and productivity result of plants positively improved the productivity growth during the post-merger times.

On the other hand, Bertrand and Zitouna (2008) examined the effect of horizontal M&A on the target company's performance in the manufacturing sector in France on both productivity and profitability. The result showed that profitability after M&A was not affected in the long term, but the productivity of the target companies increased after M&A in the long term. Different reasons were given when a company acquired another company, including management preferences, diversification, and market power. The reasons include productivity improvement or the potential efficiency gains that result from mergers (Worthington, 2004).

Ringel and Choy (2017) examined the effects of mergers and acquisitions on pharmaceutical research and development (R&D) productivity with different devices by which mergers could either help or hurt R&D. They used downstream methods of R&D productivity for both inputs and outputs using self-controlled design. The period of study was from 2001 to 2011 involving 13 large mergers in the global pharmaceutical R&D. The time scale of the study was 3 years before and 3 years after M&A. The results indicated a statistically significant increase in R&D productivity due to M&As.

In a related study, Chen, Su, and Hiele (2017) studied the influence of IT on organizational coordination costs using the theoretical lens of transaction cost economics. They addressed the following issues: does IT matter? how does IT matter to the company? how does the coordination cost mediate the relationship between IT spending and company productivity? and how does it influence IT spending and company size when considering the information product industries (IPI) and the physical product industry (PPI)? The authors utilized IT spending, coordination costs, companies' size, and company productivity with company-level data, with the information that were obtained on a weekly basis from the Compustat dataset in the US from years 2011 to 2013.The results indicated that IT spending decreases coordination cost and IT spending decreases with company size. The result also showed that IT spending did not significantly improve a company's productivity. There were evidence of strong coordination costs that became a mediator between IT spending and company size in IPI companies. Coordination costs also mediated the relationship between IT spending and company productivity in IPI companies.

Similarly, Schiffbauer, Siedschlag, and Ruane (2017) investigated whether foreign mergers and acquisitions boost the productivity of the acquired companies using micro-data from the UK from years 1999 to 2007. Their outcome suggested a significant heterogeneity in the total factor productivity effects of foreign M&As at the industry level. They found a systematic pattern of post-acquisitions TPF effect that was consistent with the most recent theoretical models of company heterogeneity and cross-border M&As as a mode of foreign entry. The result revealed the positive aggregate effects on labor productivity due to capital deepening and not due to changes in TFP.

2.4.4.2 Vertical Productivity

For the United States vertical productivity, Hortaçsu and Syverson (2006) investigated the effect of vertical integration on market power in light of foreclosure in the United States. The data from cement and ready-mixed concrete industries for over 34 years beginning from 1963 to 1997 were analyzed using regression statistics. The results revealed very little indication that foreclosure effects were quantitatively important in these industries. It was found that capacity grew and the rates fell while the entry rates remained unchanged when the markets became more integrated. Furthermore, the result revealed that higher productivity producers were more probable to integrate vertically and develop, persist, and charge lower prices. In addition, the results also showed that the basis of vertically integrated producer's productivity benefit was tied to company size.

Forbes and Lederman (2010) investigated the effects of vertical integration on the operational performance of large U.S. airline using regional partners to operate some flights. The result showed that integrated airlines performed systematically better than non-integrated airlines at the same airport on the same day. Besides that, the performance advantage increased on days with adverse weather when airports were more congested. Hence, it was suggested that vertical integration might facilitate real-time adaptation decisions in this setting.

In a productivity study, Caineli and Iacbucci (2015) examined the relationship between companies' vertical integration choices and their economic productivity performance from years 2001 to 2004. The data were part of a

research agreement among ISAT, CERIS-CNR, and Universita Politecnica Delle Marche. The result indicated that technology and price uncertainty influenced vertical integration productivity.

In a related study, D'Annunzio (2017) investigated how vertical integration affected the media investment. He reported that vertical integration decreases both consumer and total surplus and recommended that authorities assess the effects of vertical mergers on incentives to invest in content quality by incorporating non-price measures in merger analysis. In the context of developing countries and China, Li, Lu, and Tao (2017) examined the vertical integration and company productivity using three cross-industry datasets. The results suggested that vertical integration had a negative impact on productivity in contrast to the recent studies on the U.S. companies. Thus, the authors argued that in places with poor corporate governance, vertical M&A reduces company's productivity as it enables inefficient rent seeking by insiders.

2.4.4.3 Conglomerate Productivity

A study on the non-bank financial institution productivity in Malaysia was conducted by Sufian (2006, 2008), while another study on the European banks using Malmquist productivity index (MPI) was conducted by Figueira, Nellis, and Parker (2009). More specifically, the non-bank Malaysian financial institutions in Sufan's (2006, 2008) study indicated that these institutions experienced productivity improvement from years 2000 to 2004, and the improvement was mostly caused by the companies' technological development. Figueira, Nellis, and

Parker (2009) investigated the productivity and efficiency of Portugal and Spain banks from years 1992 to 2003. The result revealed a significant improvement in productivity performance of Spanish than Portuguese banks over time. They concluded that banks in Spain performed better than Portugal. The reason for the significant improvement in the banks' productivity performance was due to technological change improvement.

In a related study, Arijomandi (2012) examined the productivity and efficiency of Iranian conglomerate mergers in the banking sector. The sample consisted of 10 state-owned banks and six private banks from 2003 to 2008 pre- and post-2005 reforms. Using the Hicks-Moorsteen total factor productivity index, the result indicated that the total factor productivity increased by 32 percent from years 2006 to 2007, while technical efficiency saw improvement from years 2003 to 2007 that dropped after the regulatory changes in 2006 and 2007. During this interval, the industry experienced its highest negative scale efficiency rate of 38 percent and the highest negative growth rate of 43 percent, while industry productivity was reduced from 2007 to 2008. Additionally, productivity changes were affected by both production possibilities set and scale-efficiency.

A lot of different performance measures have been discussed in this review such as economic value added, which was applied to the residual income valuation approach (RIV) in the pilot study analysis before arriving at RIV as the most suitable for operating performance. Other fields like event studies, operating performance studies, and ratio analysis equally discuss in detail in the frontier versus non-frontier analysis sections' different traditional approaches,

merits, and limitations. In addition, it is the discussion of the different Malmquist productivity index (MPI) in evaluating productivity, as well as considering the two MPI decompositions by Fare et al. (1992) and Ray and Delsi (1997) in detail with the analysis results and confidence levels. Production cost price and unit selling price data were needed for evaluating profit efficiency that was not available after several efforts without success. Thus, it enables the investigation of operating performance (OP), technical efficiency (TE), cost efficiency (CE), and productivity efficiency (PE) as the main independent variables in evaluating the long-term performance of listed non-financial M&As companies in Nigeria. In this instance, selecting these independent variables for further methodological review is justified.

2.5 Frontier Versus Non-Frontier Analysis

Due to the numerous advantages over other pointers of performance, frontier methods such as stochastic frontier analysis (SFA) and data envelopment analysis (DEA) are recommended by researchers to assess the impact of operational strategy and policies (Assaf & Josiassen, 2016). The frontier methods provide a numerical value of performance, or also called as technical efficiency, which is easy to interpret, objective, supports resource allocation, assists companies, and measures the outcomes of their different strategies and policies. It permits executives to identify the gaps between their actual performance and optimal performance (Coelli et al., 2005). Frontier analysis can inform knowledgeable industry participants on the little they do not already know (Berger & Humphrey, 1997). It permits the combination of multiple inputs

and outputs in the measurement of performance and delivers a benchmark, which is the frontier against rivals that can classify areas of best practices and worst practices connected with high and low measures of performance (Assaf & Josiassen, 2016). The frontier analysis is an accurately determined quantitative measure that eliminates the effects of market prices and other different factors that impacted the observed performance (Bauer et al., 1998).

Non-frontier analysis (traditional approaches) is significant for strategy preparation and evaluation, and it is one of the foremost foundations of sustained competitive advantages (Assaf & Magnini, 2012). Non-frontier analysis is necessary because measuring performance aid companies improve their market situation by detecting areas of the value chain activities where rivals have stronger advantages (Barros, 2005). The non-frontier literature relied on accounting-based indicators in measuring the overall performance (Assaf & Josiassen 2016). These non-frontier approaches were incomplete in focus and sensitivity to various accounting standards between companies, and other studies used more comprehensive methods for performance measurements and control (Sainaghi, Philips, & Corti, 2013).

Another example is the cost volume profit analysis, which is useful in breakeven analysis. It can be used to analyze the performance of individual companies at the regional level for relating various types of companies (Assaf & Josiassen, 2016) as well as yield management for performance measurement (Barros et al., 2010). Yield management is beneficial in terms of exploiting revenue and using capacity efficiently with limitations. For instance, it works when there is a high level of demand and is more effective in hotel like five-star properties. The non-frontier approach is

also the balanced scorecard (BSC). These techniques report the limitations of many business performance measurement systems as it captivates both financial and non-financial performance measures (Phillips & Louvieris, 2005).

It reflects the physical assets (financial) and three unnoticeable assets and scholarly capital (internal business process, customers, and learning and growth (Sainaghi et al., 2013) on both financial and non-financial aspects. Evan (2005) stated the robust connection between strategy implementation and evaluation. Other non-frontier method includes importance performance (IP) analysis method. This has been applied across many contexts. The IP's main advantage is informing the management about the areas that need more attention, including cost-effective and areas where they have unused resources or wastages (Assaf & Josiassen, 2016).

Out of all the non-frontier methods explained and discussed, the unique feature of frontier analysis methods for performance measurement is that they have a quantity of efficiency that discloses openings between a company's actual and optimal performance. However, none of the non-frontier approaches provides a measure of performance comparative for optimal performance. Secondly, the frontier analysis technique can incorporate multiple inputs and outputs.

2.6 Methodology on OP, TE, CE and PE

The independent variables in the study evaluated the operating performance (OP), technical efficiency (TE), cost efficiency (CE), and productivity efficiency (PE) of companies' performance.

2.6.1 Operating Performance Methodology

Ratio analysis and comparable methods have been in the limelight to the economic and finance experts. The comparison methodology is established on the concept of the law of one price, which implies that two similar assets should sell for similar prices. The discounted cash flow model can be used for both companies that pay and did not pay dividends. However, the cost of equity is not considered in the model, making this method not suitable and reliable.

A study by Morard and Balu (2009) identified two serious problems arising from the use of financial accounting-based methods. First, studies using accounting measures to assess performance that adopted distinct accounting principles can lead to distinct performance interpretations. Secondly, the acquisition price and the cost of opportunity for bidder shareholders were not considered for the measurement or benchmark standard. The authors argued that there were also restrictions to free cash flow and all of these restrictions were eliminated using the residual income valuation (RIV).

Guest, Bild, and Runsten (2010) examined the effect of mergers and acquisitions on the fundamental value of the bidders' companies in the UK from years 1985 to 1996 involving 303 samples. They applied residual income valuation (RIV) method. The aim was to determine whether the mergers improve the fundamental value of the bidder companies after the deal in the long term. The result of the fundamental value was slightly negative and statistically non-significant. They stated that the takeovers on the profitability were slightly positive while the impact on the share returns was significantly negative. In addition, it is argued that stock improper pricing and market expectation were

the reasons that an event study investigation may not be suitable in analyzing the impact of mergers on the fundamental value of the bidder companies.

The event study does not consider funds paid to the target companies. Besides that, profitability study is not suitable to evaluate acquisition post-merger since the total discounted value effect is not measured. They further stated that for fundamental value to be created, the marginal profit return must be larger than the marginal cost of capital. The profit of the bidder company could be smaller following merger. But if the marginal profit is larger than the marginal cost of capital, there is the tendency for the creation of fundamental value after the merger. Furthermore, RIA is applicable whether the companies pay or did not dividends, but most importantly considered the cost of equity.

On the other hand, Sharma and Kumar (2010) stated that after conducting a study on EVA on 112 articles, more studies are needed on EVA before concluding it as a performance measurement tool, as there is varying evidence on its supremacy. The event study assumed that the stock market was efficient and the results were delicate to the periods selected. However, the findings on efficient markets are inconclusive. Thus, researchers cannot depend on event studies alone to determine M&A success, and should use other methods.

AlMamun and Mansor (2012) stated that EVA is a measurement tool in the developed countries and has about 164 adjustments in its model evaluations. In addition, it involves calculation not following the generally accepted accounting principles (GAAP). EVA is a concept that gives true economic profit to companies and creates values to the shareholder.

Talebnia, Ebrahimi, and Darvishi (2015) stated that RIV is a better alternative to dividend-discounted model in determining the value of a company. In Greece, Aggelopoulos and Georgopoulos (2015) investigated the determinants of shareholders' value in the commercial banking during the crises years from 2006 to 2010 using residual income valuation. The result showed that crises turned all positive value to negative value affecting earnings diversification and reducing the value of premium lending spreads. According to Leepsa and Mishra (2016), in the year 1997, Villiers stated that the EVA model is not suitable as it includes inflation.

Uzik (2017) stated after his study using residual income valuation (RIV), conventional financial statements reflecting returns left the shareholders to determine whether the returns were sufficient to meet their cost of equity while the economic concept of RIV explicitly considers the cost of equity. He explained that RIV has inherent value for the company in two parts: the present book value of equity and the present value of the future residual income. These methods have no 'best' valuation method in all situations.

2.6.2 Technical Efficiency Methodology

Cummins and Rubio-Misas (2006) stated that the three major ways of studying M&As as dynamic events consist of operating performance studies, dynamic efficiency studies, and event studies. They stated that dynamic efficiency studies are the outcome of the increasing development of frontiers methodologies involving the parametric methods that include stochastic frontier

approach (SFA) and thick frontier approach (TFA). Non-parametric methods involved data envelopment analysis (DEA) and free disposal hull (FDH). Furthermore, they remarked that each method is about finding out whether mergers and acquisitions improve the efficiency of the merging companies relative to the industry. DEA and SFA models provided a consistent performance assessment but required a careful selection of inputs and outputs. The accounting returns and event studies are regressive looking and unable to account for intangible assets and provide a weak picture of performance (Capasso & Meglio, 2007).

Applying a DEA model in their study, Scippacercola and Sepe (2014) stated that DEA jointly considered many inputs and outputs, and it uses the principle of linear programming to investigate how a particular DMU operates relative to other DMUs in the pool. This is to prevent the disadvantage of the simple ratio approach in multiple inputs/output cases, where the most efficient DMU according to one ratio may not be efficient by to another ratio. Furthermore, the ratio of the quantity of all computer-generated (virtual) outputs to all computer-generated (virtual) inputs is used by DEA, and the index obtained is the total factor productivity (TFP).

This is one of the most important benefits of DEA as it considers multiple inputs and outputs. DEA is operational on the selected inputs and outputs of companies called decision-making units (DMUs) and DEA. It can provide efficiency improvements for inefficient DMUs. The technical efficiency examines the number of inputs or outputs, which means that entries at a specified output are minimized or maximized at a certain input rate. The DEA model can

include external variables that influence the outputs but are not controlled by DMU executives.

Mirdehghan, Nazaari, and Vakili (2015) applied DEA model and stated that technical efficiency reflects the ability of a DMU to obtain maximum output from a given set of input. Cost efficiency (CE) measured the ability of a DMU to produce the current output at minimal cost given its input prices. Equally, allocative efficiency is the ability of a company using inputs in optimal proportion given their respective prices and the production technology. In addition, these two processes' combination offers a measure of total economic efficiency.

The impact of mergers on the cost efficiency of financial and non-financial sectors in Pakistan by Awan et al. (2016) examined whether it is improving or decreasing, using a DEA model from years 2004 to 2012. The result indicated an insignificant improvement in cost efficiency three years after the mergers of financial and non-financial companies in Pakistan.

Liu, Lu, and Lu (2016) listed the top 29 authors (see Appendix A) that have made a significant contribution to the development of DEA research study. This list shows various studies used DEA in analyzing operating performance, technical efficiency, and productivity of companies from years 1978 to 2014. When evaluating companies' operating performance, technical efficiency, and productivity, the DEA can be used. The assessment of technical efficiency is a key instrument for knowledge that slows down production growth.

2.6.3 Cost Efficiency Methodology

In Turkey, Gunes and Yildirim (2017) investigated the cost efficiency of Turkish moneymaking banks over the reorganization period of the Turkish investment system, which overlaps with the 2008 financial global crisis and the 2010 European independent debt crisis. They utilized the true fixed effects model, where the unnoticed bank heterogeneity was integrated into the inefficiency spreading at a mean level. The result disclosed that the cost efficiencies of Turkish banks had improved over time by the disaster effects of years 2008 and 2010. Additionally, not only did total cost efficiency influence the disasters, but this influence appeared to vary with regard to bank size and proprietorship structure, which is in agreement with much of the existing work.

Doan, Lin, and Doong (2018) investigated the relationship among bank efficiency and income diversion, ownership structure, bank expansion, and cost efficiency of 83 countries from years 2003 to 2012 using stochastic frontier analysis. The result showed that increased expansion tends to increase bank cost efficiency, but this was offset by the increased exposure to unpredictable non-interest activities. By using SFA as the preferred model based on an international bank efficiency research, Ab-Hamid, Abdul-Raman, Abdul-Majid, and Janor (2018) evaluated cost efficiency as an independent variable on Malaysia's post-merger and acquisition study.

In the study of Taiwan commercial banks during the after liberalization, Kashian, Lin, and Xue (2019) applied SFA in evaluating the cost efficiency using the data from Taiwan's banking bureau and financial supervisory commission before and after 2008 financial crises. The results showed that banks associated

with bank holding companies (BHC) were more efficient, but those not associated generally increased their efficiency.

Liu (2019) compared the U.S. and Canada bank efficiencies by determining whether the structural differences of two countries affect the banking industries by creating differences in efficiencies. He applied SFA and DEA models with the data from years 2008 to 2017. The result showed that the cost and profit efficiency revealed a comparative low association. However, SFA and DEA produced different and unrelated results, but DEA produced overall lower efficiencies. Otero, Razia, Cunill, and Mulet-Forteza (2020) investigated the cost efficiency in the Middle and Northern Africa (MENA) using SFA for the period from years 2005 to 2012. The result indicated that cost efficiency was positively related to economic performance.

2.6.4 Productivity Efficiency Methodology

Alhassan and Biekpe (2016) studies the productivity change of Ghanaian banks from years 2003 to 2011 using Malmquist productivity index (MPI) on 18 banks. The results indicated that productivity development was attributed to the catch-up effect of efficiency changes. In addition, the productivity growth of three categories of bank was driven by efficiency changes. Furthermore, the panel regression analysis identified income diversification, size, concentration, and risk to describe the productivity variability of Ghanaian banks.

Maheshwari (2016) stated that productivity improvement was a combination of many factors. The factors were interrelated, so it is difficult to identify the effect on a particular one. These factors included humans, the capability to work, and the quality of employees and managers. On the other hand, the ability to work was directed by experience, education, and skills. Secondly, it was the readiness to work that was the incentive and moral of the people that determined the productivity. The technological change issues were (i) the decrease and use of waste and scrape, (ii) the stock control system, and (iii) the assessment and quality control.

The factors for productivity improvement technique according to Maheshwari (2016) that are applicable to the M&As companies' need include the work study (WS) indicating a vibrant instrument of improving productivity. This is done by removing unproductive and unnecessary activities and idle time as WS saves strength and time. Manufacture plans and control create a particular direction of each important item and release necessary orders and originating. The automation is computerization, mechanization, and justification on the major contributors to productivity; the process increases the speed and accuracy of work.

An enticement arrangement–that is executives trying to satisfy needs of employees to motivate them. The employees participating in the management have a flextime plan where the staff have the liberty to select within certain limitations such as time they begin and quit their job each day. Having quality circles (QC) provides employees the chance to participate in decisions about their work as a small group can meet frequently to discuss problems, examine the causes, and recommends solutions. Then, the research and development are the

introduction of modern methods of production, improvements in current technology, and equipment. The rate of high-tech development is a direct determinant of productivity.

Kim, Oh, and Kang (2016) investigated the productivity variations in the healthcare organizations of 30 Organization for Economic Co-operation and Development (OECD) countries from years 2002 to 2012. They applied Malmquist productivity index (MPI) approach to estimate unfairness-adjusted indices of health care performance in efficiency, productivity, and technology by adjusting the original distance functions. The two inputs were health expenditure and school life expectancy, with outputs being life expectancy at birth and infant mortality rate to determine productivity development. The results indicated no noticeable tendencies in productivity changes from years 2002 to 2012. However, it showed a positive productivity improvement for most OECD countries. Furthermore, the results revealed considerable variations in yearly productivity marks across the countries. The mean yearly productivity growth was evenly produced by efficiency and technical changes, but the changes run slightly different through the years.

On the other hand, the outcomes emphasized that policy reforms in OECD countries have enhanced productivity development in the healthcare systems over the past period. Therefore, countries that are lagging behind in productivity development should level peer countries' implementation to increase performance by highlighting an attainable course on socioeconomic conditions. Furthermore, comparatively incompetent countries in the study indicated advanced income disparity, corresponding to inequality and health

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outcomes. They stated that income disparity and globalization were not straight measures to assess the health care productivity, but these concerns could be hidden factors to enlighten cross-country healthcare productivity for upcoming studies.

In the five energy-intensive industries of 23 European Union (EU) countries by Makridou, Andriosopoulos, Doumpos, and Zopounidis (2016), consisting of electrical, manufacturing, mining and quarrying, transport and construction companies from the period 2000 to 2009. The data envelopment analysis (DEA) combined with Malmquist productivity index (MPI) was applied to determine the difference between efficiency and technology change over time. The second level of analysis applied multilevel modelling to examine the key drivers behind efficiency performance using several sector and nation characteristics. The results of the DEA indicated a general efficiency enhancement in all sectors. The MPI results indicated that technology change was predominantly accountable for the improvement realized in most sectors. The results of the cross-classified model indicated that energy taxes, high electricity charges, and market share of the main generator in the electricity market have an undesirable consequence on industrial energy efficiency.

Efficiency means a peak level of performance that applies the minimum quantity of inputs to achieve the maximum amount of output. It reduces the excess resources such as energy, physical materials, and time in achieving the wanted output. On the other hand, productivity calculates the efficiency of a business' production procedure or refers to how much an organization can produce with a given amount of input. This is done by separating the outputs

made by a company by the inputs applied in the production process (Tohproblemkyahai.com 2020). Therefore, productivity and efficiency can work together or is related to each other.

Efficiency is important in an organization because it leads to improvement in the profitability of a business concern. Besides, the labor productivity cost in an organization can lead to profit. Therefore, measuring productivity efficiency of a company can be done in many ways, but the current methods rely on software tracking and monitoring, depending on the companies' affordability. Some of the productivity measurement methods are value productivity measurement method (VPMM), value-added productivity measurement method (VAPMM), single factor productivity (SFP), multifactor productivity (MFP), and Malmquist productivity index (MPI).

The VPMM applies the value of outputs and inputs to calculate productivity. It consists of the following methods: Energy Productivity = volume of output divided by volume of energy input; Labor Productivity = volume of output divided by volume of labor input; Machine Productivity = volume of output divided by Volume of machine input; Total physical productivity = Total volume of output divided by Total volume of all inputs; and Material Productivity = volume of output divided by volume of material input. The value-added productivity measurement method (VAPMM) applies value-added that is stated in financial units and taken from financial statements of companies as data for evaluation given as VAPMM = personnel expenses + current income + rent + tax + financial loss + depreciation cost (Tohproblemkyahai.com, 2020). This method

is applied in companies with several outputs or to costly raw materials needed in production.

With VAPMM, we have the methods such as labour productivity = valued-added divided by labor input, and capital productivity = value-added divided by capital (Tohproblemkyahai.com, 2020). Single-factor productivity (SFP) method is a method of calculating the ratio of output and one input factor only. Work productivity, being a ratio of output to work input, is an example of the single-factor productivity method. The multifactor productivity (MFP) reveals the complete efficiency that capital, labor, and other intermediate inputs are used in the production process (OECD, 2001). MFP does not separate the result into frontier shift and technical change like the Malmquist productivity index (MPI), which provides an advantage over MFP and is a better choice in evaluating M&A between two intervals before and after the activity. The MPI result revealed if the change in productivity is because of efficiency improvement or technological change improvement as the Malmquist Productivity Index (MPI) is used to evaluate the change in efficiency over time.

MPI categorises the results into technical efficiency change index (TECI) and technological change index (TCI). Developments in technology, changes in economic environments, and changes in government policies often bring about technical change. Technical efficiency change (TECI) indicates the change in the company's efficiency that can be attributed to sound investment planning and efficient execution of the technical experience gathered over time. Technological change index (TCI) is because of research and development and innovations (Barros, Mangi, & Yoshida, 2010).

The major problem statement in this study is the neglected evaluation of the performance of non-financial companies' involved a long-term M&A activity, which have been increasing over the years. Long-term evaluation is vital because efficiency takes a longer time to be realized. Based on the literature, operating performance, technical efficiency, cost efficiency, and production efficiency are indicators of performance. They are relevant because if value is created as the result of an M&A, the synergy effect should show a significant level in any one of these four performance measures. Considering long-term before and after M&A activities for proper performance evaluation will highlight any improvement or decline. An external benchmark in the form of non-merging companies has been highlighted in the literature in the performance evaluation of bidder companies with similar assets, market capitalization and line of business. Comparing the bidder with the non-merging companies' performance can determine the spill-over effects of the M&A activity. Thus, the M&A efficiency theory, which this study is based upon, states that for a value-maximizing M&A, the merging (bidder and target) companies' shareholders should benefit. This gain is associated with the evaluation of these companies' performances before and after the long-term M&A activities. The approaches applied were the RIV method for operating performance, the DEA and SFA for efficiency, and the Malmquist productivity index for productivity.

Therefore, a conceptual framework based on the literature reviews is presented here.

2.7 Conceptual Framework

Figure 2.1 shows the conceptual framework for this study that links the dependent variables of the long-term performance of non-financial horizontal voluntary before and after M&As of 30 bidders, 30 target, and 30 non-merging companies in Nigeria with the independent variables as follows: operating performance (OP), technical efficiency (TE), cost efficiency (CE), productivity efficiency (PE).

Figure 2.1: Conceptual Framework of the Study
Source: Developed for this study

The conceptual framework links the study objective that stems from the research questions, in terms of any significant differences between before and after M&As, leading to hypothesis generation. All the hypotheses are linked to the 30 bidders, 30 targets, and 30 non-merging companies evaluated for synergy after a long-term M&A, being the dependent variable. This evaluation process determines whether these companies' fundamental value creation after M&A activity was realized, while the Mann Whitney U-test was used for significance and the Kruska Wallis test for was performed for robustness check before drawing empirical conclusions.

2.8 Hypothesis Development

The main objective of this study is to examine the long-term performance of M&As of non-financial horizontal voluntary companies listed in Nigeria to determine if the bidders' expected improvement arises from M&A activities was achieved compared to non-merging companies. This is in line with the M&A efficiency theory for a value maximizing activity. That is, bidder companies may perform better after M&As than the non-merging companies due to the expected synergy from M&A activity. There would be a significant improvement for the target companies after the deals. In this study, we applied four measures, operating performance, technical efficiency, cost efficiency, and productivity of the bidder, the target participating companies, and the non-merging companies. These measures were evaluated before and after M&As.

The efficiency theory explains that in any M&A on competence or synergy, the acquirer and target shareholders can benefit positively from the realization of the significant expected performance after the deal. There will be a positive relationship among the target gain, bidder gain, and total gains. Hubris hypothesis suggests that M&A is generated by the agent's high pride assumption of not making a mistake and put forward a value transfer from the acquirers' shareholders to the target company's shareholders through increased premium. Additionally, most empirical evidence confirmed these theoretical predictions. Based on these theoretical and empirical positions, the hypotheses tested in this study are developed.

The first objective of this study is to examine the operating performance of selected 30 bidders, 30 targets, and 30 non-merging companies before and after M&A. The following are the corresponding general hypothesis in the null *(H1: H_{01})* and alternative *(H1: H_{A1})* forms:

H_{01}: The operating performance, technical efficiency, cost efficiency, and productivity of selected 30 bidder companies are not significantly different before and after the estimation period of long-term performance of M&As (*Ho*: Md before = Md after). Md is the median different value (before-after).

H_{A1}: The operating performance, technical efficiency, cost efficiency, and productivity of selected 30 bidder companies are significantly different before and after the estimation period of long-term performance of M&As (*HA*: Md before $\neq$ Md after).

H_{02}: The operating performance, technical efficiency, cost efficiency and productivity of selected 30 target companies are not significantly different between before and after based on the estimation period of long-term performance of M&As (Ho: Md before = Md after).

H_{A2}: The operating performance, technical efficiency, cost efficiency, and productivity of selected 30 target companies are significantly different before and after the estimation period of long-term performance of M&As (HA: Md before ≠ Md after). Md is the median different value (before-after).

H_{03}: The operating performance, technical efficiency, cost efficiency, and productivity of selected 30 non-merging companies are not significantly different before and after the estimation period of long-term performance of M&As (Ho: Md before = Md after).

H_{A3}: The operating performance, technical efficiency, cost efficiency, and productivity of selected 30 non-merging companies are significantly different before and after the estimation period of long-term performance of M&As (HA: Md before ≠ Md after).

H_{04}: There is no significant difference (declined or improvement) for the operating performance of selected 30 bidders, 30 targets, and 30 non-merging companies in the long-term performance of M&A intervals and industry.

H_{A4}: There are significant differences (declined or improvement) for the operating performance of selected 30 bidders, 30 targets, and 30 non-merging companies in the long-term performance of M&A intervals and industry.

H_{05}: There is no significant difference (declined or improvement) for the technical efficiency of selected 30 bidders, 30 targets, and 30 non-merging companies in the long-term performance of M&A intervals and industry.

H_{A5}: There are significant differences (declined or improvement) for the technical efficiency of selected 30 bidders, 30 targets, and 30 non-merging companies in the long-term performance of M&A intervals and industry.

H_{06}: There is no significant difference (declined or improvement) for the cost efficiency of selected 30 bidders, 30 targets, and 30 non-merging companies in the long-term performance of M&A intervals and industry.

H_{A6}: There are significant differences (declined or improvement) for the cost efficiency of selected 30 bidders, 30 targets, and 30 non-merging companies in the long-term performance of M&A intervals and industry.

H_{07}: There is no significant difference (declined or improvement) for the productivity of selected 30 bidders, 30 targets, and 30 non-merging companies in the long-term performance of M&A intervals and industry.

H$_{A7}$: There are significant differences (declined or improvement) for the productivity of selected 30 bidders, 30 targets, and 30 non-merging companies in the long-term performance of M&A intervals and industry.

This study used Kruskal Wallis test (KWT), which is a non-parametric test used by more than two independent groups for robustness check. This is to ensure that the three different groups, namely bidder, target, and non-merging companies, are evaluated in light of independent performance measures: operating performance (OP), technical efficiency (TE), cost efficiency (CE), and productivity efficiency (PE). As a non-parametric, KWT did not make any assumption about distributive property like Mann Whitney U-test, such as mean or variance. Thus, we have the following hypotheses.

There is no difference in the selected OP of 30 bidders, 30 targets, and 30 non-merging companies. *H$_{0\ (OP)}$:* (M$_1$) (B) OP=M$_2$ (T) OP = M$_3$ (NM) OP. *H$_A$* *$_{(OP)}$:* not all population medians are equal. M$_1$ (B) OP is the operating performance of the selected 30 bidder groups. M$_2$ (T) OP is the operating performance of the selected 30 target groups and M$_3$ (NM) OP is the operating performance of the selected 30 non-merging groups.

There is no difference in TE of selected 30 bidders, 30 targets, and 30 non-merging companies. *H$_{O\ (TE)}$*: (M$_1$) (B) TE = M$_2$ (T) TE = M$_3$ (NM) TE. *H$_A$* *$_{(TE)}$:* not all population medians are the same. (M$_1$) (B) TE is the technical efficiency of the selected 30-bidder group, M$_2$ (T) TE is the technical efficiency of the selected 30 target groups, and M$_3$ (NM) TE is the technical efficiency of selected 30 non-merging groups.

There is no difference in CE of selected 30 bidders, 30 targets, and 30 non-merging companies. $H_{0\ (CE)}$: (M_1) (B) CE = M_2 (T) CE = M_3 (NM) CE. H_A $_{(CE)}$: not all population medians are the same. (M_1) (B) CE is the cost efficiency of the selected 30 bidder group, M_2 (T) CE is the cost efficiency of the selected 30 target group, and M_3 (NM) CE is the cost efficiency of the selected 30 non-merging groups.

There is no difference in PE of selected 30 bidders, 30 targets, and 30 non-merging companies. $H_{0\ (PE)}$: (M_1) (B) PE = M_2 (T) PE = M_3 (NM) PE. H_A $_{(PE)}$: not all population median is the same. (M_1) (B) PE is the productivity efficiency of the selected 30 bidder group, M_2 (T) PE is the productivity efficiency of the selected 30 target group, and M_3 (NM) PE is the productivity efficiency of the selected 30 non-merging groups.

2.9 Chapter Conclusion

This chapter presents an extensive review of related literature on several dimensions and areas of study. The key focuses of the four performance measures were operation efficiency, technical efficiency, cost efficiency, and productivity. It also presents various theories applied, the concept of M&A activities, and various forms and types of M&As. Under the concept of M&A activity, the researcher has reviewed the various meanings.

The concept of M&A activity is understood from different perspectives ranging from growth strategy to solvency strategy. The various forms of M&As include horizontal M&As, which could be voluntary and/or involuntary

horizontal, vertical M&As, and conglomerate M&As. From the review, different scholars provided arguments against M&As. The supporters argued that the motive of M&As is efficiency gains from growth. Critics said it is not. They argued that M&As do not necessarily result in such gains.

On the various performance measures reviewed, operating performance was reviewed in depth. This performance measure focuses on accounting measurement of profitability such as return on investments and operating margin. This helps to identify sources of profits resulting from mergers and assess whether expected profits and synergistic benefits are realized. In the review, the researchers discussed measures of operating performance, vertical M&As, conglomerates, and horizontal M&As.

Technical efficiency is one of the performance measures applied, which focuses on the assessment of the difference between the actual and optimal performance at the relevant frontier. The cost efficiency and productivity came in as a pathway to economic improvement and growth required in increasing production inputs such as labor, land, capital, and technology and ultimately productivity.

Some researchers stated that for value maximizing M&A activities, the bidder and target companies should benefit after the deal as a result of the expected M&As synergy. This is also the statement of the efficiency theory because of significant improvement expected after M&As in any or all measured independent variables of operating performance (OP), technical efficiency (TE), cost efficiency (CE), and productivity efficiency (PE).

The measured independent variables (OP, TE, CE, and PE) are linked together with the long-term dependent variable after M&As. This is because they are used in evaluating the long-term performance after M&A activity that has to be evaluated for synergy (Raphael, 2013). The association among OP, TE, CE, and PE measurement in evaluating the long-term voluntary M&As performance provided the link as presented in the conceptual framework with the generating hypothesis. Thus, it has led to evaluating the 30 bidders, 30 targets, and the 30 non-merging companies before and after the M&A activities for long-term synergy. The conceptual framework shows a suitable way of doing this.

Samuels (2015) stated that Mann Whitney U-test is suitable in testing the significance of two non-parametric data, while Kruskal Wallis test (KWT) is another non-parametric test for testing three non-parametric data groups or more. This study applied KWT as a robustness check that considered the three different groups of 30 bidders, 30 targets, and 30 non-merging companies with the same measures (Samuels, 2015; Singh, Roy, & Tripathi, 2013). The Cronbach's alpha (CA) analysis was applied in checking the internal dependability of the variables for the parametric SFA data reliability in the analysis of cost efficiency. The next chapter will explain about the study methodology.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter presents the hypotheses development, data collection process and sources, and test models. The selection criteria of the 30 bidders, 30 targets, and 30 non-merging companies are also discussed. The pre-data analysis methods are tested using the Mann Whitney Significant (MWS) and Kruskar Wallis Test (KWT) for robustness check before the pilot study results are presented. The four measures applied in the study are: 1) operating performance (OP) using the Residual Income Valuation Approach (RIV), 2) technical efficiency (TE), 3) cost efficiency (CE) using both the Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA), and 4) productivity efficiency (PE) using the Malmquist Productivity Index (MPI). Finally, the data analysis software, data editing, data entry, data estimation procedure, and conclusion of this chapter will be explained.

3.2 Data Collection and Sources (Secondary Data)

The sample of this study comprised all the publicly listed non-financial companies that have initiated and completed the horizontal voluntary M&A in Nigeria from 1991 to 2020. This interval allowed for three years' data pre-1995 M&A activity (1992 to 1994) and three years' data post-2013 M&A activity

(2014 to 2016) with last year book value, residual income valuation needed (1991), and Malmquist productivity index benchmark data, hence forming a data interval from 1991 to 2020 (30 years). This period of investigation covered the recent M&As and also ensured the availability of sufficient pre- and post-M&A sample data to evaluate the performance of companies in the study.

The selection of these companies was based on several selection criteria. First, the bidder companies must be listed on the Nigerian Stock Exchange (NSE) and acquired more than 60 percent voting rights of targets, with the assumption that 60 percent is sufficient to give control as specified in Section 313(1) of the reviewed Security and Exchange Commission Act 2011. Second, the target companies are listed on the NSE to ensure all needed data is obtained and remain as a separate entity from the bidder company for at least three years after the merger. Third, the merger is restricted to the voluntary horizontal type of M&A, which takes place in the same industry among companies with similar products, services, markets, and technologies. This excludes banks and insurance and stock brokerage companies that are financially related. Fourth, the bidder and target companies are Nigerian domiciled and not foreign companies. Fifth, the merger of businesses that the acquirers already acquired more than 60 percent stake or related companies is excluded. This is because such arrangements or transactions do not show a company's intention to seek external growth (Song, Alli & Pillay, 2005b), which is the responsive focus of the study. Therefore, including them could amount to a spurious research finding. Sixth, investment trust and financial institutions (i.e., banks and insurance companies), which are mostly involuntary with government interventions, are excluded as their accounting requirement needs to be treated separately. Finally, the merging

companies must have three years pre-M&A and post-M&A financial data available for use excluding the merger year. Table 3.1 shows a summary of the sample selection.

On the other hand, the selection of the non-merging companies was also based on several selection criteria. First, the companies must be listed on the Nigerian Stock Exchange. Second, they are related in terms of market capitalization (MC) and comparable size with the bidder companies. MC implies the total value of the companies' shares of stock, which was obtained by multiplying the price of the company's stock with the total outstanding shares. Third, the non-merging companies must have comparable year of establishment with the bidder companies. Fourth, the non-merging companies are within the same industry as the bidder companies. In their M&A study in the United States, Guo, Liu and Song (2008) had selected and applied registered, operating, non-acquiring, non-merging companies from the Centre for Research in Security Prices (CRSP) that had not been an acquirer for 2 years before the M&A activity announcement date. The same horizontal business or services is generated to examine any spillover effect of M&A (Aik, 2010). Although this was not the main objective of the research, it remained relevant in the M&A study when comparing non-merging with the bidder company's post-performance after the activity (Aik et al., 2015a).

Furthermore, the number of the 30 bidder companies was matched to the 30 targets because they were acquired one-to-one with complete data. Only companies that were still listed on the exchange were eligible to form the sample size. In addition, the target companies had been maintaining separate accounts

at least 3 years after the M&A activity excluding the merger year. The evaluation

method and measures applied to the non-merging companies were also similar

with the bidder company as synergy evaluation was approximately one-to-one

before and after the M&A. Based on the classification by the Nigeria Stock

Exchange, the list of voluntary, non-financial related M&A companies and non-

voluntary (financial related) merger list from the Security and Exchange

Commission (SEC) was sorted based on the focus of the study focus. The SEC

combination list is attached in Appendix F.

Table 3.1: Summary of Sample Selection

Description	Bidder	Target	NSE (Non-Merging)
Initial deal identifies	270	270	170
Banking	72	41	25
Insurance	56	21	35
Mortgage bank	24	8	30
Investment trust	36	0	14
Discount houses	22	0	16
Non-financial (Not selected)	NA	NA	20
Involuntary excluded	210	70	NA
Not listed on the Exchange	17	126	NA
Annual reports not separated 3 years after	8	9	NA
No Three years before/after data	5	35	NA
Total not listed plus involuntary	240	240	NA
Voluntary M&A (Listed with complete data)	30	30	NA
Same horizontal business	√	√	√
Comparable year established	√	NA	√
Cross-Border M&A	0	0	NA
NSE Non-financial selected	NA	NA	30

Note: NA represents not applicable.

Source: SEC and NSE database and author's compilation. The last voluntary M&A is from 2013. Nigerian breweries (270) see Appendix F. The rest (31) were involuntary, with a few not classified or listed by NSE, hence excluded from the study. Involuntary M&A total is 210, 30 bidders plus 30 targets (60), and 30 non-merging companies from NSE listed companies, thus forming 90 sample size. Company's synergy gain or loss is evaluated on one-to-one basis, before and after M&A. The companies' set can have equal elements each for synergy evaluation. However, there is an equal set of 30

elements. The reason is that the listed companies must be in order to have a complete data before making the sample.

3.2.1 Sources of Data

Data is an important component of a research. It refers to the input variables used to analyze the proposition and assumptions of a research work through the scientific establishment of a relationship among phenomena using proven methodology. The prime interest of research data is the source of data, methods of data collection, and data analysis techniques.

This study had used secondary data to examine the long-term impact of non-financial horizontal M&A on different performance dimensions of listed companies in Nigeria. The data was obtained from the SEC database and the respective DMUs annual reports. It was then cross-checked with the fact-book data from the NSE to determine any missing data and establish its validity. The announcement list was obtained from the Nigerian SEC. The SEC is solely responsible to review and approve all M&A transactions in Nigeria until May 2019 and the role was assigned to the FCCPC by the federal government. Meanwhile, the NSE is where all listed companies on the stock exchange are maintained in the fact book. As the theoretical framework of this study is based mainly on secondary data, producing similar results and conclusions was not an issue given that the same methodology was applied, with similar information as well as authors' experience and background in ascertaining reliability.

The Nigerian Stock Exchange classifies companies into different sectors. In this regard, sectors like healthcare, services, oil and gas, consumers, and industrial are classified as non-financial, which is a voluntary M&A line of businesses. On the other hand, institutions like banks, insurance, brokerage companies, mortgage banks, and discount houses fall under the financial sector, which is an involuntary M&A line of business. For the purpose of this study, significant focus was placed on the former classification. The NSE companies listed on the exchange under the voluntary M&A classification were selected from the SEC list of M&A.

Thus, the boundary and frame of this research was built on non-financial horizontal voluntary M&As with rival non-merging companies as practiced in Nigeria. It was expected for the value creation to occur after the M&As, predominantly in the horizontal (Gupta, 2012), to ensure that the delimitation criteria were fulfilled. Table 3.2 shows the distribution of the sampled companies according to its sectors.

Table 3.2: Nigeria's M&A deals (1995-2016)[1]

Sectors	# of deals per Sector	1994-2004		2005-2016	
		Voluntary	Involuntary	Voluntary	Involuntary
Banking	NA	0	0	0	72
Insurance	NA	0	1	0	55
Mortgage bank	NA	0	0	0	24
Investment trust	NA	0	0	0	36
Discount houses	NA	0	0	0	22
Consumer group	13	6	0	7	0
Healthcare group	1	1	0	0	0
Industrial group	8	5	0	3	0
Oil & gas group	3	2	0	1	0
Services group	5	0	0	5	0
Total (270)	30*	14	1	16	209

Source: Compiled from SEC's database for the period covered.

Note: 30* denotes, 30 bidders, and 30 targets listed companies (n = 60) of voluntary M&As. NA denotes are not applicable. The three years post-2014 M&A comprises 2015, 2016, and 2017 companies' data while three years post-2015 M&A comprises 2016, 2017, and 2018 companies' data. No voluntary M&A activity for 2014 and 2015. Therefore, the three years post-2013 M&A data availability that this study needed is 2014, 2015, and 2016. Meanwhile, three years of pre-1995 M&A data is 1992, 1993, and 1994. However, company's RIV and Malmquist index past year book value is needed, making the data interval 1991 to 2016 for all companies in the sample.

Table 3.2 illustrates that the final sample of companies used in this study comprised 30 voluntary bidder companies, 30 targets companies, and 30 non-merging companies, thus forming a total of 90 decision-making units (DMUs). The bidder companies comprised various sectors including 13 consumers, 1 healthcare, 8 industrial, 3 oil and gas, and 5 service industries as classified by the NSE. The data period covered ranged from 1991 to 2020, which allowed for three years' pre-merger 1995 and three years' post-2013 M&A analysis. Most post-M&A data of the DMUs were collected in 2017 as not all DMUs annually started

in January and ended in December and reported in the same year. The list of the

sample companies is presented in Table 3.2a, 3.2b, and 3.2c.

Table 3.2a: List of Bidder Companies

S/N	Bidder Companies	Year Completed
1	Lever Brothers PLC *	1995
2	Sona Breweries Industries	1995
3	Nestle Foods PLC	1996
4	Smith Kline PLC *	1996
5	Nigerian Bottling Company	1996
6	PZ Industries PLC	1996
7	CMB PLC *	1997
8	Delta Glass PLC *	1999
9	International Textile Limited	1999
10	Total Nigeria PLC	2001
11	United Nigerian Textile PLC	2001
12	PZ Industries PLC	2001
13	Unipetrol Nigeria PLC	2002
14	Edo Cement Company PLC	2002
15	Jap Telecoms PLC	2006
16	Flour Mills of Nigeria PLC	2006
17	Oando PLC	2007
18	Tantalizers PLC	2008
19	Tower Aluminium	2008
20	MTN Nigeria PLC	2008
21	WAHU Utilities	2009
22	Crown Flour Mills PLC	2009
23	Obajana Cement PLC	2010
24	Flour Mills PLC	2010
25	Nigerian Breweries PLC	2011
26	Visa Communication PLC	2011
27	Olam International Ltd	2011
28	Nigerian Breweries PLC	2012
29	Flour Mills PLC	2012
30	Nigerian Breweries PLC	2013

Source: Security and Exchange Commission database.

Note: *Lever Brothers now: Unilever Nig. PLC, *Smith Kline Beecham now: GlaxoSmithKline, *CMB Plc now: NAMPAK Plc, * Delta Glass now: Beta Plc. Nigeria Breweries took over three different target companies by 2011, 2012, and 2013, the basis appearing on number 25, 28, and 30. Synergy evaluation analysis is on a yearly basis before and after M&A deal excluding the merger year. The basis of equality and unbiased was using the same non-merging company (i.e., Guinness Nigeria Plc.) for its synergy evaluation. Therefore, it deserves to be included in the sample with a corresponding non-merging company.

Table 3.2b: List of Target Companies

S/N	Target Companies	Year Completed
1	Lever Brothers Nigeria Ltd	1995
2	Inter Breweries	1995
3	Nestle Nigeria Ltd	1996
4	Sterling Product (Nig) Ltd	1996
5	Sapanda Industries Ltd	1996
6	Thermo Cool Engineering	1996
7	Canmakers Nigeria Ltd	1997
8	Guinness Glass PLC	1999
9	Platinum Textile Mill Ltd	1999
10	Elf Nigeria Ltd	2001
11	Nichemtex Industries Ltd	2001
12	PZ Nigeria Limited	2001
13	Agip Nigeria Ltd	2002
14	Bendel Cement Company Ltd	2002
15	Danjay Telecoms Ltd	2006
16	Golden Fertilizer Co. Ltd	2006
17	Ocean & Oil Investment Ltd	2007
18	Baytide Nigeria Ltd	2008
19	Cook N" Nigeria	2008
20	VGC Communications Ltd	2008
21	Battery Manufacturing	2009
22	Interstate Flour Mills	2009
23	Benue Cement Company	2010
24	Nigeria Eagle Flour Mills	2010
25	Champion Breweries Ltd	2011
26	Cellcom Communication	2011
27	Crown Flour Mills	2011
28	Benue Breweries	2012
29	Rom Oils Mill Limited	2012
30	Sona Systems and Life Bre.	2013

Source: Security and Exchange Commission database

Table 3.2c: List of Non-Merging Companies

S/N	Non-Merging Companies	Year Completed
1	Morison Industries PLC	1995
2	Golden Guinea Breweries	1995
3	Multi-Trex Integrated Food	1996
4	Pharma-Deko PLC	1996
5	Union Dicon PLC	1996
6	Nascon Industries PLC	1996
7	Delta Glass Company PLC	1997
8	Carnaud Metal Box Nigeria	1999
9	United Nigerian Textile PLC	1999
10	Mobil Oil Nigeria PLC	2001
11	Afprint Nigeria PLC	2001
12	Unilever Nigeria PLC	2001
13	Texaco Nigeria PLC	2002
14	Eagle Cement PLC	2002
15	Cellcom Communication Ltd	2006
16	Cadbury Nigeria PLC	2006
17	African Petroleum PLC	2007
18	IkejaHotels PLC	2008
19	First Aluminium PLC	2008
20	Glo Nigeria PLC	2008
21	Tower Aluminium Nigeria	2009
22	Flour Mills of Nigeria PLC	2009
23	Lafarge Cement PLC	2010
24	Big Treat PLC	2010
25	Guinness Nigeria PLC	2011
26	Etisalat Communications PLC	2011
27	Northern Flour PLC	2011
28	Guinness Nigeria PLC	2012
29	Crunches Food PLC	2012
30	Guinness Nigeria PLC	2013

Source: Nigerian Stock Exchange database

Notes: PZ industries PLC, Nigeria breweries, and Nigerian bottling PLC that appeared in the non-merging companies as well as bidder companies have been replaced, as non-merging companies, analysis done with no significant difference. The reason of using Guinness Nigeria PLC as the control company for the year 2011, 2012, and 2013 is because the bidder company, the Nigerian Breweries PLC is the same company that took over the three targets by 2011, 2012, and 2013 for unbiased synergy analysis.

3.2.2 Units of Analysis

For a research to stay focused and address the specific problems at a specific level of interest, it is important to specify the unit of analysis. Hashim (2012) stated that unit of analysis is the main type of entity being investigated of which the data is collected. The identification of the unit of analysis helps in variable selection and model development. How the research questions are formulated is the starting point to determine the unit of analysis. In this study, the research questions were directed towards the operating performance of merging (bidder and target) companies in the non-financial voluntary horizontal M&A in Nigeria as compared to the non-merging companies in the long term. The data needed was a company-level data, and therefore, the unit of analysis was the organizations (i.e., companies or DMUs), which is similar to other past studies (e.g., Altuntas, Berry-Stolzle & Wende, 2015).

3.2.3 Estimation Window

The timescale period concerning the measurement of post-merger performance has become a significant issue. Since assessment of these companies has to be made, longer intervals or years taken to create an opportunity for other events such as operational, tactical, and financial changes of the merging companies to influence their valuation may lead to a difficult effect of M&A. On the other hand, using longer years also questions the ability of the statistical test techniques to handle such potential confounding effect in order to improve the reliability of the test results (Sudarsanam, 2010). The post-acquisition operating performance of the United Kingdom acquirers has an

average of three years before and after M&A; and recent windows of operating performance after M&A activities have been between 3 to 5 years (Sudarsanam, 2010).

In a related study, Ramakrishnan (2008) investigated the long-term post-merger evaluation of operating performance and the efficiency of companies in India using three years before and after mergers. Therefore, this study applied three years before and after M&A as the estimation window to evaluate the post-merger performance of companies in Nigeria, with careful consideration on the country's prominent issue of high inflation rate. This is because M&As take place in different years and inflation is an important external factor that must be given significant consideration during the application of the method.

3.3 Research Procedures

The study assumes that M&A is initiated for growth and expectation of the merging company's realization of the expected synergies that will ensure growth. This will eventually lead to an improvement in the performance of companies involved in the transaction in Nigeria. Based on the efficiency theory, it is expected that M&A should lead to positive results in this study. However, as Nigeria is a transition economy, a different effect may arise since there are several country-specific factors that may intervene to cause an undesired effect. For instance, agency theory, free cash hypothesis, and managerialism propositions are among the issues of non-value maximization M&A to the shareholders of both the bidder and target companies.

Free cash flow is an important concept that managers may misuse if much is left for the negative project. The theory is not used as a primary theoretical basis to evaluate the post-M&A performance of horizontal M&A activities in Nigeria. Nevertheless, it is discussed as one of the M&A theories that the outcome of Nigeria's investigation on M&A may reflect on the fundamental value of the companies. In this regard, if there is a significant improvement after mergers in the fundamental value of the companies, efficiency theory is used as the primary basis for discussion. However, if there is no such improvement or value maximization, agency theory could constitute the basis of discussion. In this case, managers would be assumed to have cash flow used for negative projects as supported by the free cash flow proposition.

3.3.1 Pre-Data Analysis

Mann Whitney U-test (MWU) (Equation 3.1), also called the Wilcoxon rank-sum test, is an assessment explicitly used for the Kolmogorov-Smirnov (KS) and pre-data analysis to decide whether two independent samples come from corresponding populations. MWU is a non-parametric test for independent samples, but it works very differently. It first ranks the values according to its hierarchy (lowest to highest) before calculating a P assessment that depends on the difference between the mean ranks of the two groups. On the other hand, KS associates the collective distribution of the two data sets and calculates a p-value that depends on the largest difference between distributions. It is sensitive to any differences in the two distributions, the substantial differences in shape, as well as the spread or median result in a small p-value.

Meanwhile, MWU is typically sensitive to changes in the median and has extended to handle tied values as opposed to KS. Hence, MWU is commonly used as a recognized and better test by most researchers instead of KS as any tied values are considered. The MWU null hypothesis is *Ho:* Median is not significantly different (if Median different p-values are more than alpha 0.05); *HA*: Median is significantly different (if Median different p-values are less than alpha 0.05).

$$\text{MWU (Z)} = \quad W = \frac{\frac{n1(n1+n2+1)}{2}}{\sqrt{\frac{n1n2(n1+n2+1)}{12}}} \quad \text{.……….} \quad (3.1)$$

Where n1 is the number of observations from the first population, n2 is the number of observations from the second population, and W is the sum of the ranks of the first population. The study applied the median difference because it is not affected by extremely large or low values and can be calculated for ordinal-level data or higher. This is because ordinal-level data can be ranked from the least to highest (Lind, Marchal & Wathen, 2012), thus, making median score a more robust and valuable data location measure than mean parameter.

In this study, the test of significance using the MWU test was also based on the research design and data satisfying the MWU test assumptions (Singh, Roy & Tripathi, 2013; Levine, Stephan & Szabat, 2017). First, the independent variables should be measured at the continuous or ordinal level. This study operated performance, technical, cost, and productivity efficiency measured from 0-100 percent at a continuous level. Second, the independent variables

should consist of two independent groups. In this study, the pre-M&A data and post-M&As data were the two independent groups. Third, the independence of observations necessitates no relationship between the observations of the two groups, which means the pre and post-M&A observations in this study were independent. Finally, it should be determined whether the distribution of scores for both groups of independent variables has a similar or a different shape.

Because MWU is a non-parametric test, it does not require a special distribution of the dependent variable in the analysis and it is an appropriate test to compare groups when the dependent variable is not assumed normally distributed. MWU is used with two distributions having different shape to determine whether there are differences in the distributions of the two groups. If there is no difference in the distribution, MWU is used to determine whether there are differences in medians of the two groups (Singh, Roy & Tripathi, 2013). Meanwhile, the Kruskal Wallis test (KWT) applies to robustness check for three or more independent groups. In this study, the three groups were the performance measures of the 30 bidders, 30 targets, and 30 non-merging companies.

Kruskal Wallis is a non-parametric statistical test for three groups and above (Singh, Ray & Tripathi, 2013) while MWU compares the median scores of two samples. The latter is based on the sum of ranks as represented by Equation (3.2) (Lind, Marchal & Wathen, 2012). As a non-parametric test, Kruskal Wallis makes no assumption about the properties of distribution (e.g., mean and variance) where the sample data is drawn from, whether it has a normal distribution, or if it is required to fit a normal distribution. This differs from any parametric test

that makes assumptions about the properties that data is drawn from, such as the normal distribution (Singh, Roy & Tripathi, 2013).

Power is the likelihood of correctly rejecting the null hypothesis. It refers to the condition of noticing important evidence and thus rejecting the null result. Furthermore, Blair and Higgins (1980) established that the MWU test has higher power relative to the t-test, particularly under small sample circumstances. MWU allows drawing different conclusions about the data depending on the assumption made from the data distribution. Both KWT and MWT have power when the sample size is not small (i.e., not less than seven) (Kuiper & Sklar, 2012). For a larger sample size of up to 30, as in this study, both KWT and MWT are required as both have significant power testing ability for the two and three groups, respectively, for the significance test as well as for robustness checks before conclusions are drawn.

KWT's null and alternative hypothesis concerning this study with reference to Lind, Marchal and Wathen (2012) is as follows:

H_0: The population distribution of 30 bidders, 30 targets, and 30 control companies' performance measures are the same for the three groups before and after M&A.

H_1: The population distribution of 30 bidders, 30 targets, and 30 non-merging company's performance measures are not the same for the three groups before and after M&A.

The KWT formula established by Lind, Marchal and Wathen (2012) is shown in Equation (3.2):

$$\text{KWT}(\beta) = \frac{12}{n(n+1)} \left\{ \frac{(\sum Y1)^2}{n1} + \frac{(\sum Y2)^2}{n2} + \frac{(\sum Y3)^2}{n3} + \cdots + \frac{(\sum Yk)^2}{nk} \right\} - 3(n+1) \dots$$

(3.2)

with k-1 as the degree of freedom (k is the number of populations), where ($\sum Y_1$, $\sum Y_2$, $\sum Y_3$ .... $\sum Y_{1k}$ is the sum of ranks of, samples 1, 2, 3... k, respectively. Whereas, $n1, n2, n3, ... nk$ are the sizes of sample 1, 2, 3... k, respectively and n is the collective number of observations for all samples.

Unlike MWU, KWT makes no assumption about the shape of a distribution like normality. For the test to be applied, all samples selected from the population must be independent. The three groups investigated in this study (i.e., 30 bidders, 30 targets, and 30 non-merging companies) were independent of one another. In computing the KWT, all samples of merged values were ranked from the lowest to the highest based on value, and the values were replaced by ranks with the smallest. In the case of a tie, the average of the two values was given to both.

Descriptive statistics are often used to summarize and describe a body of data. Inferential statistics involve reaching generalization about the population after examining a sample. Before a sample data is taken as valid, it must be representative of the population and the error probability stated. Parametric analysis or statistical test is an analysis that makes assumptions about the defining properties such as the mean and variance of the population distribution

where the sample data is drawn from. However, non-parametric analysis makes no such assumption. Residual income valuation (RIV) approach or model expresses the market value of equity as the current equity book value and above reduced expected residual income to equity holders (Saleh, 2017).

Meanwhile, data envelopment analysis model is a non-parametric method of measuring the efficiency of decision-making units (DMUs) within both the public and private sector. There are different models of DEA, with the first Charnes, Cooper, and Rhodes (CCR) DEA model introduced in 1978. On the other hand, stochastic frontier analysis (SFA), a parametric test, is an alternative technique for frontier assessment that assumes a given useful form for the association between inputs and outputs. Malmquist productivity is used to measure the change in productivity between two-distance points. In addition, if the change in production technology exhibits a constant return to scale, two sources of productivity growth exist, namely efficiency change and technical change (Saleh, 2017).

This investigation applied four different methods to assess the change in performance before and after M&A, namely: (i) operating performance measure, residual income method applied; (ii) technical efficiency: data envelopment analysis (DEA) model and stochastic frontier analysis (SFA) models applied; (iii) cost efficiency: DEA and SFA models applied; and (iv) Malmquist productivity index (MPI) for productivity efficiency. A different set of input variables were used to operate the performance measures. Whereas, the technical efficiency, cost efficiency, and MPI used the same set of multiple inputs (three) and output (one) with additional price information (input price) required for cost efficiency.

The issue of company's operating performance evaluation either in merger and acquisition has become increasingly significant particularly to shareholders who invest funds in these companies and from the finance theory of time value of money. Such importance thus contributes to the proposal and development of various valuation methods such as the frontier analysis for efficiency using the DEA and SFA models as well as the Malmquist Productivity Index (MPI) for companies' productivity. In this regard, the Residual Income Valuations (RIV), Economic Value Added (EVA), Dividend Discount Model (DDM), accounting ratio analysis, and other comparable methods have been in the limelight among both economic and financial experts. Nevertheless, it should be noted none of these valuation methods serves as a single best method applicable to all situations. For instance, the comparable method, which is based on the concept of law of one price, implies that the two similar assets should sell for similar prices. The discounted cash flow model can be used both for companies that pay dividends and for those that do not, however cost of equity is not included in the model. On the other hand, the RIV is applicable whether companies pay dividend or not, but most importantly, it considers the cost of equity (Guest, Bild & Runsten, 2010). Furthermore, both event study methodology and accounting returns methodology have limitations relating to the non-determination of true fundamental valuation returns of an amalgamation. Meanwhile, EVA is criticized as being applicable solely in developed economies like the United States where the inflation rate is low (AlMamun & Mansor, 2012; Leepsa & Mishra, 2016).

3.3.2 Pilot Test

The existing literature has provided criticisms on the Economic Value Added (EVA) model in evaluating the operating performance of companies, on the basis that it cannot be applied with high inflation to the 164 assumptions in the model. Also, the majority of past literature suggests that EVA is mostly applied in developed economies such as the Unites States of America, Australia, and Canada. This is mainly due to the single-digit inflation rates in these countries, although similarly low inflation rates have been reported in Malaysia. Nevertheless, though no model or method is perfect in all aspects, there has been far less criticism in the literature on the Residual Income Value (RIV) model compared to EVA.

Past literature has also reported that Nigeria had an average inflation rate of 12.47 percent between 1997 and 2017. Inflation is an important external environmental factor affecting M&A as it occurs over time. Therefore, it is an issue that needs attention when considering the performance evaluation before and after non-financial M&A companies, particularly in the Nigerian context. This necessitated a pilot study involving all the 30 bidders and 30 target companies using the EVA and RIV approaches. The basis of applying the same sample number was due to fairness. It was also logical to select all of the sample population as they were the same sample that would be used in the actual study. Thus, the pilot study helped in choosing between the EVA or RIV method.

The results from the pilot study indicated that RIV is the most suitable method to evaluate the operating performance of non-financial horizontal voluntary M&As in Nigeria. The pilot study also revealed inflation as an important factor

when investigating M&A performance. This affirms the necessity to conduct a pilot study prior to an actual study involving countries with high inflation rates, as it provides valuable insights in selecting the best instrument. The results of the pilot study and the Cronbach's Alpha reliability test are presented in Chapter 4.

3.3.3 Operating Performance Variables

This study measured operating performance using the Residual Income Valuation (RIV) approach in evaluating Nigeria's non-financial horizontal voluntary companies after the M&A performance. The RIV variables used were dividend per share (DPS), book value per share (BPS), earnings per share (EPS), and cost of equity (Guest, Bild & Runsten, 2010). BPS was obtained by dividing common equity by the total number of shares outstanding while book value of an asset was the cost of that asset minus the accrued depreciation. Meanwhile, the book value of equity per share was obtained by dividing the common equity value of common stock by shares outstanding, in which similar equation was used by the investors to determine whether the stock price was undervalued.

On the other hand, EPS was calculated by first subtracting preferred dividends to be paid from the net income, giving the total earnings available to common shareholders. It was followed by dividing the remaining amount with the total value of outstanding shares listed on the balance sheet. Whereas, DPS refers to the amount of declared dividends provided by a company for every ordinary share outstanding. In this study, DPS was calculated by dividing the

total dividends paid out by a company over a period, including interim dividends, with the number of outstanding ordinary shares issued. Furthermore, the capital asset pricing model (CAPM) was used to calculate the cost of equity.

3.3.4 Technical and Productivity Efficiency Variables

Three input variables were used in this study to analyze efficiency and productivity, namely: (i) total assets, (ii) labor cost with capital cost (depreciation) as input variables, and (iii) cost of sales to account for the cost of raw materials when considering the production theory, as x input is expected to produce y output (Aik, 2010; Chen, Kao & Lin, 2011). In this regard, total assets were the value of the assets, labor cost was the annual staff cost of the company, while cost of sales (also known as the cost of revenue) was the total cost of each listed company to produce or manufacture a good or service. These costs include direct materials such as raw materials and the overhead that is directly tied to a production facility or manufacturing plant since labor cost has been taken as a separate variable. The output variable applied was the net operating profit after tax (NOPAT). In this regard, net income was the turnover minus the expenses, interest, and taxes or net profit after tax, thus making a total of four variables. Efficiency and productivity evaluation works in relation to each other and is often regarded as important in organizations because it leads to improvement in the profitability of a business concern.

Coelli et al. (2005) opined on the need to test the rule of thumb $\{(n * m)$ $* n [n+m] < DMU\}$ on input and output selection in order for the efficiencies of the DMU to be estimated, where n is the number of inputs while m is the number of outputs. The current study comprised 30 companies and the number of both input and output are 4 (3 input plus 1 output). This formed $(1x3) * 3[(1+3)] = 24$, less than 30 DMUs or companies. It shows that the selection of input and output variables complies with the rule of thumb.

3.3.5 Cost Efficiency Variables

The ratio of minimum cost to the current cost of the decision-making unit is known as cost efficiency, while the ratio of maximum revenue to the current revenue of a DMU is called revenue efficiency (Ashrafi & Kaleiber, 2017). The multiple input and output are explained in Section 3.4.4, with input prices needed to calculate cost efficiency. The price of a total asset is obtained by dividing the total assets by depreciation. In order to obtain the price of labor, the staff total annual cost is divided by the number of employees. The price of the cost of sales is obtained by revenue divided by the cost of sales.

In the context of efficiency, the basis of applying the two contending models (DEA and SFA) is to countercheck whether one can confirm the results obtained by the other, as well as other advantages from the literature reviewed. Both models are also different where DEA is non-parametric and deterministic while SFA is parametric. Nonetheless, the former has a significant advantage in which it does not

require information more than input and output quantities rather than average performance (Hossain, Kamil, Baten & Mustafa, 2012). Among the past studies that applied both models include Sav (2012), Pevcin (2014), and Aik et al. (2015a).

Pevcin (2014) applied DEA and SFA in his study and found that the former is prominent for technical efficiency. In the present study, the DEA model was applied on 30 samples of bidder, target, and non-merging companies having satisfied the rule of thumb established by Coelli et al. (2005) for evaluating technical efficiency as well as not requesting for input prices. The SFA model requires input prices and is sufficient for the evaluation of cost efficiency. These are the basis of employing the DEA model values in technical efficiency and SFA model resulting in cost efficiency in the final interpretations and drawing conclusions.

3.4 Operating Performance Test Models for Long-Term Performance of Before and after Mergers and Acquisitions (Residual Income Valuation (RIV))

According to Guest, Bild & Runsten (2010), the RIV model was first introduced by Feltham & Ohlson in 1995. The model is based on three expectations. First, it states that the fundamental value (FV) is equal to the present value of the expected dividends, as given in Equation (3.3):

$$FV_t = \sum_{i=1}^{\infty} \frac{E_i[D_{i+1}]}{(1+r_e)^i}... \qquad (3.3)$$

Where FV_t is the stock's fundamental valuation at period t, $E_i[.]$ being the expectation centered on statistics obtainable at period t, D $_{i+1}$ is the dividend for the period t+1, and r_e is the cost of equity. The second assumption is the clean surplus accounting relationship, which states that all modifications in the book value (BV) of equity have to pass through the income statement. The formula is given in Equation (3.4):

$$BV_t = B_{-1} + NeI_t - D_t \qquad \dots \qquad (3.4)$$

Where BV_t is the book value of equity at time t, and NeI_t is the net revenue for the time **t**. The basis of this assumption is that it allows for the inclusion of dividends expressed in terms of future returns and book values. Adding and rearranging Equations (3.3) and (3.4) thus produces Equation (3.5):

$$FV_t = BV_t + \sum_{i=1}^{\infty} \frac{E_i[NeI_{i+1} - r_e.B_{i+1-1}]}{(1+r_e)^i} - \frac{E_i[B_{i+\infty}]}{(1+r_e)^\infty} \dots \qquad (3.5)$$

The last term in Equation (3.5) is expected to be zero as the value tends to infinity, while the second term is the present value of future residual income. Therefore, the sum of present value of the future residual income becomes equal to the fundamental value in Equation (3.6):

$$FV_t = BV_t + \sum_{i=1}^{\infty} \frac{E_i[NeI_{i+1} - r_e.B_{i+1-1}]}{(1+r_e)^i} \dots \dots \qquad (3.6)$$

Equation (3.6) requires a truncated forecast environment with the assumption leading to the terminal value of the environment. Hence, the

fundamental value of Equation (3.6) becomes the sum of the book value and the

present value of the future residual earnings. By rearranging the model to include

the terminal values as done by Guest (2010), it thus produces Equation (3.7):

$$FV_t = BV_t + \sum_{i=1}^{T} \frac{E_i[NeI_{i+1} - r_e.B_{i+1-1}]}{(1+r_e)^i} + \frac{E_i[NeI_{i+T} - r_e.B_{i+T-1}]}{(1+r_e)^{i+T-1}} \dots (3.7)$$

The second term represents the abnormal returns in the first interval and

the third term represents the terminal value, which is evaluated as the abnormal

returns at the time i+T, discounted in perpetuity with the belief of no further

growth in Equation (3.4) after year T. Therefore, choosing the first three years

of accounting data after mergers, Equation (3.7) becomes Equation (3.8):

$$FV_t = BV_{-1} + \frac{NeI_0 - r_e.B_{-1}}{(1+r_e)} + \frac{NeI_1 - r_e.B_0}{(1+r_e)^2} + \frac{NI_2 - r_e.B_1}{(1+r_e)^3} + \frac{NeI_3 - r_e.B_2}{(1+r_e)^3 r_e} \dots$$

(3.8)

BV_{-1}= Book value in year-1, the last year before the merger while Year

0 is the year of the merger. The second, third, and fourth term each describes the

residual income in Year 0, 1, and 2 respectively, while the fourth term describes

the last terminal value, which is the abnormal returns of Year 3, discounted in

perpetuity. Further derivation and related concepts can be referred to Guest et al.

(2010), Penman and Nir (2004), Penman (2007), and Feltham and Ohlson

(1995). Therefore, operating performance (OP), using residual income valuation

(RIV) model as applied by Guest (2010), is described in Equation (3.9) for the

value of the acquirer company before M&A or pre-acquisition value, and

Equation (3.10) is for the value of acquirer after M&A or post acquisition value:

$$FV_{before} = \frac{E_{-1}(DPS_0)}{(1+r_e)} + \frac{E_{-1}(BvPS_0)}{(1+r_e)} + \frac{E_{-1}(EPS_{+1} - r_e BvPS_0)}{(1+r_e)^2} + \frac{E_{-1}(EPS_2 - r_e BvPS_1)}{(1+r_e)^3} +$$

$$\frac{E_{-1}(EPS_3 - r_{e..}BvPS_2)}{(1+r_e)^4} \ldots\ldots\ldots \qquad\qquad (3.9)$$

FV$_{before}$ = value of acquirer company before M&A or pre-acquisition value.

E-1(DPS 0, 1, 2, 3) = the expectation of dividend per share in the year of acquisition; one, two, and three years after the acquisition.

E-1(BvPS 0, 1, 2, 3) = the expectation of book value per share in the year of acquisition; one, two, and three years after the acquisition.

r_e = the cost of equity

$$FV_{post} = \frac{DPS_0}{(1+r_{e)}} + \frac{BvPS_0}{(1+r_{e)}} + \frac{EPS_1 - r_e.BvPS_0}{(1+r_e)^2} + \frac{EPS_2 - r_e.BvPS_1}{(1+r_e)^3} + \frac{EPS_3 - r_e.BvPS_2}{(1+r_e)^3 r_e}$$

….. $\qquad\qquad$ (3.10)

FV_{post} = value of acquirer after M&A or post acquisition value.

DPS = dividend per share first term, BvPS = book value per share in the year 0 second term, r_e= the cost of equity, and *EPS* = earnings per share. Dependent variable (DV) is a variable expected to be determined, caused, or controlled by the independent variable (IV) (Babbie, 2010). FV$_{(post)}$ and FV$_{(before)}$ are the dependent variables, dividend per share (DPS) is the independent variable, BvPS (book value per share) is the independent variable, and r_e (cost of equity) is the independent variable. The difference between FV$_{post}$ and FV$_{pre}$ gives the fundamental value created or lost by the acquisition, where a

positive value indicates the value created while a negative value indicates value lost. For such measure comparable to be applied across companies, the percentage change in value for each is calculated using Equation (3.11):

$$\% \nabla V = (FV_{post} - FV_{pre}) / V_{pre} \qquad (3.11)$$

r_e = cost of equity, obtained and applied from the capital asset pricing model (CAPM). CAPM is expressed as in Equation (3.12):

$$r_e = r_f + (r_m - r_f)\theta_i \quad \ldots\ldots \qquad (3.12)$$

Where r_f is the risk - free rate of interest,

r_m is the return on the Nigerian stock exchange composite index (NCI),

θ_i is the beta of the ith company.

3.5 Technical Efficiency for Long-Term Performance of Before and After Mergers and Acquisitions

In an efficiency study, Cumming, Siegel and Wright (2007) posit that stock prices and accounting measures are useful performance indices, yet may serve as inappropriate measures of a company's efficiency or productivity. This is because accounting measures cannot satisfactorily provide information concerning the stock market's capability to positively reflect variations in the company's efficiency, especially when efficient market hypothesis assumptions are not adhered (Glaeser & Shleifer, 2001). However, frontier analysis evaluates the relative performance of companies by critically providing a numerical efficiency and ranking them in order. This is to show how close companies are

to the best-practice frontiers in relation to other companies in the industry. Such notion implies that the best efficiency-based performance evaluation can be achieved by using the current available method of frontier analysis vis-a-vis data envelopment analysis (DEA) (Coelli, Rao, O'Donnel & Battese, 2005).

Klumpes (2007) opined that the advantage of frontier efficiency analysis is its standardized aspect of scaling product-based revenues and profits of each decision-making unit (DMU) in comparison to those embarked upon by "best practice" sample companies. Thus, data envelopment analysis (DEA) and stochastic frontier Analysis (SFA) models in frontier analysis are applied in most efficiency analysis studies. The difference between the two is whether efficiency is economic or technological. The former is best analyzed using the parametric technique via SFA while the latter analysis uses the non-parametric technique of the DEA model. To date, there is no consensus on whether the DEA or SFA model is the best suit in all situations.

Due to limited resources in both public and private companies, or DMUs, and the pressure on efficient management of resources, tightening budget is thus proposed that requires the need for technical improvement in productive or cost efficiency. This relates the output to a given level of inputs. Therefore, technical efficiency is determined by the difference between the observed ratio of combined quantities of output to input and the ratio achieved by the best practice. The main aim is to have the ability of producing the maximum output or utilizing the minimum inputs as compared to what is technically feasible (Cooper, Seiford, Tone & Zhu, 2007). In evaluating the technical efficiency of a DMU involving multiple outputs and inputs, utilizing the ratio method is insufficient

because most efficient DMUs cannot be efficient according to a specific ratio (Cooper et al., 2007).

Therefore, the quantity of all outputs (virtual outputs) to all inputs (virtual inputs) is applied in preventing the disadvantage of simple ratio in multiple inputs/outputs. The index of this ratio is total factor productivity (TFP). DEA is performed through the concept of TFP as it allows multiple inputs and multiple outputs. Unlike the multiple regression models, DEA is the most advantageous model in determining the production function when dealing with single output with several inputs. DEA is a convenient method of measuring the Malmquist index (MI), which is equal in decomposing cost efficiency into pure technical, allocative, and scale efficiency, subsequently accelerates the examination of scale economies (Cooper, Seiford & Zhn, 2011).

Technical efficiency refers to the accomplishment of producing the maximum output by utilizing the input in the most efficient way. In this context, all technical efficient DMUs are located on the efficient frontier while those below the frontier waste their resources relatively. Cooper et al. (2011) stated that because the frontier line cannot stretch to infinity, it is assumed to be effective within the range of interest known as the constant-return-to-scale assumption. Other assumptions of the CCR DEA model as applied to the same input and output for DMUs include (1) the weights and data are non-negative, and (2) similar weights of the target entities are applicable to all entities. The output and input are assumed variables at the preference of the designer or manager. In addition, the measurement units of different output and input do

need not to be congruent, in which the efficiency value is independent of the units measuring input and output, provided these are the same for every DMU.

In their study, Scippacercola & Sepe (2014) stated that the DEA model does not require any functional form to analyze production function, but rather it determines the production function by applying minimization techniques on the data. The external factors affecting the outputs not under the direct control of DMU managers can be included in the DEA model. Aik et al. (2015b) posit that consensus is unnecessary and emphasized that the efficiency estimates obtained from the different techniques must be similar in terms of its efficiency marks, positions, and in sorting the best from the worse DMUs.

3.5.1 Data Envelopment Analysis (DEA) Method

The DEA method introduced by Charnes, Coopper and Rhodes (1978) was founded on Farrell's (1957) seminal paper on public and not-for-profit businesses that described the probable situations where prices were unavailable or unreliable as well as when typical economic objective such as cost-minimization or profit-maximization may not be the ideal DMU target. In these situations, the DEA model serves as a method of analyzing the technical efficiency of such entity. The term 'Data Envelopment Analysis' emerged from the statistics used in the finest practice decision-making units (DMUs) that create the production frontier, which then "envelops" the statistics from other DMUs. In discussing its benefits, Cummins and Rubio-Misas (2006) stated that DEA does not require an outright specification of the cost function, but rather

computes efficient "best-practice" production and cost frontiers obtained from the linear combinations of companies in the industry. It also serves as a unique method of measuring the Malmquist index by decomposing cost efficiency into pure technical and scale efficiency that also enhances the analysis of scale economies.

As a non-parametric mathematical programming method, DEA has the flexibility to estimate the relative productive efficiency of multi-input and multi-output DMUs. This is in contrast with the multiple regression models, which determine the production function that only deals with a single output and several inputs. Kirkulak and Erdem (2014) applied the DEA model in their study to evaluate the market chain efficiency before and after the 2001 financial crisis in Turkey. The result showed that companies were more efficient at the profit level out of the four stages of marketability, profitability, productivity, and overall efficiency.

A DEA model for technical efficiency was first proposed by Charnes et al. (1978) in ratio form as provided by Bader, Mohammed, Ariff and Hassan (2008), shown in Equation (3.13):

$$\text{Max} \quad \beta\ (u_r v_i) = \frac{\sum_{r=1}^{S} u_r \varphi_{r0}}{\sum_{i=1}^{m} v_i x_{io}} \ldots\ldots \qquad (3.13)$$

$$\text{Subject to} \ \frac{\sum_{r=1}^{S} u_r \varphi_{rj}}{\sum_{i=1}^{m} v_i x_{io}} \leq 1 \quad j=0\ldots.n$$

$$\frac{u_r}{\sum_{i=1}^{m} v_i x_{io}} \geq \varepsilon \quad r=1,\ldots s$$

$$\frac{v_i}{\sum_{i=1}^{m} v_i x_{i0}} \geq \varepsilon \quad r = 1,\ldots m$$

φ_{rj} is quantity of output (r) produced by company (j),

x_{ij} is the quantity of input (i) used by company (j),

u_r is the weight of output (r),

v_i is the weight of input (i),

ε is the small positive number to hinder the weight from becoming zero.

Min $Min_{\varphi\omega}\varphi$

On the condition that: $u_{jb} \leq \sum_{J=1}^{J} \omega_j u_{jb} \quad b = 1 \ldots, M\ldots$ (3.14)

$\sum_{J=1}^{J} \omega_j x_{jc} \leq \varphi x_{jc} \quad c = 1\ldots, N \text{ post-acquisition} \ldots\ldots$ (3.15)

$$\omega_j \geq 0, \quad j = 1\ldots J$$

where φ (Dependent variable) is the quantity of efficiency to be measured and evaluated for each DMU $_j$, u_{jb} (independent variable) is output quantity b (NOPAT) produced by DMU$_j$, x_{jc} (independent variable) is the input quantity c (total assets, labor cost, and cost of sales) produced by DMU$_j$, and ω_j is the intensity variable for DMU$_j$. Similar input and output variables are used in productive efficiency, while input prices are additional information for the cost efficiency evaluation. Equation (3.14) and (3.15) specify the conditions of the output and input when $\varphi = 1$, implying that the DMU is efficient, but if $\varphi < 1$, it means that the DMU is not efficient.

A study by Sigala, Jones, Lockwood and Airey (2005) reported that the DEA model stepwise approach assisted in interpreting why particular DMUs were efficient by examining the result of each step. The units found to become efficient from one step to another were efficient due to the incorporation of the respective inputs and outputs in the step they were found to be efficient. The measurement error of non-parametric model was less and disallowed the decision-making units to divert from the frontier due to unexpected occurrences. Hence, any adjustment from the frontier is considered inefficient when using non-parametric model. The DEA and FDH are examples of non-parametric techniques to analyze frontier efficiencies. Also, non-parametric approach operates with fewer conditions on the best-practice frontier and enjoys the advantage of not forcing a particular structure on the data (Avkiran, 2011).

Coelli, Rao, O'Donnel, and Battese (2005) indicated that a more effective choice of guidance, whether input or output, should be produced in accordance with the input or output that these companies control most. Under these circumstances, DEA can make all DMUs efficient by: (a) decreasing inputs when the outputs remain constant, in what is referred to as input orientation. This is achievable by managers of companies as many companies have orders to fulfill and they are in control of most inputs; (b) increasing output when the input remains constant, in what is called output orientation; (c) increasing output, but decreasing input; this approach is called non-output-oriented. Managers of companies rarely implement this because they do not control the output easily because of some technical process that may not be to their advantage and authority.

Input oriented models recognize technical inefficiencies as a proportional decrease in input implementation with steady output. It can prevent waste by generating as much production as it can. However, the production function is determined by using information minimization methods. It shows how the inefficient DMUs can be upgraded to an efficient frontier by using reference sets (peers) of the related DMUs, as practiced by the DEA model in finding the reference sets (Karaduman, 2006). Another benefit of applying DEA is an assignment of one efficiency score, which allows the categorization of the DMUs in the sample. It identifies where improvement is needed for each DMU such as reducing the excess input or underproduction of the output, as well as allowing the possible making of inferences on DMUs' group profile. Comparison between the production performances of each DMU to a set of efficient DMUs is called the reference set. This concept allows the DMU owners to know the reference set appearing most for proper maintenance and utilization (Karaduman, 2006).

In Turkey, Tone and Tsutsui (2010) used the dynamic DEA model with slack-based evaluation approach and reported that DEA's measurement of efficiency changes through window analysis. They also stated that the Malmquist index could be done without having to do it annually. Meanwhile, Ibiwoye's (2010) study of the financial productivity in Nigeria used the frontier methods comparatively with financial ratios and index numbers with many inputs and outputs. The author concluded that the frontier methods satisfactorily carried out the analysis with many inputs and outputs simultaneously compared to ratio analysis or index number.

Furthermore, DEA was employed by Chen, Kao, and Lin (2011) in the long-term efficiency research of Taiwanese banks from 1997 to 2006. They stated that Taiwan's bank mergers are larger and more efficient in terms of assignment than non-merger. The study also discovered that both technical and cost-savings were not achieved through mergers and indicated that when cost-efficiency was separated, technical inefficiency is the principal cause of cost increases. In addition, most of the banks operated with increased returns, showing that economies of scale can be achieved by increasing production.

Cooper, Seiford and Zhn (2011) also remarked that the rule of thumb should be used when evaluating a set of *'n'* DMUs, with *'m'* is inputted to produce *'s'* outputs. Thus, this relationship should hold: $n \geq \max \{3 (m+s), m \times s\}$. They advanced that in almost all of the application cases, this rule of thumb is not adhered to and it may be the reason for inconsistent empirical results of M&A performance evaluations. Therefore, they recommended the adoption of the rule $[n \geq 3(m+s)]$ as a benchmark for input and outputs selection.

According to Cook, Tone and Zhu (2014), DEA frontier can be viewed as a manufacturing frontier, but it is a technique for performance assessment and best practice benchmarking. More importantly, Emrouznejad's (2014) analysis of advances in DEA highlighted the significant contribution of most recent works to DEA. In conclusion, the author said that the DEA methodology was and will continue to be used in relation to the significance of operational efficiency measures.

In an investigation on the efficiency of Japanese hospitals' M&As, Kawaguchi, Tone and Tsutsui (2014) advanced that dynamic and network DEA satisfactorily evaluates the efficiency of the different organizations and the rapid changes of the efficiencies simultaneously. Two non-parametric methods for evaluating technical (technological) efficiency are the Data Envelopment Analysis (DEA) and Free Disposing Hull (FDH). Although Stochastic Frontier Analysis (SFA) is parametric, it demands the functional forms of the production frontier and assumes that it may deviate from its production frontier. This could be due to technical inefficiency as well as mistakes in measurable or non-systematic variables.

In Africa, the assessment of efficiency of six ports in West Africa by Van Dyck (2015) involving the use of the DEA model revealed that the Tema Port in Ghana was the most efficient in West Africa. Despite the exhibition of several inefficiencies in its operation, the port made good use of its resources for production. In addition, the Cotonou Port was the least efficient and showed substantial mismanagement in production for over seven years. Furthermore, the ports in West Africa showed a high level of efficiency with four out of six having an average efficiency score of 76%.

In Denmark, the efficiency of Danish wastewater services was examined by Guerrini, Romano, Leardini and Martini (2015) using a two-stage DEA. The result showed that Danish wastewater industry was positively influenced by vertical integration and higher population density. Furthermore, companies serving 100 people per kilometers sewer and combining water and wastewater services had obtained better efficiency.

Meanwhile, Kutlar, Kabasakal and Babacan (2015) applied the Malmquist index analysis and DEA to investigate the efficiency of banks in Turkey between 2003 and 2012. The result showed that three banks were technically inefficient in the first year and the number doubled by 2012. The result further showed that banks with large deposits seemed to have a higher efficiency score while private banks with less deposit had lower scores of efficiency. In addition, a survey by Dong, Qiao and Yang (2015) reported that technical and scale efficiency had increased between private aerospace enterprises and state-owned aerospace ventures in China as determined by the DEA and Malmquist analysis.

Toloo, Barat and Massoumzadeh (2015) stated that the DEA model is a mathematical approach that can easily manage a big amount of variable limitations and information. It also identifies the inputs and outputs of each DMU in the process in comparison with all DMUs. In some cases, however, when the number of measures is relatively large compared to the number of DMUs, the authors posit for selected measurements to be used to identify ways of selecting certain inputs and outputs, which will produce acceptable results. They also indicated that if the amount of inputs and outputs is greater than DMUs, the majority of DMUs are assessed as efficient. The results achieved using full measures are therefore not reliable.

3.5.2 Stochastic Frontier Analysis (SFA) Method

The parametric approach identifies a functional form for production efficiency while nonparametric requires no pre-assumption for the distribution of inefficiency among observations. The main difference between parametric and non-parametric approach lies in the specification of the functional cost function. Profit or production frontier, whether estimated via Translog or Cobb Douglas, assumes that error term is a total sum of specification error and inefficiency component. The main advantage of this method is that companies may be on the frontier due to inefficiency or random error. This approach has three methods of determining the best-practice frontier, namely the stochastic frontier analysis (SFA), thick frontier approach (TFA), and distribution free approach (DFA), and both DFA and TFA differ on the distributional conditions.

Stochastic frontier is also called composed error. Sigala et al. (2005) stated that SFA is one of the most popular efficiency estimation methods particularly as it is simple and easy to use. They added that the stepwise approach helps in analyzing the efficient DMUs functional form for the cost and profit. Similarly, Acquah and Onumah (2014) opined that since SFA is another model of evaluating efficiency, it is important that SFA be applied to see whether different methods used can affect the efficiency of the study. Meanwhile, Pevcin (2014) applied SFA and DEA comparatively to study the efficiency of Slovenian municipalities for the year 2011. The result showed that inefficiency from the SFA model was between 22 to 25 percent, while DEA gave the range from 12 to 18 percent. In addition, DEA result implies that more technical efficiencies are obtained through it than SFA. Pevcin further stated that the advantage of one sometimes represents the disadvantage of the other. Whereas, Anwar (2018)

stated that SFA is mostly applied for cost efficiency. Thus, the conclusion on cost efficiency in this study was drawn based on the results of the SFA model.

This study applied the SFA model of Translog production with truncated-normal distribution in estimating the technical efficiency under the SFA. This is because an earlier study by Berger and Humphrey (1997) recognized both translated and Fourier flexible function form to generate the same average level and distribution of measured efficiency. However, Altunbas and Chakravarty (2001) recognized restrictions with Fourier signifying that translog is the ideal model approach. Therefore, as this study comprised three inputs and one output, the SFA model was applied to Translog production function with truncated-normal distribution. The model, as specified by Sokic (2015), is stated in Equation (3.16) as below:

$$\text{In}P_{it} = f(X_{it} ; P) + (W_{it} - Z_{it})$$

$$= P_0 + P_1(\text{In}X_{1it}) + P_2(\text{In}X_{2it}) + P_3(\text{In}X_{3it}) + P_4 (\text{In}X_{1it})^2$$

$$+ P_5(\text{In}X_{2it})^2 + P_6(\text{In}X_{3it})^2 + P_7(\text{In}X_{1it})(\text{In}X_{2it})$$

$$+ P_8(\text{In}X_{1it})(\text{In}X_{3it}) + P_9(\text{In}X_{2it})(\text{In}X_{3it}) + (W_{it} - Z_{it}) \dots (3.16)$$

where:

P_{it} = the output of the ith enterprise in the tth time interval,

$X_{1it}, X_{2it}, X_{3it}$ = the input items of the ith enterprise in the tth interval

W_{it} = noise component assumed to be independently and identically distributed (iid) normal random variables with zero means and variances and independent of Z_{it}

Z_{it} = {exp [-α (t-T)]}Z_{it}, Z_{it} are positive random variables, which are expected to account for the time changes of the technical inefficiency in production and expected to be (iid) as truncations at zero of the N $(z, \acute{o}_z^2)$ distribution, α is an unidentified scalar parameter to be calculated. The technical inefficiency effect of the truncated-normal distribution (Z_{it}) is ψ [Z_{it} $|\varepsilon_{it}$], being the mean productivity inefficiency for the ith company at any time t. This is symbolized by Equation (3.17):

$$\psi \, [Z_{it} \, |\varepsilon_{it} \,] = \frac{\acute{o}\hat{a}}{1+\hat{a}^2} \, [\, \frac{è(\frac{\varepsilon_{it}\hat{a}}{\acute{o}})}{\tilde{a}(\frac{\varepsilon_{it}\hat{a}}{\acute{o}})} \quad - (\frac{\varepsilon_{it}\hat{a}}{\acute{o}} + \frac{z_i}{\acute{o}\hat{a}})] \ldots\ldots\ldots (3.17)$$

Where $\varepsilon_{it} = W_{it} - Z_{it}$ $\acute{o} = (\acute{o}_w^2 + \acute{o}_z^2)^{\frac{1}{2}}$, $\beta = \acute{o}_w / \acute{o}_z$, $Z_i = -\varepsilon_i \acute{o}_w^2 / \acute{o}^2$, $\tilde{a}[.]$ are the standard normal cumulative distribution, and è[.] is the density function. Therefore, the company i^{th} technical efficiency at the interval t^{th} is calculated as in Equation (3.18):

$$\emptyset E_{it} \quad = e^{-E \, [Z_{it} \, |\varepsilon_{it} \,]} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.18)$$

The input-oriented measured by Equation (3.18) above receives the output data and calculates the inverse of the maximum realizable reduction of inputs. Z_{it} is restricted below by zero and $\emptyset E_{it}$ is situated between 1 for the

complete or full efficient company, (with Z_{it} = 0) and 0 for inefficient company (with Z_{it} tending to infinity).

3.6 Cost Efficiency for Long-Term Performance of Before and After Mergers and Acquisitions

The Stochastic frontier model is commonly used in analyzing cost efficiency (Coelli et al., 2005) or the non-parametric DEA. In the literature, SFA is established as an econometric method to examine cost while DEA is a mathematical programming method that compares DMUs to the least cost DMUs. According to Vincova (2005), the methods used in an efficiency evaluation include the stochastic frontier approach (SFA), distribution-free approach (DFA), and thick frontier approach. However, this study only used SFA as it requires input prices and mostly to evaluate cost efficiency. Variable return to scale (VRS) has more efficiency or equivalent rates than those with a constant return to scale (CRS), and it could be required in separating CRS technical efficiency (TE) from pure technical efficiency (PTE). Some studies conducted by DEA model on VRS whereas others supported CRS (e.g., Coelli et al., 2005). The author also explained that CRS makes it possible to compare small and large companies (e.g., banks). Concerning the outcome showed in several researches of big banks using VRS big companies (banks) could be effective even if they were actually not.

In his research of the SFA model involving Spanish insurance companies from 1989 to 1998, Klumpes (2007) discovered that cost efficiency in insurance was low due to inefficiency in distribution and that the insurance sector used the

technology better than input mixing approach. More so, Sav (2012) investigated the ranking employment and efficiency estimates in the management of US public colleges using both SFA and DEA between 2005 to 2009. The result showed 13 percent of colleges were 100 percent efficient through DEA while SFA only recorded 1.7 percent efficiency. Such result is further supported by Pevcin (2014).

Abdallah, Amin, Sanusi and Kusairi (2014) examined the impact of ownership structure on bank efficiency in Malaysia using the Stochastic Frontier Analysis (SFA) between 2003 and 2012. They found that bigger, foreign, and government banks are more revenue efficient than small private and local banks. Using the SFA method, Rasiah, Ming and Hamid (2014) found that mergers in Malaysia have a distinctive advantage in the enhancement of sector effectiveness in terms of improving the effectiveness of Malaysian business banks during the 2005 to 2009 period. Furthermore, the management efficiency of regional banks was also found to enhance substantially after M&A using the SFA method (Liu & Wilson, 2013; Assaf, Barres & Matousek, 2011).

In a related study, Acquah and Onumah (2014) focused on the alternative approaches to technical efficiency by using the SFA model. The findings showed a correlation between the alternatives SFA model and posited that differences in the result may be attributed to the adopted alternative methods of measuring technical efficiency.

According to Leea and Huang (2017), cost efficiency refers to the cost of the decision-making units (DMU) against those of best practice DMU. They

suggested different types of cost efficiency, including: (a) X-efficiency: this represents the way nearby DMU's actual costs are for the cost of a best-practice DMU has made similar output; (b) Scope efficiency: this represents the way nearby cost for two DMUs best-practice organizations, each concentrate on several of the productivities to the expenses of a single best-practice DMU that yields all of the productivities and lastly; (C) Scale efficiency: how nearby DMUs are regular expenses of the best-practice DMU at a given measure and combination of productivity to the regular cost of a best–practice DMU at the least-regular-price point for that manufactured good mixture. Hence, different efficiency concepts express different information about company performance, thus leading to diverse methods of evaluating efficiency. The efficiency summary, definition, and literature are presented in Appendix E.

In Russia, Mamonov and Vernikov (2017) examined cost efficiency and bank ownership post M&A from 2005 to 2013 using the SFA. The results indicated that the core state banks, which were different from other state-controlled banks, were as close to being competent as private domestic banks during and after the crisis of 2008 and 2009. The overseas groups seem to be the least efficient market members in terms of costs. They documented further that classification of banks by cost efficiency was not perpetual and was based on the differences in bank capitalization and asset structure. They also found that foreign banks gained cost efficiency when they lent more to the economy. On the other hand, core state banks had more cost efficient when they lent less to the economy.

3.6.1 Data Envelopment Analysis (DEA) Method

In evaluating cost efficiency, DEA provides a piecewise undeviating efficient frontier as reference. Therefore, cost efficiency can be evaluated when eliminating the parity restriction in Equation (3.19). Hence,

$min_{\theta CE,\beta,}\theta CE$ ………………….....................................………. (3.19)

Subject to $\beta \cdot K \geq k_o$

$\beta.C \leq \theta CE. c_o$

$\beta_i \geq 0$

$\beta i = 1$

where: K signifies an n x m matrix of observed outputs,

β signifies 1x n vector of intensity variables,

c_o signifies scalar representing a DMU's cost level

i signifies column vector of 1s,

C signifies n x1 matrix of observed costs.

3.6.2 Stochastic Frontier Analysis (SFA) Method

The stochastic frontier is assumed to contain an error term with two components that are different from DEA. One component is cost inefficiencies (w_i) and the other refers to the random disturbance (z_i), representing the

measurement errors. Therefore, the stochastic cost frontier function as presented by Aigner, Lovell and Schmidt (1997) is shown in Equation (3.20):

$$TC_i = K_i p + w_i + z_i \quad i = 1\ldots \ldots\ldots\ldots \quad (3.20)$$

Where: TC_i represents a total cost in logarithm form of company i,

K_i represents (Rx1) vector of outputs and input prices in logarithm form,

P represents an unknown vector parameter,

w_i is a two-sided classical random error term distributed independently

of z_i

z_i is a one-sided non-negative stochastic element, signifying cost inefficiency.

Following the work of Rao (2005), the cost efficiency (Ce_i), with a truncated-normal distribution of company i can be stated as the estimated value of z_i restricted on ε_{it}, as given in Equation (3.21):

$$Ce_i = E[z_i|\varepsilon_{it}] = \frac{\text{ó}\hat{a}}{1+\hat{a}^2} \left[\frac{\text{è}\left(\frac{\varepsilon_i \hat{a}}{\text{ó}}\right)}{\tilde{a}\left(\frac{\varepsilon_i \hat{a}}{\text{ó}} + \frac{\varepsilon_i \hat{a}}{\text{ó}}\right)} \right] \ldots\ldots\ldots(3.21)$$

Where: $\varepsilon_{it} = W_{it} + Z_{it}$, $\text{ó} = (\text{ó}_w^2 + \text{ó}_z^2)^{\frac{1}{2}}$, $\beta = \text{ó}_w / \text{ó}_z$, $\tilde{a}[\,.\,]$

is the cumulative standard normal density distribution and $\text{è}[.]$ is the standard normal density function.

3.7 Productivity Efficiency for Long-Term Performance of Before and After Mergers and Acquisitions

Mahadevan (2002) defined efficiency change as a catching–up effect (reaching the production frontier) and the technical (technological) change as a technological change frontier effect (shifting of production frontier). Coelli et al. (2005) opined that a Malmquist productivity change analysis between two periods is an example of comparative statistics. This is equally defined in terms of catch-up and frontier shifts and the product of both is the Malmquist index. Catch-up shows progress in technical efficiency from period one to the next. When the value is greater than one, equals to one, or less than one, it shows no change in the first two scenarios and regression in the last scenario. Frontier-shift (technological change) or innovation shows improvement in the frontier technology when the value is greater than one, and when equal to one and less than one, it shows no change and regression in technology improvement.

When the Malmquist index value is greater than one, it indicates progress in total factor productivity of the concern DMU from one period to another. Whereas, when it equals to one or less than one, it means no change and deterioration respectively for the DMU. A decline in productivity can also occur either from relative efficiency change decline, retrogression on technological change, or both. Coelli et al. (2005) recommended model specification of the non-radial and non-oriented model because radial models suffer from neglected slacks.

Cummins and Xie (2008) posit on the suitability of using the input-oriented model in evaluating M&A activities. Thus, the Malmquist index was

applied to analyze the companies' TFP using non-radial and non-oriented models. Since the Malmquist productivity index (total factor productivity) can be decomposed into catch-up and frontier-shift, this implies that productivity improvement can be either from an increase in catch-up (relative technical efficiency change), technological improvement, or from both. The CRS hypothesis means that the double price of the input must be a double value of the output. CRS posits that companies can put inputs and outputs side by side and still fail to reduce or increase efficiency. Consequently, decreasing or increasing of efficiency based on size refers to returns to scale (Karimzadeh, 2012).

The two sources of sustainable economic growth in an economy are increased quantity factors and increased productivity factors. Nevertheless, no sustainable long-term growth can be achieved from the absence of technological improvement and increase in output from a given quantity of input (Sloman & Wride, 2015). Long-term growth is what a developing country like Nigeria needs as it brings to the significance of growth in productivity, also known as total factor productivity for sustained long-term growth. The change of TFP between two data points is measured by Malmquist TFP index by calculating the ratio of the distances of each data point relative to a common technology. This is necessary because of the difficulty to assess whether an increase or decrease in the efficiency score of each year for companies is caused by an increase in technical efficiency or technological change.

This study is based on the benchmarking strategy for input and output selected. The Malmquist Productivity Index (MPI) was used to assess changes in efficiency for a time period. In order to understand if it improves or

deteriorates over time, it is essential to assess the improvements in complete efficiency in periods of those companies after M&A (Orkcu, Balicci, Dogan & Genc, 2016). Moreover, the MPI result is separated into technical efficiency change index (TECI) and technological change index (TCI). Technical change is often caused by technological developments, economic change, and changes in government policies (Orkcu et al*., 2016). TECI shows improvements in the company's experience, which can be ascribed to sound investment planning and effective implementation based on time-gathering technique. On the other hand, TCI is the case for research and development technologies (Fung, Hsieh, Naik & Ramadorai, 2008; Barros, Managi & Yoshida*, 2010).

Jin, Leem and Lee (2016) stated that the CCR model was first proposed by Farrell in 1957 as one of the earliest DEA attempts to measure the technological efficiency of single input and one output production units. Meanwhile, Charnes, Coopper and Rhodes (1978) attempted to generalize single-input single-output measurement to several inputs and multiple output. In addition, Banker, Charnes and Cooper (BCC) (1984a) expanded a DEA model to include a variable return to scale (VRS) which divided technical efficiency into pure technical efficiency (PTE) and scale effectiveness (SE), with constant returns to scale. Both technical effectiveness and efficiency scale are simultaneously analyzed by the CCR model. For any company, the DEA input-oriented model such as the CCR implies that it must reduce its inputs while producing the same output under a constant return to scale (CRS). As the output-orientated model indicates, it must improve its output while using the same input in order to be effective for any company.

3.7.1 Data Envelopment Analysis (DEA) Method

The input-oriented Malmquist productivity distance function is used for the measurement of total factor productivity (TFP). The input-oriented Malmquist TFP change index between base time period "r" and period "s" is presented based on the work of Färe, Grosskpof, Norris and Zhang (1994) as shown in Equation (3.22):

$$\ddot{o}_0^s \ (A_r, B_r, A_s, B_s,) = \frac{\tilde{n}_0^s (A_s, B_s)}{\acute{o}_0^s (A_r B_r)} \text{.....................} \quad (3.22)$$

If r reference technology is used in Equation (3.22), then the equation becomes Equation (3.23):

$$\ddot{o}_0^r \ (A_r, B_r, A_s, B_s,) = \frac{\tilde{n}_0^r (A_s, B_s)}{\acute{o}_0^r (A_r B_r)} \text{...........................} \quad (3.23)$$

Where: $\tilde{n}_0^r (A_s, B_s)$ is the distance from period s observation to period r technology under constant return to scale. Odeck (2008) posited that MPI requires CRS technology. Secondly, applying the Malmquist index in a non-constant return to scale does not measure productivity change precisely (Grifell-Tatjé & Lovell, 1995).

Productivity declines if $\ddot{o}_0^r \ (A_r, B_r, , A_s, B_s,) < 1$, and it remains unchanged if $\ddot{o}_0^r (A_r, B_r, A_s, B_s,) = 1$ and improves if $\ddot{o}_0^r \ (A_r, B_r, A_s, B_s,) > 1$.

3.7.2 Stochastic Frontier Analysis (SFA) Method

As this study matches translog stochastic production function with truncated-normal distribution by Coelli et al. (2005), the technical efficiency of production for an ith company at the tth year can be forecasted as in Equation (3.24):

$$\mu_{it} = E[\exp(-u_{it}| \varepsilon_{it})]\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.24)$$

μ_{it} is technical efficiency. The Malmquist total factor productivity index efficiency change element, EC $_{i(i+1)}$, is a ratio of two distance function both for time t+ I and t, and t is calculated as in Equation (3.25):

$$EC_{i(i+1)} = \mu_{i\,(i+1)} / \mu_{it}\ldots\ldots\ldots \quad (3.25)$$

The technical change (TC $_{i\,(i+1)}$) is an index of frontier shift, between two neighboring intervals, t+1 and t, for the ith company can be attained from the estimated parameters of the stochastic production frontier by approximating the partial derivatives of the production function for time at t+1 and t_i. The conversion of these into indices and the estimation of their geometric mean and the technological change were given by Coelli et al. (2005) as in Equation (3.26):

$$\textbf{TC}_{i\,(i+1)} = \{[1 + \frac{\partial f(x_{i(i+1)(t+1),\theta})}{\partial(t+1)}]\,x\,[1+\frac{\partial f(x_{it,t,\theta})}{\partial t}]\}^{½}\ldots(3.26)$$

Equation (3.24) and Equation (3.25) indices of efficiency change and technical change multiplied gives the stochastic parametric Malmquist TFP index, as shown in Equation (3.27):

$$TFP_{it} = EC_{it} * TC_{it} \quad \ldots.. \quad (3.27)$$

This is similar to the separation of the deterministic non-parametric Malmquist index advocated by Färe, Grosskopf and Lovell (1985).

3.8 Ray and Delsi's (1997) Alternative Malmquist Productivity Index (MPI) Decomposition

The MPI decomposition alternative proposed by Ray and Desli (1997) using the MPI decomposition was based on the geometric mean on variable return to scale (VRS) technology. Färe, Grosskopf, Lindgren and Roos (1992) MPI decomposition criticism came from Lovell (2003), where the alternative approach by Ray & Desli (1997) addressed these criticisms. The assessments of the Malmquist index (MI) produced by Ray and Desli's (1997) approach will allow for whether the variations are significant in a statistical sense as indicated by Simar & Wilson (1999). Thus, it is not sufficient to know whether the Malmquist index estimator indicates decreases or increases in productivity, but whether the changes are significant (Simar & Wilson, 1999).

The subjects of concern raised by Ray and Desli (1997) about Fare et al.'s (1992) MPI decomposition and its application to analyze the rate of productivity change among 17 OECD countries over the period of 1979 to 1988 are connected to them using the constant return to scale (CRS) and variable return to scale (VRS) technology within the same MPI decomposition, bringing about internal consistency problem. The initial Malmquist index was decomposed into two structures. First is changes in the technical efficiency, which can be interpreted as catching up and technical change. Second is the

catching up being further decomposed into pure technical efficiency change and scale efficiency change as characterized by variable returns to scale. If CRS technology is anticipated to hold, the technical change term correctly corresponds to a shift over time in the frontier. Consequently, scale efficiency change and pure efficiency changes are achieved from VRS within two different periods.

Conversely, the absence of present scale effect under CRS has prompted the occurrence of deceptive expanded decomposition. Assuming that VRS is accurate, the technical change does not display how the maximum producible output changes as a result of a technical change by keeping the input package constant. This means that independent shift in the frontier is not measured. Hence, the significance of MPI decomposition using VRS as a benchmark in measuring technical efficiency changes as a ratio of VRS distance functions while using the geometric mean of the sample. Since this affects scale efficiency only change its value, the pure technical efficiency variation value remains unaffected. The alternative nonparametric method of decomposing the Malmquist index by Ray and Desli (1997) to what Färe et al. (1992) did is based on a variable return to scale benchmark as given in Figure 3.2. Hence, changes in the most productive scale size are possible for each technological pack by achieving the most productive scale size estimates based on CRS and VRS assumptions that yield the same results. Therefore, the consistency issue raised by Ray and Desli (1997) is addressed. This is principally useful when analyzing DMUs of different industries under different periods utilizing monetary inputs and outputs, in a way that the conclusions regarding the impact of M&A in the Nigerian economy will not be affected by distinct assumptions.

Figure 3.1: VRS and CRS Production Possibility Set

Source: Ray & Desli (1997) and Färe et al. (1992)

Assuming a single input and output industry, x^t_k and y^t_k represent the input and output quantity of company k at time t. The company average productivity (AvP) at time t is shown in Equation (3.28):

$$\text{AvP} = y^t_k / x^t_k \quad ....\qquad\qquad (3.28)$$

Therefore, a productivity index of this company at time t+1, at period t being the base will be in Equation (3.29):

$$\bar{A}_k = AvP^{t+1}{}_k \ / AvP^t{}_k\ldots \qquad (3.29)$$

$$= (y^{t+1}{}_k / x^{t+1}{}_k) / \ y^t{}_k / x^t{}_k$$

We need a benchmark technology (Ray & Delsi, 1997), as this productivity index is not depending on assumptions about returns to scale as shown in Figure 3.1a. It considers an industry of four companies such as K, S, U, and R. The points K_0 through R_0 indicate the observed input-output levels of these companies in time 0. Likewise, the input-output levels of K_1 through R_1, is at time 1. Thus, company K uses input $0x_0$ to produce output K_0x_o in time 0. And input $0x_1$ to produce K_1x_1 in time 1. Therefore, company K in the period 1 productivity index is in Equation (3.30):

$$\bar{A}_A = (K_1x_1 \ / 0x_1) \ / (K_0x_0 \ /0x_0) \ \ldots \qquad (3.30)$$

All the points, $K_0,$ $S_0,$ $U_0,$ and R_0 signify possible input-output combinations in period 0. The set of points and the broken line, bounded by the horizontal axis - $M_O,$ $S_0,$ $U_0,$ R_0 extension, are the free disposal convex hull. All these points in the region represent the possible input-output combination in the period 0 under VRS. Also, under CRS, all the radial enlargements (non-negative) reduction of possible input-output packages are possible. Therefore, the CRS production possibility is set in the period 0 as cone shaped by the horizontal axis and the ray $0J_0$ through the point U_0. On the other hand, VRS frontier during the period 1 is the dotted line $M_1S_1U_1R_1$ - extension and the CRS frontier is the dotted line $0J_1$ through the point U_1. Therefore, the maximum producible output

in the period 0, from input $0x_0$ is $W_0 x_0$ under the CRS supposition and $N_0 x_0$ under the VRS assumption. Thus, the distance function (DF) as done by Ray and Delsi (1997) is shown in Equation (3.31) and (3.32):

$$DF^0{}_c \ (x_0, y_0) = K_0 \ x_0 \ / \ W_0 x_0, \ .... \tag{3.31}$$

$$DF^0{}_c \ (x_1, y_1) = K_1 \ x_1 \ / \ W_1 x_1 .$$

On CRS basis

$$DF^0{}_v \ (x_0, y_0) = K_0 \ x_0 \ / \ N_0 x_0, \ ...... \tag{3.32}$$

$$DF^0{}_v \ (x_1, y_1) = K_1 \ x_1 \ / \ N_1 x_1 .$$

On VRS basis, alternatively, the productivity index of company K can be stated as in Equation (3.33) and (3.34):

$$\bar{A}^0{}_A \ = \ DF^0{}_c \ (x_1, y_1) / DF^0{}_c \ (x_0, y_0), \ ...... \tag{3.33}$$

$$\bar{A}^1{}_A \ = \ DF^1{}_c \ (x_1, y_1) / DF^1{}_c \ (x_0, y_0), ... \tag{3.34}$$

This shows that the productivity index is equivalent to the ratio of the CRS distance function, even if it is not characterized by constant returns to scale. By comparing the CRS and VRS frontiers at 0 alongside the CRS frontier, the average productivity remains constant, but this is not the situation along the VRS. This is because both N_0 and N_1 are points on the frontier and are therefore different technically. The mean productivity at N_0 is higher than the average at N_1. The highest point of average productivity along the VRS frontier in the period 0 is U_0. This corresponds to what Banker et al. (1984) and Rajiv and Banker (1984) named as the most productivity scale size (MPSS). Thus, the mean productivity at the MPSS of the VRS frontier is equal to the constant average productivity at any point on the CR frontier. The scale efficiency (SE) at any point on the frontier is evaluated

by the ratio of the average productivity at that point to the average productivity at

MPSS. Therefore, in Equation (3.35) and (3.36):

$$SE^0 \ (x_0, y_0) = DF^0{}_c \ (x_0, y_0) \ / \ DF^0{}_v \ (x_0, y_0), .. \qquad (3.35)$$

$$SE^0 \ (x_1, y_1) = DF^0{}_c \ (x_1, y_1) \ / \ DF^0{}_v \ (x_1, y_1). \ .. \qquad (3.36)$$

Thus, the productivity index can be expressed alternatively as Ray and Delsi (1997) did as shown in Equation (3.37) and (3.38):

$$\bar{A}^0{}_A = \frac{DF^0{}_v \ (x1,y1)}{DF^0{}_v \ (x0,y0),} \frac{SE^0 \ (x1,y1)}{SE^0 \ (x0,y0)} \qquad \ldots \qquad (3.37)$$

$$\bar{A}^1{}_A = \frac{DF^1{}_v \ (x1,y1)}{DF^1{}_v \ (x0,y1),} \frac{SE^0 \ (x1,y1)}{SE^0 \ (x0,y0)} \qquad .. \qquad (3.38)$$

By using the geometric mean as Ray and Delsi (1997) did, it was proposed inEquation (3.39):

$$\bar{A}_A = \quad \left(\frac{DF^0{}_v \ (x1,y1)}{DF^0{}_v \ (x0,y0),} \ \frac{DF^1{}_v \ (x1,y1)}{DF^1{}_v \ (x0,y0),} \right)^{1/2}$$

$$X \quad \left(\frac{SE^0 \ (x1,y1)}{SE^0 \ (x0,y0)} \ \frac{SE^1 \ (x1,y1)}{SE^1 \ (x0,y0)} \right)^{1/2} \quad \ldots \quad (3.39)$$

The right hand side first factor can further be decomposed as in Equation (3.40):

$$\left(\frac{DF^0{}_v \ (x1,y1)}{DF^0{}_v \ (x0,y0),} \ \frac{DF^1{}_v \ (x1,y1)}{DF^1{}_v \ (x0,y0),} \right)^{1/2} = \quad \left(\frac{DF^0{}_v \ (x0,y0)}{DF^1{}_v \ (x0,y0),} \ * \ \frac{DF^0{}_v \ (x1,y1)}{DF^1{}_v \ (x1,y1),} \right)^{1/2}$$

$$X \frac{DF^1{}_v\ (x1,y1)}{DF^0{}_v\ (x0,y0),}$$

Thus, $\bar{A}_A$ = (TeCHCH (v)) x (PEFFCH). (ScCH (v))…..   (3.40)

Moreover, technical change efficiency is in Equation (3.41), pure technical change in Equation (3.42), and scale efficiency change in Equation (3.43):

$$\text{TeCHCH (v)} = \left(\frac{DF^0{}_v\ (x0,y0)}{DF^1{}_v\ (x0,y0),} * \frac{DF^0{}_v\ (x1,y1)}{DF^1{}_v\ (x1,y1),} \right)^{1/2} \dots \quad (3.41)$$

Pure technical efficiency change: PEFFCH = $\frac{DF^1{}_v\ (x1,y1)}{DF^0{}_v\ (x0,y0),}$ …   (3.42)

Scale efficiency change: ScCH (v) = $\left(\frac{SE^0\ (x1,y1)}{SE^0\ (x0,y0)} \frac{SE^1\ (x1,y1)}{SE^1\ (x0,y0)} \right)^{1/2}$ ..   (3.43)

Thus, the decomposition by Färe et al. (1992) applied for the 17 OECD countries from the 1979 to 1988 period of productivity growth is different. PEFFCH is the only term similar, and the technical change factor is a geometric average of the ratios of VRS distance functions. Whereas, Färe et al.'s (1992) decomposition applied on the OCED measured technical change using the ratios of CRS distance functions. Furthermore, the factor relating to scale efficiency change differs in the two decompositions. The Färe et al. (1992) scale efficiency change factor (SeCH) is the ratio of the scale efficiencies of the packages (x_0, y_0) and (x_1, y_1) by means of own-period VRS technologies as a benchmark.

Whereas, Ray and Desli's (1997) SeCH(v) is a geometric mean ratio of scale efficiencies of the two packages using the VRS technologies from the two stages as a benchmark. Technical change is measured by independent shift in the production function over time, keeping the input package constant (Ray & Delsi, 1997).

Färe et al.'s (1992) technical change from Figure 3.2 (Ray & Delsi, 1997) is shown in Equation (3.44):

$$\text{TeCHCH} = \left(\frac{\text{Loxo}}{\text{Woxo}} * \frac{\text{L1x1}}{\text{W1x1}} \right)^{1/2} \quad \cdots \cdots \quad (3.44)$$

That measures technical change when CRS holds, but at this point, VRS frontiers no longer characterize the technologies in the two periods (Ray & Delsi, 1997). It thus shows the alternative decomposition of the Malmquist productivity index, which escapes the internal problem consistency of Färe et al.'s (1992) extended decomposition that they applied to the productivity growth of OCED countries. This approach highlights the different conclusions when one reliably uses a VRS technology as a benchmark.

The bootstrapping DEA model recommended by simar and Zelenyuk (2006), using the R statistical with benchmarking package results, and the OLS regression of the unbiased and unbounded MI assessments conducted, around 1 to gain additional understanding of Nigeria's M&As MPI results is presented in Table 4.4a. The summary of these methodologies, theories and hypotheses are presented in Table 3.3.

Table 3.3: Summary of Methodology, Theory, and Hypothesis

Method	Theory	Hypothesis
Residual income valuation (RIV)	Agency theory	Operating performances of companies are significantly different before and after M&As.
Data Envelopment Analysis (DEA)	Efficiency theory	Technical efficiency of companies is significantly different before and after M&As.
Stochastic Frontier Analysis (SFA)	Efficiency theory	Cost efficiency of companies is significantly different before and after M&As.
Malmquist productivity index (MPI)	Hubris hypothesis	Productivity of companies is significantly different before and after M&As.

Source: Developed based on results of this study.

3.9 Data Analysis (Software, Data Editing, Data Entry)

DEA-Solver Pro 13.2, Statistical Package for Social Sciences (SPSS), and Limdep 11.0 software were used in running the efficiency analysis. DEA-Solver Pro.13.2 is capable of handling extensive data of over 60,000 excel sheets (Cooper, Selford, Tone & Zhu, 2007) with over 93 different models of DEA performance evaluation. The SFA model of Limdep 11.0 was applied for all SFA analysis while the SPSS software was used to conduct the Mann Whitney U-test, Kruskal Wallis test, and reliability analyses. The methodology of DEA relates to the input and output of individual DMU in constructing technical efficiency frontier that envelopes these input and output data. The benchmark that lies on the frontier is chosen by the model and measures the technical efficiency of other DMUs in relation to this benchmark. The two alternative measures of choosing the benchmarks are input oriented and output oriented models in estimating the efficient frontier. As the managers of companies are easily in control of input

variables while maintaining at least a given output level, the input oriented model is applied with constant returns to scale (CRS).

According to Coelli et al. (2005), choosing an input or output model should be based on what input managers are controlling most. Thus, 90 DMU entities of 30 bidders, 30 targets, and 30 non-merging companies were identified based on the selection criteria and the M&A data bank of the Security and Exchange Commission (SEC) were analyzed. The objective of selecting these companies is to improve performance, increase sales, reduce costs, and identify the reasons of poor performance. The issue of choosing the inputs and output was based on past literature, total asset, labor cost, and asset replacement cost as inputs (Aik et al., 2015; Chen & Lin, 2011), with net operating profit after tax (NOPAT) as output as a better alternative as all taxes and reduction have been made while others use turnover. Furthermore, cost of sales was equally used as an input variable in place of asset replacement. Turnover variable was applied in justifying that M&A in Nigeria is a good strategy considering merging and non-merged companies (See Appendix I). The needed data from the annual reports of the respective companies involved was cross-checked from the Nigerian stock exchange fact book for reliability and certainty.

3.9.1 Data Editing and Entry

The input and output data from DEA-Solver Pro 13.2, SPSS, and Limdep 11.0 were prepared in the Excel worksheet before executing the DEA-Solver and Limdep. The first three rows of the efficiency analysis in the Excel sheet were

the input variables (total asset, labor cost, and cost of sales) followed by the output variable, and one (NOPAT). This was done for all the DMUs before conducting the DEA-Solver Pro 13.2.

The DEA-Solver Pro 13.2 applied the following notations in describing the DEA models: <Model Name > - < I or O > - < C or V or GRS), where I or O was applied to Limdep and SPSS equally before running the process and drawing conclusions from the analysis. This process was conducted considering the analysis of the bidder, target, and non-merging companies represented the input or output orientation while C, V, or GRS represented constant, variable, or a general return to scale and the result produced. Once the data needed for all companies involved were sorted, it was tested for significant difference before the conclusions were drawn. This process of arranging the data as per the software needs was applied following the intervals and industry.

The operating performance, RIV process involved analyzing all the variables on the Excel sheet after testing for its significance in the DMUs analysis. Meanwhile, the SFA and input price column were needed for cost efficiency. The Excel sheets were arranged according to companies input, input cost column denoted by C, and outputs. Any input with no cost column was regarded as zero, and therefore could not be run. The Malmquist model excel table required the problem name on the top-left first row, next row DMU, first time period in the second column, below its input and output variables, the next year in the next column, below it is input and output and this process continued till the final year. The DEA-Solver Pro 13.2 and Limdep software were purchased as they were unavailable on the faculty's computers.

3.10 Data Estimation Procedure

All data were arranged in the Excel file as described above. The technical efficiency data from 1991 to 2020 were sorted and analyzed by first starting the DEA solver and selecting the DEA model, which was CCR-I. Next, the data file in the Excel sheets were opened by clicking on the dialog box before selecting a workbook to save the results. It was followed by the DEA computation and the results were stored in the workbook. Similar procedures were applied for all technical efficiency analysis of the bidder, target, and non-merging companies.

The worksheet results were then sorted, tabulated, and presented. The data were sorted on 3 years before and after the M&A activity. The process was repeated and the results were tested for significance with the Mann Whitney U-test for two independent groups. This case study involved before and after M&A and its robustness determined using the Kruskal Wallis test for three independent groups of 30 bidders, 30 targets, and 30 non-merging companies. When further analysis on industry and the interval was considered, the data were equally sorted into industries as classified by the Nigerian stock exchange of consumer, healthcare, industrial, services, as well as oil and gas. The intervals sorted and considered were 1 year before and 1 year after M&A, 2 years before and 2 years after M&A, and 3 years before and 3 years after M&A. The analysis was repeated in these intervals and significance tests were conducted once the industry was considered.

The results were sorted and presented in order for relevant conclusions to be drawn. The Malmquist procedure followed similar patterns with the Malmquist model. All procedures of sorting the data efficiently in the technical

applied in terms of industries and intervals for the Malmquist productivity index for productivity. In the operating performance process, all variables were analyzed using the Excel spreadsheet. Once the data were sorted into intervals and industries, it was applied to the MPI, technical, and cost efficiency respectively.

Following the Limdep for SFA analysis, the Excel file was saved under CSV as reviewing CSV file in Excel would result in the data and variables to appear in cells rather than separated by commas. The full path to the file had to be specified using the import command, namely from the data editor to menu options before selecting and importing the project. Once the variables were selected, the import dialog box was opened before selecting all files in the window. The data file was opened before the respective analysis model was selected and executed. The result was sent to the selected workbook that saved all the analysis results. Similar process of sorting and analyzing in DEA models was used in the industries and during intervals. The significance was tested via the Mann Whitney U-test and robustness check with the Kruskal Wallis test. The data estimation procedures are presented in Figure 3.2 involving the DMUs of 30 bidders, 30 target, and 30 non-merging companies.

Figure 3.2 Data Estimation Procedure
Source: Developed for this study.
Notes: B denotes before M&A and A denotes after M&A.

The accounting-based ratios is another form of efficiency measurement yet it has received serious criticisms (Kohers, Huang & Kohers, 2000). Guest et al. (2010) posited on the lack of agreement on the relative importance of different types of input and output using financial ratios that may not be appropriate in revealing actual efficiency in a long term. Similarly, Houston, James and Ryngaert (2001) opined that even if mergers can improve performance, the interval between mergers and the realization of operating enhancement can be long, and that financial ratios only give incomplete and limited scenarios. Pevcin (2014) viewed frontier analysis as more superior to the financial ratios for efficiency measurement. In another related study, Baten and Hossain (2014)

stated that because numerous functional forms for approximating the association between inputs and outputs exits, Cobb-Douglas functional form is desirable when the number of inputs is three or more. The Cobb-Douglas production function was applied with three input variables and one output in the study.

3.11 Chapter Conclusion

Akpan, Aik and Wong (2019) argued that share prices and accounting income are useful pointers, but may be faulty measures of a company's efficiency or productivity when the rules of the efficient market hypothesis are violated. Nevertheless, frontier analysis measures the comparative performance of companies by objectively providing numerical efficiency and ranking them accordingly. It displays how close the companies are to the best-practice frontiers in association with other companies in the industry. Meanwhile, DEA does not require explicit specification of a production or cost function, but rather computes efficient "best-practice" production and cost frontiers by obtaining linear combinations of companies in the industry.

DEA is a non-parametric mathematical programming method that flexibly estimates the relative productive efficiencies of similar multi-input and multi-output DMU. It differs from regression models that determine a production function that deals with a single output and several inputs. Meanwhile, SFA specifies a functional type of cost, profit, or production function such as Cobb-Douglas or Translog. Such reasons prompted the decision to adopt and apply these methods in this study. Following the general assertion that merging companies

should perform better, the basis of evaluating both before and after an M&A was prompted to see if any synergistic gains were achieved in Nigeria.

This study applied the residual income valuation method (RIV) for operating performance, the DEA and SFA models for efficiency, and the Malmquist productivity index (MPI) for productivity. These methods were considered appropriate for examining the long-term performance of non-financial companies in Nigeria before and after an M&A. The sample size was built on the selection standards and different intervals and industries considered in order to offer robust empirical findings. DEA-Solver pro 13.2, SPSS, and Limdep 11 softwares were used to conduct the analysis. Next, Chapter 4 will discuss the data analysis results and findings of the study.

CHAPTER 4

DATA ANALYSIS AND FINDINGS

4.1 Introduction

This chapter presents the general summarized results of the long-term performance of NHV M&As (bidder and target) and their non-merging rival companies. Pre-data analysis involved the Mann Whitney U-test (MWU) and Kruskal Wallis test (KWT) for robustness check as well as the Cronbach's alpha reliability test for pilot test data. Moreover, the significant differences in the operating performance (OP), technical efficiency (TE), cost efficiency (CE), and productivity efficiency (PE) of 30 bidders, 30 targets and 30 non-merging companies, before and after the estimation period of long-term performance of M&As are reported and discussed.

4.2 Descriptive Statistics of Selected Bidder, Target, and Non-Merging Companies

Merging companies are generally involved in an M&A transaction with the expectation of benefitting mostly via synergy or economic gains. Economies of scale, elimination of inefficiencies, and growth in market power are some sources of these synergies. Ramakrishnan (2008) mentioned that a merger improves monetary profits of companies in the long-term while efficiency seems to improve post-merger synergistic gains of the merged group. It is not easy to achieve a successful horizontal M&A and realize potential synergies. Thus, it is

significant to investigate the merging companies' long-term performance to find out if there have been any significant realizations of the expected synergies among the merging companies in Nigeria. The evaluation of the companies' long-term performance starts with the presentation of descriptive statistics, as shown in Table 4.1a and Table 4.1b.

Table 4.1a: The Descriptive Statistics of Selected 30 Bidders, selected 30 Targets, and Selected 30 Non-merging companies with the Mann Whitney U-Test

	Before M&As				After M&As			
	30 Bidder Companies				30 Bidder Companies			
Variables	Min.	Max.	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.
TA	0.0138	200.569	20.532	35.525	0.2354	1269.754	116.734*	303.929
LC	0.0115	18.325	2.767	4.515	0.0804	38.047	5.808*	9.074
CS	0.0105	13.749	1.865	3.201	0.0198	33.556	4.751*	8.003
NOPAT	(0.2890)	47.251	4.996	10.090	(0.3171)	123.252	10.303	22.524
	30 Target Companies				30 Target Companies			
TA	0.0022	15.970	1.383	2.6790	0.0092	24.551	3.386*	4.608
LC	0.0112	3.224	0.357	0.5636	0.0193	3.601	0.485*	0.702
CS	0.0041	0.971	0.174	0.1960	0.0081	12.527	0.704*	2.212
NOPAT	(1.4839)	2.443	0.160	0.6127	(2.9382)	3.886	0.229	1.113
	30 Non-Merging Companies				30 Non-Merging Companies			
TA	0.0181	76.489	10.600	14.929	0.1297	120.249	16.704*	24.077
LC	0.0214	7.922	1.737	2.261	0.0202	15.572	3.237*	4.244
CS	0.0117	5.713	0.880	1.337	0.0177	12.485	2.120*	3.428
NOPAT	(3.1702)	17.928	2.807	4.824	(8.6843)	14.611	2.330	4.625

Notes: *Indicates 5 percent significance level in Mann Whitney; values are in million (Naira). This data shows the three-year before and after average of the analytical data used in measuring residual income valuation (RIV), TE, CE and Malmquist productivity index (MPI) for the bidder, target, and non-merging companies.

The results in Table 4.1a indicate a significant positive change in the measures of bidder companies after M&As, except in net operating profit after tax operations. This was the same for the target and non-merging companies. This suggests that after M&As, all companies had a significant change in operations. The differences in the analytical and operationalized variables between the bidder, target and non-merging companies is presented in Table 4.1b.

Table 4.1b: Summary of Standard Deviation and Mean Difference between 30 Selected Bidders, 30 Selected Targets, and 30 Selected Non-Merging Companies with Mann Whitney U-test for Analytical and Operationalized Variables

	Bidder (N=30)		Target (N=30)		Difference		Non-merging Company(N=30)	Non-merging Company(N=30)	Difference	
Variables	Standard Deviation Before M&A	Standard Deviation After M&A	Standard Deviation Before M&A	Standard Deviation After M&A	Mean Before	Mean After	Standard Deviation Before M&A	Standard Deviation After M&A	Mean Before	Mean After
TA	35.525	303.929	2.679	4.608	19.149*	113.348*	14.929	24.077	(9.932)	(100.030)*
LC	4.515	9.074	0.564	0.702	2.411*	5.323*	2.261	4.244	(1.030)	(2.571)
CS	3.201	8.003	0.196	2.212	1.691*	4.047*	1.337	3.428	(0.985)	(2.631)
NOPAT	10.090	22.524	0.613	1.113	4.837*	10.075*	4.824	4.625	(2.190)	(7.974)*
NI	11.7	25.4	0.63	0.96	5.38*	10.63*	4.667	4.42	(2.921)	(8.450)*
TA	27.94	85.79	3.11	10.46	14.66*	43.11*	13.881	40.433	(6.887)*	((27.717*
IC	42.1	96.01	3.81	10.53	22.09*	53.06*	18.489	41.152	(11.557	(30.96)
TO	68.46	109.26	10.00	13.26	(0.10)*	75.13*	44.25	51.427	(18.459)	(56.039)*
SC	4.51	10.14	0.59	0.71	2.42*	5.63	2.366	3.608	(1.076)	(3.889)
TD	17.01	48.73	1.87	3.64	8.43*	28.06*	7.425	49.356	(5.259)	93.889)
EP	2309	2579	477	417	1594*	1943*	1796	1731	(305)	(699)

Notes: The standard deviation and mean difference between bidder, target and non-merging companies' analytical and operationalized variables as shown above is based on the three-year average before and after the M&A. * Indicates significance at 5 percent Mann Whitney U-test level. Values in million (Naira) except for number of employees (EP). NI: Net income, TA: Total Assets, IC: Invested capital, TO: Turnover, SC: Staff Cost and TD: Total debt for the operationalizes variables. For the analytical variables; TA: Total Asset, LC: Labor cost, CS: Cost of sales as input variables (x) and NOPAT Denotes output variables.

The results in Table 4.1b indicate that bidder companies have, on average, significantly higher analytical and operationalized variable values than the target companies, both before and after M&As. This is a reflection of their size, as all the analytical and operationalized variables were significant at the 5 percent level both before and after M&As. However, the target companies' values improved significantly after M&A activities too, except for NOPAT operations in the bidder and non-merging companies. This outcome suggests that M&As seem to improve the performance of the target company, requiring additional analysis to establish if the expected synergistic gain was achieved for the merging companies in the long-term in Nigeria. Market focus on goods and services can be seen as improving both scope and scale economies.

If an M&A deal is not properly assessed, it could discourage market competition. In the absence of effective competition in a developing market like Nigeria, through regulatory control of antitrust law agencies, market focus by companies could lead to conspiracy. This could form domination and prompt unpromising high prices for consumer goods and services at low-grade quality. M&As are anticipated to inspire effective competition; hence, it is important to measure non-merging companies' relative performance to check if any significant elimination of the bidder companies' competition has occurred.

The descriptive statistics reveal a significant increase in the non-merging companies' analytical variables after M&As in terms of total assets, labor cost, and cost of sales. Net income after taxes also improved but non-significantly. This significant improvement for non-merging companies means a change (increase) in the size of their operations, which also reflects the likelihood of them

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re-adjusting to a competitive market after M&As as fewer players are in the system. This result reveals the likelihood of a spill over effect on the non-merging companies, even though there is a non-significant improvement in their net income after tax. The result shows that on average, the non-merging companies reported lower value than the bidder companies both before and after M&As. Total asset and labor cost and cost of sales of the bidder companies were significantly higher than the non-merging companies before and after M&As. Thus, additional investigation is required to examine the relative OP of the non-merging companies compared to the bidder companies.

The operationalized variables' descriptive statistics are presented below
in Tables 4.1c.

**Table 4.1c: Operationalized Descriptive Statistics of 30 Selected Bidders,
30 Selected Targets, and 30 Selected Non-Merging Companies**

Variables	Selected 30 Bidders before M&As				Selected 30 Bidders after M&As			
	Min.	Max.	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.
NI	-0.68	61.39	5.53	11.70	-0.61	152.93	10.95	25.40
TA	0.01	163.79	16.33	27.94	0.30	427.61	47.11*	85.79
IC	0.06	223.77	24.38	42.10	0.05	345.23	57.43*	96.01
TO	0.52	238.80	45.85	68.46	1.06	378.93	81.93*	109.26
SC	0.03	18.32	2.79	4.51	0.08	38.05	5.79*	9.07
TD	0.00	85.00	9.62	17.01	0.03	213.00	30.11*	48.73
EP	35.00	9747.00	2110.66	2308.54	38	12475	2386.31	2578.68

Variables	Selected 30 Targets before M&As				Selected 30 Targets after M&As			
	Min.	Max.	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.
NI	-1.772	2.423	0.150	0.627	-1.510	3.886	0.334	0.974
TA	0.002	15.970	1.668	3.106	0.002	59.690	4.098	10.622
IC	0.035	22.162	2.295	3.814	0.005	59.612	4.481	10.691
TO	0.016	54.542	4.689	10.003	0.036	62.100	6.961	13.455
SC	0.011	3.224	0.366	0.588	0.019	3.601	0.474	0.711
TD	0.003	9.996	1.188	1.870	0.008	20.265	2.082	3.701
EP	65	1731	517.00	476.7	41	1700	(443)	417.065

Variables	Selected 30 Non-Merging before M&As				Selected 30 Non-Merging after M&As			
	Min.	Max.	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.
NI	-3.569	17.928	2.605	4.667	-9.159	14.611	(2.497)	4.420
TA	0.026	53.267	9.444	13.881	0.130	280.138	19.389*	40.433
IC	0.020	76.429	12.826	18.489	0.195	280.138	26.468*	47.152
TO	0.056	206.613	27.394	44.250	0.141	320.123	(25.889)	51.427
SC	0.009	7.922	1.710	2.366	0.020	15.226	2.659*	3.608
TD	0.001	37.621	4.361	7.425	0.016	197.653	26.221*	49.356
EP	36	8400	1805.64	1796.011	40	7440	(1687)	1731.001

Notes: NI: Net income, TA: total assets, IC: invested capital, TO: turnover, SC: staff cost, TD: total debt and EP: Employees. Min: Minimum value, Max: maximum value, Std.DEV: standard deviation. * indicates Mann Whitney 5 percent significance level.

The results from Table 4.1c show a significant improvement in the bidder
and non-merging companies' total assets and invested capital after M&As. These

improvements also lead to significant turnover and total debt for the companies. On the other hand, the target companies showed no significant improvement in total assets and invested capital after M&As. Thus, the significant differences in the net income for the three groups after M&As is not through outliers, as the bidder and non-merging companies' selection criteria were similar and strictly adhered to. Secondly, the minimum and maximum values showed no outliers. The minimum and maximum values are included in Table 4.1c for reference.

4.3 Pilot Study of Selected 30 Bidders, 30 Targets, and 30 Non-Merging Companies Before and After M&As

One of the reasons for the pilot study analysis was to help in choosing a more suitable OP analysis method between the economic value added (EVA) and RIV approaches, to evaluate the NHV performance before and after M&A activities,

Based on the literature review, there have been criticisms of the EVA method in evaluating the OP of companies. First, it cannot be applied to a high inflation rate. Second, it cannot handle the 164 assumptions in the model. Also, it is noted in the literature that EVA is mostly applied in developed economies. This is a result of single digit inflation rates in developed countries like the United States of America, Australia and Canada, though the same low inflation rate exists in Malaysia where studies have mostly applied EVA. There is no perfect model or method in all aspect when assessing research outcomes. Nevertheless, there have not been as much criticism concerning the RIV as the EVA in the literature reviewed.

In the Nigerian context, there was an average inflation rate of 12.47 percent between 1997 to 2017. Inflation is an important external environmental factor affecting M&As as it occurs over time. Therefore, it is an important issue that needs consideration when considering the performance evaluation before and after non-financial M&As in Nigeria. Thus, it was necessary in the pilot study analysis employing all the selected 30 bidder and 30 target companies using the EVA and RIV approaches. Applying the same sample number was done on the basis of fairness, as there was no research standard to select some samples and leave out others without bias in this situation, which is sometimes done in pilot study analysis. Importantly, it makes logical sense to apply the sample size as it is the same sample that will be used after deciding on a suitable approach following the pilot study analysis.

Thus, after the pilot test, the RIV approach was revealed as the most suitable and was subsequently applied in evaluating the OP of NHV M&As in Nigeria. This undertaking also demonstrated the effect of inflation as an important factor when evaluating M&As performance. This suggests that a pilot study in countries like Nigeria with a high inflation rate is necessary, as it guides the better selection of an OP measurement method.

The EVA and RIV results for OP are presented here [Using the model (CFI, 2018): EVA = NOPAT – (WACC * Capital invested). NOPAT is net operating profits after tax; WACC is the weighted average of capital, while capital invested is equal to equity + long-term debt at the beginning of the period].

Table 4.2a: Pilot Study Results of EVA Average for Bidder Companies

No	Company	Years	Mean Actual EVA	Mean Expected EVA	Mean Excess EVA
B1	Lever Brothers Nig.	1995	-58	-162	104
B2	Sona Breweries	1995	-666	-716	50
B3	Nestle Foods Nig.	1996	-238	-1618	1380
B4	Beecham	1996	-94	-660	565
B5	Nigerian Bottling company	1996	-416	-1542	1126
B6	Paterzon Zochonis Ind. Plc	1996	-548	-2198	1650
B7	Carnaud Metal Box Nig.	1997	241	-394	636
B8	Delta Glass plc	1999	-75	-3367	3292
B9	Int. textile. Ind. ltd	1999	-533	-3708	3175
B10	Total Nigeria Plc	2001	928	-5272	6200
B11	United Nig. Textile	2001	-1152	-14393	13241
B12	PZ Industries	2001	-2491	-22416	19926
B13	Unipetrol Nig. Plc	2002	-59	-16735	16676
B14	Edo Cement Company Ltd.	2002	143	-6757	6900
B15	Jap Telecoms Ltd	2006	14	-287	301
B16	Flour Mills of Nig.	2006	-1773	-41569	39796
B17	Oanda Plc	2007	-3202	-92462	89260
B18	Tantalizers ltd	2008	-1738	-666	-1072
B19	Tower Aluminium Nig Plc	2008	-185	-250	65
B20	MTN Nig. Ltd	2008	-49	-1373	1324
B21	West Africa Household	2009	813	-2146	2959
B22	Crown Flour Mills	2009	2709	-4681	7389
B23	Obajana Cement Plc	2010	-31219	-307000	275399
B24	Flour Mills of Nigeria Plc	2010	-26798	-64834	38036
B25	Nigerian breweries	2011	8542	-61796	102337
B26	Visafone Communication	2011	8	-1396	1405
B27	Olam International	2011	2885	-164000	167071
B28	Nigeria Breweries	2012	7148	-93796	92340
B29	Flour Mills of Nigeria Plc	2012	-16415	-176000	159123
B30	Nigeria Breweries	2013	8861	-421000	429544
	Total (Average)		(1801)	(51474)	49673

Note: The values are in (N'000).

Table 4.2b: Pilot Study Results of EVA Average of Target Companies

No	Company	Year	Mean Actual EVA	Mean Expected EVA	Mean Excess EVA
T1	Unilever Nigeria Ltd.	1995	-69	-397	328
T2	beverages Industries	1995	-4	-61	57
T3	Nestle Nigeria Ltd.	1996	24	-48	72
T4	Sterling product	1996	-3	-239	235
T5	Sapanda Industries	1996	105	-11	116
T6	Thermo cool Eng.	1996	44	-196	241
T7	Canmakers Nig. Ltd	1997	-17	17	-34
T8	Guinness Glass Plc	1999	-103	-57	-47
T9	Platinum Textile Ltd	1999	-61	-319	258
T10	Elf Nig.	2001	236	-1728	1964
T11	Nichemtex Industries	2001	-150	-162	13
T12	PZ Nig. Limited	2001	-2214	-125	-2089
T13	Agip Nig.	2002	1	-308	309
T14	Bendel Cement Company	2002	11	-13	24
T15	Danjay Telecoms Ltd	2006	-211	-50	-160
T16	Golden Fertilizer Co. Ltd	2006	-749	-295	-454
T17	Ocean & investment	2007	739	-2121	2859
T18	Baytide nig. Ltd	2008	-90	-281	191
T19	Cook N"Lite Nig.	2008	-123	-168	44
T20	VGC Communications ltd.	2008	-153	-11	-142
T21	Battery Manu.	2009	-320	-1108	788
T22	Interstate Flour Mills	2009	-274	-449	175
T23	Benue Cement Company	2010	-565	-3360	2796
T24	Nigeria Eagle Flour Mills	2010	-521	-5659	5138
T25	Champion Breweries	2010	-1489	-4544	3055
T26	Benue Breweries	2011	-1002	-10860	9859
T27	Cellcom Communication	2011	260	-457	718
T28	Crown Flour Mills	2011	17	-2823	2840
T29	Rom Oils Mill limited	2012	-13	-7151	7137
T30	Sona Life Breweries	2013	-54	-11247	11193
	Total (Average)		(225)	(18077)	1583

Notes: The values are in (N'000)

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Table 4.2c: Pilot Study Results of RIV for Bidder Companies

No	Bidder Companies	Years	Mean After RIV	Mean Before RIV	Mean Excess RIV
B1	Lever Brothers Nig. Plc	1995	0.2925	-0.0805	0.373
B2	Sona Breweries Industries	1995	-0.0656	-0.188	0.1224
B3	Nestle Foods Nig. Plc	1996	0.8987	0.5842	0.3145
B4	Smithlkline Beecham Nig. Plc	1996	0.2037	-0.2513	0.455
B5	Nigerian Bottling company Plc	1996	0.0355	-0.2308	0.2663
B6	Paterzon Zochonis Ind. Plc	1996	0.0298	-0.2047	0.2344
B7	Carnaud Metal Box Nig. Plc.	1997	2.2572	-0.3192	2.5764
B8	Delta Glass plc	1999	-0.0021	-0.2584	0.2563
B9	Int. textile. Ind.ltd	1999	0.5983	-0.3406	0.9389
B10	Total Nigeria Plc	2001	0.729	-0.1656	0.8946
B11	United Nig. Textile Ltd	2001	0.083	-0.0614	0.1444
B12	PZ Industries	2001	-0.1114	-0.2089	0.0975
B13	Unipetrol Nig. Plc	2002	2.6782	-0.2427	2.9209
B14	Edo Cement Company Ltd.	2002	1.9073	-0.4399	2.3472
B15	Jap Telecoms Ltd	2006	2.8868	3.3653	-0.4785
B16	Flour Mills of Nig. Plc	2006	0.0149	-0.0521	0.067
B17	Oanda Plc	2007	-0.9208	0.0032	-0.9239
B18	Tantalizers ltd	2008	0.8203	-1.2212	2.0415
B19	Tower Aluminium Nig. Plc	2008	-2.3379	-1.5596	-0.7784
B20	MTN Nig. Ltd	2008	0.0547	-1.5077	1.5624
B21	West Africa Household Utilities	2009	-0.8328	-0.4243	-0.4085
B22	Crown Flour Mills Ltd	2009	-0.5461	-0.0058	-0.5403
B23	Obajana Cement Plc	2010	0.2183	-0.0018	0.2201
B24	Flour Mills of Nigeria Plc	2010	0.0839	-0.0127	0.0966
B25	Nigerian breweries plc	2011	2.1762	-0.0042	2.1804
B26	Visafone Communication	2011	-0.2134	-0.7842	0.5708
B27	Olam International Ltd	2011	-0.8425	-0.3884	-0.4541
B28	Nigeria Breweries	2012	1.9786	-0.0297	2.0083
B29	Flour Mills of Nigeria Plc	2012	-0.0405	-0.1408	0.1003
B30	Nigeria Breweries	2013	2.2103	-0.0754	2.2857
	Total (Average)		(0.175)	0.481	(0.656)

Table 4.2d: Pilot Study Results of RIV for Target Companies

No	Companies	year	Mean After RIV	Mean Before RIV	Mean Excess RIV
T1	Unilever Nigeria Ltd	1995	-0.3008	1.2131	-1.513
T2	Beverages industries	1995	-2.2631	12.9098	-15.173
T3	Nestle Nigeria Ltd.	1996	0.7887	112.9079	-112.12
T4	Sterling product (Nig)	1996	-4.3881	-82.5865	78.1984
T5	Sapanda Industries Ltd.	1996	0.4234	-22.2385	22.662
T6	Thermo cool Eng. Co.	1996	-0.1963	-20.5519	20.3557
T7	Canmakers Nig. Ltd.	1997	-1.5624	30.3131	-31.8755
T8	Guinness Glass Plc	1999	0.2124	86.6158	-86.4034
T9	Platinum Textile Mill Ltd.	1999	-0.1822	113.0514	-113.23
T10	Elf Nig. Ltd.	2001	-0.041	32.5816	-32.6226
T11	Nichemtex Industries	2001	-3.3029	-4.7813	1.4784
T12	PZ Nig. Limited	2001	-0.6949	-10.7012	10.0063
T13	Agip Nigeria	2002	0.1534	13.789	-13.6356
T14	Bendel Cement Company	2002	0.0983	-16.5345	16.6328
T15	Danjay Telecoms Ltd	2006	1.1765	-30.2217	31.3982
T16	Golden Fertilizer Co. Ltd	2006	-0.8474	-57.814	56.9666
T17	Ocean & oil investment ltd	2007	0.6471	29.9082	-29.2611
T18	Baytide nig. Ltd	2008	0.4461	-9.0679	9.514
T19	Cook N"Lite Nig	2008	-0.2398	-59.5068	59.2669
T20	VGC Communications Ltd.	2008	0.8897	0.1668	0.723
T21	Battery Manufacturing	2009	-0.9759	17.1034	-18.0793
T22	Interstate Flour Mills	2009	1.4396	0.2717	1.168
T23	Benue Cement Company	2010	0.0014	0.954	-0.9526
T24	Nigeria Eagle Flour Mills	2010	-0.6804	-0.7073	0.0269
T25	Champion Breweries	2011	0.6508	15.5585	-14.9077
T26	Cellcom Communication	2011	3.4613	-24.8568	28.3181
T27	Crown Flour Mills	2011	0.0557	-5.9036	5.9593
T28	Benue Breweries	2012	-0.6151	-1.0057	0.3906
T29	Rom Oils Mill Limited	2012	3.4571	-2.9768	6.4339
T30	Sona Life Breweries	2013	1.7172	-9.6528	11.37
	Total (Average)		2.1062	3.607	(1.5017)

Table 4.2e Mann Whitney U-Test Excess EVA and RIV for Bidder and Target companies (Pilot Study)

	Mean Actual EVA&RIV	Mean Expected EVA&RIV	Mean Excess EVA&RIV	Mann Whitney U-Test
Bidder	-1801	-51474	49673*	0.0045
	-0.175	0.481	(0.656)*	0.001
Target	-225	-18077	17852*	0.002
	2.1062	3.607	(1.5017)	0.383

Notes: EVA: economic value added; RIV: residual income valuation

Table 4.2e above indicates a significant excess in EVA improvement results for the OP of bidder companies after M&A. The Mann Whitney U-test p-value was 0.0045, which is less than the α 0.01 level. Therefore, EVA averages for bidder companies' data show consistency and reliability. Similar to bidder companies' results, the target companies also indicate a significant improvement with EVA. The Mann Whitney U-test p-value was 0.002, that is significant at the 0.01 level. Therefore, EVA averages for target companies' data are consistent and reliable. The results of EVA are contrary to the bidder companies' OP with the RIV method. The bidders' RIV showed a significant decline while the targets' did not.

In summary, the pilot study results indicated a significant OP improvement with the EVA model after M&As for the bidder and target companies. The bidder and target OP results with the RIV model revealed a significant decline for the bidder companies and a non-significant decline for the target companies. This was the basis of Aruna's (2013) application of profitability ratios: return on invested capital (ROIC): - net profit/total assets multiplied by 100; Operating profit margin (OPM): - gross profit/turnover multiplied by 100; and net profit margin (NPM): -net profit/turnover multiplied by 100, to evaluate the bidder and target companies' financial ratios before

arriving at a fit OP method to apply. The pilot study results ultimately imply that the EVA method is not suitable for high inflation as evidenced in Nigeria's OP investigation. Thus, a pilot study is recommended before choosing a method to apply when inflation is high.

Table 4.2f: Pilot Study Results of Average Profitability Ratios with Mann Whitney U-Test (Bidder against Target Companies)

Company	Mean Before M&A (%)	Mean After M&A (%)	Mean Increased/ Decreased	Mann Whitney U-Test
Bidder				
OPM	50.123	40.443	(9.667)	0.289
ROIC	58.705	43.124	(15.580)*	0.007
NPM	36.358	28.12	(8.239)	1.000
Target				
OPM	-15.357	-32.263	(16.907)	0.402
ROIC	13.759	-5.034	(18.793)	0.216
NPM	-21.473	-41.155	(19.683)	0.462

Notes: *indicates significant at 1 percent Mann Whitney significance level. The financial measures values are based on data before and after M&A.

The profitability ratios on the OPM, ROIC, and NPM for the bidder companies show a significant decline on ROIC as presented in Table 4.2f above, while the target companies revealed non-significant declines across OPM, ROIC, and NPM.

Table 4.2g: Pilot Study Results of Average Profitability Ratios with Mann Whitney U-Test (Non-Merging against Bidder Companies)

	Bidder Mean Before M&A (%)	Mean After M&A (%)	Mean Inc./Dec. (%)	Mann Whitney U-test (p-value)	Non-Merging Before M&A (%)	Mean After M&A (%)	Mean Inc. /Dec. (%)	Mann Whitney U-test (p-value)
OPM	50.123	40.443	(9.68)	0.289	62.358	-15.099	(77.457)*	0.001
ROIC	58.705	43.124	(15.580)*	0.007	49.689	-32.13	(81.819)*	0.003
NPM	36.358	28.12	(8.239)	1.000	52.025	-6.427	(8.452)*	0.002

Note: *Indicates significant decline at 5 percent Mann Whitney U-Test level. Inc. represents Increased, Dec. represents decreased. This table shows a Mann Whitney U-test and the profitability ratios of non-merging and bidder companies three years before and after M&A

The non-merging and bidder companies' results as presented in Table 4.2g above suggest a significant decline in OPM, ROIC, and NPM for non-merging companies. It is a significant decline in ROIC, but non-significant decline in OPM and NPM for the bidder companies. The significant improvement in the EVA model results produced a decline in all ratios, namely a significant decline on return on invested capital for the bidder companies and a non-significant decline in all the target companies' profitability ratios. The non-merging companies' results showed a significant decline in all profitability ratios as well. The significant OP declines in the RIV model results were supported by the decline in the profitability ratios, thus indicating a better choice for OP measures.

The process of pilot analysis was unavoidable and unique, considering the high inflation rate in Nigeria, averaging 12.47 percent between 1996 and 2013 (Trading Economics, 2017). On the other hand, inflation is an important external factor as M&As takes place at different times. Uzik (2017) stated that conventional financial declarations reflect the returns for the stakeholders but

leaves them to determine whether the returns are sufficient to meet their cost of equity. Furthermore, the economic concept of RIV explicitly considers the cost of equity. Uzik (2017) stated further that RIV has inherent value for a company in two parts, namely the present book value of equity and the present value of future residual income. Following this pilot analysis, the RIV method was applied in the OP analysis of the entire research and tested for significance before drawing conclusions.

For proper guidance in reporting the results, the full thrust of the three specific research objectives and the three corresponding hypotheses must be restated here as follows:

Specific Objective 1. To measure the significant differences between operational performance, technical efficiency, cost efficiency, productivity, and long-term performance before and after M&As of selected 30 bidder companies.

HA1: The operating performance, technical efficiency, cost efficiency and productivity of selected 30 bidder companies are significantly different before and after the estimation period of long-term performance of M&As (HA: Md before $\neq$ Md after).

Specific Objective 2. To measure the significant differences between operational performance, technical efficiency, cost efficiency, productivity, and long-term performance before and after M&As of selected 30 target companies.

HA2: The operating performance, technical efficiency, cost efficiency and productivity of selected 30 target companies are significantly different before

and after the estimation period of long-term performance of M&As (*HA*: Md before ≠ Md after).

Specific Objective 3. To measure the significant differences between the operational performance, technical efficiency, cost efficiency, productivity, and long-term performance before and after M&As of selected 30 non-merging companies.

HA3: The operating performance, technical efficiency, cost efficiency and productivity of selected 30 non-merging companies are significantly different before and after the estimation period of long-term performance of M&As (*HA*: Md before ≠ Md after).

Next, three more specific research questions and the four corresponding hypotheses for further analysis and tests in this study are also restated here for emphasis and proper guidance. These are as follows:

Research Question 1. What are the significant declines or improvements of operational performance, technical efficiency, cost efficiency, productivity, and long-term performance before and after M&As of selected 30 bidder companies?

Research Question 2. What are the significant declines or improvements of operational performance, technical efficiency, cost efficiency, productivity, and long-term performance before and after M&As of selected 30 target companies?

Research Question 3. What are the significant declines or improvements of operational performance, technical efficiency, cost efficiency, productivity, and long-term performance before and after M&As of selected 30 non-merging companies?

HA4: There are significant differences (decline or improvement) in the operating performance of selected 30 bidders, 30 targets, and 30 non-merging companies in the long-term performance of M&As by interval and industry.

HA5: There are significant differences (decline or improvement) in the technical efficiency of selected 30 bidders, 30 targets, and 30 non-merging companies in the long-term performance of M&As by intervals and industry.

HA6: There are significant differences (decline or improvement) in the cost efficiency of selected 30 bidders, 30 targets, and 30 non-merging companies in the long-term performance of M&As by intervals and industry.

HA7: There are significant differences (decline or improvement) in the productivity of selected 30 bidders, 30 targets, and 30 non-merging companies in the long-term performance of M&As by intervals and industry.

4.4 Operating Performance, Technical Efficiency, Cost Efficiency and Productivity of Selected 30 Bidders Companies before and after M&As

Specific Objective 1. To measure the significant differences between operational performance, technical efficiency, cost efficiency, productivity, and long-term performance \ before and after M&As of selected 30 bidder companies.

HA1: The operating performance, technical efficiency, cost efficiency and productivity of selected 30 bidder companies are significantly different before and after the estimation period of long-term performance of M&As (HA: Md before ≠ Md after).

For fulfillment of specific objective 1 and *HA1* in improved operating performance is one of the expected synergies after M&A for merging companies. Therefore, the results of OP using RIV reveals the core value of these companies before and after M&A for the yearly mean results from 1991 to 2020 is considered first, for the bidder and target companies. This is followed by three years before and after M&A value of bidder and target companies. A positive difference after subtracting the expected value from the actual value signifies an improvement, while a negative value means no improvement in OP. The significance for the bidder and target companies was tested using a two independent group test of Mann-Whitney U-test, irrespective of whether it is a positive or negative value, for better interpretation.

Table 4.3: Yearly Mean Excess RIV (Selected Bidder and Target Companies)

Year	Bidder BYM (RIV)	Target TYM (RIV)
1991	0.08	19.01
1992	1.68	23.58
1993	-1.09	13.84
1994	10.02	28.69
1995	3.35	75.00
1996	0.16	-27.54
1997	-0.16	-27.68
1998	0.08	74.33
1999	-4.77	6.63
2000	-1.14	-5.34
2001	-22.12	-4.20
2002	-2.73	1.04
2003	-1.49	-7.52
2004	1.08	-24.73
2005	-2.44	49.70
2006	3.03	20.26
2007	-0.65	-0.29
2008	0.59	63.85
2009	-0.11	-5.32
2010	0.68	12.05
2011	0.74	5.78

2012	-52.08	-23.07
2013	-0.07	-2.41
2014	1.81	2.57
2015	-4.12	-7.04
2016	3.01	5.10
2017	N/A	N/A
2018	N/A	N/A
2019	N/A	N/A
2020	N/A	N/A

Notes: BYM represents bidder yearly mean excess RIV, TYM represent target yearly mean excess RIV. N/A: Denotes no non-financial M&As.

The yearly results of the bidder and target companies' RIV OP as presented in Table 4.3 above shows a high and downward volatility trend in RIV scores for the bidder and the target companies for the period covered. This requires further investigation into the different windows for three years before and after M&As in Nigeria. This is necessary and important as some mean values of M&As took place longer than others. Therefore, averaging those that occurred over a longer period with those that occurred in a shorter period is highly unlikely to yield a robust result. Furthermore, from the literature (Sudarsanam, 2010), longer years were evidenced to bring about a greater opportunity for other events such as operational, strategic, and financial changes of the merging companies, thereby influencing their valuation. In a related study, Ramakrishnan (2008) investigated long-term post-merger evaluation of Indian companies' OP and efficiency using three years before and after M&As. Hence, three years is a suitable time for evaluating M&A impacts. This concept is also applied in technical, cost, and productivity from 1991 to 2016.

4.4.1 Results of Operating Performance of Selected 30 Bidder Companies before and after M&As

In line with the research objectives and corresponding hypotheses, the operating performance results of selected 30 bidder companies are presented. The data reflecting the above research objective is presented in Table 4.3a. It presents the mean excess RIV of bidder companies before and after M&As, by subtracting the average RIV value before from after M&A activities' average RIV. The result in Table 4.3a shows that only two, representing six percent of all bidder companies, have a positive RIV value after M&As while 28, representing 93 percent of all bidder companies, have a negative RIV value after M&A activities. Table 4.3b presents the Mann-Whitney U-test of significance results for the OP of 30 bidder companies.

Table 4.3a: Mean Excess RIV for OP of Selected Bidder Companies

Bidder Companies	Mean Before M&A	Mean After M&A	Mean Increased/ Decreased
B1	3.1988	-0.0296	-3.2284
B2	-0.1969	-0.2783	-0.0814
B3	1.6226	0.0580	-1.5646
B4	0.5612	-0.0186	-0.5797
B5	0.1420	-0.1364	-0.2784
B6	0.1636	-0.2093	-0.3729
B7	6.4240	-0.8074	-7.2315
B8	-0.0016	-0.4039	-0.4023
B9	0.4105	-1.8769	-2.2874
B10	0.2025	-0.0128	-0.2153
B11	0.3498	-0.2161	-0.5659
B12	-0.1623	-0.1997	-0.0375
B13	0.8788	-0.0751	-0.9539
B14	1.5579	-0.1445	-1.7024
B15	9.9411	-4.7337	-14.6748
B16	0.0073	-0.0335	-0.0408
B17	-0.3809	0.0020	0.3828
B18	0.3443	-2.1737	-2.5180
B19	-1.7126	-5.1256	-3.4131
B20	0.5193	-1.0888	-1.6081
B21	-0.1451	-0.2997	-0.1546

B22	-0.2796	-0.0043	0.2753
B23	0.1276	-0.0002	-0.1279
B24	0.0539	-0.0044	-0.0583
B25	0.2527	-0.0003	-0.2530
B26	0.1330	-0.0018	-0.1248
B27	-0.3529	-0.9641	-0.6112
B28	-0.3408	-0.3513	-0.0105
B29	-0.0171	-0.1490	-0.1319
B30	0.1868	-0.0104	-0.1972
(Mean)	0.7869	(0.6430)	(1.4299)

Notes: The RIV values are in thousands (N'000), based on all available data after M&As

Table 4.3b: Mann Whitney U-Test Mean Excess RIV (Selected Bidder Companies)

Companies	Mean RIV Before M&A	Mean RIV After M&A	Mean RIV Increased/ Decreased	Mann Whitney U Test (p-value)
Bidder	0.7869	-0.6430	(1.4299)*	0.001

Notes: The values are in thousands (N'000) for the bidder companies based on all data after M&A, * indicates significance at 1 percent level

From the result, a value destruction of N1429.9 Naira was found. At the 1 percent level of significance, Mann Whitney U test shows a significant declining value. Consequently, the corresponding hypothesis *HA1* was accepted. This means that the bidder companies did not realize expected OP improvement or fundamental value gain, but rather a significant reduction or destruction in the long term after M&A activities in Nigeria. Though the above result shows non-realization of expected OP improvement after M&As for the bidder companies, further measures of efficiency development are necessary to know if the merging companies were economically efficient after M&A deals.

The significant reduction in bidder companies' long-term OP based on RIV results, from all aspects, does not show encouragement for the

implementation of M&As in Nigeria in the long-term. With these results, investors are less likely to support future M&A deals. This is because with such reduction and unconvincing evidence of possible improvement, investors fear that there will not be significant returns in terms of dividend payment or capital gains for their investment. Thus, both practitioners and the government need to re-appraise the M&A procedures to see where OP is sacrificed and correct these loopholes to guarantee that future M&As will lead to an improvement in OP in Nigeria.

Past M&A OP results in Nigeria, though from the financial sector (Umoren, 2007; Omoye & Aniefor, 2016), indicate an improvement in OP after M&A activities in the long-term, thus, bringing about increases in profitability, leveraged buyouts, and shareholders' wealth. However, the current finding is supported by the result of Okpanachi (2011) in the banking sector, which showed a decline in OP after taxes on post-M&As in the long-term in Nigeria. Thus, it supports the importance of investigating TE and CE.

4.4.2 Technical Efficiency before and after M&As of Selected 30 Bidder Companies

The next research aim was to analyze the TE of bidder companies. To do this, it is necessary to present comparatively the trend of TE scores of the bidder and target companies for inferential comparison. Therefore, Table 4.3c presents the average annual TE scores of the bidder and target companies after M&A transactions for the period from 1991 to 2020.

Table 4.3c: Yearly Mean DEA Technical Efficiency (Selected Bidder and Target Companies)

Year	BYT	TYT
1991	0.023	0.018
1992	0.015	0.008
1993	0.031	0.027
1994	0.055	0.021
1995	0.063	0.015
1996	0.025	0.021
1997	0.04	0.018
1998	0.031	0.036
1999	0.036	0.032
2000	0.032	0.032
2001	0.039	0.03
2002	0.041	0.068
2003	0.06	0.03
2004	0.034	0.032
2005	0.032	0.013
2006	0.032	0.012
2007	0.034	0.011
2008	0.089	0.023
2009	0.058	0.016
2010	0.104	0.095
2011	0.068	0.014
2012	0.047	0.21
2013	0.04	0.12
2014	0.039	0.286
2015	0.03	0.0471
2016	0.035	0.167
2017	N/A	N/A
2018	N/A	N/A
2019	N/A	N/A
2020	N/A	N/A

Notes: N/A: Denotes no non-financial M&As from 2017 to 2020. BYT denotes bidder's yearly technical mean score; TYT denotes target yearly technical mean score. The DEA and SFA data were almost similar, therefore, DEA is only presented, using the truncated normal form, because gamma distribution is more complex, and so not preferred (Stevenson, 1980). The average calculated value is from available data until 2016.

As shown above, the bidder and target companies' yearly means indicate relative positive volatility in TE, that is, a slightly positive upward and downward trend. This similar finding was obtained with the SFA model, hence

only the DEA results are presented. Nevertheless, the target companies tended to be a little upward between 2012 and 2014. This cannot emphatically be explained, hence the need for specific consideration of bidder companies' three years before and after M&As to offer better analysis and a basis to draw valid conclusions following significant testing.

4.4.2.1 Results of Technical Efficiency of Selected 30 Bidder Companies before and after M&As

The data reflecting the above research aim is contained in Table 4.3d. It presents the mean excess DEA of bidder companies before and after M&As, by subtracting average DEA improvements before from the after-average DEA improvements. For the TE test, two models were used, namely DEA and SFA. The results are presented in Table 4.3d.

Table 4.3d: Technical Efficiency Mean of Selected Bidder Companies

	Mean Before M&A	Mean After M&A	Increased. / Decreased	Mann Whitney U Test p-value
DEA	0.0106	0.0099	(0.0007)*	0.0280
SFA	0.0334	0.0330	(0.0004)*	0.0400

Notes: This table shows the mean selected TE results based on available data before and after M&A, using DEA and SFA models. * Indicates Mann Whitney significance test at the 5 percent level

The results from Table 4.3d indicate that under the DEA model, the bidder companies have a rating of about 1.06 percent before M&As and after M&As it declined to 0.99 percent. The 0.07 percent decrease was significant upon testing, thus signifying that on average, there was a statistically meaningful reduction in the TE rating of bidder companies after M&A activities in the long-

term, using DEA and SFA models. With this result, the corresponding hypothesis *HA1* was accepted.

Although the result of DEA and SFA models was significant, the researcher relied on DEA model results for insight analysis and interpretation or inference. This is because the DEA model is a more preferred method for evaluating TE. Pevcin (2014) stated that the DEA method is popular for assessing TE because it can easily handle multiple inputs and outputs, is non-parametric, and does not require input prices, making it more suitable for estimating TE of service. On the contrary, SFA follows parametric and stochastic logic, where the efficiency frontier is estimated based on a specific functional form using advanced econometric techniques and needs input prices.

In principle, SFA is an econometric method, which incorporates random problems with data, function, and restrictions. Pevcin (2014) stated further that if the DEA method reveals the behavior of each observation, the parametric SFA model reveals the behavior of an "average" observation. This interpretation is seen in past studies (for example, Sav, 2012; Pevcin, 2014). The authors stated that the DEA model provides a higher percentage of TE than the SFA model. In this case, both the DEA and SFA model results indicated a significant reduction for the bidder companies after M&As, thus, giving rise to TE's significant reduction for bidder companies in Nigeria.

This result is consistent with the insignificant TE improvement obtained in the literature (e.g., Babatunde & Haron, 2015). In other words, an empirical result on TE performance in Nigeria shows a significant reduction in TE for the bidder and the target companies. Past studies on the TE of listed manufacturing

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companies in Nigeria showed that quoted companies were technically efficient, though these companies were not involved in any merger (Osamwonyi & Imafidon, 2016).

Babatunde and Haron (2015) studied the TE of non-merging insurance companies in Nigeria and reported a significant decline in their TE. This result implies that post M&A effect on TE is significantly negative, which creates more worries for stakeholders. This is because merged companies, not non-merged companies (manufacturing), should achieve the expected TE improvement. However, there may be spillover effects stemming from the positive increase in merged companies to non-merged companies. This calls for attention from both practitioners and policymakers of M&A practices to look out for grey areas, as mentioned above, to make future M&A activities more fruitful.

4.4.3 Cost Efficiency of before and after M&As of Selected 30 Bidder Companies

Before looking at bidder companies, it is imperative to view CE as a dimension of performance. CE formation is a revision and extension of the TE based on the production function reflecting a company's position at the cost frontier. This is to know the cost comparative optimization before and after M&As.

Cost efficiency implies that companies can minimize input costs when producing the same amount of output sold at certain prices (Ariff & Can, 2008). Isik and Hassan (2002) and Ariff and Can (2008) remarked that the product of

TE and allocative efficiency is CE. This shows the ability of companies to provide services without resource wastage. The first task is to investigate the yearly mean of CE from 1991 to 2016 for the bidder and target companies. The yearly cost-efficient means of merging companies from 1991 to 2016 are presented in Table 4.3e.

Table 4.3e: Yearly Mean DEA for Cost Efficiency (Selected Bidder and Target Companies)

Year	BYCM	TYCM
1991	2.75	3.05
1992	1.00	0.50
1993	4.50	5.60
1994	5.50	8.10
1995	7.80	1.50
1996	2.80	2.30
1997	4.60	3.00
1998	6.00	3.33
1999	3.70	3.30
2000	5.50	3.40
2001	4.70	2.90
2002	5.60	4.80
2003	5.50	2.70
2004	4.60	2.30
2005	6.50	4.00
2006	7.40	3.00
2007	6.30	2.80
2008	5.10	1.50
2009	6.90	3.80
2010	5.20	4.70
2011	8.60	5.70
2012	6.30	8.90
2013	5.70	4.30
2014	6.60	4.40
2015	8.00	6.40
2016	7.30	5.40
2017	N/A	N/A
2018	N/A	N/A
2019	N/A	N/A
2020	N/A	N/A

Notes: BYCM represents bidder yearly cost efficiency mean Score, TYCM represent target yearly cost efficiency mean score. N/A: Denotes no non-financial M&As.

The pattern of CE volatility for target companies is similar to that of the bidder companies moving in a positive direction. A similar finding was obtained with the SFA model, hence the basis of presenting only the DEA results. The general trend of CE seems to reflect the economy, as the bidder and target companies recorded a decline in 2008 (financial crisis period). After the trend analysis, a three-year before and after M&As analysis of bidder companies was performed to test for statistical significance of the results using DEA and SFA models.

4.4.3.1 Results of Cost Efficiency of Selected 30 Bidder Companies before and after M&As

This section attempts to determine if there is any significant cost improvement for bidder companies three years before and after M&A deals using both DEA and SFA models. The result is presented in Table 4.3f.

Table 4.3f: Average Cost Efficiency of Selected Bidder Companies with Mann Whitney U-Test

	DEA Mean Before M&A	DEA Mean After M&A	DEA Mean Increased /Decreased	SFA Mean Before M&A	SFA Mean After M&A	SFA Mean Increased /Decreased
Bidder	0.0034	0.0053	0.0019*	0.0308	0.0322	0.0015*

Notes: This shows the mean cost efficiency results for the selected bidder companies Using DEA and SFA models. The average is calculated for all years, before and after M&As.

An improvement in CE score implies no excess cost after the M&A deal while no improvement or drop implies excess cost after M&As. The results from

Table 4.3f show that bidder companies under the DEA model move significantly from 0.34 percent before M&A activity to 0.53 percent, an increase of 0.19 percent, while under the SFA model, they moved significantly from 3.08 percent to 3.22 percent with an increase of 0.15 percent. This means that bidder companies had no excess cost after M&As in the long term, thus recording a significant improvement in CE.

From the result, a CE improvement of 0.0019 Naira under DEA and 0.0015 Naira under SFA is evident. At the one percent level of significance, the Mann Whitney u-test shows a significant value. Consequently, the corresponding hypothesis *HA1* was accepted. This means that bidder companies did realize expected CE improvement following M&As in Nigeria.

Past research (Onikoyi & Awolusi, 2014) on post-M&A activity on CE in Nigeria's banking sector (involuntary) reported a significant long term improvement in CE after M&As. This, according to the authors, arose from removing redundant labor, closing intersecting bank offices, and combining back-office utilities as well as sending efficient senior managers to take charge of all branches after M&A activities. The CE results, among all empirical considerations, are encouraging for future M&As in Nigeria due to its significant improvement. This signifies likely evidence of financial management competence. Therefore, investors and regulators could, with this result, join policymakers to improve other areas for performance growth after M&As performance.

Such joint efforts along with this CE improvement result could build investors' confidence and create more reasons for possible future M&As in Nigeria.

4.4.4 Productivity Efficiency of Before and after M&As of Selected 30 Bidder Companies

The productivity analysis of M&As helps to show companies' performance relative to the present technology. Since technology is constantly changing, therefore, investigation of productivity becomes necessary. As usual, the productivity of bidders and target companies for the entire period was evaluated first, followed by an evaluation of the three years before and after M&A transactions. The total factor productivity (TFP) measurement of a company can be measured by applying different methods such as Fisher and Tornqvist indices and MPI, among others. In this study, MPI was applied because it allows for the separation into catch-up (TE) and frontier shift (technological change). SFA and DEA models were also used in evaluating the total factor productivity (TFP) concerning the MPI. Table 4.3g presents the yearly mean productivity scores for the selected bidder and target companies from 1991 to 2020.

Table 4.3g: Yearly Mean DEA Malmquist Index (Selected Bidder and Target Companies)

Year	BAMPI	TAMPI
1991	1.53	1.11
1992	1.83	1.46
1993	1.24	0.75
1994	1.71	1.00
1995	0.75	1.12
1996	4.12	0.87
1997	0.85	3.19
1998	1.10	10.86
1999	1.16	1.46
2000	1.53	12.39
2001	1.76	4.18
2002	1.31	0.37
2003	6.54	14.73
2004	1.03	1.06
2005	1.34	21.21
2006	1.24	0.52
2007	1.99	12.59
2008	0.92	11.73
2009	1.53	5.43
2010	1.28	5.69
2011	1.43	5.62
2012	1.02	2.11
2013	0.81	1.29
2014	0.93	1.08
2015	0.92	1.49
2016	0.93	1.29
2017	N/A	N/A
2018	N/A	N/A
2019	N/A	N/A
2020	N/A	N/A

Notes: BAMPI denotes bidder company average MPI score, TAPMI denotes target company average MPI score. N/A: Denotes no non-financial M&As.

4.4.4.1 Results of Productivity Efficiency of Selected 30 Bidder Companies before and after M&As

The yearly MPI Table 4.3g presented above shows positive volatility and

cannot be statistically or meaningfully interpreted for significance. A similar

finding was obtained with the SFA model, hence only the DEA results are presented. This justifies the need to analyze specifically three years before and after M&As to be able to test for significance, whether positive or negative, and draw an empirical conclusion. Table 4.3h shows the bidder companies' TFP based on three years before and after M&As evaluation.

Table 4.3h: Average Malmquist Index, Selected Bidder Company with Mann Whitney U Test

	Mean Before M&A	Mean After M&A	Mean Increase/ Decrease	Mann Whitney U Test (p-value)
Bidder Company		DEA		
Catch-Up	0.0814	0.0464	(0.0351)	0.259
Frontier Shit	0.0435	0.0031	(0.0404)*	0.016
Malmquist Index	0.0539	0.0216	(0.0323)	0.026
Bidder Company		SFA		
Catch-Up	0.0323	0.0305	(0.0017)	0.165
Frontier Shit	0.0389	0.0376	(0.0013)*	0.046
Malmquist Index	0.0014	(0.0003)	(0.0016)*	0.047

Notes: * Indicates significance at 5 percent level. This Table shows the productivity results of selected bidder companies using DEA and SFA models. The average is calculated for all data three years before and after M&As.

From Table 4.3h above, the result from the DEA model shows a significant decline in technological change for selected bidder companies and a non-significant decline for a catch-up, with the MPI declining significantly after M&As. This means that TPF for selected bidder companies declined significantly as MPI reduced significantly after M&As. Based on the result of Mann Whitney u-test, which is significant, the corresponding hypothesis *HA1* was accepted. The above results imply that since the reduction in catch-up was not significant, it means there was no meaningful reduction in TE of the bidder companies except in technological change, which is the major contributor to the MPI's significant decline.

The SFA model's result for the selected bidder companies showed a non-significant decline in catch-up and significant deterioration in frontier shift and MPI. This result reveals that selected bidder companies' expected long-term productivity improvement after M&As was not realized and that PE improvement significantly depended on technological change. A past study on PE in Nigeria (i.e., Umoh & Wokocha, 2014), though not on M&As but on corporate productivity performance with production control in the Nigerian manufacturing industry, stated that resources invested into manufacturing sector by government and individuals have no noticeable outcome, as the sector's productivity was severely deteriorating.

Concerning the above study, Anyanwa (2017) mentioned that productivity in Nigeria has been on a decline. The author named factors responsible for this decline, including a low technological level, low level of capacity utilization, low investment, high cost of production, poor-performing infrastructure, and high inflation. Therefore, as a way forward, Nigeria needs a technological capacity upgrade and reduction in the cost of production and improvement on investment. This is a disturbing situation and highly challenging for future M&As. It has to improve with the government having to join with practitioners to see how the challenging TE and technological change issues could be resolved. The basis for using two contending models DEA and SFA are to countercheck whether the one can confirm outcomes achieved by the other.

4.5 Operating Performance, Technical Efficiency, Cost Efficiency and Productivity of Selected 30 Targets Companies before and after M&As

Specific Objective 2. To measure the significant differences between operational performance, technical efficiency, cost efficiency, productivity, and long-term performance before and after M&As of selected 30 target companies.

HA2: The operating performance, technical efficiency, cost efficiency and productivity of selected 30 target companies are significantly different before and after the estimation period of long-term performance of M&As (*HA*: Md before ≠ Md after). Md means median different value (before-after).

4.5.1 Operating Performance of Before and after M&As of Selected 30 Target Companies

For fulfillment of specific objective 2 and *HA2*, the data reflecting the above research objective is contained in Table 4.4a. It presents the mean excess RIV of target companies before and after M&As by subtracting average RIV improvements before from after average RIV.

Table 4.4a: Mean Excess RIV Operating Performance of Selected 30 Target Companies

Target Companies	Mean Before M&A	Mean After M&A	Mean Increased/ Decreased
T1	21.660	-1.533	-23.193
T2	4.589	-0.339	-4.928
T3	137.790	1.104	-136.686
T4	-170.105	-1.118	168.987
T5	-9.495	0.322	9.817
T6	-15.327	-0.098	15.229
T7	49.953	-3.234	-53.187
T8	36.145	0.068	-36.076
T9	45.499	-0.052	-45.551
T10	28.256	-0.154	-28.410
T11	-3.409	-0.567	2.842
T12	-23.581	-1.796	21.785
T13	4.534	0.032	-4.502
T14	-8.583	0.033	8.617
T15	-120.291	0.293	120.584
T16	-18.884	-0.867	18.018
T17	222.157	2.759	-219.398
T18	-1.432	0.674	2.106
T19	-1.682	-2.834	-1.152
T20	0.205	2.638	2.433
T21	5.818	-0.513	-6.331
T22	0.037	0.131	0.095
T23	0.608	-0.008	-0.616
T24	-0.049	-0.022	0.027
T25	7.066	46.390	39.325
T26	-0.026	-0.662	-0.635
T27	-152.448	0.373	152.821
T28	-31.553	0.027	31.580
T29	-5.892	0.954	6.845
T30	-36.515	0.233	36.748
Total (Mean)	(1.165)	1.408	2.573

Notes: The values in this Tables are in thousands (N'000), for the target companies based on all data after M&As.

Table 4.4a shows the mean OP RIV for selected target companies. From the result, 13 DMUs representing 43 percent of all target companies had negative values after M&As, while 17 DMUs representing 57 percent had positive values after M&As. This suggests that 57 percent or 17 target companies had realized

their expected fundamental value improvement after M&As. The result of the significance test of OP of target companies using Mann Whitney u- test is presented in Table 4.4b.

Table 4.4b: Mann Whitney U-Test for Mean Excess RIV (Selected Target Companies)

Companies	Mean Before M&A	Mean After M&A	Mean RIV Increased/ Decreased	Mann Whitney U Test (p-value)
Target	(1.165)	1.408	2.573	0.626

Notes: The values in this Table are in thousands (N'000) for the selected target companies based on all data after M&As. 0.626 was not significant at 5 percent Mann Whitney U-test

As shown in Table 4.4b, the value of 2,573 Naira improvements was not significant. Thus, no significant fundamental value gain or realization of expected OP improvement was seen by target companies after the M&A transaction in Nigeria. Based on the result of Mann Whitney u-test, the corresponding hypothesis *HA2* (significant improvement) was rejected.

4.5.2 Technical Efficiency of Before and after M&As of Selected 30 Target Companies

The trend of the value of TE of target companies was presented and discussed earlier in Table 4.4a. Here, the presentation is limited to the significant test with DEA and SFA. As shown in Table 4.5, under the DEA model, the average TE rating of the selected target companies was 0.82 percent before M&As, which reduced to 0.16 percent after M&As with significance.

Table 4.5: Technical Efficiency Mean of Selected Target Companies with Mann Whitney U- Test

	Mean Before M&A	Mean After M&A	Mean Increased. / Decreased	Mann Whitney U Test (p-value)
DEA	0.0082	0.0016	(0.0066)*	0.0001
SFA	0.0334	0.0330	(0.0040)*	0.0260

Notes: This table shows mean TE results based on available data three years before and after M&As, using DEA and SFA models, and * indicates significance at 1 & 5 percent Mann Whitney U-test, respectively

The above result indicates that there was a long-run significant reduction in the TE rating of selected target companies after M&As. Under the SFA model, the selected target companies' ratings moved downward from 3.34 percent to 3.30 percent after M&As and this decrease of about 0.04 percent was significant. Moreover, under the DEA model, the decline was noted from 0.82 percent to 0.16 percent and was significant when tested. The TE rating result generally shows that there was no significant long-term improvement; rather, there was a significant reduction in the TE of selected target companies after M&A activities in Nigeria. Therefore, the alternative hypothesis *HA2* **(**significant decline) was accepted.

4.5.3 Cost Efficiency of Before and after M&As of Selected 30 Target Companies

This section attempts to determine if there is any significant cost improvement for selected target companies three years before and after M&A deals, using DEA and SFA models. The result is presented in Table 4.6.

Table 4.6: Average Cost Efficiency of Selected Target Companies with Mann Whitney U-test

	DEA Mean Before M&A	DEA Mean After M&A	DEA Mean Increased /Decreased	SFA Mean Before M&A	SFA Mean After M&A	SFA Mean Increased /Decreased
Target Companies	0.0006	0.0029	0.0023*	0.0318	0.0320	0.0002*

Notes: This table shows mean CE results for selected target companies, using DEA and SFA models. The average is calculated for all years before and after M&As

An improvement in CE score implies no excess cost after an M&A deal, while no improvement or drop implies excess cost after M&As. The result from Table 4.6 shows target companies under the DEA model moved from 0.06 percent to 0.29 percent, an increase of 0.23 percent, while under the SFA model, it moved significantly from 3.18 percent to 3.20 percent, an increase of 0.02 percent. This signifies that after M&As, the selected target companies did not have excess cost in the long-term and recorded a significant improvement in their CE. Since the Mann Whitney U-test result is significant, the alternative hypothesis, *HA2* (significant improvement), was accepted. The interpretation advanced earlier for bidder companies also applies here, in line with past studies (Sav, 2012; Pevcin, 2014).

4.5.4 Productivity Efficiency of Before and after M&As of Selected 30 Target Companies

The decomposition of the selected target companies' MPI three years before and after M&A evaluation is presented in Table 4.7 below.

Table 4.7: Average Malmquist Index Selected Target Companies with Mann Whitney U-Test

	Mean Before M&A	Mean After M&A	Mean Increase/ Decrease	Mann Whitney U Test (p-value)
Target Companies		DEA		
Catch-Up	0.1589	0.0289	(0.1301)	0.555
Frontier Shit	0.0677	0.0936	0.0259	0.174
Malmquist Index	0.1542	0.1658	0.0116	0.055
Target Companies		SFA		
Catch-Up	0.0306	0.0354	0.0048	0.896
Frontier Shit	0.0399	0.0323	(0.0075)	0.055
Malmquist Index	0.0001	0.0025	0.0024	0.133

Notes: This Table shows the productivity results of selected target companies using DEA and SFA methods, with average calculated from all data before and after M&As, it is not significant at the 5 percent level.

In Table 4.7 above, the results from the DEA model shows a non-significant improvement in the MPI for selected target companies. This signifies that there was no long-term productivity improvement after M&A activities, probably due to non-significant improvement in technological change. The selected target companies appeared to be unable to catch up in TE equally after M&As as this was not significant.

With the SFA model, the result for selected target companies showed non-significant improvement in catch-up, non-significant decline in the frontier shift, and non-significant improvement in the MPI. This implies that there was no significant productivity improvement for selected target companies under SFA and DEA models. Therefore, the alternative hypothesis *HA2* was rejected here.

The results from the DEA and SFA models showed a non-significant increase (decline) in the MPI of selected target companies. This outcome

revealed that selected bidders and target companies did not realize productivity improvements after M&As. The two major contributing factors for bidder and target companies' non-significant improvement in MPI is the non-significant improvement in catch-up and improvement in technological change after M&As. This result is not encouraging and could hinder plans and decisions on M&As.

4.6 Operating Performance, Technical Efficiency, Cost Efficiency and Productivity of Selected 30 Non-Merging Companies before and after M&As

Specific Objective 3. To measure the significant differences between the operational performance, technical efficiency, cost efficiency, productivity, and long-term performance before and after M&As of selected 30 non-merging companies.

HA3: The operating performance, technical efficiency, cost efficiency and productivity of selected 30 non-merging companies are significantly different before and after the estimation period of long-term performance of M&As (*HA*: Md before ≠ Md after).

4.6.1 Operating Performance of Before and after M&As of Selected 30 Non-Merging Companies

For the fulfillment of specific objective 3 and *HA3*, the analysis here is on the OP (RIV) of the selected bidder and non-merging companies for the period 1991 to 2020 as presented in Table 4.8 below.

Table 4.8: Yearly Average Excess RIV (Selected Non-Merging and Bidder Companies)

Year	B(RIV)	NM(RIV)
1991	-0.20	-0.64
1992	1.68	0.02
1993	-2.09	-1.34
1994	4.02	4.82
1995	3.35	2.99
1996	0.16	0.25
1997	-0.16	0.32
1998	0.08	4.88
1999	-4.78	4.60
2000	-1.15	-3.56
2001	-2.12	4.99
2002	-2.73	-3.74
2003	-1.49	-1.71
2004	1.08	-2.18
2005	-2.44	-3.05
2006	3.03	4.17
2007	-0.65	0.07
2008	0.59	1.00
2009	-0.11	-5.84
2010	0.68	-4.96
2011	0.74	-1.64
2012	-5.08	-1.03
2013	-0.07	-1.09
2014	1.81	-1.10
2015	-4.12	-1.33
2016	2.97	-1.22
2017	N/A	N/A
2018	N/A	N/A
2019	N/A	N/A
2020	N/A	N/A

Notes: Table 4.8 shows the average excess RIV yearly from 1991-2016 of the selected bidder and non-merging company values in (N'000). B (RIV) represents bidder companies' RIV and NM (RIV) represents non-merging companies' RIV. N/A Denotes no non-financial M&As

Table 4.8 shows the trend of the OP of the selected bidder and non-merging companies, indicating different levels of downward or negative trends, which are slightly difficult to explain statistically. Nevertheless, a closer look reveals that both RIV results declined from the year 2007. This calls for investigation of OP within a specific period to test for significance and draw a

better statistical conclusion. Consequently, three years before and after M&As were considered to know whether the performance of these companies improved or deteriorated after M&As. The OP RIV results of non-merging companies three years before and after M&A activities is presented in Table 4.8a, while Table 4.8b contains results for the MWU test.

Table 4.8a: Selected Non-Merging Companies Average Excess RIV Results

S/N	Non-Merging Companies	RIV A M&A	RIV B M&A	RIV mean Excess
C1	Morison Industries Plc	0.353	1.449	-1.095
C2	Golden Guinea Breweries	0.907	0.571	0.335
C3	Multi-trex Integrated food	0.089	1.027	-0.939
C4	Pharma-Deko Plc	-1.256	0.316	-1.572
C5	Nes- Foods Group	0.747	4.576	-3.830
C6	Lever brothers Nigeria Plc	0.208	5.662	-5.454
C7	Delta Glass Company PLC	0.579	0.424	0.155
C8	Carnaud Metal Box Nigeria plc	-17.482	-0.254	-17.229
C9	United Nigeran textile Plc	-0.903	-0.179	-0.724
C10	Mobil oil Nigeria PLC	0.310	1.026	-0.716
C11	Afprint Nigeria PLC	-11.110	-1.365	-9.746
C12	Unilever Nigeria Plc	0.045	-0.138	0.183
C13	Texaco Nigeria Plc	0.026	2.064	-2.038
C14	Eagle cement Plc	-0.337	-1.303	0.966
C15	Cellcom communication Ltd	0.498	0.169	0.329
C16	Cadbury Nigeria Plc	-0.433	-1.519	1.086
C17	African Petroleum PLC	-0.600	-0.428	-0.172
C18	Big Treat Plc	-0.666	-0.064	-0.602
C19	First aluminiun Plc	-5.077	-0.629	-4.449
C20	Glo Nigeria Plc	1.095	-0.014	1.109
C21	Tower Aliminium Nigeria PLC	-1.949	-0.341	-1.608
C22	Flour Mills of Nigeria Plc	0.266	-0.024	0.290
C23	Lafarge Cement Plc	-0.037	0.053	-0.090
C24	Big Treat Plc	-1.933	-0.066	-1.867
C25	Guinness Nigeria PLC	0.686	0.165	0.521
C26	Etisalat communication plc	-4.690	-4.180	-0.510
C27	Northern Flour Plc	0.227	1.079	-0.850
C28	Guinness Nigeria PLC	0.353	0.115	0.201
C29	Crunches Food Plc	-3.673	-1.021	-2.652
C30	Guinness Nigeria PLC	0.083	1.541	-1.458
	Average	(1.445)	0.252	(1.737)

Notes: The values are in (N'000) based on all available data before and after M&As for the non-merging companies, B M&A denotes before M&A and A M&A denotes after M&A

Table 4.8b: Mean Excess RIV for Selected Non-Merging Companies with Mann Whitney U-test

Mean Before M&A RIV	Mean After M&A RIV	Mean Difference	Mann Whitney U Test p-value
0.292	(1.445)	(1.737)	0.145

Notes: The values in this Table are in thousands (N'000) for the selected non-merging companies based on all data after M&A, a p-value of 0.145 is not significant at 5 percent Mann Whitney u-test.

The results from Table 4.8a indicate a positive OP before M&A deals. However, it reduced to a non-significant negative value after M&As. This means that after three years of M&As in the long-term, the Nigerian non-merging companies' OP was better than bidder companies' though not significant. This outcome disclosed the likelihood of OP's positive spillover effect on non-merging companies after M&As in Nigeria in the long-term, as the Mann Whitney U- test result was not significant. Thus, *HA3* was rejected on the premise that there was no significant decline in the OP of the selected 30 non-merging companies.

4.6.2 Technical Efficiency of Before and after M&As of Selected 30 Non-Merging Companies

In Table 4.9, the TE of the selected bidder and non-merging companies is examined comparatively using DEA and SFA models. The general TE of the bidder and non-merging companies for the period 1991 to 2016 was considered first and presented before undertaking a specific investigation. This was to enable the result for a significant test with Mann Whitney U-test to be obtained.

Table 4.9: Yearly Average DEA Technical Efficiency (Selected Non-Merging and Bidder Companies)

Year	BYTM	NMTM
1991	0.023	0.05
1992	0.015	0.07
1993	0.031	0.06
1994	0.055	0.08
1995	0.063	0.09
1996	0.025	0.07
1997	0.04	0.05
1998	0.031	0.05
1999	0.036	0.08
2000	0.032	0.06
2001	0.039	0.11
2002	0.041	0.09
2003	0.06	0.09
2004	0.034	0.06
2005	0.032	0.05
2006	0.032	0.06
2007	0.034	0.11
2008	0.089	0.10
2009	0.058	0.08
2010	0.104	0.08
2011	0.068	0.07
2012	0.047	0.08
2013	0.04	0.07
2014	0.039	0.06
2015	0.03	0.05
2016	0.035	0.06
2017	N/A	N/A
2018	N/A	N/A
2019	N/A	N/A
2020	N/A	N/A

Notes: Selected non-merging and bidder companies DEA yearly technical mean result. BYTM represents bidder companies' yearly technical mean, NMTM represents Non-merging companies' yearly technical mean. N/A Denotes no non-financial M&As

The TE of the selected bidder and non-merging companies from Table 4.9 shows various levels of volatility. Nevertheless, a closer look reveals that it seems to reflect the economy, because between 2007 and 2008, during the world financial crisis, there was a noticeable TE reduction for the selected bidder and non-merging companies. This similar finding was obtained with the SFA model,

hence the basis of presenting only the DEA results. A better interpretation requires a significance test to be carried out at intervals of three years before M&As to verify if any TE improvement was achieved after M&As or not. Thus, the interval technical analysis investigation was conducted for selected non-merging companies after M&A activities. The result of this evaluation and test is presented in Table 4.10.

Table 4.10: Selected non-Merging Companies Average Technical Efficiency with Mann Whitney U-Test

Technical Rating	Mean Before M&A	Mean After M&A	Increase/ Decrease	Mann Whitney U test p-value
DEA	0.0035	0.0097	0.0062*	0.001
SFA	0.0313	0.0317	0.0004*	0.041

Note: * Indicates significance at the 1 & 5 percent level. This table shows the mean technical efficiency of selected non-merging companies using DEA and SFA models, based on available data for all the years before and after M&As.

From Table 4.10, SFA model results showed that before M&A activity, the TE of selected non-merging companies' value was 3.13 percent, but after M&As, the value increased to 3.17 percent. This increase of 0.04 percent was significant, meaning that after M&As, there was a real significant gain in TE of the non-merging companies. The DEA model result for the selected non-merging companies showed that before M&As its value was 0.35 percent, but after M&As it increased to 0.97 percent. This increase is significant, meaning that after M&As, the selected non-merged companies did realize expected TE improvement. Thus, corresponding alternative hypothesis *HA3* was accepted.

Furthermore, the TE result reveals that after M&As, the bidder companies declined significantly while the non-merging companies improved

significantly. This result implies that the selected non-merging companies' TE
is better with DEA and SFA models, even though the selected non-merging
companies were not involved in M&A deals. The significance of this TE result
is that, in general, there was no significant improvement for the bidder
companies, but for the selected non-merging companies, there was a significant
improvement after M&As in Nigeria in the long-term. Therefore, the selected
non-merging companies were able to remain competitive in the hostile market
after M&A deals, given that the bidder companies stimulated market
mechanisms to the advantage of non-merging companies, which led to their
significant improvement in TE.

4.6.3 Cost Efficiency of Before and after M&As of Selected 30 Non-Merging Companies

The analysis and discussion of TE concept was extended to the
measurement of CE, in terms of the location of the companies in the cost frontier.
The CE of the selected non-merging companies is compared with the selected
bidder companies in this section for the period from 1991 to 2016. The CE of
the selected bidder and non-merging companies is presented in Table 4.11

Table 4.11: Yearly Average DEA Cost Efficiency (Selected Non-merging and Bidder companies)

Year	BYCM	NMYCM
1991	2.75	0.016
1992	1.0	0.008
1993	4.5	0.020
1994	5.5	0.027
1995	7.8	0.047
1996	2.8	0.036
1997	4.6	0.024
1998	6.0	0.025
1999	3.7	0.034
2000	5.5	0.028
2001	4.7	0.021
2002	5.6	0.023
2003	5.5	0.021
2004	4.6	0.017
2005	6.5	0.018
2006	7.4	0.034
2007	6.3	0.051
2008	5.1	0.031
2009	6.9	0.029
2010	5.2	0.030
2011	8.6	0.029
2012	6.3	0.030
2013	5.7	0.029
2014	6.6	0.024
2015	8.0	0.018
2016	8.1	0.020
2017	N/A	N/A
2018	N/A	N/A
2019	N/A	N/A
2020	N/A	N/A

Notes: BYCM denotes bidder companies' yearly selected cost-efficient mean. NMYCM denotes selected non-merging companies' yearly cost efficiency means. N/A: Denotes no non-financial M&As.

The yearly selected CE means (refer to Table 4.11) show different upward levels of volatility from 1991 until 2016. A similar finding was obtained with the SFA model, so only DEA results are presented here. Significant testing would indicate and provide a better interpretation of this upward volatility. The

result of significance testing three years before and after M&A CE for selected non-merging companies is presented in Table 4.11a.

Table 4.11a: Mean Cost Efficiency for Selected Non-Merging Companies with Mann Whitney U-Test

DEA				SFA			
Mean Before M&A	Mean After M&A	Mean Increased/ Decreased	Mann Whitney U test p-value	Mean Before M&A	Mean After M&A	Mean Increased/ Decreased	Mann Whitney U test p-value
0.0017	0.0075	0.0058*	0.021	0.0297	0.0311	0.0013*	0.001

Notes: Table 4.11a shows cost efficiency results of selected non-merging, using DEA and SFA models. The average is based on available data for all years before and after M&As. *Indicates 1 & 5 percent Mann Whitney U- test significance.

From Table 4.11a, selected CE scores under the SFA model for non-merging companies increased from 2.97 percent to 3.11 percent after M&As at a value of about 0.13 percent. When this increment was tested, non-merging companies from the SFA model indicated a significant improvement, meaning that there was no excess cost for non-merging companies after M&As. This also means that post-M&As, there was a significant improvement in CE of selected non-merging companies. The DEA model results for non-merging companies improved from 0.17 percent before M&As to 0.75 percent after, a value of about 0.58 percent, likewise suggesting that after M&As, there was no excess cost for selected non-merging companies.

When this result was tested, significant improvement was found in the CE of selected non-merging companies. Therefore, the researcher has sufficient reason to accept and retain the alternative hypothesis *HA3*. This implies that after M&As, there was a significant CE improvement for selected non-merging companies in the long-term in Nigeria.

4.6.4 Productivity Efficiency of Before and after M&As of Selected 30 Non-Merging Companies

In the same vein, the productivity of selected bidders and non-merging companies are investigated comparatively in this section. This determines the productivity level of the selected bidder and non-merging companies to know whether to develop a new technology or improve on existing technology for the productivity of selected bidder and non-merging companies in Nigeria. The productivity investigation of the selected bidder and non-merging companies before and after M&As based on the MPI and its components (catch-up and frontier shift) was performed using DEA and SFA models.

Following this was the analysis of sub-intervals as well as the industry of the selected bidder and non-merging companies after M&As. The yearly productivity of selected bidders and non-merging companies from 1991 to 2016 was obtained first, the result of which is presented in Table 4.12.

Table 4.12: Yearly Average DEA Malmquist Productivity Index (Selected Non-Merging and Bidder Companies)

Year	BMPI	NMMPI
1991	1.53	1.47
1992	1.83	1.60
1993	1.24	1.31
1994	1.71	1.66
1995	0.75	1.31
1996	4.12	0.75
1997	0.85	0.69
1998	1.1	1.94
1999	1.16	7.84
2000	1.53	2.23
2001	1.76	7.73
2002	1.31	1.00
2003	6.54	1.24
2004	1.03	0.78
2005	1.34	5.99
2006	1.24	4.35
2007	1.99	1.49

2008	0.92	6.79
2009	1.53	1.38
2010	1.28	0.69
2011	1.43	9.00
2012	1.02	1.25
2013	0.81	5.09
2014	0.93	1.00
2015	0.92	2.45
2016	0.93	1.73
2017	N/A	N/A
2018	N/A	N/A
2019	N/A	N/A
2020	N/A	N/A

Notes: This table shows the data from the yearly mean Malmquist index of both the selected bidder and non-merging companies. BMPI denotes Bidder companies Malmquist productivity index, NMMPI denotes non-merging companies Malmquist productivity index. N/A: Denotes no non-financial M&As.

The TFP or MPI for the selected bidder and non-merging companies from Table 4.12 above shows positive volatility throughout the interval 1991 to 2016. A similar trend was obtained with the SFA model, which is the reason behind presenting only DEA. The trend is similar to the selected bidder and non-merging companies; though non-merging companies' volatility seems higher. A specific noticeable trend was the selected bidder and the non-merging companies' decline between 2007 and 2008 because of the global financial crisis. The researcher investigated further by testing significance when considering the time scale of three years before and after M&As. Only then was it possible to conclude the statistical test results. Therefore, there was a necessity for investigating three years before and after M&As' MPI of non-merging companies using DEA and SFA models. The DEA and SFA model results with Mann Whitney U-test are presented in Table 4.13.

Table 4.13: Average Malmquist Index, Mann Whitney U Test for Selected Non-Merging Companies

	DEA				SFA			
	Mean Before M&A	Mean After M&A	Mean Increase/ Decrease	Mann Whitney U test p-value	Mean Before M&A	Mean After M&A	Mean Increase/ Decrease	Mann Whitney U test p-value
Catch-Up	0.0659	0.0488	(0.0170)	0.928	0.0372	0.0396	0.0024	0.416
Frontier Shift	0.0378	0.0441	0.0063	0.739	0.0339	0.0362	0.0023	0.915
Malmquist Index	0.0541	0.0436	(0.0105)	0.566	0.0042	0.0049	0.0008	0.288

Notes: The average is based on all year's data before and after M&A

The selected non-merging companies' productivity results from the DEA and SFA models as presented above did not indicate any significant decline after M&As. However, the decline in the DEA model on catch-up and frontier shift improvement was non-significant. Therefore, hypothesis *HA3* was rejected. There was no a significant decline in the PE of the selected 30 non-merging companies.

The above PE result implies that productivity improvement for selected non-merging companies was non-significant or stagnant in the long-term in Nigeria. By extension, it could be argued that selected merged companies did not stimulate the selected non-merging companies to improve productivity significantly after M&A activities in Nigeria.

4.7 Alternative MPI Decomposition Robustness Analysis

The bootstrapping DEA model using the R statistic with benchmarking package results, and the OLS regression of the unbiased and unbounded Malmquist index (MI), were conducted around one to gain additional an understanding of the MPI results.

A bootstrapped DEA Malmquist index (MI) was carried out to check the distributional impact of inputs on the confidence levels for the productivity assessments. Thus, it is possibly causing the chronological decomposition of the productive change (MI) in its two main components, technical changes (or frontier shift effect) and efficiency changes (or catch-up effect). Because Nigeria's M&As formed an unbalanced data panel, thus requiring penetrating computational effort for designing unbalanced frontiers.

A special code was developed in R- and is presented in Appendix G. Furthermore, the developed code was built upon the smoothed bootstrapped MI, presented in the works of Fuentes and Lillo-Bañuls (2014) and Wanke and Barros (2017). The concept is to remove the inherent bias of the unbalanced small samples for each year. The type of company (bidder, target, and non-merging) and industry sector were also considered to corroborate the findings discussed thus far. There were 30 companies (bidder, target, and non-merging) each, therefore thirty replications were performed for each year.

The 95 percent confidence intervals for the bootstrapped MI and its decomposed factors under the different analytical levels are presented in Figure 4.1. This outcome specifies that, while it appears to be a slight increase for the catch-up effect over the years, the frontier shift effect appears to be stagnant over time. Moreover, target companies appear to be more capable of catching-up with the frontier of best practices than bidders and even the resulting non-merging companies. This evidences the difficulty for Nigerian companies to sustain technological progress for longer courses of time. It is also important to note, notwithstanding the heterogeneity of results among distinct economic sectors,

that oil and gas (the most relevant for the Nigerian economy's GDP and the attractor of FDIs) tends to remain stagnant even after M&As.

Consequently, it is not possible to conclude in favor of a systematic increase in productivity change, efficiency change, and technical change over the years in the Nigerian economy, as a consequence of M&As, since both lower and upper confidence limits are either under one or above one, respectively. Thus, attention should be paid to the difference in the scales shown in Figure 4.1, as a result of bias removal.

Figure 4.1: DEA Bootstrapped Results of Selected MI in Nigerian M&As

(Sources: Own Data Analysis)

In addition to the above, ordinary least squares (OLS) regression analysis of unbiased and unbounded MI assessments around one was carried out to gain further insights on the locus of eventual technological improvements derived from M&As in Nigeria.

Table 4.14a: Selected Regression Results for Catch-up Estimates

	Estimate	Std. Error	t-value	Pr (>|t|)
(Intercept)	0.49188	0.37017	1.329	0.184303
Type Non-merger	0.28405	0.24644	1.153	0.249426
Type Target	1.04112	0.31276	3.329	0.000913 ***
Sector HC	2.12313	0.57162	3.714	0.000218 ***
Sector IND	0.49058	0.26952	1.820	0.069110.
Sector O&G	-0.20895	0.37242	-0.561	0.574906
Sector SEV	1.42711	0.36605	3.899	0.000105 ***
I(Year - 1991)	0.03768	0.02115	1.781	0.075249.

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Residual standard error: 3.13 on 788 degrees of freedom
Multiple R-squared: 0.05644,   Adjusted R-squared: 0.04805
F-statistic: 6.733 on 7 and 788 DF, p-value: 9.06e-08

Table 4.14b: Selected Regression Results for Frontier-shift Estimates

	Estimate	Std. Error	t-value	Pr (>|t|)
(Intercept)	1.110661	0.059191	18.764	< 2e-16 ***
Type Non-merger	0.019575	0.039406	0.497	0.6195
Type Target	0.227271	0.050010	4.544	6.37e-06 ***
Sector HC	0.428328	0.091402	4.686	3.28e-06 ***
Sector IND	0.201374	0.043097	4.673	3.50e-06 ***
Sector O&G	-0.112442	0.059550	-1.888	0.0594.
Sector SEV	0.242512	0.058532	4.143	3.80e-05 ***
I(Year - 1991)	0.003273	0.003382	0.968	0.3335

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Residual standard error: 0.5004 on 788 degrees of freedom
Multiple R-squared: 0.1013,   Adjusted R-squared: 0.09336
F-statistic: 12.69 on 7 and 788 DF, p-value: 1.689e-15

Table 4.14c: Selected Regression Results for MI Estimates

	Estimate	Std. Error	t-value	Pr (>|t|)
(Intercept)	0.64590	0.24535	2.633	0.008641 **
Type Non-merger	0.22928	0.16334	1.404	0.160814
Type Target	0.81029	0.20730	3.909	0.000101 ***
Sector HC	1.72721	0.37887	4.559	5.96e-06 ***
Sector IND	0.50673	0.17864	2.837	0.004677 **
Sector O&G	-0.26306	0.24684	-1.066	0.286879
Sector SEV	1.11241	0.24262	4.585	5.28e-06 ***
I(Year - 1991)	0.03622	0.01402	2.584	0.009955 **

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Residual standard error: 2.074 on 788 degrees of freedom
Multiple R-squared: 0.08458,   Adjusted R-squared: 0.07644
F-statistic: 10.4 on 7 and 788 DF, p-value: 1.583e-12

The results presented in Tables 4.14a, 4.14b and 4.14c above indicate that, differently from catch-up and MI estimates, frontier-shift estimates do not present a significant increasing trend over the course of time, thus corroborating the hypothesis of technological stagnation. Yet, target companies appear to be the key for technological catching-up and innovation, as long as bidder and control companies do not differ between each other in terms of such dynamism. In fact, it seems that M&A spillovers in Nigerian companies are quite limited and difficult to sustain over the course of time, as can be observed by non-significant coefficients associated to control companies. On the other hand, while different sectors perform heterogeneously, with a consistent positive behavior in healthcare and services, it does not depend necessarily on M&A to be sustained over the course of time. Nevertheless, it is interesting to note that O&G, the prominent sector of Nigerian economy, presents a significant technological regression.

Therefore, applying the MPI decomposition alternative by Ray and Delsi (1997) with the bootstrapping DEA model (Simar & Wilson, 1999), the technological change progress is not seen to be long-lasting, and is therefore unpredictable; yet, there is no significant improvement in MI after M&As companies in Nigeria. The selected companies' productivity after M&As decline (Färe et al., 1992) significantly for the bidder companies, while non-merging and target companies remain stagnated.

4.8 Robustness Check

      To ensure that the results obtained with Mann Whitney U-test are robust,

a complimentary non-parametric test using the Kruskal Wallis test (KWT) was

performed. Kruskal Wallis non-parametric test mainly differs from Mann

Whitney based on three independent groups or more of non-parametric data. The

results obtained are presented in Table 4.15 below.

Table 4.15: Kruskal Wallis results of Selected 30 bidders, 30 target and 30 non-merging companies operating performance (OP), Technical Efficiency (TE), cost Efficiency (CE) and Productive efficiency (PE)

Null hypothesis	Test	Sig-p value	Decision
The medians of (OP) are same across categories contingent	Independent samples median	0.006<0.05	Reject the null hypothesis
The medians of (TE) are same across categories contingent	Independent samples median	0.042<0.05	Reject the null hypothesis
The medians of (CE) are same across categories contingent	Independent samples median	0.001<0.05	Reject the null hypothesis
The medians of (PE) are same across categories contingent	Independent samples median	0.022<0.05	Reject the null hypothesis

Note: The significance level is 5 percent

      The result above shows sufficient evidence to conclude that not all the

population medians' OP and TE among the three groups are the same (Levine et

al., 2017). There is enough evidence, however, to conclude that not all the

population medians' CE and PE of the three groups are identical.

      In summary, the Kruskal Wallis test results of the three groups re-

confirmed the two groups (before and after) M&As results from Mann Whitney

U-test, in terms of all the measures (OP, TE, CE, and PE) for the bidder, target

and non-merging companies. This confirmed the robustness of the Mann

Whitney U-test. Again, the summary of findings with the Mann Whitney U-test of 30 selected bidders, target and non-merging companies of the specific objectives 1, 2, and 3 with the generated hypothesis 1, 2, and 3, is presented in Table 4.16 below.

Table 4.16: General Results Summary based on Hypothesis and Objectives with Mann Whitney U-test of the Selected 30 Bidders, 30 Target and 30 Non-Merging Companies.

	OP (RIV)	TE (DEA)	TE (SFA)	CE (DEA)	CE (SFA)		MPI (DEA)	MPI (SFA)
30 Selected Bidder Companies						C/up	(0.0351)	(0.0017)
H:1A & Objective 1						F/Shit	(0.0404)	(0.0013)*
	(1.43)*	(0.007)*	(0.004)*	0.009*	0.0015*	MPI	(0.323)*	(0.0016)*
30 Selected						C/up	(0.1301)	0.0048
Target Companies H:2A						F/Shift	0.0259	(0.0075)
&Objective 2	2.57	(0.0066)*	(0.001)*	0.0023*	0.0002*	MPI	0.0116	0.0025
30 Selected						C/up	(0.017)	0.0024
Non-Merging						F/Shift	0.0063	0.0023
Companies	(1.74)	0.0062*	0.004*	0.0058*	0.0013*	MPI	(0.015)	0.0008
H:3A&Objective 3								

Notes: C/up: Denotes Catch-up, F/shift:-Denotes Frontier Shift. MPI: - Denotes Malmquist Productivity Index * indicate Mann Whitney u-test 5 percent significance

H1A is operating performance, technical efficiency, cost efficiency and productivity of selected 30 bidder companies are significantly different before and after the estimation period of long-term performance of M&As.

H2A is operating performance, technical efficiency, cost efficiency and productivity of selected 30 target companies are significantly different before and after the estimation period of long-term performance of M&As.

H3A is operating performance, technical efficiency, cost efficiency and productivity of selected 30 non-merging companies are significantly different before and after the estimation period of long-term performance of M&As.

Past study results supporting our empirical finding are, for OP, Aggelopoulos and Georgopoulos (2015) and Michal (2017), Dong, Qiao, and Yang (2015) for TE, Awan, Alishah, and Hassan (2016) and Chortareas, Kapetanios, and Ventouri (2016) for CE, and Arijomamdi (2012) and Fatemi, Fooladi, and Garehkoolchian (2017) for PE.

Table 4.17a: Nigeria's M&As Results

	30 Bidder Firms	30 Target Firms	30 Non-Merging
OP	Significant Declined	Not Significant Declined	Not significant Declined
TE	significant declined	Significant Declined	Significant Improvement
CE	Significant Improvement	Significant Declined Improvement	Significant Improvement
MPI	Significant Declined	Not significant Improvement	Not significant Declined
Expected	Improvement in OP &TE	Expected Improvement in OP & TE	Significant Improvement in TE
	MPI significant decline but on CE significant improvement	MPI Not significant improvement but on TE	MPI not significant declined but realized TE positive spill over effect
	(Cost synergy)	(Cost synergy)	

Note: (Source: Own Findings)

The summarized results of the mean differences for selected 30 bidders, and 30 non-merging companies OP, TE, CE, and PE are presented in Table 4.17a and Table 4.17b along with the bidder and non-merging companies' impact on each other after M&A activities.

Table 4.17b: Selected 30 Bidder versus 30 Non-Merging Companies Comparatively

Independent Variable Measured	Bidder Companies 30	Mann Whitney U test Sign	Non-Merging Companies 30	Mann Whitney U test Sign	Bidder Companies	Non-Merging Companies
OP	(1.43)*	0.001	(1.737)	0.145	<	>
TE	(0.0001)*	0.028	0.0062*	0.045	<	>
CE	0.0019*	0.001	0.0058*	0.021	equal	equal
PE	(0.0323)*	0.026	(0.0105)	0.566	<	>

Notes: * indicates Mann Whitney u-test 5 percent significance

The summarized results with all the hypotheses with component measures are presented in Table 4.18 based on the alternative theoretical hypotheses. The models used in evaluating each hypothesis and the decisions as to whether the hypothesis was rejected or accepted are also presented.

Table 4.18: Summary of Findings on Hypothesized Direct Relationships

Hypotheses	Hypothesis statements	Model	Findings
HA1:	*HA1*: The operating performance, technical efficiency, cost efficiency, and productivity of selected 30 bidder companies is significantly different before and after the estimation period of long-term performance of M&As		
HA1a:	The operating performance of 30 selected bidder companies is significantly different before and after the estimation period of long-term performance of M&As	RIV & MWU	Supported
HA1b	The technical efficiency of 30 selected bidder companies is significantly different before and after the estimation period of long-term performance of M&As	DEA & MWU	Supported

HA1c	The cost efficiency of selected 30 bidder companies is significantly different before and after the estimation period of long-term performance of M&As	SFA & MWU	Supported
HA1d	The productivity efficiency of selected 30 bidder companies is significantly different before and after the estimation period of long-term performance of M&As	MPI & MWU	Supported
HA2	The operating performance, technical efficiency, cost efficiency, and productivity of selected 30 target companies are significantly different before and after the estimation period of long-term performance of M&As		
HA2a	The operating performance of 30 selected target companies is significantly different before and after the estimation period of long-term performance of M&As	RIV & MWU	Not Supported
HA2b	The technical efficiency of 30 selected target companies is significantly different before and after the estimation period of long-term performance of M&As	DEA, & MWU	Supported
HA2c	The cost efficiency of selected 30 target companies is significantly different before and after the estimation period of long-term performance of M&As	SFA & MWU	Supported
HA2d	The productivity efficiency of selected 30 target companies is significantly different before and after the estimation period of long-term performance of M&As	MPI & MWU	Not Supported
HA3	The operating performance, technical efficiency, cost efficiency, and productivity of selected 30 non-merging companies is significantly different before and after the estimation period of long-term performance of M&As		
HA3a	The operating performance of selected 30 non-merging companies are significantly different before and after the estimation period of Long-term performance of M&As	RIV & MWU	Not Supported
HA3b	The technical efficiency of selected 30 non-merging companies is significantly different before and after the estimation period of long-term performance of M&As	DEA & MWU	Supported
HA3c	The cost efficiency of selected 30 non-merging companies is significantly different before and	SFA, &	Supported

	after the estimation period of long-term performance of M&As	MWU	
HA3d	The productivity efficiency of selected 30 non-merging companies is significantly different before and after the estimation period of long-term performance of M&As	MPI & MWU	Not Supported

Source: Developed from study results

4.9 Further Analysis (FA) of Selected Interval and Industry

The interval and industry analysis is based on four measures: operating performance, technical efficiency, cost efficiency, and production efficiency. It is presented separately as it is not an objective of the present study but is still an unresolved issue in M&As. For further analysis, *HA4:* There are significant differences (decline or improvement) in the operating performance of selected 30 bidders, 30 targets, and 30 non-merging companies in the long-term performance of M&As by interval and industry.

4.9.1 Operating Performance of Selected 30 Bidders and 30 Target Companies of Long-Term Performance of M&As Interval

The OP interval analysis was performed to check value creation (destruction) relatively within three years before and after M&As for the bidder and target companies. Table 4.19 shows the result of this analysis.

Table 4.19: Mann Whitney U-Test, Mean Excess RIV in Different Sub-Intervals (Selected Bidder against Target Companies)

Bidder Companies	Mean RIV Before M&A	Mean RIV After M&A	RIV Mean (Inc./Dec)	Mann Whitney U test p-value
1 Year after	1.41	-0.6	(2.01)*	0.001
2Years after	-1.29	-1.71	(0.42)*	0.025
3Yeas after	2.07	-1.69	(3.76)*	0.001
Target Companies				
1year after	0.16	0.22	0.05	0.131
2Years after	-1.4	-0.26	1.14	0.630
3Year after	-1.74	-0.62	1.12	0.160

Notes. * Indicates significance at 5 percent Mann Whitney p-value. Values in thousands (N'000) based on the available data before and after M&A, from Appendix B & C. Inc., Represent increased and Dec. Represent decreased.

From Table 4.19 above, the average value of OP as generated by RIV analysis for bidder companies in all intervals, (i.e., one year after, two years after and three years after M&As) are all negative. However, the mean values of one year and three years before M&As for the bidder companies were positive while two years before were negative. After taking the difference, the average excess mean RIV interval of bidder companies was negative after M&As. The Mann Whitney U-test results of these reductions were significant for the bidder companies. This signifies a reduction rather than improvement in OP of bidder companies within the interval.

Thus, the interval indicates destruction in OP of the selected bidder companies. On the contrary, the RIV mean value differences in target companies in the intervals were positive. However, when tested, none were significant. Meaning that after M&As, the selected target companies did not record any

significant improvement within intervals. Hence, the hypothesis *HA4* was accepted.

4.9.2 Operating Performance of Selected 30 Bidders and 30 Non-Merging Companies of   Long-Term Performance of M&As Interval

The significance of sub-period evaluation of non-merging companies is to investigate if there is any value destruction or value creation in different intervals of the selected non-merging companies compared with the selected bidder companies. This is in the intervals of one, two, and three years before and after M&As. The result is presented in Table 4.20.

Table 4.20: Average Excess RIV with Mann Whitney U- Test Sub-Intervals (Selected Non-Merging against Bidder Companies)

Bidder	RIV Before M&A	RIV After M&A	Mean Increased /Decreased	Mann Whitney U Test p-value
1 Year After	1.407	-0.604	(2.011)*	0.001
2 Years After	-1.287	-1.713	(0.426)*	0.021
3 years After	2.074	-1.687	(3.761)*	0.003
Non-Merging				
1 Year After	-2.806	-0.907	1.900*	0.030
2Years After	-1.150	0.357	1.508	0.367
3years After	1.370	-0.730	(2.100)*	0.041

Notes: * Indicates significance Mann Whitney u-test after M&As at the 5 percent level. Values in (N'000). Data extracted from Appendix D of excess RIV results in different sub-periods of the selected bidder and non-merging companies based on available data

Table 4.20 above shows that the RIV OP of selected bidder companies improved significantly one year after M&As, two years after M&As, and three years after M&As. However, non-merging companies improved significantly one year after M&As and two years after M&As but non-significantly, while

three years after M&As it declined significantly. This result shows that selected non-merging companies in the same interval recorded an increase in OP improvement in the short run after M&As. Thus, a positive spillover effect is noticeable one year after the M&A transactions. Within the same interval, selected bidder companies recorded a significant reduction and this suggests that bidder companies did not gain OP within the short run after M&A activities in Nigeria.

The result also reveals that three years after M&As, both the selected bidder and non-merging companies did not realize expected OP improvement but rather declined. The interval result is in accordance with the non-significant improvement found in the OP of non-merging companies and a significant reduction in selected bidder companies. Therefore, it can be concluded based on the interval result that the OP of the selected non-merging companies after M&As in Nigeria in the long term was better than the selected bidder companies. Hence, selected non-merging companies' interval OP hypothesis *HA4:* There are significant differences in operating performance of selected 30 non-merging companies on the long-term performance of M&As was rejected. Therefore, there is no no significant differences (not significant decline) of selected 30 non-merging companies on the long-term performance of M&As.

4.9.3 Operating Performance of Selected 30 Bidders and 30 Target Companies of Long-Term Performance of M&As Industry

The industry's effect on the OP of the selected bidder and target companies' using the RIV approach is investigated in this section. The selected

bidder and target companies are grouped as classified by the NSE into consumer

(13), healthcare (1), industrial (8), oil and gas (3), and the services (5) making a

total of 30 bidders and 30 target companies, and similar number and groups exist

for the selected non-merging companies. The summary of results obtained from

Mann Whitney u-test analysis is presented in Table 4.21 below.

Table 4.21: Mann Whitney U-Test, Different Industries Mean Operating Performance Analysis (RIV), (Selected Bidder against Target Companies).

Bidder Companies	Mean Before M&A	Mean After M&A	Mean Inc./Dec	Mann Whitney U test p-value
Consumer group	1.10	-0.81	(1.91)*	0.01
Health Care group	8.33	1.50	(7.18)*	0.03
Industrial Group	0.26	-1.83	(2.09)*	0.01
Oil and Gas	-6.56	0.12	6.68	0.31
Services Group	0.58	-2.17	(2.75)*	0.04
Target Companies				
Consumer group	-2.28	-1.58	0.70	0.26
Health Care group	-3.13	-17.74	(14.61)	0.06
Industrial Group	-1.57	-0.19	1.38	1.00
Oil and Gas	8.11	16.85	8.74	0.83
Services Group	1.40	0.54	(0.86)	0.58

Notes: * Indicates significance at the 5 percent level. Inc. Denotes Increase, Dec. Denotes decrease. Values are in the thousand (N'000) showing excess RIV results based on available data of all years before and after M&As. All the companies were selected when involved in an M&A activity based on selection criteria. However, it is not on an industry basis, considering the objective of the study. Industry valuation is on further analysis and secondary from the primary objective of the study. Healthcare and oil & gas come into analysis only when industry analysis is considered and is secondary, while the primary study aims are company performance before and after M&A. Therefore, both deserve to be included under the industry analysis, whether being one or three in number, as synergy occurs before and after M&As on a one-to-one.

The values before M&As of selected bidder companies in all industries

were positive, with the exception of the oil and gas group, while the actual (after)

values were positive, with the exception of consumer, industrial, and services

groups. After taking the difference, the selected bidder values were mostly

negative, with the exception of the oil and gas group. When tested, all values or differences were significant except those of the oil and gas group. This means after M&As, there was a significant reduction in the entire group RIV except that of oil and gas, where there was a non-significant improvement. This implies that on average, after M&As there was no realization of the expected improvement in operating performance, rather there was a significant decline in OP of all selected bidder companies' industries, except oil and gas.

The selected target companies' expected results were negative in consumer, healthcare, and industrial group, while selecting target actual industries to result is negative in consumer, healthcare, and industry. After taking the difference, the result was all positive except for the services group and healthcare, but when tested none was significant. This signifies that after M&As in Nigeria, industry alignment had no influence on selected target companies' achievement of a significant improvement in operating performance. Hence, the selected bidder companies' industry null hypothesis was rejected and the alternative hypothesis was accepted: *HA4:* There are significant differences in operating performance of selected 30 bidders' companies on the long-term performance of M&As industry, not significant differences of selected 30 target companies.

4.9.4 Operating Performance of Selected 30 Bidders and 30 Non-Merging Companies of   Long-Term Performance of M&As Industry

The effect of industry on the selected bidder and non-merging companies after M&As are evaluated in this section. The selected non-merging companies were

grouped into five industries based on the NSE's classification of the selected

bidder companies, namely consumer goods, healthcare, industrial, oil & gas, and

the services groups. The result is presented in Table 4.22.

Table 4.22: Average RIV in Different Industries (Selected Non-Merging against Bidder Companies) with Mann Whitney U-Test

Bidder Industry	RIV Before M&A	RIV After M&A	Mean Inc./Dec	Mann Whitney U-Test (p-value)
Consumer	1.1	-0.81	(1.91)*	0.010
Health Care	8.33	1.50	(7.18)*	0.028
Industrial	0.29	-1.83	(2.09)*	0.013
Oil and Gas	-6.56	0.12	6.68	0.312
Services	0.58	-2.17	(2.75)*	0.041
Non-Merging				
Consumer	6.18	7.74	1.55	0.07
Healthcare	15.36	16.17	0.81	0.77
Industrial	7.57	8.50	0.94	0.52
Oil and gas	13.88	15.73	1.85	0.63
Services	3.67	4.31	0.64	0.71

Notes: Inc. Denotes increased, Dec. Denotes decreased; the values are in (N'000).
*Indicates significant at 5 percent level. The table shows excess RIV of the selected bidder and non-merging companies in different industries, based on available data of all year before and after M&As

The selected non-merging companies' industries indicate no significant

reduction or improvement in all the industries while the selected bidder

companies showed a significant reduction in consumer, industrial, services, and

healthcare, and non-significant improvement in the oil and gas group. This

implies that value creation in the OP of the selected non-merging companies was

not stimulated by the selected bidder companies' M&As to benefit selected non-

merging companies' industries. Hence, the industry selected non-merging

companies' hypothesis *HA4:* There are significant differences in operating

performance of selected 30 non-merging companies on the long-term performance of M&As industry was rejected.

4.9.5 Technical Efficiency of Selected 30 Bidders and 30 Target Companies of Long-Term Performance of M&As Interval

For further analysis of *HA5:* There are significant differences in technical efficiency of selected 30 bidders, 30 targets, and 30 non-merging companies of long term performance of M&As interval and industry.

In order to know whether there was an improvement in TE rating in-between periods of mergers between the selected bidder and target companies, a sub-period technical rating analysis was performed. There were selected 30 companies for the interval, considering one, two and three years each before and after M&As for the selected bidder and target companies, similar to the selected non-merging companies. The result is presented below in Table 4.23.

Table 4.23: Mean Technical Efficiency in Different Sub-Intervals with Mann Whitney U-Test (Selected Bidder and Target Companies)

Bidder Companies	DEA Mean	Mann Whitney U-Test	SFA Mean	Mann Whitney U Test (p-value)
1Year Before 1Year After	(0.0028)*	0.032	(0.0273)*	0.050
2Years Before 2Year After	0.0016	0.594	(0.0008)	0.756
3Years Before 3 Years After	(0.0020)*	0.021	(0.0011)*	0.043
Target Companies				
1Year Before 1Year After	(0.0045)*	0.011	0.0007*	0.054
2Years Before 2Year After	(0.0030)	0.407	0.0014	0.371
3Years Before 3 Years After	(0.0062)*	0.016	(0.0018)*	0.011

Notes: The * p-values are significant at the 5 percent level. This table shows mean technical efficiency results based on available data before and after M&A in different sub-periods, with Mann Whitney u-test using both DEA and SFA models

The selected bidder companies' interval TE result under the DEA model showed a decrease one year before and one year after and three years before and after M&As, while two years before and after M&As showed an increase. When these differences were tested, one year and three years after M&As were significant, signifying that when the interval is considered, a significant decline was reported one and three years after, while a non-significant improvement was noted two years after for the bidder and target companies' technical efficiency.

Similar results were obtained under the SFA model, which was applicable to the selected bidder and target companies as well. Thus, the result is consistent with the general TE result of no significant improvement after M&As for the selected bidder and target companies. Hence, the interval hypothesis *HA5*: There are significant differences in technical efficiency of selected 30 bidders and 30 target companies on the long-term performance of M&As was accepted.

4.9.6   Technical Efficiency of Selected 30 Bidders and 30 Target Companies of   Long-Term Performance of M&As Industry

Results of the SFA model for the industry effect on selected bidder companies are tabulated in Table 4.24. Bidder companies in the healthcare group recorded a significant decline after M&As with DEA and SFA output indicating that it is the most inefficient sector. Moreover, service groups gained under the

DEA model and declined under the SFA model, but the results were not significant when tested. This outcome showed that an M&A deal in the healthcare industry was principally not favorable to selected merging companies, and industry made no difference in TE of selected bidder companies except for healthcare in the long- term.

Table 4.24: Average Different Industries Technical Efficiency (Selected Bidder and Target Companies) with Mann Whitney U-Test

Bidder Companies	DEA Mean Increased/ decreased	Mann Whitney U-Test	SFA Mean Increased/ decreased	Mann Whitney U Test p-value
Consumer Goods	(0.001)	0.663	(0.005)	0.060
HealthCare	(0.529)*	0.050	(0.082)*	0.050
Industrial group	0.002	0.674	(0.010)	0.062
Oil and Gas	(0.012)	0.827	90.0300	0.056
Services Group	0.001	0.917	(0.007)	0.347
Target Companies				
Consumer Goods	(0.008)	0.061	(0.003)	0.064
HealthCare	(0.093)*	0.050	(0.017)*	0.025
Industrial group	(0.023)	0.059	(0.003)	0.061
Oil and Gas	(0.117)	0.275	(0.029)	0.067
Services	(0.036)	0.117	(0.016)	0.079

Notes: *indicates 5 percent Mann Whitney significance. This table shows the mean industry technical efficiency results under DEA and SFA. Average data are based on all years before and after M&As

From Table 4.24 above, the selected target companies' industry effect indicated that all the industries under the SFA model had a non-significant reduction in TE, aside from healthcare. This signifies that selected target companies in all the industries were not significantly inefficient after M&As except the healthcare sector. Under the DEA model, all industries recorded a non-significant reduction in TE except healthcare that was significant. This result revealed that M&A transactions in the healthcare industry were

particularly not favorable to target companies, and that the industry factor makes no difference to the TE of selected target companies in the long-term.

The industry effect on technical inefficiency is worst for the healthcare sector as the efficiency of the selected bidder and target companies significantly reduced after M&As in Nigeria using both models. Therefore, the industry alternative hypothesis: *HA5*: There are significant differences in technical efficiency of selected 30 bidders and 30 target companies on the long-term performance of M&As industry was accepted in the healthcare sector but not in others. The industry TE of selected target companies in healthcare is significantly different before and after M&A activities within the estimated period while others showed a non-significant decline.

4.9.7 Technical Efficiency of Selected 30 Bidders and 30 Non-merging Companies of   Long-Term Performance of M&As Interval

The basis of the interval TE investigation is to find out any difference (if any) within windows, for the selected bidder and non-merging companies and if such difference is an improvement or a decline comparatively before and after M&As in Nigeria. The result of the sub-interval TE is presented in Table 4.25.

Table 4.25: Average Different Interval Technical Efficiency
(Selected Bidder and Non-Merging Companies) with Mann Whitney U-Test

	DEA Mean Inc./ Dec.	Mann Whitney U test p-value	SFA Mean Inc./ Dec.	Mann Whitney U test p-value
Bidder Companies				
1Year Before &1 Year After	(0.0028)*	0.0321	(0.0273)*	0.050
2Years Before & 2 Year After	0.0016	0.594	(0.0008)	0.756
3Years Before & 3Years After	(0.0020)*	0.0214	(0.0011)*	0.043
Non-merging Companies				
1Year Before &1 Year After	0.0038	0.306	0.0011	0.062
2Years Before & 2Year After	0.0057*	0.001	0.0010*	0.001
3Years Before& 3Years After	0.0066*	0.010	0.0005*	0.003

Notes: The Table shows the mean technical efficiency of both selected bidder and non-merging companies' intervals based on available data of all year before and after M&As * Indicates 5 percent Mann Whitney U-Test significance, Inc. Denotes increase, Dec. denotes a decrease

DEA and SFA model results of selected non-merging companies showed a significant technical efficiency improvement two years and three years after M&As while one year after was non-significant. Selected bidder companies declined significantly one year and three years after M&As while two years after showed a stagnation. This implies a significant TE improvement of selected non-merging companies' when the sub-interval is considered after M&As.

The result implies that selected bidder companies stimulated the non-merging companies' TE improvement within the intervals. The TE interval result is in accordance with the general TE result obtained. The selected non-merging companies performed better than the bidder companies' after M&As in Nigeria. Hence, there is a positive TE spillover effect in the long term in Nigeria. Therefore, the interval hypothesis *HA5*: There are significant differences in technical efficiency of selected 30 bidders and 30 non-merging companies on the long-term performance of M&As was accepted.

4.9.8 Technical Efficiency of Selected 30 Bidders and 30 Non-merging Companies of Long-Term Performance of M&As Industry

In the result of the industry effect from Table 4.26, the TE of selected non-merging companies with DEA and SFA models on all industries showed non-significant decline or improvement. Comparatively, the bidder companies have a significant decline in DEA and SFA models in the healthcare group.

Table 4.26: Average Different Industry Technical Efficiency (Selected Bidder and Non-Merging Companies) with Mann Whitney U-Test

	DEA		SFA	
	Mean Increased/ Decreased	Mann Whitney U test (p-value)	Mean Increased/ Decreased	Mann Whitney U test (p-value)
Bidder Companies				
Consumer Goods	(0.0013)	0.663	(0.005)	0.060
HealthCare	(0.529)*	0.050	(0.082)*	0.050
Industrial group	0.002	0.674	(0.010)	0.062
Oil and Gas	(0.012)	0.827	(0.030)	0.056
Services	0.001	0.917	(0.007)	0.347
Non-Merging companies				
Consumer Goods	(0.0102)	0.274	0.0019	0.060
HealthCare	(0.4680)	0.376	0.0220	0.056
Industrial group	0.0001	0.708	0.0030	0.060
Oil and Gas	(0.0240)	0.744	0.0143	0.079
Services	0.0092	0.075	0.0054	0.062

Notes: The average is calculated based on available data before and after M&As technical efficiency under DEA and SFA for the selected bidder and non-merging companies, with Mann Whitney U-test in different industries. * Indicates 5 percent Mann Whitney U-Test significance.

Hence, the research accepted the industry TE alternative hypothesis of selected bidder companies (Healthcare). however, it rejected it for non-merging companies. Therefore, *HA5*: The industry technical efficiency of selected 30 bidder companies (HealthCare) is significantly different between before and after M&As based on the estimated period (*HA5*: M1 (TE) before $\neq$ M2 (TE) after). Thus, the alternative hypothesis was accepted. However, *HA5*: The industry technical efficiency of the selected 30 non-merging companies are not

significantly different between before and after M&As based on the estimated period (*Ho5*: M1 (TE) before = M2 (TE) after). In effect, the alternative hypothesis was rejected and the null hypothesis was accepted.

4.9.9 Cost Efficiency of Selected 30 Bidders and 30 Target Companies of Long-Term Performance of M&As Interval

For further analysis of *HA6*: There are significant differences in the **cost** efficiency of selected 30 bidders, 30 targets, and 30 non-merging companies of long-term performance of M&As interval and industry.

The sub-interval analysis was carried out to examine differences in CE in terms of different intervals. The result is presented in Table 4.27a, while the test statistic is presented in Table 4.27b. The result from the SFA model showed a significant improvement in CE of selected bidder companies three years before and three years after M&As, two years before and two years after M&As, and one year before and one year after M&As. Thus, a non-significant decline in cost synergy was noted.

Table 4.27a: Cost Efficiency (Selected Bidder and Target Companies) Different Intervals

| | DEA | | | SFA | | |
	Mean Before M&A	Mean After M&A	Mean Increased/ Decreased	Mean Before M&A	Mean After M&A	Mean Increased/ Decreased
Bidder Companies						
1Year Before and 1Year After	0.010	0.005	(0.004)	0.025	0.032	0.007
2Years Before and 2 Years After	0.008	0.006	(0.002)	0.019	0.031	0.012
3Years Before and 3 Years After	0.004	0.006	0.002	0.032	0.032	0.001
Target Companies						
1Year Before and 1Year After	0.005	0.003	(0.001)	0.019	0.021	0.002
2Years Before and 2 Years After	0.004	0.004	0.000	0.022	0.029	0.006
3Years Before and 3 Years After	0.003	0.008	0.005	0.016	0.028	0.012

Notes: This table shows the sub-interval of selected target and bidder companied cost efficiency under DEA and SFA models

Table 4.27b: Average Cost Efficiency (Selected Bidder against Target Companies) Different Interval with Mann Whitney U-Test

| | DEA | | SFA | |
	Mean Increased/ Decreased	Mann Whitney U-Test	Mean Increased/ Decreased	Mann Whitney U-Test
Bidder Companies				
1Year Before and 1Year After	(0.004)	0.055	0.007*	0.050
2Years Before and 2 Years After	(0.002)	0.427	0.012*	0.040
3Years Before and 3 Years After	0.002*	0.049	0.001*	0.001
Target Companies				
1Year before and 1Year After	(0.001)	0.056	0.002*	0.051
2Years Before and 2 Years After	0.001	0.774	0.007*	0.050
3Years Before and 3 Years After	0.005*	0.018	0.012*	0.043

Notes: This Table shows the sub-interval of selected target and bidder companies' cost efficiency, under DEA and SFA and its Mann Whitney U-test. *Indicates 5 percent Mann Whitney U-test significance

The selected bidder companies' interval result showed no real significant decline in cost synergy in this window as none was significant in SFA models, similar to the general result obtained. From Table 4.27b, the result of the DEA model showed a non-significant reduction in the CE of selected target companies one year after M&As, meaning no real excess cost. Non-significant improvement was seen two years after M&As, while for three years after a

significant improvement is noted, meaning no real excess cost was incurred in this window after M&As though the SFA model showed significant improvement in all the intervals. Hence, the hypothesis: *HA6:* There are significant differences in the cost efficiency of selected 30 bidders and 30 target companies of long-term performance of M&As interval was accepted.

4.9.10 Cost Efficiency of Selected 30 Bidders and 30 Target Companies of Long-Term Performance of M&As Industry

The industry effect analysis results in Table 4.28a, for bidder companies under SFA models, indicate a significant improvement in cost synergy in consumer groups and services. This implies no excess cost in the industry for bidders and target companies as there was no significant cost reduction.

Table 4.28a: Average Cost Efficiency Industry with Mann Whitney U Test (Selected Bidder against Target Companies)

Companies/Industry	DEA Increase/ Decrease	Mann Whitney U Test (p-value)	SFA Increase/ Decrease	Mann Whitney U Test (p-value)
Bidder Companies				
Consumer Goods	0.026*	0.041	0.018*	0.001
Healthcare	(0.649)	0.060	0.044	0.071
Industrial Goods	(0.028)	0.068	0.022	0.060
Oil and Gas	0.133	0.150	0.034	0.065
Services	0.084*	0.021	0.029*	0.006
Target Companies				
Consumer Goods	0.002*	0.001	0.027*	0.011
Healthcare	0.050	0.057	0.297	0.066
Industrial Goods	(0.001)	0.960	0.047	0.071
Oil and Gas	0.037*	0.050	0.098*	0.037
Services	0.012*	0.043	0.082*	0.002

Notes: This table shows all data available from all year before and after M&As Industry of the cost efficiency of the selected bidder and target companies *Indicates 5percent Mann Whitney significance

Therefore, industry selected bidder and target companies' alternative hypothesis: *HA6:* There are significant differences in the cost efficiency of selected 30 bidders' consumer and services not others and 30 target companies on the long-term performance of M&As industry was accepted, except for the healthcare and industrial groups.

4.9.11 Cost Efficiency of Selected 30 Bidders and 30 Non-Merging Companies of Long-Term Performance of M&As Interval

The significance of sub-period evaluation of selected non-merging companies is to investigate if there is any value destruction or value creation in different intervals of the selected non-merging comparatively with the selected bidder companies. This is in the intervals of one year before and after M&As, two years before and after M&As, and three years before and after M&A activities. The result is presented in Table 4.28b.

Table 4.28b: Average Cost Performance Intervals (Selected Non-Merging against Bidder Companies) with Mann Whitney U-Test

	DEA		SFA	
	Mean	Mann	Mean	Mann
	Increased/	Whitney	Increased/	Whitney
Bidder	Decreased	U test (p-value)	Decreased	U test (p-value)
1Year before and 1year After	(0.0043)	0.060	0.0074*	0.050
2Years Before and 2Years After	(0.0023)	0.427	0.0116*	0.047
3Years Before and 3Years After	0.0020*	0.049	0.0008*	0.001
Non- Merging				
1Year before and 1year After	0.0059*	0.011	0.0009*	0.003
2Years Before and 2Years After	0.0068*	0.021	0.0014*	0.010
3Years Before and 3Years After	0.0056*	0.001	0.0017*	0.001

Notes: * Indicates Mann Whitney u-test after M&As at 5 percent significance level.
The Table shows data average cost efficiency results in selected bidder and non-

merging companies under DEA and SFA, all year before and after M&As with Mann Whitney u-test for different windows

Table 4.26b showed selected non-merging CE companies' results with SFA model indicating a significant CE improvement one year, two years, and three years after M&As, similarly with selected bidder improvement one year, two years, and three years after M&As. Thus, the improvement of CE results in the interval is consistent with the general CE improvement of the selected bidder and non-merging companies after M&As in the long-term in Nigeria. Therefore, the alternative interval hypothesis of the selected non-merging companies' CE is accepted, as *HA6*: the cost efficiency of the selected 30 non-merging companies is significantly different between before and after M&As based on the estimated period interval (*HA6*: M1 (CE) before ≠ M2 (CE) after).

4.9.12 Cost Efficiency of Selected 30 Bidders and 30 Non-Merging Companies of Long-Term Performance of M&As Industry

The effect of industry on the selected bidder and non-merging companies after M&As are evaluated in this section. The non-merging companies were grouped into five industries based on the NSE's classification of the bidder companies, namely, consumer goods, healthcare, industrial, oil & gas, and the services groups. The result is presented in Table 4.28c.

Table 4.28c: Average Cost Performance Industries (Selected Non-Merging against Bidder Companies) with Mann Whitney U-Test

	DEA		SFA	
	Mean Increased/ Decreased.	Mann Whitney U test p-value	Mean Increased/ Decreased.	Mann Whitney U test (p-value)
Bidder Companies				
Consumer Goods	0.0264*	0.041	0.0180*	0.001
Healthcare	(0.6489)	0.060	0.0435	0.063
Industrial Goods	(0.0280)	0.068	0.0221	0.060
Oil and Gas	0.1332	0.150	0.0342	0.065
Services	0.0839*	0.021	0.0286*	0.006
Non-Merging				
Consumer Goods	0.0182*	0.001	0.0025*	0.010
Healthcare	0.0235	0.180	0.0388	0.056
Industrial Goods	0.0213*	0.001	0.0058*	0.005
Oil and Gas	0.0556*	0.006	0.0141*	0.003
Services	0.0083*	0.037	0.0092*	0.023

Notes: *Indicates significance at 5 percent level. This table shows average data on cost efficiency under DEA and SFA calculated from all year before and after M&As of the selected bidder and non-merging companies

The selected non-merging companies' industries CE indicate a significant improvement in the industries except on healthcare while the selected bidder companies' showed a significant improvement in consumer and services group. This implies the bidder companies stimulated value creation in cost synergy for the non-merging companies in the industry after M&As. Hence, the industry selected non-merging companies' hypothesis *HA6* was accepted except for healthcare.

4.9.13 Productivity Efficiency of Selected 30 Bidders and 30 Target Companies of Long-Term Performance of M&As Interval

For further analysis of *HA7:* There are significant differences in productivity efficiency of selected 30 bidders, 30 targets, and 30 non-merging companies of long-term performance of M&As by interval and industry.

The selected merging companies' PE under intervals is necessary for finding out within windows if there was an improvement on any sub-interval, hence the investigation under sub-period analysis. The MI results in Table 4.29 for selected bidder companies with DEA and SFA model showed a significant decline in PE two years before and two years after M&As, while others remained stagnant. Stated clearly, a decline within the interval is notable because of a significant decline in frontier shift two years before and wo years after M&As. There was no significant decline in DEA and SFA models for the target companies within all the intervals.

Table 4.29: Mean Malmquist Index of Selected Interval Bidder and Target Companies with Mann Whitney

Bidder Companies	DEA Mean Before M&A	DEA Mean After M&A	Mean Increase/ Decrease	Mann Whitney U-Test	SFA Mean Before M&A	SFA Mean After M&A	Mean Increase/ Decrease	Mann Whitney U-Test
Catch-up	0.0477	0.0427	(0.0050)	0.952	0.0303	0.0030	(0.0273)	0.554
1year before and 1 year after								
2years before and 2 years after	0.0482	0.0562	0.0079*	0.040	0.0327	0.0319	(0.0008)	0.756
3years before and 3 years after	0.0439	0.0495	0.0055	0.496	0.0334	0.0323	(0.0011)	0.433
Frontier-shit								
1year before and 1 year after	0.0403	0.0319	(0.0084)	0.885	0.0416	0.0410	(0.0007)	0.506
2years before and 2years after	0.0376	0.0346	(0.0030)*	0.050	0.0379	0.0366	(0.0013)*	0.045
3years before and 3years after	0.0378	0.0326	(0.0052)	0.145	0.0374	0.0364	(0.0010)	0.467
Malmquist Index								
1year before and 1 year after	0.0446	0.0372	(0.0074)	0.261	0.0016	0.0003	(0.0012)	0.073
2years before and 2years after	0.0497	0.0366	(0.0131)*	0.038	0.0017	0.0001	(0.0016)*	0.050
3years before and 3years after	0.0431	0.0518	0.0087	0.929	0.0016	0.0010	(0.0006)	0.776
Target Companies								
Catch-up								
1year before and 1 year after	0.0378	0.0781	0.0403*	0.032	0.0321	0.0386	0.0007	0.848
2years before and 2years after	0.0362	0.0322	(0.0040)	0.555	0.0326	0.0340	0.0014	0.371
3years before and 3years after	0.0300	0.0415	0.0115	0.166	0.0366	0.0348	(0.0018)	0.918
Frontier-shit								
1year before and 1 year after	0.0446	0.0357	(0.0088)*	0.007	0.0365	0.0369	0.0004	0.941
2years before and2 years after	0.0415	0.0461	0.0046	0.496	0.0364	0.0334	(0.0029)	0.371
3years before and 3years after	0.0361	0.0303	(0.0058)	0.495	0.0330	0.0326	(0.0005)	0.976
Malmquist Index								
1year before and 1 year after	0.0438	0.0467	0.0039	0.051	0.0007	0.0031	0.0024	0.888
2years before and 2years after	0.0428	0.0350	(0.0078)	0.853	0.0011	0.0020	0.0009	0.470
3years before and 3years after	0.0498	0.0408	(0.0090)	0.567	0.0031	0.0020	(0.0011)	0.941

Notes: ***** Indicates 1 & 5 percent M**a**nn Whitney significance**.** The average productivity results and decompositions under DEA and SFA of selected target and bidder companies' calculation are based on available data before and after M&As

The above Table 4.29 result means there was no significant improvement in PE of the selected target companies within these intervals but stagnation. This result is in accordance with the general PE result earlier. Hence, the hypothesis *HA7* was accepted.

4.9.14 Productivity Efficiency of Selected 30 Bidders and 30 Target Companies of   Long-Term Performance of M&As Industry

From Table 4.30 below, the MPI as generated by the DEA and SFA models showed a significant reduction in PE of selected bidder companies' consumer group, because of a significant decline in the frontier shift on both models, and a significant decline in industrial group catch-up. This means that technological change in PE is the most important contributor to the selected bidder companies' PE improvement.

Table 4.30: Mean Malmquist Index Industry (Selected Bidder against Target Companies) with Mann Whitney U Test

Bidder Companies Catch-up	DEA Mean Before M&A	DEA Mean After M&A	Mean Increase/ Decrease	Mann Whitney U-Test	SFA Mean Before M&A	SFA Mean After M&A	Mean Increase/ Decrease	Mann Whitney U-Test
CG	0.0852	0.1743	0.0891	0.320	0.0911	0.0745	(0.0166)	0.101
HC	0.9891	0.9945	0.0054	0.200	1.5087	0.4286	(1.0801)	0.110
IDG	0.1297	0.0877	(0.0420)*	0.038	0.1411	0.1236	(0.0175)	0.382
OG	0.3333	0.4909	0.1576	0.700	0.375	0.3225	(0.0525)	0.400
SV	0.238	0.2506	0.0125	1.000	0.1977	0.1985	0.0008	0.841
Frontier shit								
CG	0.1072	0.0559	(0.0513)*	0.001	0.0716	0.0795	0.0079	0.101
HC	2.5121	0.1804	(2.4117)	0.121	0.6628	1.3329	0.6701	0.431
IDG	0.1917	0.1116	(0.080)	0.105	0.1406	0.1265	(0.0141)	0.382
OG	0.1808	0.2483	0.0675	0.700	0.3034	0.3447	0.0413	0.400
SV	0.1096	0.184	0.0744	0.062	0.2041	0.2016	(0.0026)	0.841
Malmquist Index								
CG	0.117	0.0641	(0.0529)*	0.034	0.0089	(0.0025)	(0.0114)*	0.016
HC	2.5121	0.1804	(2.3317)	0.314	0.3372	0.3400	(0.0028)	0.321
IDG	0.1954	0.1222	(0.0732)	0.328	0.0033	(0.0015)	(0.0048)	0.067
OG	0.1808	0.3556	0.1748	0.400	0.0334	(0.0113)	(0.0447)	0.100
SV	0.1095	0.241	0.1315	0.151	(0.0032)	(0.0015)	0.0017	0.161
Target Companies Catch-up								
CG	0.038	0.0719	0.0338	0.153	0.0771	0.0772	0.0001	0.113
HC	0.995	0.9961	0.0011	0.511	1.0971	0.8618	(0.2353)	0.211
IDG	0.0816	0.1037	0.0221	0.535	0.1235	0.1245	0.0010	0.053
OG	0.3263	0.4204	0.0941	0.400	0.3425	0.5758	0.2333	0.200
SV	0.0806	0.0899	0.0094	1.000	0.2147	0.208	(0.0067)	0.841
Frontier-shit								
CG	0.1102	0.1082	(0.002)	1.000	0.0779	0.0771	(0.0008)	0.113
HC	1.4425	0.01	(1.4325)	0.311	0.2488	0.1603	(0.0885)	0.168
IDG	0.0742	0.1167	0.0424	0.057	(0.001)	0.1255	0.1265	0.058
OG	0.5085	1.3454	0.8368	0.100	(0.1375)	0.2019	(0.1375)	0.200
SV	0.2384	0.3301	0.0917	0.151	0.0054	0.1935	0.0054	0.841
Malmquist Index								
CG	0.0856	0.1002	0.0146	0.241	(0.0004)	0.0001	0.0005	0.101
HC	1.4425	0.010	(1.4325)	0.124	0.0885	0.0900	(0.0015)	0.115
IDG	0.0453	0.1167	0.0713	0.067	(0.0037)	(0.001)	0.0027	0.179
OG	0.3722	1.3163	0.9441	0.200	0.0015	0.136	0.1345	0.408
SV	0.5586	0.1636	(0.3949)	0.690	0.0127	0.0071	(0.0047)	0.350

Notes: * Indicates 5 percent Mann Whitney U-Test significance. This Table shows mean productivity results and decompositions under DEA and SFA models in different industries, with the average taken from all data before and after M&As.

The selected target companies DEA and SFA models showed no significant decline or improvement in all the industries. The industry outcome revealed that selected bidders and target companies did not realize productivity improvement after M&As. The two major contributing declined factors are non-significant improvement in catch-up and technological change. Therefore, the hypothesis *HA7* was accepted.

4.9.15 Productivity Efficiency of Selected 30 Bidders and 30 Non-Merging Companies of Long-Term Performance of M&As Interval

The interval investigation result is presented in Table 4.31. DEA and SFA model results for the selected non-merging companies showed no significant decline or improvement within all the MPI intervals. Thus, it is implying a non-significant drop in productivity of the selected non-merging companies as were obtained in the general result.

Table 4.31: Average Malmquist Index Intervals (Selected Non-Merging against Bidder Companies) with Mann Whitney U-Test

	DEA		SFA	
	Mean	Mann	Mean	Mann
Bidder Companies	Increased/	Whitney	Increased/	Whitney
Catch-up	Decreased.	U test p-value	Decreased.	U test p-value
1year before and 1 year after	(0.0050)	0.952	(0.0273)	0.554
2years before and 2 years after	0.0079*	0.040	(0.0008)	0.756
3years before and 3 years after	0.0055	0.496	(0.0011)	0.433
Frontier-shit				
1year before and 1 year after	(0.0084)	0.885	(0.0007)	0.506
2years before and 2years after	90.0030)*	0.050	(0.0013)	0.451
3years before and 3years after	(0.0052)	0.145	(0.0010)	0.467
Malmquist Index				
1year before and 1 year after	(0.0074)	0.261	(0.0012)	0.073
2years before and 2years after	(0.0131)*	0.038	(0.0016)	0.720
3years before and 3years after	0.0087	0.929	(0.0006)	0.776
Non-Merging Companies				
Catch-up				
1year before and 1 year after	(0.0097)	0.328	(0.0156)	0.063
2years before and 2years after	(0.0016)	0.689	(0.0420)	0.060
3years before and 3years after	0.0001	0.864	(0.0423)*	0.050
Frontier-shit				
1year before and 1 year after	(0.0041)	0.176	0.0363	0.247
2years before and2 years after	0.0133	0.344	(0.032)*	0.042
3years before and 3years after	(0.0144)	0.178	0.0317	0.059
Malmquist Index				
1year before and 1 year after	(0.0073)	0.096	(0.0047)	0.806
2years before and 2years after	(0.0060)	0.672	(0.0025)	0.671
3years before and 3years after	(0.0248)	0.848	(0.0113)	0.116

Notes: This Table 4.31 shows mean data of Malmquist productivity index intervals for the selected bidder and non-merging companies under DEA and SFA, and Mann Whitney U-test in different sub-periods, based on available data before and after M&As. * indicates significance at 5 percent Mann Whitney

The bidder companies' MPI declined significantly two years after M&As as a result of a significant decline in frontier shift two years after and catch-up two years after M&As. The interval result is in accordance with the general result of non-significant improvement in the PE of the selected bidder, but a decline and non-significant drop for selected non-merging companies after M&As in Nigeria. Therefore, the researcher rejected the alternative hypothesis *HA7*. There

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was no significant difference in the PE of selected 30 non-merging companies of long-term performance of M&As by interval.

4.9.16 Productivity Efficiency of Selected 30 Bidders and 30 Non-Merging Companies of   Long-Term Performance of M&As Industry

The industry consideration of selected non-merging against selected bidder companies was based on the NSE classification under consumer group, industrial, healthcare, oil and gas, and lastly, the services group. This was necessary since the general productivity result showed a significant decline for the selected bidder companies and non-significant improvement in the selected non-merging companies. The interval result indicated non-significant improvement for selected non-merging companies and better production efficiency than the selected bidder companies. Therefore, the industry investigation determines where significant productivity improvement for the selected non-merging companies could occur. The MPI result is presented below.

Table 4.32: Average Malmquist Index Industries (Selected Non-Merging against Bidder Companies) with Mann Whitney U-Test

Non-Merging Companies Catch-up	DEA				SFA			
	DEA Before M&A	DEA After M&A	Mean Increase/ Decrease	Mann Whitney U- test (p-value)	SFA Before M&A	SFA After M&A	Mean Increase/ Decrease	Mann Whitney U- test (p-value)
CG	0.136	0.05	(0.085)*	0.005	0.101	0.065	(0.036)*	0.001
HC	1	1	0.001	1.000	1.566	0.814	(0.752)	0.317
IDG	0.525	0.17	(0.35)	0.267	0.133	0.188	0.055	0.141
OG	0.976	1.09	0.117	0.827	0.309	0.392	0.083	0.513
SV	0.72	0.19	(0.531)	0.746	0.203	0.193	(0.010)	0.602
Frontier-shit								
CG	0.087	0.08	(0.011)*	0.001	0.064	0.096	0.031*	0.011
HC	2.715	0.01	(2.705)	0.317	0.639	1.228	0.59	0.317
IDG	0.057	0.22	0.166	0.001	0.15	0.095	(0.056)	0.141
OG	0.229	0.28	0.049	0.827	0.511	0.318	(0.193)	0.514
SV	0.084	0.32	0.235	0.009	0.257	0.21	(0.047)	0.602
Malmquist Index								
CG	0.153	0.14	(0.027)8	0.001	0.017	0.003	(0.015)*	0.033
HC	2.715	0.01	(2.705)	0.317	0.361	0.3	(0.061)	0.317
IDG	0.176	0.37	0.121	0.958	0.021	0.033	0.012	0.705
OG	0.574	0.62	0.045	0.827	0.046	0.064	0.018	0.817
SV	0.182	0.31	0.132	0.346	0.019	0.005	-0.013	0.18
Bidder Companies Catch-up								
CG	0.085	0.17	0.089	0.32	0.091	0.075	(0.017)	0.101
HC	0.989	0.99	0.005	0.20	1.509	0.429	(1.08)	0.110
IDG	0.13	0.09	(0.042)*	0.038	0.141	0.124	(0.018)	0.382
OG	0.333	0.49	0.158	0.70	0.375	0.323	(0.053)	0.400
SV	0.238	0.25	0.013	1.00	0.198	0.199	0.001	0.841
Frontier shit								
CG	0.107	0.06	(0.051)*	0.001	0.072	0.079	0.008	0.101
HC	2.512	0.18	(2.332)	0.121	0.663	1.333	0.67	0.431
IDG	0.192	0.11	(0.080	0.105	0.141	0.127	(0.014)	0.382
OG	0.181	0.25	0.068	0.7	0.303	0.345	0.041	0.4
SV	0.11	0.18	0.074	0.062	0.204	0.202	(0.003)	0.841
Malmquist Index								
CG	0.117	0.06	(0.053)*	0.034	0.009	(0.033)	(0.011)*	0.016
HC	2.512	0.18	(2.332)	0.314	0.337	0.301	(0.036)	0.321
IDG	0.195	0.12	(0.073)	0.328	0.003	(0.020)	(0.005)	0.067
OG	0.181	0.36	0.175	0.4	0.033	(0.010)	(0.045)	0.1
SV	0.11	0.24	0.131	0.151	(0.003)	(0.020)	0.002	0.161

Notes: This Table shows data extracted from the Industries Malmquist index of both the selected bidder and Non-Merging companies, under DEA and SFA based on available data before and after M&As, with Mann Whitney U-test. *Indicates 5 percent Mann Whitney Significance.

The selected non-merging companies' results from DEA and SFA models indicate a significant decline in the consumer group MPI. This is caused by frontier shift and catch-up significant decline respectively. Even with the emerged competitive market following M&As, selected non-merging companies did not record any significant improvement; instead, those industries under the consumer group were most affected by the significant decline in productivity in the long-term, while others remained stagnant. The industry effect result showed that M&A deals did not stimulate productivity growth in the selected non-merging companies, while the selected bidder companies recorded a significant decline after M&As, as evidenced by the consumer group. The industry result also reveals a non-significant productivity improvement in the selected bidder and non-merging companies after M&As in the long-term in Nigeria. Therefore, the hypothesis *HA7* was rejected.

Table 4.33: Summary of Selected Interval Further Results, Hypothesis 4 to Hypothesis 7, with Mann Whitney U-test Significance

Interval	OP(RIV) H:4	TE(DEA) H:5	TE(SFA)	CE(DEA) H:6	CE(SFA)	MPI(DEA) H:7	MPI(SFA)
Bidder	(2.01)*	(0.0028)*	(0.027)*	(0.004)	0.007*	(0.0074)	(0.0012)
	(0.42)*	0.0016	(0.008)	(0.002)	0.012*	(0.013)*	(0.0016)*
	(3.76)*	(0.002)*	(0.0011)*	0.002*	0.001*	(0.0087)*	(0.006)
Target	0.05	(0.0045)*	0.0007*	(0.001)	0.002*	0.0039	0.0024
	1.14	(0.003)	0.0014	0.001	0.006*	(0.0078)	0.0009
	1.12	(0.0062)*	(0.0018)*	0.005*	0.012*	(0.009)	(0.0011)
Non-Merging	1.9*	0.0038	0.0011	0.0059*	0.0009*	(0.0073)	(0.0047)
	1.51	0.0057*	0.001*	0.0068*	0.0014*	0.006	(0.0025)
	(2.1)*	0.0066*	0.005*	0.0056*	0.0017*	(0.0248)	(0.0113)

Notes: * indicates 5 percent Mann Whitney U-test significance

Table 4.34: Summary of Selected Industry Further Results, Hypothesis 4 to Hypothesis 7, with Mann Whitney U-test Significance

Company	Industry	OP(RIV) H:4	TE(DEA) H:5	TE(SFA)	CE(DEA) H:6	CE(SFA)	MPI(DEA) H:7	MPI(SFA)
Bidder	CG	(1.91)*	(0.001)	(0.005)	0.026*	0.018*	(0.053)*	(0.0114)*
	HC	(7.18)*	(0.529)*	(0.082)*	(0.649)	0.044	(2.3317)	(0.0028)
	IND	(2.09)*	0.002	(0.01)	(0.028)	0.022	(0.0732)	(0.0048)
	OG	6.68	(0.012)	(0.03)	0.133	0.034	0.1748	(0.0447)
	SV	(2.75)*	0.001	(0.007)	0.084*	0.029*	0.1315	0.0017
Target	CG	0.7	(0.008)	(0.003)	0.002*	0.027*	0.0146	0.0005
	HC	(14.61)	(0.093)*	(0.017)*	0.05	0.297	(0.4325)	(0.0015)
	IND	1.38	(0.023)	(0.003)	(0.001)	0.047	0.0713	0.0027
	OG	8.74	(0.117)	(0.029)	0.037*	0.098*	0.9441	0.1345
	SV	(0.86)	(0.036)	(0.016)	0.012*	0.082*	(0.3949)	(0.0047)
Non-Merging	CG	1.55	(0.0102)	0.0019	0.0182*	0.0025*	(0.027)	(0.015)
	HC	0.81	(0.468)	0.022	0.0235	0.0388	(2.705)	(0.061)
	IND	0.94	0.001	0.003	0.0213*	0.0058*	0.121	0.012
	OG	1.85	(0.024)	0.0143	0.0556*	0.0141*	0.045	0.018
	SV	0.64	0.0092	0.0054	0.0083*	0.0092*	0.132	(0.013)

Notes: * indicates 5 percent Mann Whitney U-test significance. Operating performance (OP) interval and industry are *H:4* is for the selected bidder, target, and non-merging companies. Technical efficiency (TE) interval and industry are *H:5 is* for the selected bidder, target, and non-merging companies. Cost efficiency (CE) interval and industry are *H:6* is for the selected bidder, target, and non-merging companies.

Productive efficiency (PE) interval and industry are *H:7* is for the selected bidder, target, and non-merging companies. F/shift is for the frontier shift.

The summary chart, with all the hypotheses and component measures of further analysis, interval, and industry, and with the alternative theoretical hypotheses, is presented in Table 4.35 below. The models used in evaluating each hypothesis and the findings (supported or rejected) are also included Table 4.35 below.

Table 4.35: Further Analysis Summarized Results of Selected Interval and Industry M&As with Hypothesis, Models and Significant

	Hypothesis Statements	Mean Increase/ decrease after M&A	Significant /Not significant	Models	Find ings
Operating performance (*HA4*)	*HA4:* There are significant differences (declined or improvement) in operating performance of selected 30 bidders, 30 target and 30 non-merging companies of long-term performance of M&As interval and industry				
Bidder (Interval)	1Year Before &1Year After 2Year Before &2Year After 3Year before &3Year after	-2.01 -0.42 -3.76	Sig. Sig. Sig.	RIV & MWU RIV & MWU RIV & MWU	S S S
Target (interval)	1Year Before &1Year After 2Year Before &2Year After 3Year before &3Year after	0.05 1.14 1.12	Not Sig. Not Sig. Not Sig.	RIV & MWU RIV & MWU RIV & MWU	NS NS NS
Non-Merging (interval)	1Year Before &1Year After 2Year Before &2Year After 3Year before &3Year after	1.90 1.51 -2.10	Sig. Not Sig. Sig.	RIV & MWU RIV & MWU RIV & MWU	S NS S
Bidder (Industry)	Consumer Health Care Industrial Oil and Gas Services	-1.91 -6.83 -2.09 6.68 -2.75	Sig. Sig. Sig. Not Sig. Sig.	RIV & MWU RIV & MWU RIV & MWU RIV & MWU RIV & MWU	S S S NS S
Target (Industry)	Consumer Healthcare Industrial Oil and gas Services	11.52 13.83 5.27 12.53 -1.5	Not Sig. Not Sig. Not Sig. Not Sig. Not Sig.	RIV & MWU RIV & MWU RIV & MWU RIV & MWU RIV & MWU	NS NS NS NS NS
Non-Merging (Industry)	Consumer Healthcare Industrial Oil and gas Services	1.55 0.81 0.94 1.85 0.64	Not Sig. Not Sig. Not Sig. Not Sig. Not Sig.	RIV & MWU RIV & MWU RIV & MWU RIV & MWU RIV & MWU	NS NS NS NS NS
Technical Efficiency (*HA5*)	*HA5:* There are significant differences (declined or improved) in technical efficiency of selected 30 bidders, 30 targets and 30 non-merging companies of long-term performance of M&As interval and industry				
Bidder (Interval)	1Year Before &1Year After 2Year Before & 2year after 3Year before &3Year after	-0.004 0.0016 -0.002	Sig. Not Sig. Sig.	DEA, SFA&MWU DEA, SFA &MWU DEA, SFA&MWU	S NS S
Target (Interval)	1Year Before &1Year After 2Year Before &2Year After	-0.0045 -0.003	Sig. Not Sig.	DEA, SFA&MWU DEA, SFA &MWU	S NS

	3Year before &3Year after	-0.0062	Sig.	DEA,SFA &MWU	S
Non-Merging (interval)	1Year Before &1Year After 2Year Before &2Year After 3Year before &3Year after	0.0038 0.0057 0.0066	Not Sig. Sig. Sig.	DEA, SFA &MWU DEA, SFA &MWU DEA, SFA &MWU	NS S S
Bidder (Industry)	Consumer Healthcare Industrial Oil and gas Services	-0.001 -0.529 0.002 -0.012 0.001	Not Sig. Sig. Not Sig. Not Sig. Not Sig.	DEA, SFA&MWU DEA, SFA, &MWU DEA, SFA, &MWU DEA, SFA&MWU DEA,SFA &MWU	NS S NS NS NS
Target (industry)	Consumer Healthcare Industrial Oil and gas Services	-0.008 -0.093 -0.023 -0.117 -0.036	Not Sig. Sig. Not Sig. Not Sig. Not Sig.	DEA, SFA&MWU DEA, SFA&MWU DEA.SFA&MWU DEA, SFA&MWU DEA,SFA &MWU	NS S NS NS NS
Non-Merging (industry)	Consumer Healthcare Industrial Oil and gas Services	-0.0102 -0.468 0.0001 -0.024 0.0092	Not Sig. Not Sig. Not Sig. Not Sig. Not Sig.	DEA, SFA&MWU DEA, SFA&MWU DEA, SFA&MWU DEA, SFA&MWU DEA,SFA&MWU	NS NS NS NS NS
Cost Efficiency (*HA6*)	*HA6*: There are significant differences (declined or improved) in the cost efficiency of selected 30 bidders, 30 targets and 30 non-merging companies of long-term performance of M&As interval and industry				
Bidder (Interval)	1Year Before &1Year After 2Year Before &2Year After 3Year before &3Year after	0.007 0.012 0.001	Sig. Sig. Sig.	SFA, DEA& MWU SFA, DEA& MWU SFA,DEA& MWU	S S S
Target (interval)	1Year Before &1Year After 2Year Before &2Year After 3Year before &3Year after	0.002 0.006 0.012	Sig. Sig. Sig.	SFA, DEA& MWU SFA, DEA& MWU SFA,DEA& MWU	S S S
Non-Merging (interval)	1Year Before &1Year After 2Year Before &2Year After 3Year before &3Year after	0.0009 0.0014 0.0017	Sig. Sig. Sig.	SFA, DEA& MWU SFA, DEA& MWU SFA,DEA& MWU	S S S
Bidder (Industry)	Consumer Healthcare Industrial Oil and gas Services	0.018 0.044 0.022 0.034 0.029	Sig. Not Sig. Not Sig. Not Sig. Sig.	SFA, DEA& MWU SFA, DEA& MWU SFA, DEA& MWU SFA, DEA& MWU SFA,DEA& MWU	S NS NS NS S
Target (Industry)	Consumer Healthcare Industrial Oil and gas Services	0.027 0.297 0.047 0.098 0.082	Sig. Not Sig. Not Sig. Not Sig. Sig.	SFA, DEA& MWU SFA, DEA& MWU SFA, DEA& MWU SFA, DEA& MWU SFA,DEA& MWU	S NS NS NS S
Non-Merging (Industry)	Consumer Healthcare Industrial Oil and gas Services	0.0025 0.0388 0.0059 0.0141 0.0092	Sig. Not Sig. Sig. Sig. Sig.	SFA, DEA& MWU SFA, DEA& MWU SFA, DEA& MWU SFA, DEA& MWU SFA,DEA& MWU	S NS S S S
Malmquist Productivity Index (MPI) Interval (*HA7)*	*HA7*: There are significant differences (declined or improvement) in productivity efficiency of selected 30 bidders, 30 targets and 30 non-merging companies of long-term performance of M&As interval and industry				
Bidder (interval)	1Year Before &1Year After 2Year Before &2Year After 3Year before &3Year after	-0.0074 -0.0131 0.0087	Not Sig. Sig. Not Sig.	DEA, SFA, MPI&MWU DEA, SFA, MPI&MWU DEA,SFA, MPI &MWU	NS NS NS
Target (Interval)	1Year Before &1Year After 2Year Before &2Year After 3Year before &3Year after	0.0039 -0.0078 -0.009	Not Sig. Not Sig. Not Sig.	DEA, SFA, MPI&MWU DEA, SFA, MPI&MWU DEA,SFA, MPI &MWU	NS NS NS
Non-Merging (Interval)	1Year Before &1Year After 2Year Before &2Year After 3Year before &3Year after	-0.0073 0.006 -0.0248	Not Sig. Not Sig. Not Sig.	DEA, SFA, MPI&MWU DEA, SFA, MPI&MWU DEA,SFA, MPI &MWU	NS NS NS
Bidder	Consumer	-0.0529	Sig.	DEA, SFA, MPI&MWU	S

(Industry)	Healthcare	-2.3317	Not Sig.	DEA, SFA, MPI&MWU	NS
	Industrial	-0.0732	Not Sig.	DEA, SFA, MPI&MWU	NS
	Oil and gas	0.1748	Not Sig.	DEA, SFA, MPI&MWU	NS
	Services	0.1315	Not Sig.	DEA,SFA, MPI &MWU	NS
Target (industry)	Consumer	0.0146	Not Sig.	DEA, SFA, MPI&MWU	NS
	Healthcare	-1.4325	Not Sig.	DEA, SFA, MPI&MWU	NS
	Industrial	0.0713	Not Sig.	DEA, SFA, MPI&MWU	NS
	Oil and gas	0.9441	Not Sig.	DEA, SFA, MPI&MWU	NS
	Services	-0.3949	Not Sig.	DEA,SFA, MPI &MWU	NS
Non-Merging (Industry)	Consumer	-0.027	Not Sig.	DEA, SFA, MPI &MWU, DEA, SFA, MPI &MWU	NS
	Healthcare	-2.705	Not Sig.		NS
	Industrial	0.121	Not Sig.		NS
	Oil and gas	0.045	Not Sig.	DEA, SFA, MPI, MWU	NS
	Services	0.132	Not Sig.	DEA, SFA, MPI, MWU	NS
				DEA, SFA,MPI,&MWU	

Source: Developed from Study Results based on Hypothesis

Table 4.36: The Research General Result Summary

Selected 30		OP(RIV)	TE(DEA)	TE(SFA)	CE(DEA)	CE(SFA)	H7	MPI(DEA)	MPI(SFA)
Bidder		H4	H5		H6		CA-up	(0.0351)	(0.0017)
							F/S	(0.0404)*	(0.0013)*
(H:1)		(1.43)*	(0.007)*	(0.004)*	0.009*	0.0015*	MPI	(0.323)*	(0.0016)*
Interval		(2.01)*	(0.0028)*	(0.0273)*	(0.004)	0.007*		(0.0074)	(0.0012)
		(0.42)*	0.0016	(0.008)	(0.002)	0.012*		(0.013)*	(0.0016)*
		(3.76)*	(0.002)*	(0.0011)*	0.002*	0.001*		0.0087	(0.006)
Industry	CG	(1.91)*	(0.0001)	(0.005)	0.026*	0.018*		(0.053)*	(0.0114)*
	HC	(7.18)*	(0.529)*	(0.082)*	(0.649)	0.044		(2.3317)	(0.0028)
	IND	(2.09)*	0.002	(0.01)	(0.028)	0.022		(0.0732)	(0.0048)
	OG	6.68	(0.012)	(0.03)	0.133	0.034		0.1748	(0.0447)
	SV	(2.75)*	0.001	(0.007)	0.084*	0.029*		0.1315	0.0017
Selected 30							CA-up	(0.017)	0.0024
Non-merging							F/Shift	0.0063	0.0023
(H:3)		(1.74)	0.0062*	0.004*	0.0058*	0.0013*	MPI	(0.015)	0.0008
Interval		1.9*	0.0038	0.0011	0.0059*	0.0009*		(0.0073)	(0.0047)
		1.51	0.0057*	0.001*	0.0068*	0.0014*		0.006	(0.0025)
		(2.1)*	0.0066*	0.005*	0.0056*	0.0017*		(0.0248)	(0.0113)
Industry	CG	1.55	(0.0102)	0.0019	0.0182*	0.0025*		(0.027)	(0.015)
	HC	0.81	(0.468)	0.022	0.0235	0.0388		(2.705)	(0.061)
	IND	0.94	0.001	0.003	0.0213*	0.0058*		0.121	0.012
	OG	1.85	(0.024)	0.0143	0.0556*	0.0141*		0.045	0.018
	SV	0.64	0.0092	0.0054	0.0083*	0.0092*		0.132	(0.013)
Selected 30							CA-up	(0.1301)	0.0048
Target							F/Shift	0.0259	(0.0075)
(H:2)		2.57	(0.0066)*	(0.001)*	0.0023*	0.0002*	MPI	0.0116	0.0025
Interval		0.05	(0.0045)*	0.0007*	(0.001)	0.002*		0.0039	0.0024
		1.14	(0.003)	0.0014	0.001	0.006*		(0.0078)	0.0009
		1.12	(0.0062)*	(0.0018)*	0.005*	0.012*		(0.009)	(0.0011)
Industry	CG	0.7	(0.008)	(0.003)	0.002*	0.027*		0.0146	0.0005
	HC	(14.61)	(0.093)*	(0.017)*	0.05	0.297		(0.4325)	(0.0015)
	IND	1.38	(0.023)	(0.003)	(0.001)	0.047		0.0713	0.0027
	OG	8.74	(0.117)	(0.029)	0.037*	0.098*		0.9441	0.1345
	SV	(0.86)	(0.036)	(0.016)	0.012*	0.082*		(0.3949)	(0.0047)

Notes: NM Denotes Non-Merging company, F/Shift Denoted Frontier shift, MPI: Denoted Malmquist Productivity Index, H:1, H:2, H:3, H:4, H:5, H:6, H:7 denotes hypothesis 1 to hypothesis 7 respectively, *denoted 5 percent Mann Whitney significance test. CA: denotes catch-up, F/Shift: Denotes Frontier shift, MPI: Malmquist productivity Index.

The general result summarized in Table 4.36 above indicates few significant differences between results obtained from DEA and SFA models. The explanations of literature justifying likely causes are discussed in Section 5.4.1.

4.10 Cost Efficiency Normality Test Results Analysis

Shapiro-Wilk's test ($p>0.05$) (Shapiro & Wilk, 1965; Razali & Wah, 2011) and a visual inspection of their histograms, normal Q-Q plots, and box plot showed that the CE data was not in any way normally distributed before and after M&As: skewness of (I)TA: 2.646 (SE=0.254), kurtosis:8.419(SE=0.254); Skewness (C)TA:1.298 (SE=0.254), Kurtosis:1.170 (SE=0.503), Skewness I(LC):2.063(SE=0.254), kurtosis :3.204 (SE=0.503), Skewness (C)LC:9.451 (SE=0.254),kurtosis: 89.534(SE=0.503), Skewness(I)CS:2.044(SE=0.254), kurtosis: 3.447(SE=0.503),. None of these skewness and kurtosis results were less than 3.00 or in the range of -1.96 to +1.96. Skewness(C)CS:3.853(SE=0.254), Kurtosis:16.267 (SE=0.503). The Shapiro-Wilks's results were significant for all the variables [I(TA), C(TA), I(LC), C(LC), I(CS), C(CS)]; thus, none of the variables were above 0.05 to be classified or assumed as normal distribution.

Table 4.36a: Normality Test Results Analysis

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig	Statistic	df	Sig.
(I)TA	0.288	90	0.000	0.634	90	0.000
(C)TA	0.149	90	0.000	0.866	90	0.000
I(LC)	0.296	90	0.000	0.636	90	0.000
(C)LC	0.478	90	0.000	0.107	90	0.000
(I)CS	0.332	90	0.000	0.622	90	0.000
(C)CS	0.264	90	0.000	0.533	90	0.000
	a. Lilliefors Significance Correction					

4.10a Reliability Analysis

The degree of inner reliability, that is, how carefully the associated questions, set of variables, or items are as a set of measuring construct is what Cronbach's alpha (CA) measures. Reliability implies the consistency of measures or that the observed variable measures the accurate value and is consequently error-free. The data of the bidder companies before and after M&As in evaluating CE in Nigeria's' long-term M&As performance was analyzed for reliability using Cronbach Alpha (CA). The analysis showed a CA value of 0.70 for the before data and 0.73 for the after M&As data. The generally accepted range of CA value at a sufficient level of reliability is that which falls between 0.60 and 0.70 (Hulin, Netemeyer, & Cudeck, 2001).

An alpha value of 0.80 or greater is considered very good. Therefore, the CA for this study showed evidence of results reliability before and after M&As in evaluating CE. Using the respective variables: NOPAT (NO) as output, total assets (TA), cost of total assets (CTA), labor (LA), cost of labor (CLA). In addition, the cost of sales (CS) and price of cost of sales (PCS) as input variables in evaluating CE. This is because none of the variables have a Cronbach alpha less than 0.10 or 0.20, which could have been considered removing or dropping from the variables. The Cronbach alpha Tables 4.37 before and Table 4.38 after are presented below, while Cronbach's analysis is in Appendix H.

Table 4.37: Selected Cost Efficiency Reliability Analysis (SFA Model) after M&As

Cronbach's Alpha	Cronbach's Alpha Based on Standardized items	No of items
0.70	0.85	7

	Item-Total Statistics	
Variable	Scale Mean if item is Deleted	Cronbach's Alpha if item is deleted
TA	11.36	0.70
CTA	1156	0.72
LA	8.73	0.52
CLA	11.57	0.72
CS	9.67	0.56
PCS	10.16	0.68
NO	6.37	0.66

Notes: The Cronbach alpha SPSS output is at Appendix H for references

Table 4.38: Selected Cost Efficiency Reliability Analysis (SFA Model) after M&As

Cronbach's Alpha	Cronbach's Alpha Based on Standardized items	No of items
0.73	0.82	7

	Item-Total Statistics	
Variable	Scale Mean if item is Deleted	Cronbach's Alpha if item is deleted
TA	22.09	0.62
CTA	26.47	0.75
LA	20.34	0.64
CLA	26.47	0.75
CS	21.37	0.60
PCS	26.47	0.75
NO	15.61	0.73

Notes: The Cronbach alpha SPSS output is at Appendix H for references

4.11 Chapter Conclusion

This chapter has discussed the results of the long-term performance of NHV M&A companies (bidder and target) and their non-merging rival companies in Nigeria. Furthermore, this chapter mentioned the OP, TE, CE, and PE results of the companies in relation to the three M&A theories discussed in Chapter 2. The efficiency theory (synergy) refers to value maximization. In this case, the shareholders of the bidder and target companies are expected to benefit in the form of equity value increase or improvement in dividend payment, returns on investment, or both. As a result of significant performance from the companies after M&A activities, expected synergy should have been realized over a long time, since efficiency realization is a long term achievement. This hypothesis is how capital market studies posit that stock values of M&As companies improve after the transaction. If this is true and M&As create value, then the improvement should relate to the company's performance that should reflect in any of the measures (OP, TE, CE, or PE) after the M&As in the long-term.

The agency and hubris theories relate to non-value maximization. Agency acts out of personal interest, meaning that an M&A transaction is not for the benefit of the bidder shareholders but for personal interest. For the hubris hypothesis, M&A occurs out of pride to pay a premium for the target companies, resulting in a similar non-value maximization for the bidder company's shareholders.

The OP, TE and PE significantly declined for the bidder companies after M&As. The target companies' TE declined significantly but showed a non-significant improvement in productivity. On the other hand, M&As' efficiency theory is

about the merging (bidder and target) companies' benefit that is obtained in CE. The non-merging companies improved in CE and TE significantly, indicating a positive TE spillover effect. Thus, none of the three theories specifically can be held responsible for the significant measures' decline among the bidder and target companies, as it could be the contribution of the agency or hubris theory or both. Nonetheless, NHV M&As must be encouraged for future M&As. This can be done through the bidder companies' due diligence before, during and after M&A activity in Nigeria.

CHAPTER 5

DISCUSSION AND CONCLUSION

5.1   Introduction

This chapter presents the summary of the statistical analysis results from Chapter 4. The discussions of the major findings related to the study hypothesis and supporting literature are included. The chapter concludes by outlining policy implications, limitations of the study, and recommendations for future research.

5.2 Summary of Statistical Analysis

The statistical analysis summary is presented below based on the measured variables, namely operating performance (OP), technical efficiency (TE), cost efficiency (CE), and productivity efficiency (PE).

5.2.1 Operating Performance (OP)

Using the RIV method, the study's robustness check showed that the OP of the selected 30 bidder companies significantly declined three years after M&A activities. During the intervals, the bidder companies experienced a significant decline in OP one year, two years, and three years after M&As. The selected

bidder companies' in the oil and gas sector were the only ones that did not experience a significant OP decline when the industry was considered. The 30 selected target companies' OP, after three years of M&A, improved non-significantly or stagnated. The non-significant OP result for target companies was noted both when intervals and industries were considered. The selected 30 non-merging companies' OP after three years declined non-significantly or stagnated. There was a significant interval improvement one year after M&As among non-merging companies and a non-significant improvement two years after, but a significant decline at the three-year interval after M&A activities. The selected non-merging companies' OP results by industry did not indicate any significant improvement within the period.

5.2.2 Technical Efficiency (TE)

The selected bidder companies' TE results, using the DEA model after three years of M&As, showed a significant decline. The TE decline was experienced at the intervals of one year and three years after M&As were signed. When industry was considered, healthcare and consumer sectors' bidders experienced a more significant decline in TE. The TE of oil and gas companies declined non-significantly, while industrial and services sectors improved non-significantly or stagnated. The selected target companies' TE significantly declined three years after M&A activities. This decline was shown one year and three years after M&As but was not significant two years after.

The selected non-merging companies' TE significantly improved after three years of M&As. This was evident at the two- and three-year intervals after

M&As but not at the one year mark. When industry was considered, there was no significant decline or improvement among the selected non-merging companies' TE results.

5.2.3 Cost Efficiency (CE)

The CE of the selected bidder companies significantly improved three years after M&As, according to the results of the SFA model, which was seen at all three intervals. When the industry sector of the bidder companies was considered, the consumer and services sectors experienced a significant improvement in CE, while other sectors' CE performance displayed non-significant improvement. The selected target companies' CE after three years of M&A activities improved significantly, even when the intervals were considered. When industry was considered, the CE of companies in the consumer, oil and gas, and services sectors significantly improved, while those in the healthcare and industrial sectors improved non-significantly. The selected non-merging companies' CE after three years of M&As significantly increased; this was noted during all the intervals as well. The industry CE of the selected non-merging companies result indicated significant improvement in the consumer, industrial, oil and gas, and service sectors, but non-significant improvement in the healthcare sector.

5.2.4 Productivity Efficiency (PE)

The PE of the selected bidder companies' as per the MPI results declined significantly after three years of M&As in Nigeria. The major contributor of the decline was technological change while technical efficiency decline was non-significant. The significant decline in technological change was repeated at all intervals, causing a non-significant stagnation in MPI and technical efficiency. This PE result reveals that technological change is the major determinant of any productivity improvement in Nigeria when considering the entire NHV M&A sector. The non-significant improvement in selected bidder companies' MPI results were present during intervals as well as industries. The selected target companies' MPI results after three years of M&As improved non-significantly or stagnated, both when intervals and industries were considered. Moreover, the selected non-merging companies' MPI results after three years M& declined non-significantly, also during the intervals and when the industry was considered.

5.3 Discussions of Major Findings

The major findings of this study are discussed in the following sub-sections with regard to the study hypotheses and the support of past research.

5.3.1 Major Hypothesis

HA1: Supported

The operating performance, technical efficiency, cost efficiency, and productivity of selected 30 bidder companies are significantly different before and after the estimation period of long-term performance of M&As (*HA*: Md before ≠ Md after).

HA1a: Supported

The operating performance of selected 30 bidder companies is significantly different before and after the estimation period of long-term performance of M&As, using the RIV and MWU approaches.

Past studies that reported a significant decline in the OP of bidder companies after M&As lend support to our empirical findings. These studies include that of Banerjee et al. (2014), Aggelopoulou and Georgopoulos (2015), Rao-Nicholson, Salaber, and Cao (2016), Aik et al. *(*2015) and Michal (2017), Other studies that indicated promising results were Onikoyi and Awolusi (2014) and Alexandridis, Antypas, and Travlos (2017).

HA1b: Supported

The technical efficiency of selected 30 bidder companies is significantly different before and after the estimation period of long-term performance of M&As, using the DEA model and the MWU.

The results on TE that indicated no significant improvement, but a decline of the bidder companies after M&As are supported by the works of Chen, Kao, and Lin

(2011) and Dong, Qiao, and Yang (2015). Those that reported enhanced bidder companies' TE include Kutlar, Kabasakal, and Babacan (2015) and Rani et al. (2015).

HA1c: Supported

The cost efficiency of selected 30 bidder companies is significantly different before and after the estimation period of long-term performance of M&As, using the SFA model and the MWU.

The finding on the improved CE of bidder companies' after M&As is consistent with the research of Awan, Alishah, and Hassan (2016) and Chortareas, Kapetanios, and Ventouri (2016), while Gudmundsson, Merkert, and Redondi (2017) and Gunes and Yildirim (2017) reported no significant improvement.

HA1d: Supported

The productivity efficiency of selected 30 bidder companies is significantly different before and after the estimation period of long-term performance of M&As, using the MPI and MWU approaches.

In related prior research, Arijomamdi (2012) and Fatemi, Fooladi, and Garehkoolchian, (2017) found a significant decline in the MPI of bidder companies after M&A activities, thus supporting the present result. Natarajan and Simons (2015) and Ringel and Choy (2017), however, indicated an improvement in PE after M&A.

HA2: Partially Supported

The operating performance, technical efficiency, cost efficiency and productivity of selected 30 target companies are significantly different before and after the estimation period of long-term performance of M&As.

HA2a: Rejected

The operating performance of selected 30 target companies is significantly different before and after the estimation period of long-term performance of M&As, using the RIV and MWU approaches.

HA2b: Supported

The technical efficiency of selected 30 target companies is significantly different before and after the estimation period of long-term performance of M&As using the DEA model and the MWU.

HA2c: Supported

The cost efficiency of selected 30 target companies is significantly different before and after the estimation period of long-term performance of M&As, using the SFA model and the MWU.

HA2d: Rejected

The productivity efficiency of selected 30 target companies is significantly different before and after the estimation period of long-term performance of M&As, using the MPI and MWU approaches.

Past studies findings on the lack of improvement in target companies' OP, TE, and PE after M&As support our results, for example Pervan, Višić, and Barnjak (2015) from Croatia. While the results of Teti and Tului (2020), Filipović (2012), and Vretenar (2011) showed an improvement in the target companies' performance after M&As.

HA3: Partially Supported

The operating performance, technical efficiency, cost efficiency and productivity of selected 30 non-merging companies are significantly different before and after the estimation period of long-term performance of M&As.

HA3a: Rejected

The operating performance of selected 30 non-merging companies is significantly different before and after the estimation period of long-term performance of M&As, using the RIV and MWU approaches.

HA3b: Supported

The technical efficiency of selected 30 non-merging companies is significantly different before and after the estimation period of long-term performance of M&As using the DEA and MWU.

HA3c: Supported

The cost efficiency of selected 30 non-merging companies is significantly different before and after the estimation period of long-term performance of M&As, using the SFA model and the MWU.

HA3d: Rejected

The productivity efficiency of selected 30 non-merging companies is significantly different before and after the estimation period of long-term performance of M&As, using the MPI and MWU approaches.

Aik, Hassan, Hassan, and Mohamed (2015) reported a better improvement in the non-merging companies' OP and PE than bidder companies in Malaysia. This supports our results that the non-merging companies performed better than the bidder companies in terms of TE, resulting in a positive spillover effect onto OP and PE.

Therefore, with respect to the major hypotheses *HA1, HA2,* and *HA3*, about 70 percent of the results supported the hypotheses. According to the M&A efficiency theory, for a value-maximizing M&A, both the bidder's and target's shareholders should benefit. The value maximization performance implies a significant improvement in the performance measures (e.g., OP, TE, CE, PE) of companies involved in the M&A activity. The CE of the selected 30 bidders, 30 targets, and even 30 non-merging companies were found to significantly improve after M&A activities. Thus, the results support the efficiency theory that this study is based upon. The significant improvement of the selected 30 non-merging companies' TE further confirmed a positive spillover effect.

The non-significant improvement in other performance measures (OP, TE, and PE) for the merging companies could be attributed to either agency or hubris theory or both, before, during, and after the M&A deals. However, in the Nigerian context, this study's results on the PE and TE are indirectly related to the company's OP after M&As, which identified technological change as a major

contributor to productivity decline. The indirect association of the significant decline in OP with the decline in TE and PE is because it is highly unlikely that OP can be significantly improved while TE and PE are decreasing. Consequently, OP, TE, and PE all work together for collective improvement in M&As companies' performance.

Possible differences from past research results in terms of OP, TE, CE, and PE could be due to the different sample, the methods applied, as well as the country-specific external environmental conditions. These could apply to the selected bidder, target, and non-merging companies. According to Krishnakumar and Sethi (2012), the method of M&A performance evaluation could be established based on the country of study, but is more meaningful when tailored to the aspects under examination, which are efficiency, OP, PE, and stock market perception.

5.3.1.1 Further Analysis of Selected Interval and Industry Evaluation after M&As

HA4: There are significant differences in the operating performance of selected 30 bidders, 30 targets, and 30 non-merging companies' long-term performance of M&As by intervals and industry.

The selected bidder companies' OP interval results supported this hypothesis while the selected target companies' interval OP results did not, as there was no significant improvement but stagnation. The selected non-merging companies' OP intervals hypothesis result was supported one year after M&As, while the three-year interval showed a significant decline and two years showed non-

significant improvement; thus, it was not fully supported. The selected bidder companies' industry OP results was supported under consumer, healthcare, industrial, and services sectors but not in oil and gas. The selected target companies' and non-merging companies' industry OP results were not supported by the findings.

HA5: There are significant differences in the technical efficiency of selected 30 bidders, 30 target and 30 non-merging companies' long-term performance of M&As by intervals and industry.

The selected bidder companies' TE interval results support this hypothesis at the one and three year mark but not at two years after M&As, which was similar to results for the target companies' TE at these intervals. The selected non-merging companies' interval results on TE supports the hypothesis at two and three years after M&As. The selected bidder companies' industry TE findings supported this hypothesis in healthcare, but not in other sectors of the industry. Likewise, only healthcare was supported in the target companies' industry TE result, while the non-merging companies' results did not support the hypothesis.

HA6: There are significant differences in the cost efficiency of selected 30 bidders, 30 targets, and 30 non-merging companies' long-term performance of M&As by intervals and industry.

The selected bidder, target, and non-merging companies' interval CE results supported the hypothesis at all intervals. For the industry CE results, the selected bidder and target companies' results were supported by the consumer and services sectors, while for the selected non-merging companies' industry CE, the hypothesis was supported in all sectors except for healthcare.

HA7: There are significant differences in the productivity of selected 30 bidders, 30 targets, and 30 non-merging companies' long-term performance of M&As by intervals and industry.

For the selected bidder companies' interval MPI results, the hypothesis was supported two years after M&As with a significant decline in frontier shift (technological change) causing MPI stagnation, while the target and non-merging companies' interval MPI results did not support the hypothesis. For the selected bidders, the MPI results supported the hypothesis in the consumer sector only; for target and non-merging companies, the MPI results did not support the hypothesis.

Past studies interval and industry results, such as by Aik (2010) in Malaysia, indicated that the OP of non-merging companies improves within a short interval (one year) and is better than the bidder companies within the interval, which supports our results for intervals as well as industry. This was also applicable to the target companies' non-significant improvement in OP. His result showed no TE improvement by the merging companies, which again supports our findings. Furthermore, as in our study, the non-merging companies did better in TE. In productivity, the non-merging companies performed better than bidders, equally supporting our results.

Therefore, while 70 percent of the main hypotheses were supported by the empirical findings, about 60 percent of the further analysis hypotheses were supported as a secondary consideration of significance in NHV M&A performance.

5.4 Implications of the Study

This study examined the long-term performance of NHV M&A companies' in terms of OP, TE, CE, and PE and compared them to their non-merging competitors in Nigeria. Voluntary M&As' performance evaluation has been unnoticed since the 1990s, even when in existence and increasing in volume and value. NHV M&As are one of the largest capitalized sectors at the NSE and have higher stock market trading values than others in the non-financial group not involving in M&As. Thus, this study has uniquely important contributions to companies and Nigeria as a whole.

In the study, initially, the RIV and EVA methodologies were applied in a pilot study analysis to evaluate the OP of the selected merging companies' (bidder and target) before arriving at RIV as the most suitable method. Post-M&A OP literature from other African countries, including Nigeria, have scarcely applied the residual income methodology in research, even in involuntary MAs or voluntary non-financial horizontal M&As that are market driven in the long term. It is worth noting that the RIV approach, as applied in the study, is better and more suitable for Nigeria's high inflation context. Therefore, the RIV methodology applied in evaluating the M&As' OP is a unique and significant methodological contribution of this study. Furthermore, a comparative methodological approach at the pilot study analysis level is rare, but is necessary as it leads to a logical method selection with empirical and logical reasoning based on a litmus test of country-specific external environmental conditions.

Next, the period of study from 1991 to 2020 is fairly current and therefore has a significant practical contribution to the post-M&A long-term performance

literature in Nigeria. This is because other researchers will now know both practically and empirically what has been investigated in Nigeria's long-term market-driven post-M&A context. This study outcome, being the first, is a practical reference material for long-term NHV M&As in Nigeria. It also offers information to future researchers, investors, and M&A practitioners in other economies or regions on how to draw well-informed decisions based on empirical results about post voluntary M&A activity.

The companies' performance evaluations are long-standing issues related to their core value after M&As, which have laid in wait for empirical research in Nigeria to provide more acceptable answers to investors for the long-term. Investors need to know the long-term value of these companies after M&A activities as presented by the parameters of this study. Therefore, future practitioners, stakeholders, and investors will have a better understanding of the core values of these companies after M&As in Nigeria, in terms of whether the deal was beneficial or not.

On the other hand, future regulators, M&A practitioners, and investment bankers with access to this study's results can use it as reference material for future M&As and investment decisions. It informs them on where care and attentiveness was not properly considered, taken, or thinly implemented, possibly before, during, or after the M&As. For instance, they will be able to trace whether areas such as proper valuation of a suitable target company was given concentration or if the expert input acquired from investment bankers or practitioners is sufficient for a good M&A activity to be consummated. This study found that no expected significant OP result is realized by bidder companies following the integration process. Practitioners can thus look into

issues like why OP, TE, and PE decline significantly after M&As and find ways to revive performance.

These are practical issues of importance for management to understand their business investment and how investors value supersedes everything they do. This study's results will put future private sector (bidder and target) management in the know and incite sound decision-making. Areas like marketing, distribution, and innovation (equipment/technology) are expected and needed for greater improvement in the company's performance after M&As, as well as a government agency (FCCPC) controlling and supervising all M&As. This is relevant to companies intending to involve in future M&A activity, either as a bidder or target.

Chen and Lin (2011) applied turnover as an output variable in evaluating companies' efficiency after M&As. This study applied NOPAT instead as an output variable, with cost of sales as the input variable accounting for the raw materials and other direct costs in producing goods and services. This is because all taxes and other reductions have been taken from these companies' business transactions with this value, as per the theory of production. NOPAT is a better variable than turnover as both taxes and other reductions have not been deducted. The use of NOPAT is therefore a significant contribution of this study.

A positive Mann Whitney U-test significant result, with a robustness check of the CE of the merging companies, revealed that M&A activities have yielded expected synergistic gains in some aspects of companies' performance. In this study, an alternative MPI decomposition was carried out alongside a bootstrap DEA model, where the MPI's estimated results were obtained as statistical

inferences and confidence intervals. This is a better approach than just expressing the MPI estimator results in terms of increasing or decreasing in technological change, catch-up, and Malmquist index (Simar & Wilson, 1999), representing a further contribution.

This study's results have policy implications, made specifically from OP, TE, CE, and PE measures. The study findings clearly indicate that, except for the oil and gas industry, the OP of the selected bidder companies significantly declined - rather than at least remaining stagnant or even improving as one would expect - for all interval periods and across industry sectors. However, in the selected target companies, the OP was stagnant and robust for the M&A intervals and across sectors. Thus, while the OP of the selected bidder companies significantly declined, that of the target company stagnated consistently throughout M&A intervals (years one, two, and three) and across sectors, with the exception of the oil and gas target companies where OP also stagnated. Overall, while the OP of both the selected bidder and target companies in the oil and gas sector stagnated, the OP of selected bidder companies in other sectors significantly declined. However, for the selected non-merging companies, there was a significant interval improvement only in the first year after an M&A; it gradually gave way to stagnation in the second year and an actual decline in OP in the third year after M&A activities.

The implications of these results are that although M&As never led to an improvement in the OP of the merging companies (selected bidder and target), the initial improvement in the OP of the selected non-merging companies gradually gave rise to stagnation in their OP and eventually, a significant decline in their OP. This suggests that both the merging and non-merging companies

clearly operated under a poor and difficult business environment. M&A companies are business entities possibly lacking in managerial skills, competent employees, and funding. When necessary raw materials, basic equipment, or current technology are not provided by the companies' management through shareholders and investors, the business owners are possibly lacking funds. On the other hand, the government may have failed in cultivating a basic good business operating environment that encourages and supports merging and non-merging businesses' OP improvement in Nigeria.

The policy implications of OP exist in two ways: (i) The M&A companies' investors and shareholders should uphold the employment of a competent management team to manage merging companies. This will ensure the effective utilization of production materials, where and when necessary. The employment of qualified and skillful employees should be coordinated by the competent management; and (ii) the M&As' shareholders and investors will have to solve the likely lack of funds by injecting more to resuscitate these companies for effective and positive OP under the experienced and skillful management team. On the other hand, the government may undertake reforms to reduce the undue business regulation problem (as in the USA). Reducing the high cost of doing business by addressing the economic infrastructure problem will entail a conducive M&A performance environment, leading to a likely improvement in their OP results.

The finding of a non-significant TE among the selected bidder and target companies during the M&A period (three years after M&As) suggests that M&A activities did not lead to an improvement in the TE of the companies. It was also found that the non-significant TE was robust in all the intervals (one, two, and

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three-year period after M&As) and across the sectors. An exception here was the oil and gas sector that recorded a non-significant decline in TE. A possible explanation for this is that the merging companies lack basic modern technology, a productive labor market, and skill efficiency. In Nigeria, it does not support the improvement in the TE performance of a large company that resulted from M&A activities.

The policy implication of TE is two-fold. First, M&A investors must adequately provide funds that talented management will utilize for current equipment, innovation, or modern technology to work with. It involves employing skillful employees and meeting adequate raw materials and the other company's needs in a timely manner. On the other hand, the government will need to provide a good educational system and good training in the country to develop skillful employees needed by M&As and others. It eases access to credit, strengthens investor protection, and controls corruption. An additional implication of the findings is that TE in merging companies in Nigeria calls for serious scrutiny of M&A activities, umpired by the FCCPC.

The result on CE clearly shows that the CE of the selected bidder and target companies improved significantly after three years of M&A and remained consistent across the companies over the intervals. For the selected non-merging companies, the results also showed a significant improvement in CE. The key implication here is that the M&As led to a reduction in operation costs of the merging companies (bidder and target). In much the same way, the selected non-merging companies showed a reduction in cost (improvement in CE). Thus, a further implication is that the improvement in CE of the merging companies may not have resulted from the M&As.

To be clear, it is important to state what this result implies and what it does not. Evidently, the CE of the merging companies improved as did the CE of the non-emerging companies. We cannot, therefore, claim that the improvement in the CE of the merging companies resulted from the M&As alone. Indeed, our finding that the CE of the non-merging companies improved just like the CE of the merging companies suggests that factors other than M&As might have led to the improvement in CE. Such factors could include reduction in operation (running) cost and better financial management skills.

The non-significant result for PE among both bidder and target companies during the M&A period (three years after M&As) suggests that M&As did not lead to an improvement in the PE of the merging companies. It was also found that the non-significant PE is robust within the intervals and across the sectors. An exception here was in the target and non-merging companies, which recorded non-significant productivity. The selected bidder companies' major contributing factor to the significant decline in PE was identified as technological change. A possible explanation of this result is that M&As lack innovation, modern technology, managerial competence, and a good labor market with skill efficiency. In addition, it could be the result of a poor business environment with excessive government regulation, poor physical infrastructure, and high cost of doing business in Nigeria, which do not support the improvement in PE of large companies formed by M&As.

The policy implication of this is similar to TE as TE and PE are related. However, the PE decline shows an urgent need by the M&A companies for technological change or innovation for the improvement of PE. This is because

technological change has clearly been identified as a major contributing factor behind PE's significant decline.

Overall, the results strongly indicate that:

(i) The M&A companies need to be totally resuscitated by investors and shareholders not only through injecting funds but also by recruiting a competent management team to manage the companies and realize the expected improvement. In fact, not much can be said about M&A companies' management competence as the performance results have not shown to be positive. If shareholders and investors do not put the required funds for the proper running of these companies, limited positive results can be achieved by any good management team.

(ii) The management of M&As will have to provide current innovation or technologies and employ skillful employees. In addition, they must inject funds for the timely provision of raw materials and other necessities like repairs and maintenance. For instance, given its poor electricity supply, the provision of fuel or diesel for generators in Nigeria is important for the effective running of these companies and to benefit from M&A synergy.

(iii) Supervising agencies like the SEC are not performing their oversight function properly, as the M&A companies' performance results have declined significantly over 25 years. Even though M&As are now under FCCPC supervision, with SEC's appropriate oversight function, the declining performance in OP, TE, and PE for such a long time should have been noticed and possibly corrected. Therefore, the government needs to intervene by scrutinizing FCCPC and reviewing their modes of supervision and control.

On the part of the government, it needs to do more in terms of providing basic infrastructures and amenities that make doing business more conducive, which will reflect positively in M&A companies' performance. In addition, it should cultivate a good and functional education system that will train the middle skilled employees in M&As companies. There is certainly a need for skillful employees in charge of production and other key sections of M&As companies, especially those skilled in innovation and modern technology. As these M&As companies' in-house training may not be enough, a good education system in the country, provided by the government, in essential. The result has also shown a significant decline in technological change or innovation affecting the M&A companies, leading to a significant decline in PE. The government must step in by trying to improve technological capabilities by investing more in R&D in the country, so not all equipment, innovation, or modern technology needs to be imported by the M&A companies.

These are the areas of improvement that will realize the expected synergy from M&As in terms of OP, TE, and PE in Nigeria. Thus, the study results and implications have highlighted the significance of the actual findings for the decision-making of the stakeholders, M&As practitioners, investment bankers, and private sector (selected bidder and target companies). Under the scrutiny of the FCCPC, the government needs to put in place serious and meticulous policy through a quality regulatory institution, such as the anti-corruption force under the Economic and Financial Crime Commission (EFCC).

With these policies in place, future investors and stakeholders will realize better rewarding returns on their investment, as the bidder and target companies' OP, TE and PE will improve, leading to better earnings and profits after tax for the

companies as well as good tax payments for the government for infrastructure development. The voluntary M&As' expected improvement in performance result will be achieved by the future, private companies (bidder and target). As the companies' operations will likely be more transparent and more productive with competent management, the companies will become more cost-effective with likely improvements in profitability and after-tax earnings, leading to a win-win situation.

Finally, these merging companies' results are concrete evidence that M&A policy needs to be overhauled or re-strategized in Nigeria. In addition, the M&A performance results are potential evidence that due diligence was probably not followed before, during, and after the M&A activities in Nigeria.

5.5 Limitation of the Study

The first limitation of the study is the lack of data on the number of goods produced and sold with production cost price and selling price. This could have enabled profit efficiency investigations. However, this data was not available after several efforts; as such, profit efficiency was not investigated. Second, this study is limited by its scope of coverage. In other words, a study of this magnitude would most appropriately be a cross-country investigation with more countries that are relatively homogenous. However, due to the lack of cross-country data from neighboring countries, particularly on the internet, the study was narrowed to one country – Nigeria. This does not allow for the generalization of findings to other countries. Third, the study is limited by sector as the focus of this study was on the non-financial sector of the country. Studying

events in just one sector would not give a clear picture for generalization on the performance of companies in the entire economy. The next section explains the limitations, justification, and applicability of the DEA and SFA models.

5.5.1 Limitations, Justification, and Applicability of DEA and SFA Models

The basis for using two contending models or approaches is to countercheck whether one can establish the results obtained by the other. Two types of models widely used to evaluate efficiency as well as to calculate productivity are DEA (non-parametric) and SFA (parametric). The significant advantage of DEA is that it does not require information more than input and output quantities and efficiency is measured relative to the highest observed performance rather than average performance (Hossain, Kamil, Baten, & Mustafa, 2012). The DEA-based estimate is sensitive to measurement errors or other noise in the data being deterministic and attributes all the deviations from the frontier to inefficiencies.

Hossain et al. (2012) explained further that the SFA model considers stochastic noise in the data and allows statistical testing of hypotheses concerning the production structure and the degree of inefficiency, which is an advantage. SFA has the main disadvantage of requiring an explicit imposition of a particular parametric functional form representing the underlying technology as well as an explicit distributional assumption for the inefficiency terms. In this regard, Pevcin (2014) remarked that DEA is popular in assessing technical efficiency since it can handle multiple inputs and outputs, since it is non-parametric and does not require input prices. On the other hand, SFA needs input prices, particularly for cost efficiency.

Furthermore, according to Miranda, Gramani, and Andrade (2012), the DEA model reveals the behavior of each observation, while the parametric SFA model reveals the behavior of an average observation. Nguyen, Nguyen and Chin (2012) mentioned that the DEA must pinpoint and use an efficient company as a benchmark in order to work out the efficiency levels of other companies. On the other hand, the SFA model does not confirm such efficient companies. Moreover, the efficiency measures obtained by the SFA and DEA models are highly correlated and consistent, but can be significantly different. The SFA model's non-confirmation of the DEA efficient company benchmark is an issue. Furthermore, using the same data set gives outputs that are reasonably correlated yet one of the two methods dominate the other.

Along the same line of argument, Bezat (2009) remarked that the most distinguished DEA characteristic is its deterministic approach to efficiency measurement, meaning that it does not allow for the estimation of measurement error. Nevertheless, other noise, outliers, and measurement errors may influence the shape and position of the frontier. Furthermore, the measurement can differ depending on the degree of aggregation and the units used to measure inputs and outputs as well as the model specified. The technical efficiency of any single DMU underestimation of the DEA model tends to decrease as the number of DMUs included in the DEA application increases, because as the number of DMUs increases, the likelihood of meeting companies close to the true production frontier increases.

The frontier constructed by DEA approaches the frontier asymptotically as the number of companies in the industry increases. In the SFA, a wrong choice of production function may influence the results. The maximum likelihood (ML)

estimator that SFA can apply does not allow assessment of the reliability of inferences in small samples. This is because ML has desirable large sample properties. An SFA model's total level of TE is quite sensitive to distributional assumptions while rankings are less sensitive and the model requires using a large number of DMUs, unlike DEA.

In our study, a sample of 30 each of bidder, target, and non-merging companies were available. The 90-entity satisfied the rule of thumb of input (3) and output (1) from $n \geq max\ \{3(m+s),\ m\ x\ s\}$. Where n is the number of DMUs with m inputs to produce outputs, established by Cooper, Seiford, and Zhn (2011). Therefore, given the above issues of the DEA and SFA models, SFA required a larger sample size while DEA did not. The larger size requirement of the SFA model was disadvantageous considering our sample size of 30 bidders, 30 targets, and 30 non-merging DMUs.

On the other hand, efficiency benchmarks by the DEA model may not be confirmed by SFA. Therefore, any of the above situations or combinations could contribute to the significant contradicting results as supported in the literature (e.g., Nguyen, Yung, & Sun, 2012). Furthermore, based on Pervin (2014), the DEA and SFA models' applicability forms the basis of choosing the results of the DEA model for TE and the SFA model for CE when drawing conclusions.

5.6 Recommendation for Future Research

Past studies on Nigeria's M&A outcomes have mostly been on involuntary (financial) institutions, short-term performance, and accounting return measures.

This study focused on market-driven NHV M&As from 1991 to 2020, though the country only experienced involuntary M&A activities from 2017 till 2020. In view of the limitations of this study, future researchers could consider other areas in their upcoming research efforts. First, they are recommended to investigate conglomerate M&As to complement the results on voluntary horizontal M&As in Nigeria.

Second, future researchers could investigate horizontal voluntary M&As in the financial sector of Nigeria. The need for this type of investigation has arisen following the recent events of M&A activity in the Nigerian financial sector, which are not mandatory or a compulsory requirement by the apex regulatory body – the CBN. A typical case of this type of M&A activity is the merging of the erstwhile Diamond Bank and Access Bank in 2019. This was more of a voluntary merger than regulatory pressure or requirement to meet any set capital base or financial benchmark for an investment.

Future studies could also emphasize the use of alternative modeling techniques to evaluate the beneficial impacts of M&As. Aside from parametric frontier approaches such as SFA (controlling for industry type), multi-criteria decision making (MCDM) modeling could be applied to capture different gradations in the operational and financial performance of M&As, as well in frontier shift and catch-up metrics. The MCDM would allow the modeling of the inherent trade-offs between short- and long-term perspectives of the M&A dilemma.

In addition, future research could address an important limitation of this study related to the impact of current socio-economic and demographic variables on M&A results. Most problems verified in M&A activities in Nigeria appear to be

a consequence of poor levels of human and physical capital. Therefore, future studies could try, for instance, to understand M&A benefits in light of current conditions of human development, wherein Gini and other relevant indexes can be used to describe the current development status of the country.

5.7 Chapter Conclusion

This study has investigated the concept of horizontal voluntary M&A activities in relation to the four dimensions of company performance, which are OP, TE, CE, and PE of selected 30 bidders, 30 targets, and 30 non-merging companies. The researcher has argued that horizontal voluntary M&As have the potential for synergistic gains. This argument has been substantiated following an extensive conceptual, theoretical, and empirical review of the literature relevant to the aims and measures of the study. From the literature, it is concluded that the horizontal voluntary M&A literature is evolving and calls for further studies.

From the research methods used in the literature, the study concluded that research on horizontal voluntary M&As has scarcely explored the power of different methodologies. Hence, this study applied different methods, namely RIV for OP, DEA and SFA for efficiency, and MPI for productivity. Each of these methods has unique characteristics and features that are most appropriate for analyzing its corresponding performance measure. Based on the findings of the study, it can be concluded that horizontal voluntary M&As have yielded expected gains for the selected 30 bidders, target, and non-merging companies. Nevertheless, these gains are not without sacrifice.

In specific terms, the result of RIV proves that horizontal voluntary M&As have not led to a significant improvement in the OP of bidder, target, and non-merging companies. Similarly, from the results of the DEA and SFA models, the conclusion drawn is that horizontal voluntary M&As have not delivered expected efficiency gains to bidder and target companies, but have done so in non-merging companies in Nigeria; thus, there is a positive TE spillover effect. Finally, the result of the MPI has led to the conclusion that horizontal voluntary M&As in Nigeria have led to a productivity decline for bidder companies but a stagnation for target and non-merging companies. Overall, horizontal voluntary M&A activities' expected synergistic gains are in the area of CE, and not in the area of productivity for the 30 bidders, targets, and non-merging companies in Nigeria.

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Appendices

Appendix A

Top twenty-nine researchers that significantly contributed to the development of DEA research study (Chapter 3, p.139)

Serial number	Authors	G-index	H-index	Years active	Total number of papers
1	Cooper, William W	71	35	1978-2014	71
2	Zhu, Joe	49	30	1995-2014	71
3	Färe, Rolf	48	23	1978-2014	48
4	Grosskopf, Shawna	44	26	1983-2013	44
5	Cook, Wade D	43	25	1985-2014	55
6	Banker, Rajiv D.	42	26	1980-2010	42
7	Thanassoulis, Emmanuel	40	21	1987-2014	41
8	Sueyoshi, Toshiyuki	38	30	1986-2013	51
9	Charnes, A	35	26	1978-1997	35
10	Seiford, Larry M.	34	26	1982-2009	34
11	Lovell, C.A. Knox	31	20	1978-2012	31
12	Kao, Chiang	31	18	1991-2014	36
13	Simar, Leopold	28	20	1995-2014	28
14	14 Pastor, Jesus T	26	14	1995-2014	26
15	Liang, Liang	25	15	2006-2014	25
16	Tone, Kaoru	25	14	1996-2014	25
17	Thrall, R.M.	24	15	1986-2004	24
18	Golany, Boaz	23	19	1985-2008	23
19	Chen, Yao	22	15	2002-2013	28
20	Podinovski, Victor V.	22	12	1997-2013	25
21	Wilson, Paul W.	21	16	1993-2012	21
22	Forsund, Finn R.	21	13	1979-2014	21
23	Kuosmanen, Timo	21	13	2000-2014	32
24	24 Paradi, Joseph C.	21	13	1997-2014	21
25	Ruggiero, John	20	11	1996-2014	25
26	Dyson, Robert G.	19	16	1987-2010	19
27	Athanassopoulos, A.D.	19	14	1995-2004	19
28	Ray, Subhash C.	19	10	1988-2014	19
29	Camanho, Ana S.	19	9	1996-2014	19

Source: Liu et al (2016), *Note, the authors are listed according to their g-index followed by h-index with their total number of article

Appendix B

RIV Operating Performance of Selected Bidder Companies Interval
(Chapter 4, p.289)

Bidder	RIV Before	RIV After	3B&3A % Change	RIV Before	RIV After	2B&2A % Change	RIV Before	RIV After	1B&1A % Change
B1	3.92	-0.16	-1.04	2.85	-0.39	-1.14	10.81	0.07	-0.99
B2	-0.24	0.68	-3.89	-1.26	-0.88	-0.3	0.93	-1.31	-2.42
B3	1.4	-0.03	-1.02	3.51	2.93	-0.17	5.92	0.19	-0.97
B4	-0.65	-0.07	-0.9	2.71	0.03	-0.99	2.44	-0.02	-1.01
B5	-1.94	-1.11	-0.43	2.21	1.75	-0.21	4.15	0.09	-0.98
B6	-0.09	-1.27	13.22	1.53	0.05	-0.95	1.45	0.11	-0.93
B7	55.06	-2.98	-1.05	4.06	-2.24	-1.55	1.63	-0.74	-1.45
B8	0.26	-1.5	-6.71	0.08	-12.1	-14.76	-0.25	-1.08	3.29
B9	2.43	-7.95	-4.27	1.44	-5.6	-4.89	1.05	-4.3	-5.11
B10	0.34	-0.04	-1.12	-61.73	0.06	-1	-0.9	-0.05	-0.94
B11	-0.42	-6.13	13.65	-10.05	-3.97	-0.6	-1.18	-3.13	1.66
B12	-0.23	-0.88	2.79	-0.29	-0.6	1.07	-0.49	-1.1	1.25
B13	-2.98	-0.35	-0.88	0.51	-0.33	-1.61	6.75	-0.16	-1.02
B14	-1.26	-0.1	-0.92	-0.1	-0.76	1.57	2.13	0.04	-0.98
B15	3.9	0.29	-0.93	2.75	1.38	-0.31	2.17	1.51	-0.31
B16	-0.32	-0.51	0.57	-0.71	1.07	-2.49	-0.38	-0.15	-0.61
B17	-0.33	1.83	-6.57	-0.25	-0.53	1.1	-0.45	0.63	-2.41
B18	0.42	-10.47	-26.09	-0.58	3.48	-7.01	-0.38	-3.22	7.48
B19	0.05	-0.41	-8.96	0.11	0.26	1.35	-0.01	-0.06	3.63
B20	-0.96	5.97	-7.21	-0.1	-7.26	74.97	-0.3	-1.05	2.46
B21	0.17	-0.89	-6.18	-0.23	-2	7.57	2.11	0.87	-0.59
B22	1.13	-0.73	-1.65	-0.58	-2.88	3.93	0.16	-0.07	-1.45
B23	-0.98	-0.1	-0.9	0.61	-0.08	-1.13	-0.56	-0.58	0.03
B24	-0.11	-0.37	2.36	1.95	-0.25	-1.2	-0.69	-2.16	2.16
B25	1.24	-1.04	-1.84	0.39	-0.05	-1.12	1.14	-0.01	-1.01
B26	1.24	-1.04	-1.83	0.39	-0.05	-1.12	1.14	-0.01	-1.01
B27	0.66	-9.63	-15.64	-1.64	-2.17	-0.19	2.99	-1.62	-1.54
B28	0.54	-9.74	-18.92	-0.5	-0.76	0.52	0.23	-0.27	-2.19
B29	-0.44	-1.76	3.05	2.14	-18.04	-9.42	-0.04	-0.43	8.69
B30	0.39	-0.15	-1.38	12.14	-1.44	-2.07	0.65	-0.07	-1.11
Total (Average)	**2.07**	**-1.69**	-2.82	**-1.29**	**-1.71**	1.26	**1.41**	**-0.60**	0.05

Appendix C

RIV of Target Selected Companies Intervals before and After M&A
(Chapter 4, p. 289)

Target	T3B	T3A	%Change	T2B	T2A	%Change	T1B	T1A	%Change
T1	30.61	-6.18	-1.2	29.49	-3.38	-1.11	6.83	-6.34	-1.93
T2	16.55	-0.53	-1.03	9.16	-0.87	-1.1	39.41	-0.64	-1.02
T3	229.61	-6.66	-1.03	32.07	2.04	-0.94	32.75	0.68	-0.98
T4	-120.24	-2.77	-0.98	-6.79	-4.75	-0.3	-54.07	-1.88	-0.97
T5	-27.33	-5.05	-0.82	-134.62	0.13	-1	-61.58	-0.02	-1
T6	-35.21	-0.33	-0.99	-106.91	-0.28	-1	-105.11	-0.27	-1
T7	79.2	-4.56	-1.06	-120.76	-1.88	-0.98	89.59	21.77	-0.76
T8	140.37	1.04	-0.99	-9.99	-1.64	-0.84	11.2	-1.48	-1.13
T9	448.08	-0.09	-1	-79.9	-0.96	-0.99	7.33	-2.07	-1.28
T10	-15.53	-0.44	-0.97	76.45	4.88	-0.94	22.03	-7.39	-1.34
T11	1.55	0.46	-0.7	-27.12	-0.56	-0.98	-38.26	-0.1	-1
T12	28.05	-6.19	-1.22	-39.62	-4.9	-0.88	0.73	0.05	-0.93
T13	-23.9	-0.42	-0.98	1.51	-0.24	-1.16	-3.63	0.09	-1.02
T14	-66.89	0.53	-1.01	-16.55	-0.13	-0.99	-20.58	0.51	-1.02
T15	-289.37	-0.65	-1	51.75	-0.64	-1.01	-46.1	1.14	-1.02
T16	-67.92	0.1	-1	-12.68	-3.58	-0.72	12.23	-1.02	-1.08
T17	-226.03	-0.63	-1	243.17	0.57	-1	18.22	67.81	2.72
T18	-0.82	-0.39	-0.52	5.94	2.68	-0.55	-1.87	-0.43	-0.77
T19	-8.83	3.11	-1.35	7.44	-15.49	-3.08	-9.81	-0.38	-0.96
T20	-2.71	-0.52	-0.81	8.72	11.2	0.28	0.36	-1.19	-4.3
T21	-0.18	-0.38	1.13	10.92	-0.89	-1.08	2.52	-3.78	-2.5
T22	19	0.56	-0.97	-0.92	0.4	-1.43	-18.67	1.19	-1.06
T23	0.61	2.9	3.77	4.48	-0.13	-1.03	0.29	-0.4	-2.38
T24	-1.34	-0.18	-0.87	2.91	-0.06	-1.02	4.01	-0.07	-1.02
T25	-73.22	-0.3	-1	7.63	0.88	-0.88	10.45	-5.85	-1.56
T26	-6.46	-0.5	-0.92	-0.86	-1.57	0.82	-48.72	-2.69	-0.94
T27	-111.06	4.93	-1.04	-36.76	-0.03	-1	38.4	-26.11	-1.68
T28	37.12	2.01	-0.95	-42.08	0.3	-1.01	53.25	-0.38	-1.01
T29	-3.54	1.01	-1.28	79.25	7.34	-0.91	22.85	-24.33	-2.06
T30	-2.32	1.61	-1.69	22.81	3.87	-0.83	40.86	0.12	-1
Total(AVG)	**-1.74**	**-0.62**	-0.78	**-1.40**	**-0.26**	-0.92	**0.16**	**0.22**	-1.20

Appendix D

Selected Non-Merging Companies 1, 2 & 3 Years RIV Intervals Before and After M&A (Chapter 4, p.291)

MATCHING Companies	RIV Before	RIV After	3B&3A %Change	RIV Before	RIV After	2B&2A %Change	RIV Before	RIV After	1B&1A %Change
C1	2.44	0.04	-0.98	1.62	0.86	-0.47	2.13	0.47	-0.78
C2	0.04	1.69	37.69	-0.12	0.77	-7.66	4.12	0.71	-0.83
C3	-0.43	-0.28	-0.35	4.3	1.01	-0.77	3.13	0.62	-0.8
C4	0.06	-2.41	-43.77	0.37	-1.57	-5.25	0.72	0.53	-0.26
C5	0.39	1.95	3.94	4.41	0.65	-0.85	9.47	0.38	-0.96
C6	-1.09	5.01	-5.62	17.13	21.63	0.26	12.69	-0.2	-1.02
C7	0.86	0.21	-0.75	0.07	-5.38	-77.9	0.44	0.32	-0.27
C8	1.17	-10	-9.57	-0.14	-8.85	63.1	-1.12	-14.99	12.35
C9	0.08	-0.56	-8.29	-0.31	6.75	-22.72	-0.42	-5.61	12.41
C10	1.6	-0.51	-1.32	4.37	0.28	-0.94	0.03	0.02	-0.32
C11	-0.35	-9.48	25.73	9.05	-10.64	-2.18	-4.99	-5.77	0.16
C12	-8	-0.01	-1	5.28	0.18	-0.97	-0.12	0.16	-2.38
C13	10.16	0.07	-0.99	0.86	0	-1	5.23	0.08	-0.98
C14	0.14	0.02	-0.85	-0.94	-0.62	-0.34	0.75	-0.96	-2.29
C15	-2.26	0.05	-1.02	-2.23	0.18	-1.08	-0.21	-0.61	1.92
C16	0.23	-0.39	-2.7	-0.28	-1.54	4.47	0.11	-0.27	-3.4
C17	19.11	-2.44	-1.13	-0.66	14.74	-23.33	1.14	0.15	-0.87
C18	-0.07	-0.71	9.55	0.16	4.5	26.76	-0.09	-0.51	4.54
C19	-0.15	0.31	-3.08	3.54	2.14	-0.39	-0.24	-0.21	-0.11
C20	0.04	1.47	35.2	0.63	1.64	1.62	-0.04	0.42	-11.16
C21	3.37	-1.39	-1.41	-0.24	-1.36	4.72	0.5	1.04	1.06
C22	-0.81	0.02	-1.02	-0.11	0.16	-2.44	1.25	1.89	0.5
C23	-0.45	-0.11	-0.75	0.21	0.03	-0.85	-0.37	0.55	-2.47
C24	0.15	-1.48	-10.86	0.36	0.34	-0.06	11.37	-0.6	-1.05
C25	1.16	0.58	-0.5	-0.01	-0.59	38.41	0.91	0.14	-0.84
C26	1.16	0.58	-0.5	-0.01	-0.59	38.41	0.91	0.14	-0.84
C27	-0.21	-1.62	6.74	-89.55	-8.08	-0.91	-129.17	-2.45	-0.98
C28	0.88	0.42	-0.52	0.1	0.08	-0.2	2.84	0.41	-0.86
C29	0.18	-2.9	-16.69	6.95	-6.26	-1.9	-6.16	-3.15	-0.49
C30	11.72	-0.04	-1	0.68	0.23	-0.65	0.99	0.11	-0.89
Total(Average)	**1.37**	**-0.73**	0.14	**-1.15**	**0.36**	0.83	**-2.81**	**-0.91**	-0.06

Appendix E

Summary of Efficiency Definitions (Chapter 3, p.198)

Efficiency Concept	Definition	Literature
Operational efficiency	Most advantageous input mix and production mix (Allen and Rai, 1996	Vander (1996)
Scale economies	By increasing output, will lead to reducing the unit cost of production (Yao *et al.,* 2007)	Cummins and Rubio-Misas (2006)
Cost efficiency (input X-efficiency)	The Part of the overheads of a fully an efficient companies with similar production amounts and input costs to the given business's actual costs (Cummins and Rubio-Misas, 2006)	(Lin(2002); Cummins and Rabio-Misas,2006)
Scope economies	Looks at whether charges per unit can be dropped by combined production (Yao *et al.,* 2007)	Lang and Welzel (1996)
Revenue efficiency (output X-efficiency	The correlation of a given business's revenues to the revenues of a totally efficient companies with the equal input sums and output costs (Cummins *et al*., 1999)	Cummins et al., (1999)
Alternative (non-standard) profit efficiency	Examines exactly how proficient a companies is at receiving its maximum obtainable profit given its output levels relatively than its output costs (Berger and Mester, 1997)	(Lacewell *et al*. (2002); Hollo and Nagy, 2006)
Standard profit efficiency	Examines how nearby a companies is to yield the maximum possible revenue gave a particular level of input prices and output prices (Berger and Mester, 1997)	Akhavein et al. (1997); Berger and Mester (1997)
X-efficiency 2 (managerial efficiency)	Profitable competence of any single companies less scale and Scope efficiency effects. Management capacity to control costs or to make the most of Revenue, A dimension composed of catch-up and allocative efficiency (Garden and Ralston, 1999)	(Kohers *et al*. (2000); Hollo and Nagy ,2006)
Allocative efficiency	Examines the capacity of a company Using inputs in best Quantities with their prices given	(Neal (2004); Cummins and Rabio-Misas

	and the production technology (Garden and Ralston, 1999)	,2006)
Pure technical efficiency	Examines how far off a manufacture unit is from the production frontier to specify the possible reduction in inputs a manufacture unit can achieve by implementing the best production and/or managing practices of the best-performance production unit (Dong and Featherstone, 2006)	Worthington (2001, 2004); and Cummins and Rubio-Misas ,2006)
Technical efficiency	Examines the capability of a companies to get greatest output for a specified set of inputs, and can be separated into pure technical efficiency and scale efficiency (Cummins and Rubio-Misas, 2006)	Cummins and Rubio-Misas,(2006)
Scale efficiency	Examines efficiency exclusively related with size and specifies whether the production unit is manufacturing at the most efficient size (Rhoades, 1998)	Cummins and Rubio-Misas, ,2006)
(Cost) technical X-inefficiency	Proportional misuse of all inputs (Berger and Humphrey, 1992)	Berger et al., (1999)
(Revenue) allocative X-inefficiency	Responding below par to production prices in selecting its production package (Berger and Humphrey, 1994)	English et al., (1993)
(Revenue) technical X-inefficiency	Producing less production than it would like (Berger and Humphrey, 1994)	English et al., (1993)
(Cost) allocative X-inefficiency	Failing to produce the topmost value of production for a particular set of input quantities and output prices (Akhavein et al., 1997)	Berger and Hannan (1998) Akhavein et al., (1997)

Source : Aik *et al.,* (2015b)

Appendix F

Business Combination Applications Handled by Securities & Exchange Commission (1994 – 2016) (Chapter 3, p.161)

Appendix F

BUSINESS COMBINATION APPLICATIONS HANDLED BY SECURITIES & EXCHANGE COMMISSION (1994 – 2016)

S/N	Acquiring company	Target company(ies)	Year of Approval	Terms of Conversion/Business Combination Type	Mode of settlement
1.	United Nig. Ins. co. Plc (UNIC) (Public quoted company)	United Nig. Life Ins. Co. (UNLIC). (Public Quoted Company)	1994	Share exchange ratio of 100 ordinary shares of UNIC for every 125 ordinary shares of UNLIC was approved.	Exchange of shares
2.	Lever Brothers Nig. Plc (LBN)	Unilever Nigeria Ltd.	1995	An exchange ratio of nine (9) ordinary shares of LBN for every five (5) UNL shares leading to 112.5 million shares of LBN issued to the shareholders of UNL which was wholly owned by Foreigner	Exchange of shares
3.	Sona Breweries Industries of Nigeria Ltd.	International Beer and Beverages Industries of Nigeria Ltd.	1995	Foreign shareholders of Sona breweries acquired the entire 9.69 million ordinary shares ofN1.00 or 64.65 of total share capital held by seven (7) Nigerian associates.	Exchange of shares
4.	Multichem Nig. Ltd.	Wheonye Int'l Enterprises Ltd.	1995	A par price of N1.00 per share was approved for the acquisition of the entire 20,000,000 Ordinary shares of Multichem Industries ltd	Cash
5.	Nestle Foods Nig. Plc (NFN)	Nestle Nigeria Ltd.	1996	Acquisition of 705 of paid-up share capital of NNL by exchange of one (1) ordinary share of 50k each of NFN for four (4) ordinary shares of N1.00 each of NNL.	Exchange of shares
6.	Smithlkline Beecham Nig. Plc (SBN)	Sterling product (Nig) Plc (SPN)	1996	Exchange of 7 ordinary share of N4.87 each of SPN for 4 ordinary shares of N8.44 in SBN	Exchange of shares
7.	Nigerian Bottling company Plc (NBC)	Sapanda Industries Ltd. (SIL)	1996	Exchange of 5 ordinary shares of N2.00 each in SIL for 9 ordinary shares of 50k each in NBC	Exchange of shares
8.	Paterzon Zochonis Ind. Plc (PZI)	Thermo cool Eng. Co. Plc (TEC)	1996	Exchange of 2 ordinary shares of N2.00 each in TEC for 7 Ordinary shares of 50k each of PZI.	Exchange of shares
9.	Carnaud Metal Box Nig. Plc.	Canmakers Nig. Ltd. (CNL) Crown Cork & seal Co. Ltd. (CCSL) Carnaud metal Box Nig. Plc (CMB)	1997	An exchange ratio of 4 CMB's ordinary shares for CNL's shares of 50k. While 0ne (1) ordinary share of 50k each of CMB would be exchange for 3 shares of CCSL.	Exchange of shares

10.	Royal Niger Insurance Co. Ltd.	Destiny Insurance co. Ltd.	1998	All Assets acquired	Cash
11.	International Textile Industries Ltd. (ITI)	Platinum Textile Mill Ltd. (PTM)	1999	The entire 60-million ordinary shares of 50k each of Platinum Textile Mill Ltd. Were exchanged for the number of shares in ITI – PTM was absorbed in to ITI.	Exchange of shares
12.	Delta Glass plc	Guinness Glass Plc	1999	The entire 102 million ordinary shares of N1.00 each of Guinness Glass were exchange for 163.2 million ordinary shares of 50k each of Delta Glass Plc. Delta Glass emerge as the new company.	Exchange of shares
13.	A.G. Leventis Nig. Plc	Iddo Investment Ltd. London Africa & overseas Ltd. (LAFRO) Victoria Beach Hotel Plc (VBH)	1999	69 million ordinary shares of 50k each of A.G. Leventis were to be issued to the shareholders of Iddo, LAFRO and VBH in exchange for 21.6 million, 2.4 million and 9.6 million ordinary shares of 50k respectively.	Exchange of shares
14.	Nig. Westminster Dredging & marine Ltd. (NWDML)	Nig. Dredging & Marine Ltd. (NDM) Westminster Dredging Nig. Ltd. (WDN)	1999	The shareholders of NDM and WDN were to exchange their shareholding in exchange for shares of NWDML.	Exchange of shares
15.	British American Tobacco Limited (BATL)	Nigerian Tobacco Co. Plc (NTC)	2000	The entire 400 million ordinary shares of NTC was surrendered for cancellation by the holders, NTC shareholders received N3.00 per share as consideration	BATL increases its shares capital from N10m to N2b so as to accommodate the incoming shares of the NTC. All the entire assets, liabilities and undertakings of NTC were merged with those of BATL
16.	Stanbic Merchant Bank Nig. Ltd. (SMBN)	Financial Equities Ltd. (FEL)	2000	SMBL acquired 90% equity interest in FEL	The acquisition was effected partly through 75% debt/equity swap involving 15million ordinary shares of N1.00 each and 15% cash payment involving 3 million ordinary shares of N1.00 each
17.	Total Nigeria Plc	Elf Nig. Ltd.	2001	The shareholders Surrender their share for an appropriate number in Total Nig. Plc	Exchange of 100 ordinary share of 50k each in Total for 82 ordinary share of 50k each in Elf oil Nig. Ltd

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18.	United Nig. Textile Ltd. (UNTL)	Nichemtex Industries Plc	2001	All the assets, liabilities & undertakings of Nichemtex be transferred to UNTL, the entire share capital of Nichemtex be cancelled and dissolved without winding up.	13 ordinary shares of 50 kobo each of UNTL be exchanged for 5 ordinary shares of N2.00 each of Nichemtex Industries Plc
19.	PZ Industries	PZ Nig. Limited Ekopak Nig. Limited Groove Properties Nig. Ltd.	2001	All assets, liabilities & undertakings of PZN, EN, and GPN be transferred to PZI, who in turn paid monetary value of shares to respective shareholders	Cash was paid for the entire shares of the companies by PZI as PZI – 33,918,600 ordinary share at 50 kobo EN – 10,000,000 ordinary share of N1.00 each GPN – 1250 ordinary share of N2.00 each
20.	Edo Cement Company Ltd.	Bendel Cement Company Ltd.	2002	All the assets, undertaking of Bendel Cement was transferred to Edo Cement, while Edo state Government assume liabilities of Bendel Cement	Edo cement was newly created company, while major shareholders SCANCEMENT pay the naira value equivalent of 4 & 4 million to Edo State Government in consideration, to transfer all assets & undertakings of Bendel cement and transferred of all liabilities to Edo State Government.
21.	Unipetrol Nig. Plc	Agip Nig. Plc	2002	All the assets, liabilities, and undertakings including real properties and intellectual property & right of Agip are transferred to Unipetrol.	Unipetrol share price of N47.00 per share & Agip share price of N23.00 per share was exchanged, and every one ordinary share of 50 kobo in Elf for two ordinary shares of 50 kobo each in Agip.
22.	Lexington International Company Ltd	Express Insurance Safeway Insurance	2004	One ordinary share of enlarged Lexington Insurance Company was issued in exchange for one ordinary share of Safeway Insurance Company and one ordinary share of Express Insurance Company Ltd.	Cash
23.	United Bank for Africa Plc	Standard Trust Bank Plc	2005	All assets, liabilities and undertakings including real property and intellectual property right of STB be transferred to UBA and the entire share capital of 8,000,000,000 ordinary share of 50 kobo each of STB be cancelled and dissolved without winding up.	1ordinary share of 50 kobo each in UBA plc, be credited and fully paid in exchange for 2 ordinary shares of 50 kobo in STB

24.	United Bank for Africa Plc	Standard Trust Bank Plc		2005	All assets, liabilities and undertakings including real property and intellectual property right of STB be transferred to UBA and the entire share capital of 8,000,000,000 ordinary share of 50 kobo each of STB be cancelled and dissolved without winding up.	1ordinary share of 50 kobo each in UBA plc, be credited and fully paid in exchange for 2 ordinary shares of 50 kobo in STB
25.	First Inland Bank Plc	Inland Bank of Nigeria Plc First Atlantic Bank Plc		2005	All the ordinary shares of first Atlantic are to be surrender by the holders and cancelled, and all the assets, liabilities and undertakings of First Atlantic were merged with those of Inland Bank. First Atlantic will subsequently be dissolved with winding up.	3 ordinary shares of 50 kobo each of Inland Bank plc for 2 ordinary shares of 50 kobo each of First Atlantic Bank Plc.
26.	Access Bank of Nigeria Plc	Marina International Bank Plc Capital Bank limited	2005		All assets liabilities and undertakings, including real property and intellectual property right of Capital Bank and Marina Bank are transferred to Access bank plc and the entire share capital of Marina bank plc be cancelled. Capital bank and Marina bank will then be dissolve without winding up.	7 ordinary shares of Access bank Plc at N2.00 for 10 ordinary share of Capital bank at N2.15 and 10 ordinary share of Marina Int'l bank at N1.75
27.	Intercontinental Bank	Equity Bank of Nigeria Plc Gateway Bank Plc Global Bank plc	2005		The entire share capital of Equity Bank plc Gateway Bank and Global Bank plc be surrender by holders and cancelled and all the assets, liabilities and undertakings including real property and intellectual property right be transferred to Intercontinental Bank plc .and the banks be dissolve without winding up.	One ordinary share of Intercontinental Bank Plc at 50 kobo each for; 4 ordinary shares in Equity Bank plc. 8 ordinary shares of 50 kobo each in Gateway Bank and 5 ordinary shares of 50 kobo in Global Bank plc.
28.	Equatorial Trust Bank limited	Equatorial Trust limited Devcom Bank Limited	2005		All assets, liabilities and undertakings including real property and intellectual property rights of Equity bank, Gateway bank, and Global were transferred to IB and they were subsequently dissolved without winding up.	Share exchange ratio of 1 ordinary share of 50 kobo of Devcom Bank for 1 Equitorial Bank Share of 50 kobo.

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29.	First City Monument Bank Plc	First City Monument Bank Plc Co-operative Dev. Bank plc Nigeria-American Bank Ltd	2005	All assets, liabilities and undertakings including real properties and intellectual properties rights of CBD, were transferred to FCMB and entire share capital cancelled. Also the entire assets, liabilities and the undertakings of NAMBL real property, and intellectual rights were transferred to FCMB plc. Both CDB and NAMBL were subsequently dissolved without winding up.	2 ordinary shares of FCMB for 9 ordinary share of Co-operative Bank of 50 kobo each. NAMBL will received 2 ordinary shares of 50 kobo of FCMB for 11 ordinary shares of N1.00
30.	First Bank of Nigeria Plc	First Bank of Nigeria PLC FBN [Merchant Bankers] Ltd MBC International Bank Ltd	2005	All assets, liabilities and undertakings including real properties and intellectual property rights of FBNMB and MBC were transferred to First bank and the entire share capital of transferee banks were cancelled	1 ordinary share of FBN Plc for; 14 ordinary shares of FBNMB and 25 0rdinary shares of MBC Int'l Bank
31.	Sterling Bank Plc	NBM Bank Plc, Magnum Trust Bank Plc, Trust Bank of Africa Plc, Indo- Nigeria Bank Ltd, and NAL Bank Plc	2005	All assets, liabilities & undertakings, including real properties and intellectual property rights of Indo-Nig. Bank, Magnum, NBM Bank and Trust Bank be transferred to NAL and the entire share capitals of the transformed banks be cancelled and dissolved without winding up.	14 ordinary shares of NAL for 10 Indo-Nigeria, 1 NAL for 1 Magnum, 3 NAL for 10 NBM, 1NAL for 1 Trust Bank of Africa.
32.	Unity Bank Plc	Intercity Bank Plc , First Interstate Bank Plc Pacific Bank Limited, Tropical Commercial Bank Plc, Centre Point Bank Plc Societe Bancaire Nig. Ltd	2005	All assets, liabilities and undertakings Including real properties and intellectual rights of FIB, PB, TCB, SB and, CPB, were transferred to IC. The entire shares were cancelled and subsequently dissolved without winding up.	6 ordinary shares of Intercity for; 11 shares of First Interstate, 1 share of Intercity for 3 Tropical , 2 shares of Intercity for 5 Pacific Bank, 2 shares of Intercity for 25 Bancaires', and 1 share of Intercity for 9 Center-Point Bank.
33.	IBTC Chartered Bank Plc	IBTC Plc Chartered Bank Plc Regent Bank Plc	2005	All assets, liabilities & undertakings, including real properties and intellectual property rights of Chartered Bank and Regent Bank be transferred to IBTC. The entire share capital of Chartered Bank and Regent Bank be cancelled and dissolved without winding up.	4 IBTC ordinary shares for 5 Chartered Bank and 2 shares of IBTC for 15 shares of Regent Bank.
34.	Platinum Habib Bank Plc	Platinum Bank Plc Habib Nig. Bank Plc	2005	All assets, liabilities & undertakings, including real properties and intellectual property rights of Habib be transferred to PlatinumHabiib Bank and the entire share capital of Habib Bank be cancelled.	13 Habib Bank for 17 Platinum Bank

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				All assets, liabilities & undertakings, including real properties and intellectual property rights	
35.	Fidelity Bank Plc	Fidelity Bank Plc FSB Int'l Bank Plc Manny Bank Plc	2005	All assets, liabilities & undertakings, including real properties and intellectual property rights of FSB and Manny Bank be transferred to Fidelity and the entire share capital of FSB and Manny be cancelled.	8 Fidelity shares for 15 FSB Int'l and 2 Fidelity shares for 9 Manny Bank
36.	SKYE Bank Plc	Prudent Bank Plc EIB Int'l Bank Plc Bond Bank Plc Reliance Bank Plc	2005	All assets, liabilities & undertakings, including real properties and intellectual property rights of Prudent, EIB, Bond Bank and Reliance Bank be transferred to SKYE and the entire share capital cancelled	1 Prudent for 1 EIB Int'l, 1 Prudent for 3 Bond Bank and 10 Prudent for 29 Reliance
37.	Afribank Nigeria Plc	Afribank Nigeria Plc Afribank Int'l (Merchant Bankers) Ltd	2005	All assets, liabilities & undertakings, including real properties and intellectual property rights of Afribank Int'l Merc. Ltd be transferred to Afribank Nig. Plc and the entire share capital of AIL be cancelled	1 Afribank Nigeria Plc for 10 Afribank Int'l (Merchant Bankers) Ltd
	Diamond Bank Plc	Lion Bank Plc	2005	Acquisition	7 Diamond Bank shares for 25 Lion Bank Shares.
38.	First Inland Bank Plc	First Inland Bank Plc NUB International Bank Plc IMB International Bank Plc	2006	All assets, liabilities & undertakings, including real properties and intellectual property rights of NUB and IMB be merged with those of First Inland Bank.	2 First Inland Bank for; 5 NUB Int'l Bank, 15 IMB Int'l Bank
39.	Oceanic Bank Int'l Plc	Oceanic Bank Int'l Plc International Trust Bank Plc	2006	All assets, liabilities & undertakings, including real properties and intellectual property rights of ITB be transferred to Oceanic Bank and the entire share capital of ITB be cancelled	The entire 1 billion ordinary shares of 50kobo each, issued share capital of ITB, were exchanged for a nominal value of N1.00.
40.	Oceanic Bank Int'l Plc	Oceanic Bank Int'l Plc International Trust Bank Plc	2006	All assets, liabilities & undertakings, including real properties and intellectual property rights of ITB be transferred to Oceanic Bank and the entire share capital of ITB be cancelled	The entire 1 billion ordinary shares of 50kobo each, issued share capital of ITB, were exchanged for a nominal value of N1.00.
41.	United Bank for Africa Plc	Continental Trust Bank Ltd	2005	Acquisition	Cash
42.	SKYE Bank Plc	SKYE Bank Plc Cooperative Bank Plc	2006	All assets, liabilities & undertakings, including real properties and intellectual property rights of Cooperative Bank be transferred to SKYE Bank and the entire share capital of Cooperative Bank be cancelled	7 SKYE Bank for 10 Cooperative Bank
43.	Spring Bank Plc	Citizens Int'l Bank Plc Guardian Express Bank Plc ACB Int'l Bank Plc Omega Bank Plc Fountain Trust Bank Plc Trans Int'l Bank Plc	2006	All assets, liabilities & undertakings, including real properties, intellectual property rights of Guardian Express, ACB, Omega, TIB and Fountain Trust are to be cancelled. Guardian Express, ACB, Omega, TIB and Fountain Trust will subsequently be dissolved. Citizen will be renamed Spring Bank Plc.	100 units of Citizens Bank for; 88 units of Guardian Express, 140 units of ACB Int'l, 52 units of Omega Bank, 43 units of Fountain Trust Bank and 399 units of Trans International Bank.

44.	Union Bank Plc	Broad Bank Plc Universal Trust Bank Plc Union Merchant Bank Ltd	2006	Acquisition	1 Union Bank share for; 43 Broad Bank shares, 36 UTB shares and 17 Union Merchant Bank shares.
45.	First City Monument Bank Plc	FCMB Plc Midas Bank Ltd	2006	Acquisition	FCMB acquired assets and Liabilities of Midas based on nominal purchase and additional payment will be due to shareholders after recovery of N700.0 million bad loans.
46.	Wema Bank Plc	National Bank Ltd	2006	Acquisition	1 Wema Bank ordinary share for 2 National Bank shares.
47.	Unity Bank Plc	Unity Bank Plc Bank of the North Limited NNB International Bank Plc New Africa Bank Limited	2006	All assets, liabilities and undertakings Including real properties and intellectual rights of BONL NNB and NABL were transferred to Unity Bank Plc. The entire shares were cancelled and subsequently dissolved without winding up.	5, 4 and 1 Unity Bank shares for every 2 BON shares, 5 NNB shares and 5 New African Bank shares correspondingly
48.	Custodian and Allied Insurance Plc	Custodian and Allied Ins. Ltd Signal Insurance Ltd	2006	All assets, liabilities & undertakings, including real properties, intellectual property rights of Signal be transferred to Custodian and the entire share capital of Signal be cancelled	53 ordinary shares of 50k of Custodian for every 50 ordinary shares of N1.0 of Signal
	Custodian and Allied Insurance Plc	Custodian and Allied Ins. Plc Fire Equity & Gen. Ins. Ltd	2006	All assets, liabilities & undertakings, including real properties, intellectual property rights of FEGIC be transferred to Custodian & Allied Ins. and the share capital of FEGIC be cancelled	52 ordinary shares of 50k of Custodian for every 63 ordinary shares of N1.00 of FEGIC
49.	International Energy Insurance Co. Ltd	Int'l Energy Insurance Co. Ltd Rivbank Insurance Co. Ltd	2006	All assets, liabilities & undertakings, including real properties, intellectual property rights of Rivbank be transferred to International Energy Insurance and the entire share capital of Rivbank cancelled	62 ordinary shares of 50k of IEI be exchange for every 25 ordinary shares of N1.0 of Rivbank
50.	Standard Trust Assurance Plc	Standard Trust Assurance Plc Summit Insurance Co. Ltd	2006	All assets, liabilities & undertakings, including real properties, intellectual property rights of Summit be transferred to STACO and the entire share capital of Summit be cancelled	1 ordinary share of 50k of STACO for every 1 ordinary shares of 50k of summit
51.	Royal Exchange Assurance Plc	Royal Exchange Assurance Plc Phoenix of Nig. Assurance Plc African Prudential Co. Ltd	2006	All assets, liabilities & undertakings, including real properties, intellectual property rights of Phoenix and African Prudential be transferred to Royal Exchange and the entire share capital of Phoenix and African Prudential be cancelled and the companies dissolved without winding up	4 and 1 ordinary shares of 50k each in Royal Exchange for every 11 and 1 ordinary shares of 50k each in Phoenix and African Prudential respectively

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52.	Aiico Insurance Plc	Aiico Insurance Plc NFI Insurance Co. Plc Lamda Insurance Co. Ltd	2006	All assets, liabilities & undertakings, including real properties, intellectual property rights of NFI and Lamda be transferred to Aiico and the entire share capital of NFI and Lamda be cancelled while the companies will be dissolved without winding up	2 and 100 ordinary shares of 50k each in Aiico for every 3 and 117 ordinary shares in NFI and Lamda respectively
53.	Flour Mills of Nig. Plc	Flour Mills of Nig. Plc Golden Fertilizer Co. Ltd	2006	All assets, liabilities & undertakings, including real properties, intellectual property rights of Golden Fertilizer be transferred to Flour Mills and the entire share capital of Golden Fertilizer be cancelled while the company dissolved without winding up	Nominal transaction (Golden Fertilizers is wholly own by flour mills)
54.	Kamfin Lebanon Holding S.A.L.	Kamfin Lebanon Holding S.A.L. Dumez Nig. Plc	2006	Acquisition	Nominal and normal transfer of 2,249,004,734 and 52,000,000 respectively of Dumez Nig. Plc to kamfin Lebanon
55.	Jap Telecoms Ltd	Jap Telecoms Ltd Danjay Telecoms Ltd	2006	Acquisition	Jap Telecoms acquired 2,000,000 ordinary shares of Danjay Telecoms at N1.00 per share
56.	Fenwick Overseas Holding Ltd	Fenwick Overseas Holding Ltd Regency Overseas	2006	Acquisition	Fenwich acquired 30,000,000 shares of Regency at N8.00 per share
57.	Goldlink Insurance Co. Ltd	Goldlink Insurance Co. Ltd Lexington Int'l Insurance Ltd Lister Insurance Ltd	2006	Acquisition	Goldlink acquired the assets, liabilities and business undertakings of Lexington and Lister based on issuance of 45,454,545 Goldlink shares to Lexington shareholders and payment of N30,000,000 to Lister shareholders in exchange for their shares
58.	Jupiter Assets Management Ltd	Jupiter Assets Man. Ltd Nig. Embroidery Lace Man. Ltd	2006	Acquisition	Jupiter acquired 4,501,765 shares at N2.00 per share of Nig. Embroidery Lace Man. Ltd
59.	Sterling Assurance Nig. Ltd	Sterling Assurance Nig. Ltd Newline Insurance Com. Ltd Universe Reinsurance Co. Ltd	2007	Merger	1 ordinary share N1.0 each of Sterling Assurance for every 2 ordinary shares of N1.0 each of Newline Insurance and 10,000 ordinary shares of N1.0 each of Sterling Assurance for every 1 ordinary shares of N1,000 each of Universe Reinsurance
60.	Linkage Assurance Plc	Linkage Assurance Plc Central Insurance Company Ltd	2007	Merger	200 ordinary shares of 50k each of Linkage Assurance for every 119 ordinary shares of N1.0 each of Central Insurance Company Plc

61.	Regency Alliance Insurance Plc	Regency Insurance Plc Destiny Insurance Co. Ltd Nigerian Alliance Insu. Corp Ltd Capital Express Gen. Insu. Ltd	2007	Merger	6 ordinary shares of 50k each in Regency Alliance for every 5 ordinary shares of Regency Insurance, 26 ordinary shares of 50k each of Regency Alliance for every 20 ordinary shares of Destiny Insurance, 14 ordinary shares of Regency Alliance for every 10 ordinary shares of N1.00 each of Nigerian Alliance Assurance and 24 ordinary shares of 50k each of Regency Alliance for every 25 ordinary shares of Capital Express.
62.	Capital Express Insurance Company Ltd	Capital Express Insu. Com. Ltd Regency Life Assur & Pension Ltd	2007	Merger	1 ordinary share of N1.0 each of Capital Express for every 5 ordinary shares of 50k each of Regency Life Assurance.
63.	NEM Insurance Plc	NEM Insurance Plc Vigilant Insurance Com.0 Ltd	2007	Merger	100 ordinary shares of NEM Insurance for every 103 ordinary shares of Vigilant Insurance Company.
64.	Kapital Insurance Company Ltd	Kapital Insurance Company Ltd Intercontinental Assu. Com. Ltd Global Commerce & Gen. Assur. Co. Ltd	2007	Merger	3 ordinary of N1.0 each of Kapital Insurance for every 2 ordinary shares of N1.0 each of Intercontinental Assurance and 5 ordinary shares of N1.0 each of Kapital Insurance for every 21 ordinary shares of 50k each of Global Commerce & General Assurance.
65.	Equity Indemnity Insurance Plc	Equity Indemnity Insurance Co. Plc First Assurance Plc	2007	Merger	5 ordinary shares of 50k each of First Assurance for every 2 ordinary shares of Equity Indemnity Insurance
66.	Crusader Insurance Plc	Crusader Insurance Com. Plc Admiral Insurance Company Ltd	2007	Merger	100 ordinary shares of 50k each of Crusader Insurance for every 366 ordinary shares of 50k each of Admiral Insurance.
67.	Stanbic IBTC Bank Plc	IBTC Chartered Bank Plc Stanbic Bank (Nig) Ltd	2007	Merger	Entire 6.25 billion ordinary shares of IBTC Chartered in exchange for the assets and liabilities of Stanbic Bank
68.	Aiico Insurance Plc	Aiico Insurance Plc NFI Insurance Plc Lamda Insurance Company Ltd	2007	Merger	2 ordinary shares of 50k each of Aiico Insurance for 3 ordinary shares of N1.0 each of NFI Insurance and 100 ordinary shares of 50k each of Aiico Insurance for every 117 ordinary shares of N1.0 each of Lamda Insurance.
69.	Royal Exchange Assurance Plc	Royal Exchange Nig. Plc Phoenix Assurance of Nig. Plc African Prudential Ins. Co. Ltd	2007	Merger	4 ordinary shares of 50k each of Royal Exchange for every 11 ordinary shares of 50k each of Phoenix Assurance and 1 ordinary shares of 50k each of Royal Exchange for every 1 ordinary shares of N2.0 each of African Prudential.

70.	Custodian & Allied Insurance Plc	Custodian & Allied Insurance Plc Fire, Equity & General Ins. Co. Ltd	2007	Merger	52 ordinary shares of 50k each of Custodian Insurance for every 63 ordinary shares of N1.0 each of Fire, Equity & General Insurance.
71.	Leadway Assurance Company Ltd	Atlantic Assurance Ltd	2007	Acquisition	Shareholders of Atlantic Assurance received N265.7 million for the acquisition of the entire shares of the company by Leadway Assurance.
72.	Crusader Insurance Plc	Golden Insurance Ltd Refuge Insurance Ltd Royal Trust Assurance Ltd	2007	Acquisition	50 ordinary shares of Crusader Insurance for every 291 ordinary shares of Golden Insurance, 100 ordinary shares of Crusader for every 313 ordinary shares of Royal Trust and 100 ordinary shares of Crusader for every 2749 ordinary shares of Refuge Insurance.
73.	Diamond Bank Plc	Diamond Bank Plc African Development Ins. Co. Ltd	2007	Acquisition	Shareholders of African Development Insurance Company received N539.75 million for the acquisition of the 95% of the company's shares by Diamond Bank.
74.	Sona Systems Associates Management Ltd	Sona Breweries Plc Food, Agro & Allied Industries Ltd International Beer & Beverages	2007	Acquisition	Shareholders of Sona Breweries, Food, Agro & Allied Industries and International Beer & Beverages received from Sona Systems the sum of N640.368 million, N661,165,254.55 and N227.514 million respectively for the acquisition of the entire assets of the companies.
75.	Industrial & General Insurance Company Ltd	Nasal Insurance Ltd	2007	Acquisition	1 ordinary share of IGI for every 7 ordinary shares of Nasal

76.	Oando Marketing Ltd	Oando Plc	2007	De-merger	Oando Marketing Ltd received assets worth N16.386 billion for 49,750,000 ordinary shares of N1.0 each of Oando Plc. Oando Marketing thus became a separate entity from Oando Plc
77.	Niger Delta Exploration & Production Plc	Niger Delta Petroleum Resources Ltd	2007	Acquisition	Payment of net consideration of $4,227,476 by issuance of 7,410,232 ordinary shares of Niger Delta Exploration & Production Plc, representing 50% of the amount and $2,223,062 worth Niger Delta Petroleum Resources Ltd Irredeemable Participating Investment Notes (IPINs).
78.	Niger Delta Exploration & Production Plc	Chemur Ltd	2007	Acquisition	Payment of net consideration of $2,361,150 by issuance of 6,746,143 ordinary shares of N10.0 each in Niger Delta Exploration & Production Plc to the shareholders of Chemur Ltd
79.	Oando Plc	Ocean & Oil Investment Ltd Gaslink Nig Ltd (involving 12 Identified shareholders)	2007	Acquisition	Issuance of 118,177,993 ordinary shares of Oando Plc for 11,765,889 fully paid ordinary shares of Ocean & Oil Investments in Oando Energy Services Ltd, Oando Production & Development Co. Ltd, Oando Exploration & Production Ltd, Oando Supply & Trading Ltd and Oando Trading (Bermuda) Ltd. 12 identified minority shareholders of Gaslink Nig. Ltd received 63,591,633 ordinary shares of Oando Plc for 635,916,330 ordinary shares of Gaslink Nig. Ltd.

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80.	Niger Delta Exploration & Production Plc	Chemur Ltd	2007	Acquisition	Payment of net consideration of $2,361,150 by issuance of 6,746,143 ordinary shares of N10.0 each in Niger Delta Exploration & Production Plc to the shareholders of Chemur Ltd
81.	Niger Delta Exploration & Production Plc	Chemur Ltd	2007	Acquisition	Payment of net consideration of $2,361,150 by issuance of 6,746,143 ordinary shares of N10.0 each in Niger Delta Exploration & Production Plc to the shareholders of Chemur Ltd
82.	Oando Plc	Ocean & Oil Investment Ltd Gaslink Nig Ltd (involving 12 Identified shareholders)	2007	Acquisition	Issuance of 118,177,993 ordinary shares of Oando Plc for 11,765,889 fully paid ordinary shares of Ocean & Oil Investments in Oando Energy Services Ltd, Oando Production & Development Co. Ltd, Oando Exploration & Production Ltd, Oando Supply & Trading Ltd and Oando Trading (Bermuda) Ltd. 12 identified minority shareholders of Gaslink Nig. Ltd received 63,591,633 ordinary shares of Oando Plc for 635,916,330 ordinary shares of Gaslink Nig. Ltd.
83.	Tower Aluminium Nigeria Plc	Tower Aluminium Nigeria Plc Cook "N" Lite Nigeria Plc	2008	All the assets, Liabilities and undertakings including real properties of Cook 'N' Light Nig. Plc were transferred to Tower Aluminium Nig. Plc. Merger	Cash payment of N1.54 billion in exchange for every 1 ordinary share of 50k each of Cook "N" Lite Nigeria Plc
84.	Sovereign Trust Insurance Plc	Sovereign Trust Insurance Plc Coral Int'l Insurance Company Ltd Prime Trust Insurance Co. Ltd	2008	Merger	11 ordinary shares of Sovereign Trust for every 15 ordinary shares of Confidence Insurance, 8 ordinary shares of Sovereign Trust for every 5 ordinary shares of Coral Int'l Insurance and 7 ordinary shares of Sovereign Trust for every 16 ordinary shares of Prime Trust
85.	MTN Nigeria Ltd	MTN Nigeria Ltd VGC Communications Ltd	2008	Merger	No new shares were issued and no cash payment (MTN wholly owned VGC).
86.	Tantalizers Ltd	Baytide Nigeria Ltd	2008	Acquisition	The transaction was a nominal transfer of 100% equity in Baytide Nig. Ltd, involving 20 million ordinary shares of N1.0 each to Tantalizers Ltd.

87.	Chapel Hill Advisory Services Ltd	Denham Management Ltd	2008	Acquisition	4 ordinary shares of Denham Management for every 3 ordinary shares of Chapel Hill Advisory Services.
88.	Consolidated Hallmark Insurance Plc	Hallmark Assurance Plc Nigerian General Ins. Co. Ltd	2008	Acquisition	375 ordinary shares of Consolidated Hallmark Insurance for every 100 ordinary shares of Hallmark Assurance and 120 ordinary shares of Consolidated Hallmark Assurance for every 100 ordinary shares of Nigerian General Insurance Company Ltd.
89.	Damnaz Cement Company Ltd	Cement Company of Northern Nigeria Plc	2008	Acquisition of 50.7% Holdings of Scancem International in Cement Company of Northern Nigeria Plc by Damnaz Cement	Scancem Nig. Ltd received a cash payment of N3,453,580,080 from Damnaz Cement Company for its 637,403,152 ordinary shares or 50.7% holdings in Cement Co
90.	Standard Alliance Insurance Plc	Perpetual Assurance Company Ltd	2008	Acquisition	1 ordinary share of Standard Alliance Insurance Plc for every 4 ordinary shares of Perpetual Assurance Company Ltd.
91.	Dufil Prima Foods Ltd	De-United Foods Industries Ltd Insignia Print Technology LFTZ Ent.	2008	Acquisition	Shareholders of Insignia Print received 540,000,000 ordinary shares of Dufil Prima for their 999,999 ordinary shares of N1.0 each and Shareholders of De-United Foods received 1,223,333,334 ordinary shares of Dufil Prima for their 59,999,998 ordinary shares of N1.0 each.
92.	FCMB Capital Markets Ltd	CSL Stockbrokers Ltd City Securities Registrars Ltd	2008	Acquisition	CSL Stockbrokers and City Securities Registrars received N6.65 billion and N995 million respectively from FCMB Capital Market Ltd in consideration of their issued and fully paid shares.
93.	MTN Nigeria Communications Ltd	VGC Communications Ltd	2008	Acquisition	The entire equity holdings of VGC Communications Ltd was purchased at the cost of N8.35 billion by MTN Nigeria Ltd.
94.	Gyallesu Community Bank Ltd	Kudandami Community Bank Ltd	2008	Acquisition	1 ordinary share of Gyallesu Community Bank for every 1 ordinary share of Kudandami Community Bank
95.	West Africa Household	Battery Manufacturing Company Nigeria Limited (BAMCO)	2009	Merger	Shareholders of BAMCO were paid N6.67 per every share held

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		Utilities Manufacturing Company Limited (WAHUM)			
96.	Bank PHB Plc	Spring Bank Plc	2008	Takeover	Bank PHB took over the management of Spring Bank after acquiring 33% of Spring Bank. Bank PHB thereafter bid to purchase 26.97% of issued and paid-up capital of Spring Bank.
97.	Crown Flour Mills Ltd	Interstate Flour Mills Ltd and Mix and Bake Flour Mills Industries	2009	Merger	Four (4) ordinary shares of Interstate Flour Mills Ltd to every Five (5) ordinary shares of Crown Flour Mills Ltd; and Five (5) ordinary shares of Mix and Bake Industries to every four (4) ordinary shares of Crown Flour Mills
98.	Lasaco Insurance Plc	Elmac Insurance Company Ltd	2009	Acquisition	For the Acquisition of 100% equity of Elmac, its shareholders will receive One (1) ordinary share of Lasaco Insurance Plc for every forty two (42) ordinary shares held
99.	Niger Delta Exploration and Production Plc	Investors in the Irredeemable Participating Investment Notes (IPINs) of Niger Delta Exploration and Production Plc	2009	Acquisition	Acquisition/Cancellation of 3,393,589 IPINs by payment of $10,542,620.23, representing 30% and a total of 18,727,321 ordinary shares of Niger Delta Exploration and Production Plc
100.	Ecobank Nigeria Plc	African International Bank Ltd	2009	Acquisition	A total of N65,000,000 was paid to the shareholders of African International Bank by Ecobank Nigeria Plc based on N65 per share
101.	Bank PHB Plc	GTI Insurance (51% equity holding)	2009	Acquisition	A total N1,530,000,000 was paid to the shareholders of GTI Insurance Ltd.
102.	Mutual Benefits Assurance Plc	Worldwide Insurance Company Ltd	2009	Acquisition	One (1) ordinary share of Mutual Benefits Assurance for every five (5) ordinary shares of Worldwide Insurance Co. Ltd
103.	SW8 Investment Ltd	- -Bank Plc (26.50% equity holdings)	2009	Acquisition	A total of N13.50 billion was paid to Wema Bank by SW8 Investment Ltd for 2.70 billion ordinary shares of the bank at a unit price of N5.00

S/N	Acquiring company	Target company(ies)	Year of Approval	Terms of Conversion/Business Combination Type	Mode of settlement
104	Renaissance Securities (Nigeria) Limited	Rencap Securities (Nigeria) Limited	2009	Acquisition	A total of N70,000,000 was paid to the shareholders of Rencap Securities Ltd
105	Consolidated Breweries Plc	DIL/Maltex Nigeria Plc (95.5% equity holdings of CFAO)	2009	Acquisition	A total of €4,277,250 and N808,708,212 respectively were paid to CFAO for its 95.5% holdings in Dil/Maltex Nig. Plc
106	Asset & Resource Management Ltd (ARM) (Management Buy-Out)	ARM Ltd and its Management (70% equity holdings of GT Bank Plc in ARM)	2009	Management Buy-Out	A total of N80.o million was paid to GT Bank Plc
107	ARM Pension Managers	First Alliance Pension & Benefit Ltd	2010	Merger	The holders of the cancelled First Alliance shares shall be entitled to 37% share holdings in the post-merger ARM Pension.
108	Rubber Estates Nigeria Ltd	Araromi Rubber Estates Ltd Osse River Rubber Estates Ltd Utagbo-Uno Rubber Estates Ltd Water Side Rubber Estates Ltd	2010	The merger transaction involved the transfer of assets, liabilities and undertakings of the four target companies to Rubber Estates Nigeria Ltd	Prior to the Merger Rubber Estates Nig. Ltd had 80% shareholdings in Osse River, Utagbo-Uno and Water Side respectively and 60% in Araromi.
109	Obajana Cement Plc (Dangote Cement Plc)	Benue Cement Company Plc	2010	The merger transaction involved the transfer of assets, liabilities and undertakings of Benue Cement to Dangote Cement	Exchange of shares
110	NEM Insurance Plc	Lombard Insurance Company Plc	2010	Acquisition of 100% equity of Lombard Insurance	A total of 303,580,147 ordinary shares of NEM Insurance Plc were issued to the shareholders of Lombard Insurance.
111	Asset Resource Management (ARM) Co. Ltd	The Majority shares of Hamilton Hammer & Co. Ltd	2010	Transfer of majority shares of Hamilton Hammer & Co Ltd to ARM Ltd.	Cash
112	Emerging Market Telecommunication Services Ltd	Alheri Mobil Ltd	2010	Acquisition of 100% equity shareholding in Alheri Mobile by Emerging Market Communication	Cash

S/N	Acquiring company	Target company(ies)	Year of Approval	Terms of Conversion/Business Combination Type	Mode of settlement
113	Flour Mills of Nigeria Plc	Nigeria Eagle Flour Mills Ltd	2010	Involves the acquisition of 51% equity holdings of Nigeria Eagle Flour Mills by Flour Mills of Nigeria Plc.	Cash
114	Dangote Cement Plc	Obajana Cement Plc Dangote Bail Ltd DCW Ltd	2010	Restructuring of Dangote Cement Business	Consolidation
115	Aiico Insurance Plc	Aiico General Insurance Company Ltd	2010	Restructuring of Aiico Group Business	Consolidation
116	Diamond Bank Plc	Diamond Securities Ltd Diamond Capital & Financial Markets Ltd	2010	Transfer of Diamond Bank Plc's Shareholding in Diamond Securities Limited to Diamond Capital & Financial Markets Limited	No Consideration
117	CFAO Nigeria Plc	CFAO Motors Ltd	2010	Group restructuring	No Consideration
118	FCMB Plc	CSL Stockbrokers Limited, CSL Registrars Limited	2010	Acquisition	A total of N6.65 billion and N995.0 million were paid for 100% equity of CSL Stockbrokers and CSL Registrars at a unit price of N66.5 and N19.90 respectively.
119	Pan-Marine Investment Ltd	Golden Guinea Plc	2010	Small Merger	
120	Nigeria Motors Industries Ltd	CFAO Motors Nigeria Ltd	2011	Intra Group Restructuring	Internal restructuring (no consideration)
121	Nigeria Motors Industries Ltd	CFAO Motors Nigeria Ltd	2011	Intra Group Restructuring	Internal restructuring (no consideration)
122	Oceanic Bank International Plc	Corporate Ideal Insurers Ltd	2011	Oceanic Bank acquired Corporate Ideal Insurers Ltd	Cash consideration of N80, 000, 000
123	UAC Foods Ltd	UAC Diaries Division UAC Foods	2011	Unbundling of UAC Foods and UAC Diaries into UAC Foods Ltd	No consideration
124	Flour Mills of Nigeria Plc	Golden Pasta Company Ltd	2011	Intra Group Restructuring	Internal restructuring (no consideration)

125	African Oilfield Services Ltd	Orwell International Oil & Gas Ltd	2011	Reorganization of capital between African Oilfield Services and holders of its fully paid shares and Merger between African Oilfield Services and Orwell International Oil & Gas	Reduction of share capital by 80% and thereafter cancellation of remaining 20% in Orwell International in exchange for 19% of economic value of the Merger entity.
126	Tiger Brand Ltd	Deli Foods Nigeria Ltd	2011	Tiger Brand acquired Deli Foods Nigeria	Total cash consideration of $46, 000,000 for 97, 659, 634 ordinary shares.
127	Nigeria Bottling Company	Minority Shareholders	2011	Scheme of arrangement	Each holder of the scheme shares shall receive the sum of N47.00 for each scheme share.
128	United Nigeria Textile	Minority Shareholders	2011	Scheme of arrangement	Holders of scheme shares who are on the register of members of UNTP shall be entitled to receive N1.20 for each scheme share.
129	Nampak Nigeria Plc	Minority Shareholders	2011	Scheme of arrangement	Holders who are on the register of members shall be entitled to receive N5.05 for each scheme share.
130	Visafone Communication	Cellcom Communication Ltd	2011	Jim Ovia (Visafone) acquired Cellcom Communication Ltd	
131	Emerging Markets Telecommunication Ltd	Fibertech Ltd	2011	Emerging Market Telecomm acquired Fibertech Ltd	EMTS will acquire 100% of the 10, 000, 000 issued and fully paid ordinary shares of Fivertech at a cash consideration of N1.05 billion (US $7 million equivalent).
132	Consolidated Breweries Plc	Benue Breweries Williams Dark Ale	2011	Consolidated Breweries acquired Benue Breweries and Williams Dark Ale	Cash consideration of US $11, 206, 904.
133	Zenith General Insurance Company Ltd	Piccadilly Insurance Company Ltd	2011	Zenith General Insurance acquired Piccadilly Insurance Company	Purchase consideration of N35, 000,000.
134	ADIC Insurance	ADIC Insurance (Life Business) ADIC Insurance (Non-Life Business)	2011	Combination of the life and Non-Life Insurance Business of ADIC Insurance Ltd into one company	Restructuring (no settlement involved)
135	Golden Capital Plc	Golden Capital Shareholders	2011	Scheme of arrangement	Scheme of arrangement
136	Adasa Catering Services Ltd	Compass Group International BV Whassan Euroset Nigeria Ltd	2011	Adasa Catering Services acquired shares of Whassan Euroset Nigeria	Purchase consideration for the sale of shares is between US $500 and US $3, 500,000 depending on the success of Whassan.

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				Ltd from Compass Group International BV	
137	Finbank Plc	Holders of Finbank fully paid shares	2011	Reorganization of capital	Shareholders receive N0.13 or 1 FCMB share for every 60 existing shares. Total consideration paid by FCMB is N6 billion.
138	Union Bank Plc	Holders of Union Bank fully paid shares	2011	Reorganization of capital	Holders of shares shall retain 3 ordinary shares of 50 kobo each for every 16 ordinary shares of 50 kobo previously held.
139	Intercontinental Bank Plc	Holders of Intercontinental Bank fully paid shares	2011	Reorganization of capital	N1, 000,000,000 comprising 2, 000, 000, 000 ordinary shares of 50 kobo each will be retained as ordinary shares attributable to existing shareholders.
140	Sabmiller Investment Ltd	Pabod Breweries Ltd Voltic Nigeria Ltd	2011	Restructuring of Sabmiller Investment Ltd shareholding in Pabod Breweries Ltd and Voltic Nigeria Ltd	Internal restructuring (no consideration).
141	GTB Asset Management Ltd		2011	Management Buy-Out	Cash consideration of N1, 754,999,999,22 at N0.78 per share of 2, 249, 999,999 ordinary shares.
142	Nigerian Breweries Plc	champion Breweries Company Ltd	2011	Nigerian Breweries acquired champion Breweries	The shareholders of champion Breweries so cancelled shall receive 1 ordinary share each in Nigerian Breweries in exchange for every 6 ordinary shares in champion Breweries.
143	Assurance Africa Holding	Guaranty Trust Assurance Plc	2011	Assurance Africa Holding acquired GT Bank's holdings in Guaranty Trust Assurance	Purchase consideration of N11, 910,965,987.36 at N1.76 per share for entire ordinary shares of 6,767,594,311 of 50 kobo each.
144	Leoplast Industries Ltd	Papilon Industry Ltd Leocool and Leoplast Ltd	2011	Merger of the entities	No consideration
145	Wema Bank Plc	Wema Savings & Loans Ltd	2011	Scheme of arrangement	No consideration
146	Sterling Bank Plc	Equatorial Trust Bank	2011	Merger of the entities	Share exchange –shareholders of ETB received 2 Sterling Bank shares at N2.53 per share and in exchange gave up 1 ETB share at N5.41.
147	Hip Oils Topco Ltd	Multi-Links Telecommunications Ltd	2011	Hip Oils Topco acquired Multi-Links Telecommunications	An initial cash consideration of US $300 in addition to a differed consideration $10, 000,000 upon Multi-Links achieving a certain predetermined threshold.

148	Olam International Ltd	Crown Flour Mills	2011	Olam International Ltd acquired Crown Flour Mills	Purchase consideration of US $44, 644,414 at N148 each (N6, 607,373,272.00)
149	Alliance & General Life Assurance Plc	Alliance & General Insurance Company	2011	Merger of the entities	3 ordinary shares of 50 kobo each in Alliance General Life Assurance for every 13 ordinary shares of Alliance & General Insurance Company.
150	Oceanic Bank Plc	Holders of Oceanic Bank fully paid shares	2011	Reorganization of capital	Share capital of N11,110,684,606.50 reduced to zero and holders of cancelled shares to receive 1 ordinary share of US $0.025 and 0.428 preference shares of US $0.1032 in Ecobank Transnational Incorporated for every 20 ordinary shares of 50 kobo previously held in Oceanic Bank.
151	Consolidated security Plc	Champion security ltd	2011	Consolidated security acquired Champion security	Purchase consideration of US $5,682,652 to Montgomery venture for acquisition of Montgomery Ventures' 57% equity in Champion security.
152		United Bank of Africa (UBA) Plc	2011	Scheme of arrangement	Scheme of arrangement between the company and its shareholders.
153	Ecobank Plc	Oceanic Bank Plc	2011	Merger of the entities	Share exchange-shareholders of Oceanic Bank were to receive 16.1 billion new shares in Ecobank and N2.6 billion credited to Oceanic Bank shareholders as deposit for shares in Ecobank.
154	Marina Securities	United Securities Ltd	2011	Marina Securities acquired United Securities.	Purchase consideration of N550 million.
155	Lakeport Ltd	GTB Registrars Ltd	2011	Lakeport acquired GT Bank Plc's equity stake in GTB Registrar	Cash consideration of N67,500,000.00 for 99.9% shareholding of GTB Registrars at N1.35 per share.
156	First City Monument Bank	Finbank and First City Monument Bank	2012	First City Monument Bank acquired Finbank	Preference shareholders received N100 for each varied share
157	First City Monument Bank	Fin Bank	2012	Merger of the two entities	No Consideration
158	Access Bank Plc	Intercontinental Bank Plc	2012	Merger of the entities	Each shareholder of intercontinental received 100 shares in exchange in exchange for 414 ordinary shares held in Intercontinental Bank.
159	-	Computer Warehouse group Ltd, DCC Networks Ltd, Expertedge Software Ltd, ANAS Network	2012	Restructuring of Group	No Consideration

160	NSIA Participations S.A. Holdings	ADIC Insurance Ltd and NSIA Participations S.A. Holdings	2012	Acquisition of 8,782,887,009 ordinary shares of fifty-kobo each in Adic Insurance Ltd by NSIA Participations S.A. Holdings ("the acquisition")	The sum 6,750,000,000 was paid as consideration to Diamond Bank
161	SWAP Telecoms Plc	SWAP Telecoms Plc	2012	**Restructuring** This is exclusively for the shareholders holding less than 49,999,999 in SWAP via the scheme of arrangement by transferring assets from SWAP that are relevant to prime without any transfer of liabilities.	No Consideration
162	Assur Africa Holding	Guaranty Trust Bank Plc and Assur Africa Holding	2012	Tender offer to minority shareholders of Guaranty Trust Assurance Plc for the acquisition of up to 7.32% of its issue share capital.	Total cash consideration of N3,224,860.30 representing 0.003% at N1.76 per share for the acceptance 610,768,997 shares
163	Multipro Enterprises Ltd, Hypo Hygiene Products Ltd and BHN Ltd	Multipro Enterprises Ltd	2012	Restructuring	No Consideration
164	Nigerian Breweries	Benue Breweries	2012	Merger of the entities	The holders of Benue Breweries received 1 ordinary share in Nigeria Breweries in exchange for every 6 ordinary shares in Benue Breweries.
165	-	Stanbic IBTC Plc	2012	Restructuring-Transfer of subsidiaries under section 539 of CAMA ,Transfer of the shareholdings in Stanbic IBTC Bank Plc, Stanbic IBTC Asset Management Limited, Stanbic IBTC Brokers Limited, Stanbic IBTC Trustees Ltd and Stanbic Ventures Ltd to Stanbic IBTC Group Plc (Holding Company) and reduction of Share Capital under Section 106 of CAMA ,2004	No Consideration

166	Bluestream Development and project Limited	GT Homes and Bluestream Development and project Limited	2012	Acquisition of GTBank equity stake of 3,499,999,999 ordinary shares of N1.00 (representing 75.11%) in GTHomes Limited by Bluestream Development and Project Ltd	Cash consideration of 2,850,000,000
167	Transnational Corporation of Nigeria Plc	Kingsville Hotel Ltd and Transnational Cooperation of Nigeria Plc	2012	Transnational Cooperation of Nigeria Plc acquired Kingsville Hotel Ltd	The sum of N3,499,999,999 was paid as consideration
168	Transnational Cooperation of Nigeria Plc	Kingsville Hotel Ltd and Transnational Cooperation of Nigeria Plc	2012	Transnational Cooperation of Nigeria Plc acquired Kingsville Hotel Ltd and	The sum of N3,499,999,999 was paid as consideration
169	-	First Bank	2012	Restructuring It involves the shareholders of First Bank as at terminal date to surrender their shares in First Bank to FBN Holdings in exchange for the issuance of same number shares held in First Bank	No Consideration
170	Tiger Brands Limited	Dangote Flour Mills	2012	Acquisition of 3,167,667 (63.35)ordinary shares of 50kobo each in Dangote Flour Mills from Dangote Industries Ltd by Tiger Brands Ltd	A sum of N30,903,308.50 (N9. 50 k) per share was paid as consideration
171	Trancorp Hotel & Tourism Services	Kingsville Hotel Ltd	2012	Sale of entire share capital of Transcorp Metropolitan comprising of 5,000,000 ordinary shares	Cash consideration of 3,390,00,000
172	Ecobank Transnational Incorporation Limited	Oceanic Bank Plc	2012	Unbundling of core assets of Oceanic bank plc to ETI	No Consideration
173	ARM Limited	Skye bank and Skye Financial Services Ltd	2012	Acquisition of 31.11% of Skye bank and 10.37% of Financial Services equity stake in Crystal Life Assurance Plc by ARM	Cash consideration of N1,896000,000 @N0.79

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174	Dunn Loren Merrifield Investment Company Limited	ESS Investment Limited	2012	Acquisition of 100% equity holding in ESS Investment Limited	Consideration of 72,000,000.00 @ N1.028 per share
175	First City Monument Bank	Finbank and First City Monument Bank	2012	Merger of the two entities	No Consideration
176	Stanbic IBTC Bank Plc	Stanbic IBTC Bank Plc	2012	Scheme of arrangement between Stanbic IBTC Bank Plc and the holders of its fully paid ordinary shares of 50K each.	No Consideration
177	Revised scheme of arrangement between United Bank for Africa Plc (UBA) and the holders of its fully paid	Revised scheme of arrangement between United Bank for Africa Plc (UBA) and the holders of its fully paid	2012	Revised scheme of arrangement between United Bank for Africa Plc (UBA) and the holders of its fully paid	For every 33 shares held in UBA Plc, eligible shareholders received: 1 ordinary shares in Afriland Properties, 1 ordinary shares in Africa Prudential Registrar Plc and 4 ordinary shares in UBA Capital Plc respectively.
178	Flour Mills of Nigeria Plc	Rom Oils Mill Limited	2012	Acquisition of 90% shareholding in ROM Oil Mill Limited	Cash consideration of N1,494,171,509 @N166.02
179	Ovalsites Limited	NWS Nigeria Limited	2012	Acquisition of NWS Nigeria Limited and Ovalsites Limited (Noted Transaction)	No Consideration
180	First City Monument Bank (FCMB) Plc	First City Monument Bank (FCMB) Plc	2012	Scheme of arrangement between First City Monument Bank (FCMB) Plc and the holders of its fully paid ordinary shares of 50k each	The holders of FCMB Plc received 1 ordinary share for every one share previously held in FCMB
181	Total Nigeria Plc	Total Nigeria Plc	2012	Intra Group restructuring of Total Nigeria Plc	Total S.A and Elf Acquisition contributed 153,600,000 and 55,959,630 ordinary shares respectively in Total Nigeria to Total Reffinage Marketing Ltd.
182	Oceanic Life Assurance	Old Mutual Nigeria Insurance Company Limited	2012	Merger of the two entities	Old Mutual Nigeria Life Insurance Company Ltd paid the sum of N2,240,000 to Cressida Nigeria Ltd the beneficial owner of Oceanic Life Insurance Plc
183	Dunn Loren Merrifield Investment Company Limited	Access Investment and Securities Limited.	2012	Acquisition of 100% equity holding in Access Investment Securities Limited	Consideration of N 100,000,000.00 in exchange for issued and allotment of 495,000,000 ordinary shares.

184	Apel Asset & Trust Limited	PHB Capital.	2012	Acquisition of PHB Capital by Apel Asset & Trust Limited	111,558,690(100%) ordinary shares of N1.00 was purchased at the sum of 28,000,000.00
185	Halo Africa Limited	TDA Capital Management Limited	2012	Acquisition of 66.7% of issued shares capital of TDA Capital Management Limited by Halo Africa Limited	Cash consideration of 15,000,000.00 was paid to TDA Capital Management Limited.
186	Lapo Microfinance Bank Limited	Lift Microfinance Bank	2012	Lift Microfinance Bank by Lapo Microfinance Bank Limited (Noted Transaction)	No Consideration (Noted Transaction)
187	Afrinet Investment Limited	Femi Johnson	2012	Acquisition of 60% shareholding in Femi Johnson by Afinet Investment Limited	Cash consideration of N220,928,000.00
188	Citadel Nominees Ltd	Wema Registrars Ltd	2012	Acquisition of 100% shares of Wema Registrars Limited by Citadel Nominees Ltd	In consideration for the acquisition of 50,000,000 ordinary shares of N1.00 each, Citadel Nominees paid N50, 000,000 to the shareholders of Wema Registrars.
189	Interrec Ltd	Ecobank Transnational	2012	Acquisition of 51.88% stake in Intercontinental Homes & Savings Loans by Interrec	Access Bank sold its 51.88% equity of N1.00 at N0.74k at the price of N2,100,000,000.00
190	Aterios Capital Limited	Unity Investment and Capital Limited	2012	Acquisition of 89.01% shareholding in Unity Capital by Aterios Capital Limited	In consideration for acquiring 445,059,420 Aterios paid the sum of N500,000,000.00 to Unity Bank Plc.
191	-	Dangote Sugar refinery and Savanah Sugar Company Limited	2013	Acquisition of 95% shareholding of Savanah Sugar Company Ltd from Dangote Industries Limited	No Consideration
192	-	Tiddo Securities Limited and Tiddo Investment Management Limited	2013	Merger of the two entities	The sum of 2,071,814.00 was paid as cash consideration.
193	-	Wapic Insurance Plc and Intercontinental Properties Ltd	2013	Merger of the two entities	Transfer of shares- All shareholders of Intercontinental Properties received 2 shares in Wapic Insurance in exchange for 1 share held by them in Intercontinental Properties.
194	Consolidated Breweries	DIL/ Maltex and Benue Brewery	2013	Merger of the tree entities	Each DIL / Maltex shareholder received 1 Consolidated Breweries share in exchange for 20 ordinary shares held in DIL Maltex. No consideration to the shareholders of Benue Brewery

					because it is wholly owned subsidiary of Consolidated Breweries.
195	Custodian & Allied Insurance Plc	Crusader Nigeria Plc	2013	Merger of the two entities	8 ordinary shares of 50K each in Custodian for every 34 ordinary shares in Crusader
196	GEM Global Markets Limited	Treasure Capital Limited	2013	Acquisition of 52% share of Treasure Capital Limited	The sum of N 517,000,000.000 was paid as consideration to Treasure Capital Limited.
197	Flour Mills of Nigeria Plc	Nigeria Bag Manufacturing Company Plc , Northern Bag Manufacturing Ltd and Bagco Morpac Nigeria Ltd	2013	Merger of the four entities	Transfer of assets , liabilities band undertakings of Bagco Group , each shareholder received N2.75 as cash consideration for each scheme share or 1 Flour Mills share for every 25 scheme shares
198	Cadbury Nigeria Plc	Stanmark Cocoa Processing Company	2013	Merger of the two entities	Minority shareholders received N4.00 per share for every share held. Sranmark Cocoa Processing Company is wholly owned subsidiary (99.34%) of Cadbury.
199	Flour Mills	Niger Mills	2013	Merger of the two entities	In consideration of the transfer of assets, liabilities and undertakings, Shareholders Niger Mills received 2 ordinary shares of 50Kobo each in Flour Mills in exchange every 11 shares of N2.00 each.
200	-	Emerging Markets Telecommunication Services Ltd and Alheri Services Limited	2013	Internal restructuring	No Consideration
201	-	Honeywell Flour Mills Plc and Honeywell Superfine Foods	2013	Internal restructuring	No Consideration
202	MMC Group	Femi Johnson and Company Limited	2013	Acquisition of 60% ordinary shares of Femi Johnson and Company Limited.	N304,813,740 was paid as consideration for 60% equity in Femi Johnson.
203	Crystal Global Asset Ltd	Pivot Trust & Investment Company Ltd	2013	Acquisition of Pivot Trust & Investment Ltd by Crystal Global Ltd.	Crystal Global Asset Ltd injected the sum of N79,700,000 into Pivot Trust as recapitalization.
204	Flour Mills of Nigeria Plc	Thai Farm International Limited	2013	Acquisition of 100% share Capital	The sum of 874,125,338.00 was paid as consideration
205	Alpha Partners Limited	Oceanic Health Management Limited	2013	Acquisition of 95% equity stake in Oceanic Health Management	N350,000,000 was paid as consideration.
206	UAC of Nig. Plc	Portland Paints & Products of Nig. Plc	2013	Acquisition of 51% shares of UAC of Nig.	In consideration for acquiring 204,000,000ordinary shares of Portland Paints @ N6.00 per share UAC of Nig. Plc paid the sum of N1,224,000,000 as consideration to the shareholders: Auroes West Africa Fund LLC N 840,000,000, Mr. Adebayo

					Osibo N249,600,000 and other shareholders N134,400,000
207	-	Glaxosmithkline Nigeria Plc	2013	Reorganization of capital between Glaxosmithkline Nigeria Plc and holders of its fully paid ordinary shares of 50K each	Reorganization of capital between Glaxosmithkline Nigeria Plc and holders of its fully paid ordinary shares and a reduction in GSK Nigeria share capital 2 out of every 3 shares held by existing shareholders of GSK Nigeria shall be cancelled and the holders of the shares so cancelled shall retain 1 ordinary share of 50k each in the reorganized GSK Nigeria credited as fully paid for 3 ordinary shares of 50k each.
208	Southern Sun Africa	Ikoyi Hotels Limited	2013	Acquisition of 65,551,785 ordinary shares representing 72.84% equity stake in Ikoyi Hotels	A consideration of US$43.9m was paid for the transaction.
209	Cardinalstone Partners and City Securities Registrars Limited		2013		
210	-	Food concept Plc and Free Range and Farms Limited	2013	Internal restructuring of Food concept Plc and Free Range and Farms Limited	The transaction was consummated through a scheme of arrangement pursuant to section 539 and 540 of CAMA. All the issued shares of Free Range Farms Limited were transferred to the shareholders of Food Concept Plc on a pro-rata basis.
211	Paradox Limited, Discount Windows Ltd & Others	Zenith Registrars Limited	2013	Acquisition of 100% shares of Zenith Registrars	Payment of N 4,648,000,000 as consideration
212	SRM Partners Limited	First Registrars Nigeria Limited	2013	Acquisition of 100% equity stake in First Registrars by SRM Partners Limited	Acquisition of 500,000,000 shares in First Registrars Limited owned by First Bank Plc for a purchase consideration of N3,5000,000,000
241	Africa Prudential Registrars Limited	UAC Registrars	2013	Acquisition of 100% shareholding in UAC Registrars Limited by Africa Prudential Registrars	A consideration of N750,000,000 was paid for the acquisition.
243	Reorganisation of Crown Flour Mills Ltd.	Olam Sanyo Foods Limited	2013	Transfer of the assets in the noodles producing arm of Crown Flour Mills Ltd to Olam Sanyo Foods Limited.	

244	Aterios Capital Limited	Unity Investment and Capital Limited	2012	Acquisition of 89.01% shareholding in Unity Capital by Aterios Capital Limited	In consideration for acquiring 445,059,420 Aterios paid the sum of N500,000,000.00 to Unity Bank Plc.
245	-	Dangote Sugar refinery and Savanah Sugar Company Limited	2013	Acquisition of 95% shareholding of Savanah Sugar Company Ltd from Dangote Industries Limited	No Consideration
246	-	Tiddo Securities Limited and Tiddo Investment Management Limited	2013	Merger of the two entities	The sum of 2,071,814.00 was paid as cash consideration.
247	-	Wapic Insurance Plc and Intercontinental Properties Ltd	2013	Merger of the two entities	Transfer of shares- All shareholders of Intercontinental Properties received 2 shares in Wapic Insurance in exchange for 1 share held by them in Intercontinental Properties.
248	Consolidated Breweries	DIL/ Maltex and Benue Brewery	2013	Merger of the tree entities	Each DIL / Maltex shareholder received 1 Consolidated Breweries share in exchange for 20 ordinary shares held in DIL Maltex. No consideration to the shareholders of Benue Brewery because it is wholly owned subsidiary of Consolidated Breweries.
249	Custodian & Allied Insurance Plc	Crusader Nigeria Plc	2013	Merger of the two entities	8 ordinary shares of 50K each in Custodian for every 34 ordinary shares in Crusader
250	GEM Global Markets Limited	Treasure Capital Limited	2013	Acquisition of 52% share of Treasure Capital Limited	The sum of N 517,000,000.000 was paid as consideration to Treasure Capital Limited.
251	Flour Mills of Nigeria Plc	Nigeria Bag Manufacturing Company Plc , Northern Bag Manufacturing Ltd and Bagco Morpac Nigeria Ltd	2013	Merger of the four entities	Transfer of assets , liabilities band undertakings of Bagco Group , each shareholder received N2.75 as cash consideration for each scheme share or 1 Flour Mills share for every 25 scheme shares
252	Cadbury Nigeria Plc	Stanmark Cocoa Processing Company	2013	Merger of the two entities	Minority shareholders received N4.00 per share for every share held. Sranmark Cocoa Processing Company is wholly owned subsidiary (99.34%) of Cadbury.
253	Flour Mills	Niger Mills	2013	Merger of the two entities	In consideration of the transfer of assets, liabilities and undertakings, Shareholders Niger Mills received 2 ordinary shares of 50Kobo each in Flour Mills in exchange every 11 shares of N2.00 each.
254	-	Emerging Markets Telecommunication Services Ltd and Alheri Services Limited	2013	Internal restructuring	No Consideration

255	-	Honeywell Flour Mills Plc and Honeywell Superfine Foods	2013	Internal restructuring	No Consideration
256	MMC Group	Femi Johnson and Company Limited	2013	Acquisition of 60% ordinary shares of Femi Johnson and Company Limited.	N304,813,740 was paid as consideration for 60% equity in Femi Johnson.
257	Crystal Global Asset Ltd	Pivot Trust & Investment Company Ltd	2013	Acquisition of Pivot Trust & Investment Ltd by Crystal Global Ltd.	Crystal Global Asset Ltd injected the sum of N79,700,000 into Pivot Trust as recapitalization.
258	Flour Mills of Nigeria Plc	Thai Farm International Limited	2013	Acquisition of 100% share Capital	The sum of 874,125,338.00 was paid as consideration
259	Alpha Partners Limited	Oceanic Health Management Limited	2013	Acquisition of 95% equity stake in Oceanic Health Management	N350,000,000 was paid as consideration.
260	UAC of Nig. Plc	Portland Paints & Products of Nig. Plc	2013	Acquisition of 51% shares of UAC of Nig.	In consideration for acquiring 204,000,000 ordinary shares of Portland Paints @ N6.00 per share UAC of Nig. Plc paid the sum of N1,224,000,000 as consideration to the shareholders: Auroes West Africa Fund LLC N 840,000,000, Mr. Adebayo Osibo N249,600,000 and other shareholders N134,400,000
261	-	Glaxosmithkline Nigeria Plc	2013	Reorganization of capital between Glaxosmithkline Nigeria Plc and holders of its fully paid ordinary shares of 50K each	Reorganization of capital between Glaxosmithkline Nigeria Plc and holders of its fully paid ordinary shares and a reduction in GSK Nigeria share capital 2 out of every 3 shares held by existing shareholders of GSK Nigeria shall be cancelled and the holders of the shares so cancelled shall retain 1 ordinary share of 50k each in the reorganized GSK Nigeria credited as fully paid for 3 ordinary shares of 50k each.
262	Southern Sun Africa	Ikoyi Hotels Limited	2013	Acquisition of 65,551,785 ordinary shares representing 72.84% equity stake in Ikoyi Hotels	A consideration of US$43.9m was paid for the transaction.
263	Cardinalstone Partners and City Securities Registrars Limited		2013		
264	-	Food concept Plc and Free Range and Farms Limited	2013	Internal restructuring of Food concept Plc and Free Range and Farms Limited	The transaction was consummated through a scheme of arrangement pursuant to section 539 and 540 of CAMA. All the issued shares of Free Range Farms Limited were transferred to the shareholders of Food Concept Plc on a pro-rata basis.

265	Paradox Limited, Discount Windows Ltd & Others	Zenith Registrars Limited	2013	Acquisition of 100% shares of Zenith Registrars	Payment of N 4,648,000,000 as consideration
266	SRM Partners Limited	First Registrars Nigeria Limited	2013	Acquisition of 100% equity stake in First Registrars by SRM Partners Limited	Acquisition of 500,000,000 shares in First Registrars Limited owned by First Bank Plc for a purchase consideration of N3,5000,000,000
267	Africa Prudential Registrars Limited	UAC Registrars	2013	Acquisition of 100% shareholding in UAC Registrars Limited by Africa Prudential Registrars	A consideration of N750,000,000 was paid for the acquisition.
268	Reorganisation of Crown Flour Mills Ltd.	Olam Sanyo Foods Limited	2013	Transfer of the assets in the noodles producing arm of Crown Flour Mills Ltd to Olam Sanyo Foods Limited.	
269	Investment One Financial Services Ltd	Kakawa Assets Management Ltd	2013	Acquisition of 250,000,000 Ordinary Shares of N1.00 each in Kakawa Assets Management Ltd by Investment One Financial Services Ltd The transaction involves the acquisition of 250,000,000 ordinary shares of N1.00 each of N937,500,000 at N3.75 per share representing 99.9% shareholding in Kakawa Asset Management Limited.	
270	Nigerian Breweries	Sona Life Breweries	2013	It involves the acquisition of 513,000,000 ordinary shares of sona life Breweries from Consolidate Breweries .	Cash
271	FBN Life Assurance	Oasis Insurance Plc	2013	Acquisition of 71.2% equity interest in Oasis Insurance Plc by FBN Life Assurance Ltd. from majority shareholders in the company	Cash

272	Suntrust Savings & Loans Ltd.	Oceanic Homes Savings & Loans Ltd	2013	Acquisition of 99.2% Equity in Oceanic Homes Savings & Loans Ltd. by Suntrust Savings & Loans Ltd.	Cash
273	United Mortgage Ltd.	Spring Mortgage Plc	2013	The acquisition is for 43.75% equity holding of Enterprise Bank in Spring Mortgage Plc by United Mortgage Ltd.	Cash
274	FIN Insurance	Capital Alliance Private Equity III Limited	2014	The transaction involves the acquisition of 3,171,698,774 Ordinary shares (96.11% shareholding) of FIN Insurance Company limited for a cash consideration of N5,118,239,000	Cash
275	FINBANK Insurance Brokers Limited	Oriental Capital Asset Management Limited	2014	The transaction is the acquisition of 2,5000,000 Ordinary shares(100%) of FinBank Insurance Brokers Limited for a cash consideration of N15,000,000.	Cash
276	FinBank Securities and Asset Management Limited by	Quad Capital Ltd.	2014	The transaction involves the acquisition of FinBank Securities and Asset Management (FINSEC) by Quad Capital Ltd at a cash consideration of N 70,000,000.	Cash
277	FinBank Capital	Quad Capital Ltd	2014	The transaction was involves the acquisition of N2,500,000,000 Ordinary shares of N1 each at a cash consideration of N500,557754.	Cash

278	Restructuring of Ringardas Nigeria Limited, ASCA Bitumen Company Limited, Moraga	Mortain Nigeria Limited and GNB Logistics Nigeria Limited.	2014	The restructuring involves the consolidation of Ringadas Nigeria Limited, ASCA Bitumen Company Limited, Morgan Nigeria Limited and GNB Logistics Nigeria Limited.	No consideration was involved
279	Planet Capital Limited	Emerging Capital Limited And Strategy And Arbitrage Limited.	2014	Involves the merger between Planet Capital Limited, Emerging Capital Limited and Strategy and Arbitrage Limited into one entity known as Planet Capital Limited	Holders of Strategy & Arbitage Ltd shares shall receive 155 shares of N1.00 each in Planet Capital Plc, for every 100 shares previously held. Holders of Emerging Capital Ltd shares shall receive 6 shares of N1.00 each in Planet Capital for every 100 shares previously held, as consideration for the merger.
280	Afriland Properties Plc And	Heirs Real Estate Limited	2014	The transaction involves the transfer of assets, liabilities and undertakings including real and intellectual property rights of Heirs Real Estate Properties Ltd to Afriland Properties Plc	
281	Japaul Oil Maritime Services Plc	.	2014	It involves restructuring of its business through a transfer of the assets, contracts and obligation of its offshore business division into a wholly owned subsidiary (Japaul Shipping and Offshore Services Ltd-JSOSL). The proposed restructuring will involve the transfer of the relevant assets and liabilities of the offshore business division with a book value of N21.4Billion and N27.8Billion respectively from Japul to JSOSL	Cash and share exchange

282	Dangote Agrosacks Limited	Dangote Flour Mills	2014	Acquisition of 84,150,000 ordinary shares N1 each representing 99% equity stake in Dangote Agrosacks Limited held by Dangote Flour Mills by Dangote industries Limited for a consideration of N7,553,750,000	Cash
283	Oceanic Homes Limited	Suntrust Savings & Loans(Restructuring)	2014	The application involves the transfer of asset, liabilities and undertakings from Suntrust Savings to Oceanic Homes.	Cash
284	Glassforce Limited	Consol Glass Proprietary Limited	2014	An application for the acquisition of 1,914,339,368 ordinary shares equivalent to 51% equity stake in Glassforce Ltd by Consol Glass Proprietary Ltd.	Cash
285	Union Registrars	Citadel Nominees	2014	Proposed of 80% equity stake in Union registrars Ltd by Citadel Nominees Ltd	Cash
286	Nokia West Africa	Microsoft mobile OY	2014	Acquisition of 99.998% of equity stake in Nokia West Africa by Microsoft Mobile OY	Cash
287	Oando Energy Resources	Philips Oil Company Nigeria Ltd, Conoco Exploration & Production Nigeria Ltd and Philips Deepwater Exploration Nigeria Ltd	2014	Acquisition of Philips Oil Company Nigeria Ltd, Conoco Exploration & Production Nigeria Ltd and Philips Deepwater Exploration Nigeria Ltd by Oando Energy Resources	Cash

288	Kaizen Partners Nigeria Limited.	Diamond Capital and Financial Markets Limited	2014	Acquisition of Diamond Capital and Financial Markets Limited by Kaizen Partners Nigeria Limited.	Cash
289	Marina Securities Limited	Marina Securities Stockbroking Services Ltd.	2014	It involves the transfer of designated assets and issuing house license undertakings of Marina Securities to its Wholly owned subsidiary, Marina Securities Stockbroking Services Ltd. Marina Securities has assets worth N8.7billion out of which N2.3 billion will be transferred to MSSL	Share exchange
290	British American security	BAT Iseyin security Limited	2014	Scheme of external restructuring between british American tobacco Nigeria limited and BAT Isetin Agronomy Limited	Cash

S/N	Acquiring company	Target company(ies)	Year of Approval	Terms of Conversion/Business Combination Type	Mode of settlement
291	Nigerian Bank Plc	Consolidated Bank ltd	2014	Merger	Cash and equity option
292	Skye bank Plc.	Mainstreet Bank Ltd by	2014	Acquisition of 100% stake in Mainstreet Bank Ltd by Skye Bank Plc	Cash
293	ACA Holdings Limited	SIM Capital Alliance Limited	2014	Acquisition of 25,000,000 ordinary shares of N10 and 29,000,000 preference shares of N10 in SIM Capital Alliance Limited by ACA Holdings Limited from Sanlam Investments Holdings Limited.	Cash
294	HBCL Investments Limited	Enterprise Bank Limited	2014	Acquisition of 6,250,000,001 ordinary shares (100% Equity) by HBCL Investments Services Limited in Enterprise Bank Limited from Restructuring Company Limited and Eligible Securities Limited.	Cash
295	Zenith General Insurance Limited	Veritas Registrars Limited	2014	Acquisition of 658,300,000 ordinary shares (45.4% Equity) by Veritas Registrars Ltd in Zenith General Insurance Ltd. from Zenith bank Plc.	Cash
296	Union Capital Markets Limited	Stacap Limited	2014	Acquisition of 437,063,391 ordinary shares (100% Equity) stake in Union Capital markets Ltd by Stacap Ltd.	Cash

297	CUMMINS West Africa Ltd	CMI Africa Holdings	2014	Acquisition of 160,000,000 ordinary shares (50% equity stake)in CUMMINS West Africa Ltd by CMI Africa Holdings B.V from Leventis Power Systems Limited.	Cash
298	Penman Pensions Limited	Mansard Insurance Plc.	2014	Acquisition of 2,067,672,000 ordinary shares (60% Equity Stake) in Penman Pensions Limited by Mansard Insurance Plc.	Cash
300	Nokia West Africa	Microsoft Mobile OY	2014	Acquisition of 55,614,999 ordinary shares (99.998% equity stake) in Nokia West Africa by Microsoft Mobile OY.	
301	CITADEL Registrars Ltd	Union Registrars Limited.	2014	Acquisition of 50,000,000 ordinary shares (100% Equity) in CITADEL Registrars by Union Registrars Limited.	Cash
302	East Horizon Gas Company limited	Seven Energy International Limited.	2014	Proposed acquisition of 10,000,000 ordinary shares (100% interest) in East Horizon Gas Company limited by Seven Energy International Limited.	Cash
303	Marina Stockbroking Services Limited	Associated Discount House Limited.	2014	Acquisition of 100% equity shareholding in Marina Stockbroking Services Limited by Associated Discount House Limited.	Cash
304	Newdevco Inv & Sec Ltd	Gamzaki Transnational Ltd	2014	Acquisition of 299,216,313 shares of Unity Bank Plc (100% equity) in Newdevco Inv & Sec Ltd by Gamzaki Transnational Ltd.	Cash

305	Union Assurance Company Plc	Greenoaks Global Holdings Ltd	2014	Acquisition of 6,970,922,000 shares (92.75% Equity) by Greenoaks Global Holdings Ltd in Union Assurance Company Plc from Union Bank Plc and its subsidiaries (Union homes, UBN properties, Union trustees, William Street Trustees)	Cash
306	Independent Securities Ltd.	Butterpot Capital Limited	2014	Acquisition of 94.7% of the issued ordinary shares by Butterpot Capital Limited in Independent Securities Ltd.	Cash
307	FinBank Securities Limited and Asset Management	Quad Capital Ltd.	2014	Acquisition of FinBank Securities and Asset Management Limited by Quad Capital Ltd.	Cash
308	Kakawa Discount House Limited	FBN Capital Limited	2014	Acquisition of 54% equity interest in Kakawa Discount House Limited (representing 2,160,000,000 ordinary shares) by FBN Capital Limited and simultaneous redistribution of 20% interest to FBN Holding Limited	Cash
309	Lasaco Nigeria Plc	Lasaco Life Assurance Plc	2014	Scheme of arrangement between Lasaco Plc. and Lasaco Life Assurance Company Ltd it involves a scheme of arrangement to dissolve Lasaco Life Assurance Ltd and transfer its assets and liabilities to Lasaco Assurance Plc.	Cash

310	Seven Energy International Limited	East Horizon Gas Company limited	2015	Acquisition of 100% interest in East Horizon Gas Company Limited by Seven Energy International Limited	Cash
311	Nexans Kabelmetal Nigeria	Jagdish Jetvani	2015	Notification of the Acquisition of 206,528,170 shares representing 60% shareholding in Nexans Kabelmetal Nigeria	Cash
312	Associated Asset Managers Limited	Sterling Asset Managers Limited	2015	Notification of the acquisition of Associated Asset Managers Limited by Sterling Asset Managers Limited	Cash
313	Union Trustees Limited	Oreon Investments Limited	2015	Acquisition of 100% Equity stake in Union Trustees limited by Oreon Investments Limited	Cash
314	AshakaCem Plc	Lafarge Africa Plc	2015	Takeover bid by Lafarge Africa Plc for 927,008,865 the shares of Ashaka Cement Plc	Cash or option of equity
315	Kedari Capital	Kedari Securities Limited	2015	Merger of Kedari Capital Limited and Kedari securities Limited by way of an external restructuring.	No consideration
316	ITC Global Inc ITC Netherlands Cooperative U.A	Panasonic Corporation	2015	Notification of the acquisition of 100% stake in ITC Global Inc and ITC Netherlands Cooperative U.A by Panasonic Corporation. Both of the acquires operate in Nigeria through the acquirer's subsidiary- Newsat Communications Nigeria Limited.	

317	Fleet Technologies	Afriprice Investments	2015	Proposed acquisition of 83.73% Shareholding in Fleet Technologies by Afriprice Investment	Cash
318	Mount Pine Limited	Flour Mills Registrars Limited	2015	Notification of the acquisition of Flour Mills Nigeria Plc by Mount pine Limited	Cash
319	Ringardas Nigeria Limited	Starolux SA	2015	Acquisition of 32,949,996 shares representing 96.9% equity stake in Ringardas Nigeria Limited by Starolux SA	Cash
320	Tower Sites	ATC Nigeria Wireless Infrastructure Limited	2015	Acquisition of 4,800 telecommuniation tower assets of Airtel Nigeria Network Limited for a consideration of $1.05bn by ATC Nigeria Wireless Infrastructure Limited	Cash
321	United Mortgage Ltd	Spring Mortgage Plc	2015	Merger between United Mortgage ltd and Spring Mortgage Plc	

Appendix G

R Code for unbalanced MI decomposition (Chapter 4, p.277)

```
### Unbalanced Malmquist
install.packages("Benchmarking")
install.packages("boot")
install.packages("sm")
library(Benchmarking)
library(boot)
library(sm)
library(ggplot2)


setwd("C:/Users/stone/Dropbox/My PC (LAPTOP-716G7I0I)/Desktop")


x<-read.csv(file="MFONDATA2_CSV.csv",head=TRUE,sep=";")
names(x)
attach(x)


######---------------------------------------
#####Bootstrapping DEA function


bootdeafunc <- function(eff,inputs,outputs,B) {
 theta<-eff
 n<-length(theta)
 bootmatrix<-matrix(nrow=B,ncol=n)
 thetati<-matrix(nrow=B,ncol=n)
 thetastar<-matrix(nrow=B,ncol=n)
 h<-0.001
 for (b in 1:B) {
```

```r
  beta<-sample(theta,n,replace=TRUE)

  eps<-rnorm(n)

  thetatilde<-rep(0,n)

  for (i in 1:n) {

   if(beta[i]+h*eps[i]<=1.0){thetatilde[i]<- beta[i]+h*eps[i]}

   else {thetatilde[i]<- 2.0-beta[i]-h*eps[i]}

   thetati[b,]<-thetatilde

  }

  v=var(thetati[b,])

  thetastar=mean(beta)+(thetati-mean(beta))/(sqrt(1.+h^2/v))

  xstar=theta/thetastar[b,]*inputs

  #xstar=matrix (1,dim(inputs)[1],1)%*%theta/thetastar*inputs

  dea.boot<-dea(xstar,outputs,RTS="vrs",ORIENTATION="out")

  bootmatrix[b,]<-1/dea.boot$eff

  }

 return(t(bootmatrix))

}


####--------------------

##### Making Frontier
# These are the DMUs in t to be run in Frontier t

make.frontier<-list()

frontier.set<-list()

DMUtFrontiert<-matrix(NA,ncol=1,nrow=dim(x)[1])

DMUt.Frontiert.boot<-matrix(NA,ncol=B,nrow=dim(x)[1])

B<-30

for (temp in (min(x$Year):max(x$Year))) {

 make.frontier[[temp]]<-x[x$Year==temp,]
```

```
frontier.set[[temp]]<-c(make.frontier[[temp]][1])

front<-
     dea(x[unlist(frontier.set[[temp]]),c(7:9)],x[unlist(frontier.set[[temp]]),10],RTS="vrs",ORIE
     NTATION="out")

eff<-1/front$eff

DMUtFrontiert[unlist(frontier.set[[temp]]),1]<-eff

inputs<-x[unlist(frontier.set[[temp]]),c(7:9)]

outputs<-x[unlist(frontier.set[[temp]]),10]

teste<-
     bootdeafunc(eff,x[unlist(frontier.set[[temp]]),c(7:9)],x[unlist(frontier.set[[temp]]),c(10)],30
     )

for (b in (1:B)) {

DMUt.Frontiert.boot[unlist(frontier.set[[temp]]),b]<-t(teste[,b])

}

}


# These are the DMUs in t+1 to be run in Frontier t+1


make.frontiert1<-list()

frontier.sett1<-list()

DMUt1Frontiert1<-matrix(NA,ncol=1,nrow=dim(x)[1])

DMUt1.Frontiert1.boot<-matrix(NA,ncol=B,nrow=dim(x)[1])

B<-30

for (temp in (min(x$Year+1):max(x$Year))) {

 make.frontiert1[[temp]]<-x[x$Year==temp,]

 frontier.sett1[[temp]]<-c(make.frontiert1[[temp]][1])

 front<-
      dea(x[unlist(frontier.sett1[[temp]]),c(7:9)],x[unlist(frontier.sett1[[temp]]),10],RTS="vrs",O
      RIENTATION="out")

 eff<-1/front$eff

 DMUt1Frontiert1[unlist(frontier.sett1[[temp]]),1]<-eff

 inputs<-x[unlist(frontier.sett1[[temp]]),c(7:9)]
```

```r
outputs<-x[unlist(frontier.sett1[[temp]]),10]
teste<-bootdeafunc(eff,inputs,outputs,30)
for (b in (1:B)) {
DMUt1.Frontiert1.boot[unlist(frontier.sett1[[temp]]),b]<-t(teste[,b])
}
}


# Making Frontier DMU t Frontier t+1
# These are the DMUs of year t that should be run each at a time in frontier t+1


frontier.set.1<-list()
DMUtFrontiert1<-matrix(NA,ncol=1,nrow=dim(x)[1])
DMUt.Frontiert1.boot<-matrix(NA,ncol=B,nrow=dim(x)[1])
for (temp in c(min(x$Year):(max(x$Year)-1))){
 make.frontier[[temp]]<-x[x$Year==temp,]
 #frontier.set[[temp]]<-c(make.frontier[[temp]][3])
 frontier.set.1[[temp]]<-
      intersect(x[unlist(frontier.set[[temp]]),3],x[unlist(frontier.set[[temp+1]]),3])
 for (i in unlist(frontier.set.1[[temp]])){
 auxt<-which((x$Year == temp) & (x$DMU == i))
 auxt1<-which((x$Year == temp+1) & (x$DMU == i))
 front<-
     dea(x[union(auxt,setdiff(unlist(frontier.set[[temp+1]]),auxt1)),c(7:9)],x[union(auxt,setdiff(
     unlist(frontier.set[[temp+1]]),auxt1)),10],RTS="vrs",ORIENTATION="out")
 eff<-1/front$eff
 DMUtFrontiert1[auxt,1]<-eff[1]
 inputs<-x[union(auxt, setdiff(unlist(frontier.set[[temp+1]]),auxt1)),c(7:9)]
 outputs<-x[union(auxt, setdiff(unlist(frontier.set[[temp+1]]),auxt1)),10]
 teste<-bootdeafunc(eff, inputs,outputs,30)
 for (b in (1:B)) {
  DMUt.Frontiert1.boot [auxt,b]<-t(teste[1,b])
```

```
  }

 }

}


# Making Frontier DMU t+1 Frontier t

# These are the DMUs of year t+1 that should be run each at a time in frontier t


frontier.set.2<-list()

DMUt1Frontiert<-matrix(NA,ncol=1,nrow=dim(x)[1])

DMUt1.Frontiert.boot<-matrix(NA,ncol=B,nrow=dim(x)[1])

for (temp in c(min(x$Year):(max(x$Year)-1))){

 make.frontier[[temp]]<-x[x$Year==temp,]

 #frontier.set[[temp]]<-c(make.frontier[[temp]][3])

 frontier.set.2[[temp]]<-
      intersect(x[unlist(frontier.set[[temp]]),3],x[unlist(frontier.set[[temp+1]]),3])

 for (i in unlist(frontier.set.2[[temp]])){

 auxt<-which((x$Year == temp+1) & (x$DMU == i))

 auxt1<-which((x$Year == temp) & (x$DMU == i))

 front<-
      dea(x[union(auxt,setdiff(unlist(frontier.set[[temp]]),auxt1)),c(7:9)],x[union(auxt,setdiff(unl
      ist(frontier.set[[temp]]),auxt1)),10],RTS="vrs",ORIENTATION="out")

 eff<-1/front$eff

 DMUt1Frontiert[auxt,1]<-eff[1]

 inputs<-x[union(auxt,setdiff(unlist(frontier.set[[temp]]),auxt1)),c(7:9)]

 outputs<-x[union(auxt,setdiff(unlist(frontier.set[[temp]]),auxt1)),10]

 teste<-bootdeafunc(eff,inputs,outputs,30)

 for (b in (1:B)) {

  DMUt1.Frontiert.boot[auxt,b]<-t(teste[1,b])

 }

 }

}
```

Single Results

```
catch.up<-c(NA,DMUt1Frontiert1[2:dim(x)[1],]/DMUtFrontiert[1:dim(x)[1]-1,])

frontier.shift<-sqrt(DMUt1Frontiert*DMUtFrontiert/DMUt1Frontiert1/DMUtFrontiert1)

MI<-catch.up*frontier.shift

compact.data1<-
    data.frame(x,DMUtFrontiert,DMUt1Frontiert1,DMUtFrontiert1,DMUt1Frontiert,catch.up,f
    rontier.shift,MI)

compact.data2<-na.omit(compact.data1)
```

Bootstrapped Matrices

```
catch.up.boot<-matrix(NA,ncol=B,nrow=dim(x)[1])

for (b in 1:B) {

 catch.up.boot[,b]<-
    c(NA,DMUt1.Frontiert1.boot[2:dim(x)[1],b]/DMUt.Frontiert.boot[1:dim(x)[1]-1,b])

}


frontier.shift.boot<-matrix(NA,ncol=B,nrow=dim(x)[1])

frontier.shift.boot<-
    sqrt(DMUt1.Frontiert.boot*DMUt.Frontiert.boot/DMUt1.Frontiert1.boot/DMUt.Frontiert1.
    boot)


MI.boot<-catch.up.boot*frontier.shift.boot

MI.final<-matrix(MI.boot)


compact.data1.boot<-data.frame(x,catch.up.boot,frontier.shift.boot,MI.boot)

compact.data1.boot<-na.omit(compact.data1.boot)

MI.final<-rowMeans(compact.data1.boot[,71:100])

frontier.shift.final<-rowMeans(compact.data1.boot[,41:70])

catch.up.final<-rowMeans(compact.data1.boot[,11:40])

compact.data2.boot<-data.frame(compact.data1.boot,catch.up.final,frontier.shift.final,MI.final)
```

```r
par(mfrow=c(3,3))
```

Sector

```r
boxplot(catch.up.final ~ Sector, data=compact.data2.boot, ylim=c(0,4),ylab="Bootstrapped
    Catch-Up Indexes",xlab="Sector")
```

```r
boxplot(frontier.shift.final ~ Sector, data=compact.data2.boot, ylim=c(0,4),ylab="Bootstrapped
    Frontier Shift Indexes",xlab="Sector")
```

```r
boxplot(MI.final ~ Sector, data=compact.data2.boot, ylim=c(0,4),ylab="Bootstrapped Malmquist
    Indexes",xlab="Sector")
```

Year

```r
boxplot(catch.up.final ~ Year, data=compact.data2.boot,
    col=c("limegreen"),ylim=c(0,4),ylab="Bootstrapped Catch-up Indexes",xlab="Year")
```

```r
boxplot(frontier.shift.final ~ Year, data=compact.data2.boot,
    col=c("limegreen"),ylim=c(0,4),ylab="Bootstrapped Frontier Shift Indexes",xlab="Year")
```

```r
boxplot(MI.final ~ Year, data=compact.data2.boot,
    col=c("limegreen"),ylim=c(0,4),ylab="Bootstrapped Malmquist Indexes",xlab="Year")
```

Type

```r
boxplot(catch.up.final ~ Type, data=compact.data2.boot,
    col=c("blue"),ylim=c(0,4),ylab="Bootstrapped Catch-up Indexes",xlab="Type")
```

```r
boxplot(frontier.shift.final ~ Type, data=compact.data2.boot,
    col=c("blue"),ylim=c(0,4),ylab="Bootstrapped Frontier Shift Indexes",xlab="Type")
```

```r
boxplot(MI.final ~ Type, data=compact.data2.boot,
    col=c("blue"),ylim=c(0,4),ylab="Bootstrapped Malmquist Indexes",xlab="Type")
```

Regression

```r
reg.catch.up<-lm(catch.up.final~Type+Sector+I(Year-1991),data=compact.data2.boot)
summary(reg.catch.up)
reg.frontier.shift<-lm(frontier.shift.final~Type+Sector+I(Year-1991),data=compact.data2.boot)
summary(reg.frontier.shift)
reg.MI<-lm(MI.final~Type+Sector+I(Year-1991),data=compact.data2.boot)
summary(reg.MI)
```

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	90	100.0
	Excluded[a]	0	0.0
	Total	90	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.697	.850	7

Item Statistics

	Mean	Std. Deviation	N
TA	.212731784222222	.353215292403296	90
CTA	.014947333333333	.011234826751438	90
LA	2.835278777777780	4.489013491017890	90
CLA	.001665333666667	.001943799133810	90
DE	1.900404922222220	3.186125955470780	90
CDE	1.408666666666670	2.159303466554470	90
NO	5.196982366666670	10.037702595935200	90

Inter-Item Correlation Matrix

	TA	CTA	LA	CLA	DE	CDE	NO
TA	1.000	.018	.695	.619	.891	.735	.829
CTA	.018	1.000	-.169	.058	-.201	-.187	-.122
LA	.695	-.169	1.000	.845	.832	.239	.902
CLA	.619	.058	.845	1.000	.619	.110	.759
DE	.891	-.201	.832	.619	1.000	.687	.851
CDE	.735	-.187	.239	.110	.687	1.000	.390
NO	.829	-.122	.902	.759	.851	.390	1.000

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
TA	11.357945400333300	326.201	.879	.938	.701
CTA	11.555729851222200	337.605	-.164	.398	.717
LA	8.735398406777780	205.485	.869	.960	.524
CLA	11.569011850888900	337.483	.753	.823	.717
DE	9.670272262333330	237.669	.913	.957	.565
CDE	10.162010517888900	300.781	.428	.889	.677
NO	6.373694817888890	78.308	.892	.911	.662

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
11.570677184555600	337.537	18.372185231709000	7

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	90	100.0
	Excluded[a]	0	0.0
	Total	90	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.728	.818	7

Item Statistics

	Mean	Std. Deviation	N
TA	4.376013880000000	7.555863816270440	90
CTA	.000013981295000	.000013132081029	90
LA	6.131834177777780	9.084270433057660	90
CLA	.000276280956667	.000282256944272	90
DE	5.101612355555560	7.980866056501160	90

Inter-Item Correlation Matrix

	TA	CTA	LA	CLA	DE	CDE	NO
TA	1.000	-.075	.640	.449	.816	.403	.884
CTA	-.075	1.000	-.226	-.157	-.266	-.361	-.134
LA	.640	-.226	1.000	.786	.897	.516	.617
CLA	.449	-.157	.786	1.000	.701	.624	.454
DE	.816	-.266	.897	.701	1.000	.508	.856
CDE	.403	-.361	.516	.624	.508	1.000	.277
NO	.884	-.134	.617	.454	.856	.277	1.000

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
TA	22.094399572145000	1336.200	.879		.617
CTA	26.470399470850000	1879.054	-.179		.749
LA	20.338579274367200	1327.340	.709		.637
CLA	26.470137171188300	1879.039	.607		.749
DE	21.368801096589400	1280.772	.936		.598
CDE	26.470241421473900	1879.048	.415		.749
NO	15.609922706256100	519.549	.839		.730

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
26.470413452145000	1879.054	43.348056698862200	7

Appendix I

Analysis of Merged and Non-Merged Firms Turnover in Nigeria

This study focuses on non-financial voluntary horizontal M&As with the prime purpose of presenting empirically-backed facts and strategic options for making future M&A deals more fruitful. The importance of M&A deals, as discussed earlier, is enormous. Given the above experience in the Nigerian nonfinancial sector, practical discussion at this juncture could make the good and bad of M&As more revealing and could offer a leeway on how best to resolve the odds while capitalizing on the strength of M&As. As the basis of practical and applied discussion, Table 1.2 is presented. It contains the percentage of change in the turnover of the merged firms in the non-financial sector in Nigeria. Turnover is one of the two proxies used in evaluating operating performance, which itself is one of the three bases of evaluating the effectiveness of M&As deals in this study. Another proxy is net profit after tax, while other bases include efficiency and productivity. For purposes of comparative assessment, though conjectural rather than empirical, Table1.2 also presents percentage changes in the total gross turnover of non-merging firms within the same time interval for each subsector. The essence of this presentation and assessment is to further highlight the potentials of M&A and why it should be considered as a plausible option for improving firm performance. However, it suffices to say that, this presentation shows the practical scenarios of post-M&A deals in Nigeria in the selected subsectors of the nation's economy.

Table 1.2 Percentage Changes in the Total output of Merged and Non-Merged Firms in Nigeria

Year	Consumer Group		Industrial Group		Healthcare Group		Oil & Gas Group		Service Group	
	M&A Firms total turnover (%Δs)	Non M&A firms total turnover (%Δs)	M&A Firms total turnover (%Δs)	Non-M&A firms total turnover (%Δs)	M&A Firms total turnover (%Δs)	Non-M&A firms total turnover (%Δs)	M&A Firms total turnover (%Δs)	Non-M&A firms total turnover (%Δs)	M&A Firms total turnover (%Δs)	Non-M&A firms total turnover (%Δs)
1998	-7.87	19.07			-12.18	92.8	-	-	-	-
1999	26.84	13.37	11.06	15.1	-11.65	49.74	-	-	-	-
2000	11.33	15.57	424.17	14.94	10.31	18.61	-	-	-	-
2001	19.64	14.31	14.04	19.79	1.4	24.73	-	-	-	-
2002	61.01	7.85	275.32	11.79	52.83	-7	-	-	-	-
2003	21.73	13.44	55.32	14.58	38.37	-7.33	135.1	47.77	-	-
2004	19.88	13.79	1.88	16.8	26.03	-0.73	38.91	56.37	-	-
2005	6.58	17.21	-5.81	18.09	20.15	5.67	37.29	33.05	-	-
2006	10.9	15.98	9.65	17.27	20.95	2.75	35.17	22.29	-	-
2007	59.34	4.89	-34.76	16.53	-4.56	62.43	-3.7	8.93	-	-
2008	17.23	14.23	19.25	14.95	26.52	-1.41	164.9	9.24	28.53	20.08
2009	-1.91	21.01	-2.4	15.07	15.29	21.84	-0.46	-21.95	140.03	20.5
2010	-25.77	23.84	13.34	12.86	-	-	7.76	117.26	-14.52	18.93
2011	83.39	4.42	15.75	26.64	-	-	43.32	29.91	5.39	11.17
2012	38.95	12.2	344.27	19.88	-	-	17.12	0.52	144	17.6
2013	75.42	0.21	18.87	29.86	-	-	-26.19	-6.29	109.05	17.25
2014	22.64	3.68	17.93	20.16	-	-	-62.52	0.35	19.38	15.15
2015	6.15	-2.7	11.4	3.02			24.52	-40.59	-90.48	13.29
Ave.	23.45	11.18	69.96	16.9	15.29	21.84	31.63	19.76	42.67	16.75

Source: Authors' computation based on data from various sources of data & CBN Statistical Bulletin, 2015

The first subsector is the consumer group. This is one of the most important subsectors in the Nigerian economy. It is the second most capitalized sector, housing many businesses and it has the highest number M&As for the period covered in this study. It is comprised of firms that relate to items bought and consumed by households rather than by manufacturers and industries. Companies in this sector deal on the production of final goods for final consumption such as toys and games, non-alcoholic beverages, food products-diversified, textiles/apparel, food products, automobiles/auto parts, tobacco products, beverages-brewers/distillers, consumer electronics, personal/household products, and household durables. The effect of M&As is chiefly felt in this sector with a total of 13 out of 30 deals taking place. Figure 1.1 shows the trend of percentage changes in the total output of merged and non-merged firms for a period of 17 years (1998-2015).

Figure 1.1: The trend of the percentage changes in total gross turnover of merged and non-merged consumer group firms in Nigeria, 1998-2015

Source: Authors' computation based on data from Table 1.2

From the above figure, it appears that changes in total turnover of merged firms are highly volatile, with large variations, while that of non-merged firms lie low with relative stability. On average, merged firms recorded about 12.27% (23.45% -11.18%) turnover over non-merged firms. This shows that M&A can generate good returns. However, the higher percentage of return is based on gross returns which may fall drastically when netted over M&A and other organisational relevant related costs thus making such huge returns that are unlikely to be reliable. In other words, though merged firms' total turnover is higher than that of non-merged firms, it may not be true that such return will translate to better post-M&A firm performance since costs and other obligations are not deducted to get the net turnover. But this reality within the consumer group sector in Nigeria has given insight into why M&A could be a viable strategic tool for corporate rejuvenation.

Similarly, the industrial group is another important subsector where M&A has proven to be useful. This subsector houses firms that produce and distribute capital goods for purposes of commercial use. Such products include engineering and building (materials) products, industrial machinery and tools, packaging products including containers for industrial and consumer goods, aerospace and defense, electrical and electronic products among others. For the period covered in this study, this sector had a total of 8 out of 30 M&A deals. Figure 1.2 presents the trend of the changes in the total turnover of merged and non-merged firms in this sector.

Figure 1.2: Trend of the percentage change in total gross turnover of merged and non-merged industrial group firms in Nigeria, 1999-2015

. In the above Figure 1.2, merged firms in this sector recorded very high returns between 1999 and 2003 from which it fell with marginal difference below non-merged firms from 2004 through to 2011 after which it increased largely in 2012. Like it is with the consumer group, the volatility of return is high for merged firms than non-merged firms also gave support to M&A. The statistics from the graph show that merged firms have about 53.06% (69.96% - 16.90%) return higher than non-merged firms in Nigeria for the period covered. This does not imply that the higher return is a sure translation to higher performance, but in the least, it has given M&A a higher likelihood of embarkation.

The next subsector is healthcare, which comprises companies that provide healthcare services, produce healthcare equipment and supplies and distribute the same to both industrial and household users. The firms are also involved in the research, development, production, and marketing of pharmaceuticals and biotechnology products. Another line of operations includes diagnostics services, preventive, remedial, and therapeutic services such as doctors, nurses, hospitals, and other public and voluntary organizations and health insurance services. Unfortunately, few M&As that took place in this subsector, on average, show that non-merged healthcare firms seemingly do better than merged firms in Nigeria. M&A is thus said to lose its support as this subsector's percentage changes in turnover for merged firms below that of non-merged firms. In Figure 1.3, the trend of these changes for each of these two types of entities is presented.

Figure 1.3: Trend of the percentage change in total gross turnover of merged and non-merged healthcare group firms in Nigeria, 1998-2015

Figure 1.3 indicates that, following M&As that took place in this subsector, the merged firms only recorded positive changes in turnover from 2001 through to 2006 and 2008. In other years, these firms recorded negative changes in turnover. Compared to non-merged firms, only in 2002 and 2003 did the firm's recorded negative changes in turnover. On average, non-merged firms have about 6.55% (21.84%-15.29%) turnover higher than merged firms. This is not to say that this negative performance will eventually result in worst or better performance. But practically, this scenario has presented some intriguing issues about M&A in this sector that further make this study quite imperative. One of such issues is the likelihood that M&As could be a counterproductive business strategy in some sectors of the economy. Although this study is not poised toward sectorial analysis but the above trend has provided an additional paradigm of the empirical inquest.

Oil and Gas group is another subsector that has experienced M&A. This sector plays host to Nigeria's economy and accounts for more than 80% of Nigeria's source of revenue since 1970 when oil was first discovered in Nigeria. This sector includes all firms that engage in operating or developing oil and gas field properties or both. It also includes firms that primarily engage in recovering and producing liquid hydrocarbons from oil and gas fields. They have two main preoccupations which include (i) the exploration, production, marketing, refining and/or transportation of oil and gas products, coal as well as other consumable fuels, and (ii) the construction or provision of oil rigs, drilling equipment and other energy-related services and equipment. Between 2003 and 2015, the sector had three M&As and the experience as illustrated by Figure 1.4 suggests that the sector has benefited from M&A in terms of total gross turnover.

Figure 1.4: Trend of the percentage change in total gross turnover of merged and non-merged Oil and Gas group firms in Nigeria, 2003-2015

In Figure 1.4, merged firms' changes in turnover maintained a positive downward trend with intermittent positive drift from 2003 to 2012 and fell to negative drift in 2013 and 2014. The non-merged firms have also exhibited a similar trend but with a negative drift in 2009, 2013 and 2015. On average, the merged firms had 11.87% (31.63%-19.76%) percentage turnover over non-merged firms. This signifies that M&As in the sector is good, though it may not guarantee a significant transcendental positive effect at the end of the firms' operation in a given financial year. Nevertheless, this trend has presented a practical scenario of M&A in Nigeria in this sector, which further suggests that adopting M&A could drive positive performance in an economy.

Finally, the services group is the last sector that has also experienced M&A. This sector encompasses all companies, whose stock in trade primarily includes the provision of a variety of services for household, business, government establishment and other organizations. Their preoccupations range from commercial services and supplies such as, printing, employment, advertising, environmental works, among others, to transportation services such as marine, road and rail, courier, airlines and other transportation infrastructure and services like cargo warehousing and storage, airport operation, harbour services, stevedoring, parking, navigation services and postal services. A total number of five M&As comprised this sector. The experience, as illustrated, in Figure 1.5 shows that M&A may equally be a good corporate growth strategy.

Figure 1.5 Trend of the percentage change in total gross turnover of merged and non-merged services group firms in Nigeria, 2008-2015

From Figure 1.5, changes in the turnover of merged firms exhibit a dynamic trend movement with negative values in 2010 and 2015. The non-merged firm has maintained a less dynamic positive trend. Comparatively, on average, merged firms have about 25.92% (42.67% – 16.75%) turnover change over non-merged firms. This scenario reveals that M&As in the sector are good in terms of total gross turnover.

In summary, M&As as reviewed above, in real-life practical scenarios, based on the total gross turnover of merged and non-merged firms in each of five sectors have proven to be a good strategy as merged firms in four out of the five sectors experienced higher percentage growth rates in turnover than non-merged firms. However, what is uncertain from this analysis is whether or not such growth can translate to better net operating performance. If reviewed using measures of the remaining two bases of M&A evaluation (efficiency and productivity measures), a similar trend could also be revealed. But judging from this purview of turnover, it suffices to say that M&A is good and could prove useful for firms that anticipate better gross turnover in future operations if well consummated.

Appendix J: Normality results output cost efficiency data Bidder before(BB) M&A

BB Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
(I)TA	90	100.0%	0	0.0%	90	100.0%
(C)TA	90	100.0%	0	0.0%	90	100.0%
I(LC)	90	100.0%	0	0.0%	90	100.0%
(C)LC	90	100.0%	0	0.0%	90	100.0%
(I)CS	90	100.0%	0	0.0%	90	100.0%
(C)CS	90	100.0%	0	0.0%	90	100.0%

BB Descriptive

			Statistic	Std. Error
(I)TA	Mean		212.568688333333340	37.241156678299940
	95% Confidence Interval for Mean	Lower Bound	138.571303268591240	
		Upper Bound	286.566073398075450	
	5% Trimmed Mean		160.171620679012340	
	Median		42.226355000000000	
	Variance		124821.338	
	Std. Deviation		353.300633407855000	
	Minimum		.138260000000000	
	Maximum		2005.688460000000000	
	Range		2005.550200000000100	
	Interquartile Range		224.904697500000000	
	Skewness		2.646	.254
	Kurtosis		8.419	.503

440

(C)TA	Mean		14.9032222222 22222	1.18675075268 9116
	95% Confidence Interval for Mean	Lower Bound	12.5451737550 06410	
		Upper Bound	17.2612706894 38035	
	5% Trimmed Mean		13.9008024691 35805	
	Median		11.4599999999 99999	
	Variance		126.754	
	Std. Deviation		11.2585061802 50405	
	Minimum		1.32000000000 0000	
	Maximum		49.1400000000 00000	
	Range		47.8200000000 00000	
	Interquartile Range		13.8424999999 99998	
	Skewness		1.298	.254
	Kurtosis		1.170	.503
I(LC)	Mean		28.3435858888 88885	4.73237117410 9507
	95% Confidence Interval for Mean	Lower Bound	18.9404651677 77795	
		Upper Bound	37.7467066099 99976	
	5% Trimmed Mean		22.5883732716 04937	
	Median		7.37758000000 0000	
	Variance		2015.580	
	Std. Deviation		44.8952149305 33896	
	Minimum		.114830000000 000	

	Maximum		183.247860000000000	
	Range		183.133030000000000	
	Interquartile Range		24.272215000000000	
	Skewness		2.063	.254
	Kurtosis		3.204	.503
(C)LC	Mean		.057574508888889	.040853645101322
	95% Confidence Interval for Mean	Lower Bound	-.023600813724609	
		Upper Bound	.138749831502387	
	5% Trimmed Mean		.015467048148148	
	Median		.007520050000001	
	Variance		.150	
	Std. Deviation		.387571707721070	
	Minimum		.000635900000000	
	Maximum		3.688990000000000	
	Range		3.688354100000000	
	Interquartile Range		.021378275000000	
	Skewness		9.451	.254
	Kurtosis		89.534	.503
(I)CS	Mean		19.0021536	3.35857114
	95% Confidence Interval for Mean	Lower Bound	12.3287442	
		Upper Bound	25.6755629	
	5% Trimmed Mean		14.5656257	
	Median		3.7410000	
	Variance		1015.200	

	Std. Deviation	31.86220342	
	Minimum	.10485	
	Maximum	137.49267	
	Range	137.38782	
	Interquartile Range	11.92455	
	Skewness	2.044	.254
	Kurtosis	3.447	.503
(C)CS	Mean	1.4141	.22751
	95% Confidence Interval for Mean Lower Bound	.9620	
	95% Confidence Interval for Mean Upper Bound	1.8662	
	5% Trimmed Mean	1.0505	
	Median	.9000	
	Variance	4.659	
	Std. Deviation	2.15837	
	Minimum	.05	
	Maximum	11.91	
	Range	11.86	
	Interquartile Range	1.29	
	Skewness	3.853	.254
	Kurtosis	16.267	.503

BB Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
(I)TA	.288	90	.000	.634	90	.000
(C)TA	.149	90	.000	.866	90	.000
I(LC)	.296	90	.000	.636	90	.000
(C)LC	.478	90	.000	.107	90	.000
(I)CS	.332	90	.000	.622	90	.000
(C)CS	.264	90	.000	.533	90	.000

a. Lilliefors Significance Correction

Appendix: Normality results output cost efficiency data Bidder After(BA) M&A

BA Descriptive

			Statistic	Std. Error
(I)TA	Mean		212.568688333333340	37.241156678299940
	95% Confidence Interval for Mean	Lower Bound	138.571303268591240	
		Upper Bound	286.566073398075450	
	5% Trimmed Mean		160.171620679012340	
	Median		42.226355000000000	
	Variance		124821.338	
	Std. Deviation		353.300633407855000	
	Minimum		.138260000000000	
	Maximum		2005.688460000000000	
	Range		2005.550200000000100	
	Interquartile Range		224.904697500000000	
	Skewness		2.646	.254
	Kurtosis		8.419	.503
(C)TA	Mean		14.903222222222222	1.186750752689116
	95% Confidence Interval for Mean	Lower Bound	12.545173755006410	
		Upper Bound	17.261270689438035	
	5% Trimmed Mean		13.900802469135805	
	Median		11.459999999999999	
	Variance		126.754	
	Std. Deviation		11.258506180250405	

	Minimum		1.320000000000000	
	Maximum		49.140000000000000	
	Range		47.820000000000000	
	Interquartile Range		13.84249999999999998	
	Skewness		1.298	.254
	Kurtosis		1.170	.503
I(LC)	Mean		28.343585888888885	4.732371174109507
	95% Confidence Interval for Mean	Lower Bound	18.940465167777795	
		Upper Bound	37.746706609999976	
	5% Trimmed Mean		22.588373271604937	
	Median		7.377580000000000	
	Variance		2015.580	
	Std. Deviation		44.895214930533896	
	Minimum		.114830000000000	
	Maximum		183.247860000000000	
	Range		183.133030000000000	
	Interquartile Range		24.272215000000000	
	Skewness		2.063	.254
	Kurtosis		3.204	.503
(C)LC	Mean		.057574508888889	.040853645101322
	95% Confidence Interval for Mean	Lower Bound	-.023600813724609	

			.138749831502 387	
	5% Trimmed Mean		.015467048148 148	
	Median		.007520050000 001	
	Variance		.150	
	Std. Deviation		.387571707721 070	
	Minimum		.000635900000 000	
	Maximum		3.68899000000 0000	
	Range		3.68835410000 0000	
	Interquartile Range		.021378275000 000	
	Skewness		9.451	.254
	Kurtosis		89.534	.503
(I)CS	Mean		19.0021536	3.35857114
	95% Confidence Interval for Mean	Lower Bound	12.3287442	
		Upper Bound	25.6755629	
	5% Trimmed Mean		14.5656257	
	Median		3.7410000	
	Variance		1015.200	
	Std. Deviation		31.86220342	
	Minimum		.10485	
	Maximum		137.49267	
	Range		137.38782	
	Interquartile Range		11.92455	
	Skewness		2.044	.254
	Kurtosis		3.447	.503
(C)CS	Mean		1.4141	.22751
	95% Confidence Interval for Mean	Lower Bound	.9620	
		Upper Bound	1.8662	
	5% Trimmed Mean		1.0505	
	Median		.9000	
	Variance		4.659	

Std. Deviation	2.15837
Minimum	.05
Maximum	11.91
Range	11.86
Interquartile Range	1.29
Skewness	3.853	.254
Kurtosis	16.267	.503

BA Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
(I)TA	.288	90	.000	.634	90	.000
(C)TA	.149	90	.000	.866	90	.000
I(LC)	.296	90	.000	.636	90	.000
(C)LC	.478	90	.000	.107	90	.000
(I)CS	.332	90	.000	.622	90	.000
(C)CS	.264	90	.000	.533	90	.000

a. Lilliefors Significance Correction