



**Healthcare, Service, Oil and Gas and long-term Intervals and Industries Technical Efficiency of Non-Financial Mergers and Acquisitions in Nigeria**

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**Abstract**

*Oil and gas, healthcare, and Service long-term intervals and industry technical efficiency (TE) of non-financial mergers and acquisitions (M&As) in Nigeria were examined. Data Envelopment Analysis (DEA) and stochastic Frontier Analysis (SFA) with Mann Whitney U-test model in testing the results for significance. Interval DEA TE results showed bidder significant decline, one, and three years after M&A with two-year non-significant improvement, similar results for the target firms' interval. Non-merging firms' interval TE significantly improved, two and three years but one year non-significant after M&A. Industry results showed bidder firms decline significantly in both DEA and SFA models in healthcare, but non-merging indicated non-significant decline both in DEA and SFA models. The implication of this result is that selected bidder companies stimulated the non-merging companies' TE improvement within the intervals. The findings of a non-significant TE among the selected bidder and target companies during the M&A period (three years after M&As) suggest that M&A activities did not lead to an improvement in the TE of the companies. 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. 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. An additional implication is that TE in merging companies in Nigeria calls for serious scrutiny of M&A activities, mediated by the FCCPC.*

**Keywords:** Oil and gas, healthcare, Service, M&A, Technical efficiency, Nigeria



## INTRODUCTION

Today, mergers and acquisitions (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 will produce better results and therefore, higher profits (Akpan, Akpan and Aye, 2023). On the other hand, an unsuccessful M&A activity is said to be when the bidder company does not increase shareholder value or fails to achieve the commercial, financial, or strategic goals set when buying the enterprise (Akpan, Akpan and Aye, 2023).

A merger occurs according to Teti and Tului (2020), 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 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).

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 firm as if there was no merger (Humphery-Jenner, Lisic, Nanda, & Silveri, 2016).

Sudarsanam (2010) and Zollo and Meier (2007) stated that 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. The benchmarking issue in an M&A activity is the determination of a suitable timescale to evaluate firm value to decide if any benefit has been created for stakeholders' investment. In this respect, Ramakrishnan (2008) investigated long-term post-merger firms in India in terms of operating performance and efficiency three years before and after mergers. Rahman and Limmack (2004), and Rahman, Lambkin, and Hussain (2016) stated that the impact of M&A efficiency needs a sufficient long-term interval preceding evaluation because efficiency improves over a longer time horizon. 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.

The reasoning 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. 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, Swaminathan, Groening, Mittal, and Thomaz, (2013), Rani, Yadav and Jain (2015) among others.



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 using a Data Envelopment Analysis (DEA) model and then used a bootstrap truncated regression to identify technical efficiency. Because of limited resources in both public and private companies and pressure on the efficient management of resources, tightening budgets calls for technical improvement (productivity or cost efficiency). In evaluating the technical efficiency of a decision-making unit (DMU), the data envelopment analysis (DEA) and Stochastic Frontier Analysis (SFA) models are better known for technical efficiency and cost efficiency respectively (Pervin, 2014).

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 number 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).

## LITERATURE REVIEW

M&As are horizontal between competing yet similar companies in the same sector that produce similar products or services (Khanal, Mishra, & Mottaleb, 2015). The recapitalization exercise in the banking and insurance industry in Nigeria from 2004 to 2005 is an example of horizontal M&As. The advantages of horizontal M&As include the achievement of economies of scope and scale, a decrease in production cost, a rise in market share, and an upsurge in synergies. When a company achieves these advantages, it can expand its services and products, sell those products and services to a larger market, and reduce external competitors. The disadvantages include issues of antitrust and legalities, flexibility reduction, and the potential of destroying value rather than creating it.

### Voluntary and Involuntary M&As

Unpaid M&As occur when two or more companies, determined by market forces, intentionally decide to merge for the purpose of best mutual benefits. Unpaid M&As are observed within the non-financial sector of the economy, while involuntary M&As are mostly noticed in finance-related sectors. Unpaid M&A events are important for Nigerian companies for a number of reasons. It is stated that voluntary and involuntary listed companies in the NSE have not disbursed returns to investors for many years (NSE, 2017). Thus, calls for companies to re-strategize for performance improvement. One method 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 disadvantage as there is little empirical evidence to support and guide their quest for growth via M&As (Afunwa *et al.*, 2020). For relative analysis, studies on voluntary M&A are scarce in the literature compared to those on involuntary M&As. This prevents an adequate understanding of which M&A activity is better for Nigerian companies. So, 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.

The classification of firms as non-financial horizontal voluntary (NHVs) is done by the Nigerian Stock Exchange (NSE) consisting: Of services (SV), Healthcare (HC), Industrial (IND), Oil and Gas (O&G) and Consumer goods (CG). Thus, M&As relating to these companies are called NHV M&As, considering SV, HC, and O&G, the focus of this study. NSE classifies banking institutions, insurance companies, mortgage banks, investment trusts, and discount houses as financial (involuntary) companies. Involuntary M&As are often driven by law and regulated agencies; oftentimes, 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).

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

In Nigeria, before May 2019, the SEC was the main supervising and regulatory body for all M&A activities. By May 2019, the federal government ruled that the SEC's role be taken over by the Federal Competition and Consumer Protection Commission (FCCPC), which now reviews, monitors, and approves all M&As in Nigeria.

### **Relevance of M&A Activities in Nigeria**

From 1995 to 2016, the SEC recorded 270 M&A activities which involved both the financial and non-financial sectors. Among these 270 M&A activities, involuntary bidder and target companies numbered 240 each with 30 voluntary NHV M&A firms. Considering this data range, this study can reveal better empirical results if Nigeria's M&A companies' performance is similar to the trend of low, zero, or negative returns on investment reported in the literature (Moeller, Schliemann, and Stulz, 2005b; Chen, Kao, and Lin, 2011). This motive further inspired the direction of the study to consider interval and industry analysis within the period. Both are of interest to reveal the empirical performance differences, if any, within these intervals and industries respectively.

### **Current M&A-related studies in Nigeria**

Akpan, Akpan, and Aye (2023) investigated the long-term NHV M&A consumer and industrial sector stock performance in Nigeria. Method: regression of the listed stock prices with the Nigeria stock market returns in establishing stock performance. Mann Whitney U-test, a non-parametric test applied in testing the significance of the results for the bidder, target and non-merging firms. The stock performance results of the bidder companies' non-financial horizontal Industrial sector showed an improvement after 3 years of M&A activities, but when tested not significant. A nonsignificant decline result in stock performance was obtained also for the Target firm. The non-merging firms' stock performance three years after M&A improved after M&A, but was not significant when tested. This implies that shareholders in the industrial and consumer sectors did not realize any significant improvement in stock performance value after M&A activity.



The technical progress of non-financial long-term impact of M&A firms in Nigeria. examined by Akpan, Aye, Wong, Wanke, and Aaron (2022). Technical progress is measured by the Malmquist Productivity Index (MPI). The long-term impact assessed the significance of the productivity changes, through the Mann-Whitney U-test and Kruskal Wallis test. The result indicated that before M&A the target firms had the highest Malmquist index (MI), followed by one of the results in one of the non-merging companies. The bidder firms had the lowest MI. A further result showed a long-term impact of M&A on the bidder firms, resulting in non-merging companies and target firms, evidenced by the significant efficiency changes a few years after the M&A.

The horizontal non-financial post-mergers and acquisitions performance and spillover effect in Nigeria with 90 sampled entities was examined by Akpan, Aik and Wong (2019). Using residual income valuation (RIV) for operating performance, non-parametric frontier analysis data envelopment analysis (DEA), and parametric model (stochastic frontier analysis, SFA) for efficiency and Malmquist productivity index for productivity. outcome with robustness check showed realization of expected merging firms' improvement in cost efficiency after mergers and acquisitions, but not on operating performance, technical and productivity efficiency. Furthermore, the result indicated a positive spill-over effect after M&A on the non-merging firms' technical efficiency, and a short-term operating performance improvement one year after the activities.

The M&A consequence on productivity and efficiency of companies in the oil and gas (O&G) and consumer sectors using quantitative research design with data drawn from financial reports of selected firms, analysis performed with DEA and Malmquist productivity index (MPI) was carried out by Akpan and Akpan (2019). The outcome showed no technical efficiency benefit for firms in both sectors after, but an improvement in productivity of merging firms in the consumer sector.

The NHV M&A shockwave on operating performance in Nigeria under different complementary methods was carried out by Akpan, Aik, Wanke and Wong (2018). The outcome indicated a statistically significant improvement in the technical efficiency of merging companies, and reduced efficiency levels of the bidder companies under DEA scores, revealing the specifics of the productive technology. Suggesting that the resulting merged firms in Nigeria may have not become too big in scale or even reached the most productive scale size, nevertheless their almost monopolistic position in the sector. This emerges since the scale size of the sector is small *per se*, signifying that the investment necessary to achieve synergistic benefits has to be partially covered by price increases.

This study primarily examines the long-term TE performance of NHV M&As interval and industry, because there is a dearth of empirical studies on this from the above current literature reviewed in Nigeria.

## Review of Supporting Theories

Three M&As' basic documented theory categories are namely: efficiency, agency problem and hubris hypothesis. The efficiency theory offers the fundamentals for M&A as value-maximizing decisions, while agency problem and hubris are managerial self-theories of nonvalue-maximizing decisions. Accordingly, in an M&A intensified by efficiency, the

Healthcare, Service, Oil and Gas and long-term Intervals and Industries Technical Efficiency of Non-Financial Mergers and Acquisitions in Nigeria



shareholders of both bidder and target companies are expected to gain from the expected economic benefits. Also, M&A is motivated by managerial self-interest, the bidder's decision-making extracts value from their shareholders using the target companies and distributing this value to the target company's shareholders.

*HAI: There are significant differences (declined or improvement) in technical efficiency of selected bidders, targets and non-merging companies of long-term performance of M&As interval and industry*

## METHODOLOGY

The study data included all the publicly listed non-financial companies that have initiated and completed the horizontal voluntary M&A in Nigeria from 1991 to 2021. This interval 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. The selection criteria. First, the bidder firms must be listed on the Nigerian Stock Exchange (NSE) and acquire more than 60 per cent voting rights of targets, with the assumption that 60 per cent is sufficient to give control as specified in Section 313(1) of the reviewed Security and Exchange Commission (SEC) Act 2011. Second, the target firms are listed on the NSE to ensure all needed data is obtained and remain as a separate entity from the bidder firm for at least three years after the merger.

Third, the merger is restricted to the voluntary horizontal type of M&A as classified by NSE, which takes place in the same industry among firms with similar products, services, markets, and technologies. This excludes banks and insurance and stock brokerage firms that are financially related. Fourth, the bidder and target firms are Nigerian-domiciled and not foreign firms. Fifth, the merger of businesses that the acquirers already acquired more than 60 per cent stake or related companies is excluded. This is because such arrangements or transactions do not show a firm's intention to seek external growth (Song, Alli & Pillay, 2005b), which is the responsive focus of the study. Therefore, including them could amount to spurious research findings. 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. Lastly, the merging companies must have three years of pre-M&A and post-M&A financial data available for use excluding the merger year.

The selection of the non-merging firms was based on several selection criteria. First, the firms must be listed on the Nigerian Stock Exchange. They are related in terms of market capitalization (MC) and comparable size with the bidder firms. MC implies the total value of the companies' shares of stock, obtained by multiplying the price of the firm's stock with the total outstanding shares. Third, the non-merging firm must have a comparable year of establishment with the bidder firms. Fourth, the non-merging firms are within the same industry as the bidder firms. Guo, Liu and Song (2008) in their M&A study in the United States, 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 number of the bidder firms was matched to the targets because they were acquired one-to-one with complete data. Individual companies that were still listed on the exchange were eligible to form the sample size. Also, the target firms maintain a separate account at least 3 years after the M&A activity excluding the merger year. The same appraisal method and measures applied to the non-merging firms were also similar to the bidder firm as synergy evaluation was approximately one-to-one before and after the M&A. Built 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 this study. SEC combination list can be provided on request. Based on the NSE classification, the industry obtained were: - consumer (13), healthcare (1), industrial (8), oil and gas (3), and the services (5) making a total of 30 bidders and 30 target companies,

### 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 signifies not applicable. Source: SEC And NSE database and author's compilation



## RESULTS

The interval and industry analysis were based on DEA and SFA models for the technical efficiency performance of the oil and gas, healthcare and service sectors.

### Technical Efficiency of selected bidders and target companies of long-term performance of M&As interval

There are significant differences (decline or improvement) in the DEA technical efficiency performance of selected bidders, targets, and non-merging companies in the long-term performance of M&As by 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 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 in Table 4.1a below

**Table 4.1a: Mean Technical Efficiency in Different Sub-Intervals with Mann Whitney U-Test (Selected Bidder and Target Companies)**

			Mann		Mann
Bidder Companies		DEA	Whitney	SFA	Whitney
		Mean	U-Test	Mean	U Test (p-value)
1 Year 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					
1 Year 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 per cent 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. Hence, the interval hypothesis. Thus, the interval hypothesis: *HAI*: 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.





#### 4.1b: Technical Efficiency of Selected Bidders and Target Companies of Long-Term Performance of M&As Industry

The outcome of the SFA model for the industry effect on selected bidder companies are tabulated in Table 4.1b. The buyer 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. Besides, service groups gained under the DEA model and declined under the SFA model, but the results were not significant when tested. This result 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 4.1b: Average Different Industries Technical Efficiency (Selected Bidder and Target Companies) with Mann Whitney U-Test**

		DEA		SFA		
		Mean	Mann	Mean	Mann	
		Increased/	Whitney	Increased/	Whitney	
		decreased	U-Test	decreased	U Test p-value	
<b>Bidder Companies</b>						
HealthCare		(0.529)*	0.05	(0.082)*	0.05	
Oil and Gas		-0.012	0.827	90.03	0.056	
Services Group		0.001	0.917	-0.007	0.347	
<b>Target Companies</b>						
HealthCare		(0.093)*	0.05	(0.017)*	0.025	
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 4.1b above, the designated target companies' industry effect indicated that all the industries under the SFA model had a non-significant reduction in TE, aside from healthcare. Thus, suggests that selected target companies in all the industries were not significantly inefficient after M&As except the healthcare sector. From the DEA model, all industries recorded a non-significant reduction in TE except healthcare which was significant. This outcome exposed that M&A transactions in the healthcare industry were particularly not favourable to target companies and that the industry factor makes no difference to the TE of selected target companies in the long term.

The technical inefficiency industry effect 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. So, the industry alternative hypothesis: *HAI*: There are significant differences in technical efficiency of selected bidders and target companies on the long-term performance of the 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.

#### 4.1c Technical Efficiency of Selected Bidders and Non-merging Companies of Long-Term Performance of M&As Interval

The interval TE investigation basis 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 4.1c

**Table 4.1c: Average Different Interval Technical Efficiency (Selected Bidder and Non-Merging Companies) with Mann Whitney U-Test**

	DEA	Mann	SFA	Mann
	Mean	Whitney	Mean	Whitney
	Inc./ Dec.	U test p-value	Inc./ Dec.	U test p-value
<b>Bidder Companies</b>				
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
<b>Non-merging Companies</b>				
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 years before and after M&As \* Indicates 5 per cent Mann Whitney U-Test significance, Inc. Denotes increase, Dec. denotes a decrease.

The SFA and DEA 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 implication of this result is that selected bidder companies stimulated the non-merging companies' TE improvement within the intervals. The non-merging companies selected performed better than the bidder companies after M&As in Nigeria. Therefore, there is a positive TE spillover effect in the long term in Nigeria. Therefore, the interval hypothesis *HAI*: There are significant differences in technical efficiency of selected bidders and non-merging companies on the long-term performance of M&As was accepted.



#### 4.1d Technical Efficiency of Selected Bidders and Non-merging Companies of Long-Term Performance of M&As Industry.

The industry effect results from Table 4.1d, showed that TE of selected non-merging companies with DEA and SFA models on all industries indicated non-significant decline or improvement. Comparatively, the bidder companies have a significant decline in DEA and SFA models in the healthcare group.

**Table 4.1d: Average Different Industry Technical Efficiency (Selected Bidder and Non-Merging Companies) with Mann Whitney U-Test**

		DEA		SFA	
		Mean	Mann	Mean	Mann
		Increased/ Decreased	Whitney U test (p- value)	Increased/ Decreased	Whitney U test (p- value)
<b>Bidder Companies</b>					
HealthCare		(0.529)*	0.05	(0.082)*	0.05
Oil and Gas		-0.012	0.827	-0.03	0.056
Services		0.001	0.917	-0.007	0.347
<b>Non-Merging companies</b>					
HealthCare		-0.468	0.376	0.022	0.056
Oil and Gas		-0.024	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&A technical efficiency under DEA and SFA for the selected bidder and non-merging companies, with the Mann Whitney U-test in different industries. \* Indicates 5 per cent Mann-Whitney U-Test significance

Therefore, the research accepted the industry TE alternative hypothesis of selected bidder companies (Healthcare). But not accepting it for non-merging companies. So, *H<sub>A1</sub>*: The industry technical efficiency of selected bidder companies (HealthCare) is significantly different between before and after M&As based on the estimated period. Consequently, the alternative hypothesis was accepted. However, *H<sub>A1</sub>*: The industry technical efficiency of the selected non-merging companies is not significantly different between before and after M&As based on the estimated period. Therefore, the alternative hypothesis was rejected and the null hypothesis was accepted.



**Table 4.2: Summary of Selected Interval and Industry Results, Hypothesis: *HAI* with Mann Whitney U-test Significance**

Interval	TE(DEA)	TE(SFA)	Industry	TE(DEA)	TE(SFA)
Bidder	(0.0028)*	(0.027)*	HC	(0.529)*	(0.082)*
	0.0016	-0.008	OG	-0.012	-0.03
	(0.002)*	(0.0011)*	SV	0.001	-0.007
Target	(0.0045)*	0.007*	HC	(0.093)*	(0.017)*
	-0.003	0.0014	OG	-0.117	-0.029
	(0.0062) *	(0.0018)*	SV	-0.036	-0.016
Non-	0.0038	0.0011	HC	-0.468	0.022
Merging	0.0057*	0.001*	OG	-0.024	0.0143
	0.0066*	0.005*	SV	0.0092	0.0054

**Notes: \* indicates 5 percent Mann Whitney U-test significance. Technical efficiency (TE) interval and industry are *HAI*: is for the selected bidder, target, and non-merging companies**

**Table 4.3: Summarized Analysis Results of Selected Interval and Industry M&As with Hypothesis, Models and Significant**

	Hypothesis statement	Mean increase/	Significant /Not significant	Models	Findings	
	<i>HAI</i> : There are significant differences (declined or improvement) in technical efficiency of selected 30 bidders,30 targets and 30 non-merging firms of long-term performance of M&As interval and industry	<b>after M&amp;A</b>				
Technical Efficiency ( <i>HAI</i> )	Bidder (Interval)	1Year Before &1Year After	-0.004	Sig.	DEA, SFA&MWU	S
		2Year Before & 2year after	0.0016	Not Sig. Sig.	DEA, SFA &MWU	NS
		3Year before &3Year after	-0.002		DEA, SFA&MWU	S
Target (Interval)		1Year Before &1Year After	-0.0045	Sig.	DEA, SFA&MWU	S
		2Year Before &2Year After	-0.003	Not Sig.	DEA, SFA &MWU	NS
		3Year before &3Year after	-0.0062	Sig.	DEA, SFA &MWU	S
Non-Merging		1Year Before &1Year After	0.0038	Not Sig.	DEA, SFA &MWU	NS
		2Year Before &2Year After	0.0057	Sig.	DEA, SFA &MWU	S

**Healthcare, Service, Oil and Gas and long-term Intervals and Industries Technical Efficiency of Non-Financial Mergers and Acquisitions in Nigeria**



(interval)	3Year before &3Year after	0.0066	Sig.	DEA, SFA &MWU	S
Bidder	Healthcare	-0.529	Sig.	DEA, SFA, &MWU	S
(Industry)	Oil and gas	-0.012	Not Sig.	DEA, SFA&MWU	NS
	Services	0.001	Not Sig.	DEA, SFA &MWU	NS
Target	Healthcare	-0.093	Sig.	DEA, SFA&MWU	S
(industry)	Oil and gas	-0.117	Not Sig.	DEA, SFA&MWU	NS
	Services	-0.036	Not Sig.	DEA,SFA &MWU	NS
Non-	Healthcare	-0.468	Not Sig.	DEA, SFA&MWU	NS
Merging	Oil and gas	-0.024	Not Sig.	DEA, SFA&MWU	NS
(industry)	Services	0.0092	Not Sig.	DEA, SFA&MWU	NS

Source: Researcher Developed from Study Results based on Hypothesis

### SUMMARY AND POLICY IMPLICATION

The statistical analysis summary of the technical efficiency (TE) using DEA and SFA is presented here. 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.

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 support 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 results, while the non-merging companies' results did not support the hypothesis.

The findings of a non-significant TE among the selected bidder and target companies during the M&A period (three years after M&As) suggest 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 three-year periods after M&As) and across the sectors. An exception here was the oil and gas sector which recorded a non-significant decline in TE. A possible explanation for this is that the merging companies lack basic modern technology, a productive labour 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, mediated by the FCCPC.

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