Analysis of Financial Innovation Development in Nigerian Banking Sector

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Abstract: **This paper analysed financial innovation development in Nigerian banking sector between 2009 and 2018. Using trend analyses and descriptive statistics, we examined four major channels of financial innovation namely; Automated Teller Machine (ATM), Point of Sale terminals (POS), Web/Internet payment (WEBP) and Mobile pay (MBP) channels. The findings revealed that the four innovation channels jointly grew at an average rate of 296.47% in value terms and 112.63% in volume terms between 2009 and 2018. In contrast, activities on value and volume of cheque transactions plummeted during the period with the trend indicating 82.89% and 69.08% decline, respectively. Annual average decline in value and volume of cheque transactions was -13.73% and -7.13%, respectively. The paper compared pre (2000-2008) and post (2009-2018) financial innovation in respect of fraud and forgery cases. We found that on the average, number of fraud and forgery cases increased by 674.63% from 1,127.67 (pre-innovation) to 8,735.22 (post-innovation). Similarly, total amount involved and total expected loss in fraud increased by 53.43% and 34.20%, respectively from pre to post financial innovation. We conclude that financial innovation is a dominant channel of financial transaction in the Nigerian banking sector with potential of crowding out traditional transaction media in the foreseeable future. However, financial innovation is associated with rising incidence of fraud compared to the pre-innovation era and, therefore, calls for drastic measure towards protecting the unsuspecting users of these channels. Effective regulations, guidelines, citizens' education and adequate monitoring are important in ensuring security and healthy competitiveness in the financial innovation era.**

Keywords: **Financial Innovation, Fintech, Information Technology, Artificial Intelligence, Innovation Diffusion.**

I. INTRODUCTION

The Nigerian banking sector, as other banking sectors in various jurisdictions was characterized with primordial products and services. These products under payment systems included: coins and notes, cheques, bank cheques and bank drafts. Payments with coins had limitation as to amount. Notes, depending on the denomination, could be cumbersome, as the highest denomination at a time was twenty naira, then fifty before the country got to the present higher denominations.

Payments with cheques ameliorated the inconveniences encountered by payments with notes especially where large sums were involved. Drafts quickened payments by banks located outside the same Central Bank Clearing Area (CBCA) while bank cheques quickened payments by banks within the same CBCA. With all these mode of transactional settlement, valuable days were spent except where cheques were drawn on the same banks with the payees.

As in global banking sector, the Nigerian banking ecosystem has changed and still changing. Financial technology has brought increased use of internet as well as the rise of cutting edge technological innovations in the financial services sector which is shaping the advent of the digital banking. Financial innovation, fallout of technological innovation, has indeed re-defined banking operation. It has advanced over time the financial instruments and payment system used in granting credit and in payment mechanism of the economy. To Abel (2018) financial innovation is the act of creating and popularizing new financial instruments.

Wikipedia (no date) sees financial innovation as the act of creating new financial technologies, institutions and markets. Financial innovation involves the creation of new technological advances in the market of financial products. The outline that allows the operator to simultaneously transfer money to multiple accounts qualifies as a financial innovation.

The Automated Teller Machine (ATM) is a practical example of financial innovation that has benefited both the customers and the banks. Available 24/7, with a touch of a button, the machine vomits cash. Running cost is reduced for the bank. For the customer, he/she needs not to wait for the bank to open and queue up in front of a teller to collect cash. Other commonly financial innovations in Nigerian financial system today include; Point of Sale (POS), mobile banking, WEB payment, internet banking.

Financial innovation has brought with it a number of credits. In addition to those earlier mentioned above, it has shown to increase the material wellbeing of the economic players. Individuals and businesses by enlarging their possibilities for mentally advantageous exchanges of goods and services are helped to attain their economic goals more efficiently. Financial innovation helps to increase the volume of products in the market and facilitate their intermediation thereby promoting savings and channeling these resources to the most productive uses. Available credit is widened and with the aid of artificial intelligence (AI) helps to re-finance obligations and allow for better allocation of risk. It lowers transactional cost and promotes greater efficiency. With the new products contributing to deepened banking services, innovation in turn fosters economic development. However, the success of any new innovation depends on: how good the product is;

appropriate use of the product; and competence of the person handling it.

Financial innovation cannot exist without a trace of systematic risk. A new product without a track record expands rapidly in a buoyant economy. Uncontrolled embrace of the product could lead to catastrophe should the economy becomes depressed. Fraudulent activities with financial innovations are easier, more penetrating and faster. Tables 2 and 3.

The past two decades have witnessed a revolution in the Nigerian banking sector. Some of the earlier products have been crowded out while some others have been scaled up, courtesy of financial innovation. With the selection of some of the products, this paper analyses the extent this revolution has impacted the Nigerian banking sector.

The paper will proceed with the review of literature, presentation of trends of the proxied financial innovations namely: ATM, POS, Mobile banking, WEB payment and Internet banking. Analysis, summary and conclusion and recommendations follow.

II. REVIEW OF LITERATURE

The primary function of a financial system is to facilitate the allocation and development of economic resources in an environment characterized with uncertainty, (Merton, 1992).

Payments system with a medium of exchange; the transfer of resources from savers to borrowers, the gathering of savers for time transformation and risk reduction through insurance and diversification encompass the financial function. Financial innovation that is novel, reduces costs, reduces risk or provides an improved product, service or instrument that satisfies the financial demands of participants will be generally welcomed(Frame and White, 2004). To Tufano (2003), financial innovation includes the process of invention and diffusion of new products, service, or ideas. Finance is central in an economy and is important for economic growth. This raises the importance of financial innovations. An improved financial sector will encourage more and better savings and investments decisions which will make financial innovation even more valuable for an economy.

A number of scholars share this view and they include: Van Home (1985), Miller (1986, 1992) Merton (1992, 1995), Tufano (2003), Berger (2003), and Frame and White (2004).With the recent global financial crisis, some other scholars like Krugman (2007) and Volcker (2009) have cast doubt on the usefulness of some financial innovations. They see such innovations to be associated with malpractice and instability. Some studies actually blame excessive growth of the financial economy as detrimental to the growth of the real economy (Piazza, 2010), (Shin, 2010), (Johnson and Kwalk, 2012). Stiglitz (2010) belief that financial innovation is a double-edged sword.

Financial innovation should not all be welfare enhancing or successful. They could also be failure with colossal cost. A peep at some traditional and modern banking products will throw up the elegance of financial innovation. This is shown in Table 1.

2.1 Historical Development of Financial Innovations in the Nigerian Banking Sector

2.1.1 Automated Teller Machine (ATM)

Nigeria joined the countries using ATM following the installation of the first ATM by National Cash Register (NCR) for the defunct Society Generale Bank in 1987 (Jegede, 2014). According to Adeoti (2013), the defunct Society Generale Bank (SGBN) was the first Nigerian bank to introduce ATM for their customers. SGBN had "Cash Point 24" as the trade name for the new introduced ATM which was the only ATM in operation at that time in Nigeria. First Bank of Nigeria was the next bank in Nigeria to introduce the use of ATM to its customers in December 1991. The trade name for the first bank ATM was "First Cash". The operations of these ATMs were limited as most of them not only served as cash dispensers but could only accept cards from the bank that has the ATM.

The Central Bank of Nigeria (CBN) Banking Reform of 2004, led by Prof. Chukwuma Soludo stretched the landscape of the banking industry in Nigeria, given rise to significant growth and development in Nigerian financial service industry. This development increased the competitiveness among the players in the banking industry who took advantage of the development in technology to serve their customers better. The cashless policy of the government is one of the major factors that stimulated the integration of ATM into the Nigerian banking sector. The CBN in pursuit of this policy mandated all banks in Nigeria to provide at least one ATM at every of their branches and other points convenient for the customers. It is against this background that all the Nigerian banks through their collaboration with other technology companies like inter-switch, implemented the CBN directives of accelerating the spread of ATM in every location in the country.

According to Muhammad, (2010) banks in Nigeria have used various classes of ATM ranging from ATM that only dispensed cash, ATM that dispensed cash and perform other financial services like fund transfers and payment of bills etc., to those that accepted deposit. The diversities of bank customers in Nigeria have equally given rise to the introduction of different types of ATM ranging from those that have biometric features to accommodate physically challenged persons to those without biometric features. The volume and value of transactions conducted through ATM have increased significantly from 2009 to 2018, an indication of the acceptability of the ATM technology by users of financial services in Nigeria. The growth in the volume and value of ATM transactions is clearly presented in the next section that evaluated the trend of ATM transactions in Nigeria (see Tables 4 and 5).

2.1.2   Point-of-Sale Terminals (POS)

Nigeria like most countries of the world started the modern payment systems relying completely on paper-based payments with banknotes, payment orders, and cheques the most widely used payment options. When the CBN granted the then All states Trust Bank approval to introduce a closed system electronic purse known as ESCA in 1996, the Nigeria payment system witnessed a significant modification to include card-based e-payment products. Diamond bank complemented this effort by introducing "pay card" in February 1997. The approval by the CBN to float two-card service companies (Smartcard Nigeria and Gemcard Nigeria Ltd) by a consortium of 20 banks in 1999 popularized the use of card-based payment products in Nigeria.

In 2007, the CBN launched the Payment System Vision 2020, to further strengthen the evolving Nigerian payment system by facilitating a wider range of electronic payment methods like the POS terminals. The introduction of the cashless policy by the CBN aimed at reducing the cost of banking in Nigeria, encouraging financial inclusion, increasing the amount of capital available for investment in the banking sector, reducing tax evasion and driving real economic growth have equally facilitated the development of the POS payment channels in Nigeria. The CBN issued a POS guideline to stakeholders to ensure the smooth and effective operation of the payment system. From the report by the Nigeria Inter-Bank Settlement System Plc. (NIBSS) in 2015, the number of POS terminals had increased from 120,191 in 2013, to 121,886 in 2014, representing a growth rate of 1.4%. The values of the transaction have also increased by 4.9% in 2014, which indicated increased acceptability of POS as a payment option in Nigeria.

2.1.3   Internet/Web Payment.

The payment system in Nigeria before 2012 had been dominated by cash and cheque options, as earlier stated. Following the increasing difficulty associated with cash-heavy economy, the CBN in 2012 introduced cashless policy intending to promote online electronic payment in place of manual cash payment. That channel provided a payment system that was secure, convenient and affordable. The internet payment system opened the door for many other forms of online payment which has deepened the Nigerian payment systems. The first attempt to introduce the internet in Nigeria was through UNESCO sponsored project in 1995. The arrival of cost-effective internet infrastructure in Nigeria with effect from 2006, following the formation of Internet Service Providers of Nigeria (ISPAN), has significantly increased internet access in Nigeria. The number increased by 0.67 million from what it was in January of the same year.

Following the significant increase in internet subscriptions, the CBN in 2012 introduced the web/internet payment a digital payment system as one of the strategies for the implementation of the cashless policy of the government which took effect on January 2012, with Lagos state as the pilot state. The increase in internet subscription has been leveraged upon to advance the financial inclusion policy of the government. This payment channel has equally enhanced the Nigerian payment system as many users have demonstrated their acceptance of the channel by an increased number of volumes and value of transactions recorded by web payment. More detailed analysis of the growth in the value and volume of web payment services will be provided in the next section (see Tables 4 and 5).

2.1.4   Mobile Payments.

Mobile money is one of the mobile financial services which involve the payment and/or receipt of cash through the instrumentality of mobile phone. According to *gsmaintelligence.com*, real-time intelligent data, over 5.13 billion people globally have mobile devices representing about 66.53% of the world population. Out of this number, 2.71 billion use smartphones showing that 35.13% of the worldwide population has a smartphone. Nigerian is ranked number 15 among the top 50 global smartphone penetration markets. A total of 36.45 million people in Nigeria use a smartphone, this implies that 18.50% of Nigerian population use smartphone devices. On the other hand, 58.7 million people own both smartphone and other types of phone, amounting to 62.8% of the adult population (Enhancing Financial Innovation & Access (EFInA), 2018). Out of 4.2 billion adults worldwide, 2.3 billion are unbanked. In Nigeria, 99.6 million of the population are adults and the unbanked population amount to 60.1 million adults.

Mobile money is a financial innovation that was introduced to leverage on the increasing mobile phone subscription to provide financial services that improve banking sector performance, minimize the number of those financially excluded and effectively implement cashless policy resulting to overall growth in the real economy. According to the International Finance Corporation (IFC) report in 2012, a significant relationship exists between increased mobile phone subscription and financial inclusion. Monetary authorities world over have adopted and implemented mobile money policies aimed at bringing in the unbanked and financially excluded into the financial service to reduce poverty.

In Nigeria, the CBN introduced Mobile money services in 2011, as part of the strategy for the implementation of cashless policy. Shortly after the introduction of the payment system, the CBN issued licenses to 21 mobile money operators (MMO) in Nigeria. Following the issuance of these licenses, the apex Bank released the guideline for mobile money services that will monitor implementation of the innovative payment system (Adeniji, 2015). The guideline identified five participants in the mobile money service industry; banks, licensed corporate organizations, infrastructure providers, mobile network operators, and consumers. The growth in mobile money subscribers from 1.5 million in 2016 to 3.3 million in 2018 is an indication of the increasing acceptance of mobile money as a system of

payment in the Nigerian financial system. Despite the increase in the number of subscription, (EFInA, 2018) indicates that 57% of the total transaction in mobile money is from remittances, showing an increase of 12% from 2016 to 2018. Similarly, Air time purchases account for 26% of the mobile money transaction in 2018 representing an increase of 1% from 2016. Payment of bills accounts for 9% of the total mobile money transaction in 2018. A more detailed analysis of the trend in the volume and value of all the transactions in mobile money are provided in Tables 4 and 5.

2.2 Theory of innovation diffusion

In 1962, Rogers E.M. developed the Diffusion of Innovation (DOI) theory. He argued that over time, an innovation or a product gains momentum and spread through a specific population or social system. The outcome of the diffusion process is that as people integrate effectively in a social system, they tend to adopt new idea, and, or behavior about the product. The concept of adoption according to him deals with the willingness of a person to do something different from what ordinarily he or she would not have done.

However, in a given social system, adoption of new idea, behavior or product (i.e innovation) do not happen simultaneously, instead, it is a process whereby certain people are more apt to adopt the innovation than other. Studies have shown that people who are quick to adopt innovation have different characteristics than those who adopt it later (Lanzolla and Suarez, 2007), (Chiesa and Frattini, 2011), and (Whalley and Curwen, 2012). The theory presupposes that when a firm is promoting innovation to a particular target audience, it is pertinent to understand the specific characteristics of the target population that will make or mar the adoption of the innovation.

A close look at the trend of growth of financial innovation in Nigeria reveals that the diffusion theory is upheld. The level of acceptance of this innovative product has continued to grow every year suggesting that more of late majority adopters are dragged into the net of digital payment system (see Tables 4 and 5).

2.3 Perspective of other Studies on Financial Innovation

Frame, et al. (2018), in their paper captioned, Technological Change and Financial Innovation in Banking. Some implications for Fintech, describe the role of the financial system in a modern economy and how technological change and financial innovation can affect social welfare. They surveyed the empirical literatures relating to several specific financial innovations and broadly categorized them, drawing from literature on financial innovations from 1990s to 2000s. In addition to others, they find that financial innovation has resulted in expanded credit availability along both intensive and extensive margins.

Baicu, (2001) examines the Impact of Financial Innovation on Banking Regulation. Evidence from the Global Financial Innovations are developing in a fast pace which has led to increased efficiency in financial system but also raises issues regarding the regulation and supervision of financial activity. She asserts that financial innovation has led to rapid development in the recent decades.

Okafor et al. (2017), question: Does Financial Innovation Drive Growth? The paper is an empirical analysis of the Nigerian case, and examines the effectiveness of financial innovation in driving growth in Nigeria using quarterly data from 2009:Q1-2014:Q4.Four proxies: ATM, transactions, WEB/internet transactions, POS services and mobile payments were applied. While ATM, WEB/internet and mobile payments have positive effect on growth, POS did not. They recommend more investments on financial innovation to be accompanied by awareness on the financial products.

Lerner (2006), studies the origin of financial innovations in his paper "The New Financial Thing". He examines which institutions were the key financial institutions between 1990 and 2002, using Wall Street Journal articles as an indicator. His findings, suggests that smaller firms account for greater share of the innovations. He finds that less profitable firms innovate more and this in a short while change their fortune positively.

When the CBN announced the introduction of ₦5000 notes effective from 2013, Okafor (2012) argued that the introduction will not only increase inflation, but will aggravate corruption to super highways. Happily, the CBN dropped the idea and rather embraced and promoted financial innovation.

III. PRESENTATION OF DATA AND ANALYSES

Here, we present the intrinsic data of the proxied payment systems. These are also graphically presented with the analyses accompanied where necessary.

3.1 Table 1 compares the traditional and modern banking

Table 1. Traditional versus modern banking

Traditional Banking	Modern Banking
Product and services: LIMITED • Loans • Deposits	Product and Services: UNIVERSAL • Loans • Deposits • Insurance • Securities/Investment banking • Pensions • Other financial services
Income Sources: • Net interest income	Income Sources: • Net interest income • Fee and commission income
Competitive environment • Restricted	Competitive environment • High competition
Strategic Focus: • Assets size and growth	Strategic Focus: • Returns to shareholders • Creating shareholder value (generating Return-equity, ROE, greater than the cost of capital)
Customer focus: Supply led	Customer focus: • Demand led • Creating value for customers

Source: Casu, B.; Claudia, G.; Phillip M.(2006): Introduction to Banking. Pearson Education Limited, Edinburgh, p.52.

3.2   *Table 2 shows the volume and value of fraud and forgeries in pre-financial innovation, between year 2000 and 2008. It also stated the total expected loss involved.*

Table 2. Returns of Insured Banks on Frauds and Forgeries in Pre-Financial Innovation

Year	TNF	TAI(₦'m)	TEL(₦'m)	PEL (%)
2000	403.00	2,851.11	1,094.55	37.9
2001	943.00	11,243.94	906.30	8.06
2002	796.00	12,919.55	1,299.69	10.06
2003	850.00	9,383.67	854.46	9.14
2004	1,175.00	11,754.00	2,610.00	22.21
2005	1,229.00	10,606.18	5,602.05	52.82
2006	1,193.00	4,832.17	2,768.67	57.29
2007	1,553.00	10,005.81	2,870.85	28.69
2008	2,007.00	53,522.86	17,543.09	32.78
Total	**10,149.00**	**127,119.29**	**35,549.66**	**-**
Average	**1,127.67**	**14,124.37**	**3,949.96**	**28.77**

Source: NDIC Annual Reports (Various Years).

TNF= Total Number of Fraud,

TAI= Total Amount Involved (N'm)

TEL= Total Expected Loss (N'm)

PEL= Proportion of Expected Loss to Amount Involved (%).

3.3   *Correspondingly, Table 3 shows also the volume and value of fraud and forgeries in post-financial innovation for the year 2009 to 2017. The total expected loss was also stated.*

Table 3. Returns of insured banks on frauds and forgeries in post-financial innovation

Year	TNF	TAI(₦'m)	TEL(₦'m)	PEL (%)
2009	1,764.00	41,265.50	7,549.23	18.29
2010	1,532.00	21,291.41	11,679.00	54.85
2011	2,352.00	28,400.86	4,071.00	14.33
2012	3,380.00	17,965.00	4,517.00	25.14
2013	3,756.00	21,795.00	5,757.00	26.41
2014	10,621.00	25,608.00	6,192.00	24.18
2015	12,279.00	18,021.00	3,173.00	17.61
2016	16,751.00	8,683.00	2,396.00	27.6
2017	26,182.00	12,012.00	2,372.00	19.75
Total	**78,617.00**	**195,041.77**	**47,706.23**	**-**
Average	**8,735.22**	**21,671.31**	**5,300.69**	**25.35**

Source: NDIC Annual Reports (Various Years).

TNF= Total Number of Fraud,

TAI= Total Amount Involved (N'm)

TEL= Total Expected Loss (N'm)

PEL= Proportion of Expected Loss to Amount Involved (%).

3.4   *Table 4 presents the volume of transactions for automated teller machines (ATM), Point-of Sale terminals (POS), Web/Internet payment (WEBP), Mobile payments (MOBP) and Cheque (CHQ) for the period 2009 to 2018.*

Table 4. Volume of Transactions

Year	ATMvol	POSvol	WEBPvol	MOBPvol	CHQvol
2009	109,161,646	918,256	2,703,516	1,809,251	29,166,780
2010	60,133,610	1,072,426	1,601,086	1,156,533	33,973,919
2011	347,569,999	2,100,673	1,932,355	3,649,374	37,718,585
2012	375,487,756	2,555,045	2,276,464	2,297,688	12,045,833
2013	295,292,940	9,402,255	2,900,473	15,812,435	14,145,839
2014	400,102,507	20,817,423	5,587,081	29,156,406	15,365,565
2015	433,587,623	33,720,933	7,981,361	43,933,362	13,466,461
2016	590,238,934	63,715,203	14,088,247	47,053,252	11,719,847
2017	800,549,099	146,267,156	28,991,097	47,804,561	10,808,983
2018	295,890,167	50,815,901	87,086,260	729,437,055	9,019,278

Source: Central Bank of Nigeria (CBN) Statistical Bulletin, 2018.

3.5   *Table 5 expresses the value of transactions for ATM, POS, WEBP, MOBP and CHQ for the same period, 2009 to 2018.*

Table5. Value of Transactions (₦'Billion)

Year	ATMval	POSval	WEBPval	MOBPval	CHQVal
2009	548.6	11.03	84.15	1.27	29,436.02
2010	399.71	12.72	25.05	6.65	19,675.51
2011	1,561.74	31.02	59.61	18.98	22,302.65
2012	1,984.66	48.01	31.57	31.51	7,461.63
2013	2,828.94	161.02	47.32	142.8	7,674.86
2014	3,679.88	312.07	74.04	346.47	7,269.08
2015	3,970.25	448.51	91.58	442.35	6,195.46
2016	4,988.13	759	132.36	756.9	5,829.55
2017	6,437.59	1,409.81	184.6	1,102.00	5,381.91
2018	2,383.11	404.6	1,830.70	80,423.03	5,035.33

Source: Central Bank of Nigeria (CBN) Statistical Bulletin, 2018.

3.6   *We also present in Table 6 the descriptive statistics of volume and value of transactions for ATM, POS, WEBP, MOBP and CHQ for the same period, 2009 to 2018.*

Table 6. Descriptive Statistics of Transactions Activities

Channel	Average	Maximum	Minimum	Total
ATMvol	370,801,428	800,549,099	60,133,610	3,708,014,281
ATMval	2,878.26	6,437.59	399.71	28,782.61
POSvol	33,138,527	146,267,156	918,256	331,385,271
POSval	359.78	1,409.81	11.03	3,597.79
WEBPvol	15,514,794	87,086,260	1,601,086	155,147,940
WEBPval	256.1	1,830.70	25.05	2,560.98
MOBPvol	92,210,992	729,437,055	1,156,533	922,109,917
MOBPval	8,327.19	80,423.03	1.27	83,271.95
CHQvol	18,743,109	37,718,585	9,019,278	187,431,090
CHQVal	11,626.20	29,436.02	5,035.33	116,261.99

Source: Author's computation from CBN Statistical Bulletin, 2018.

3.7   Trend Analyses of Development of Financial Innovation in Nigerian Banking System

Figure 1 presents graphically the analysis of bank frauds and forgeries in pre and post financial innovation.

Figure 1: Analysis of Banks on frauds and forgeries in pre- and post-financial innovation
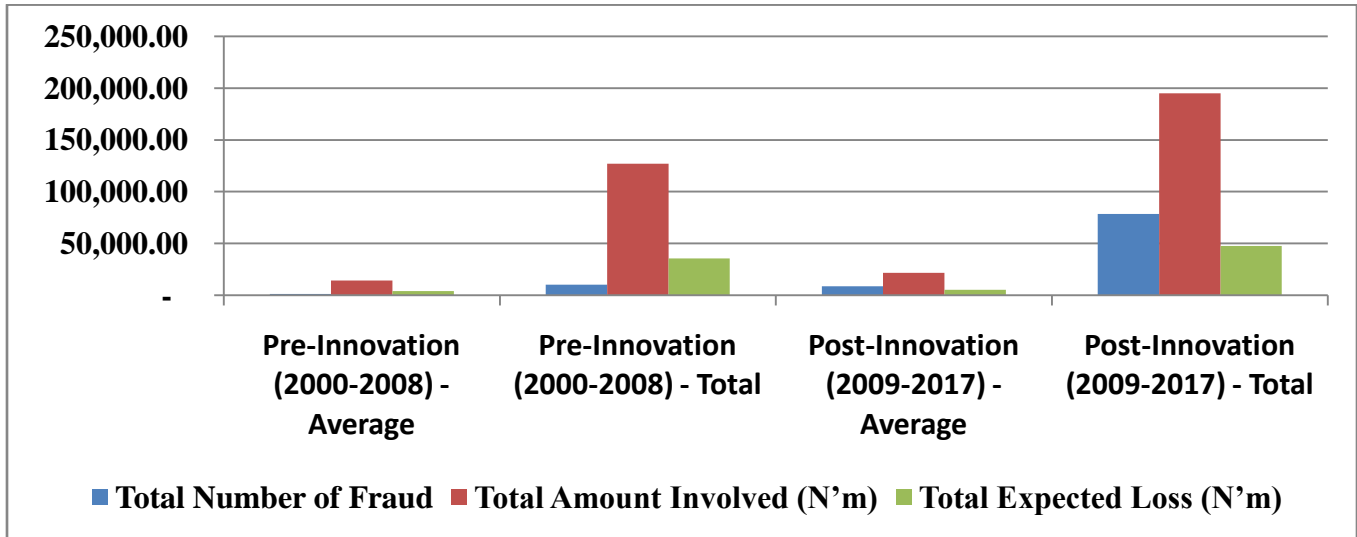
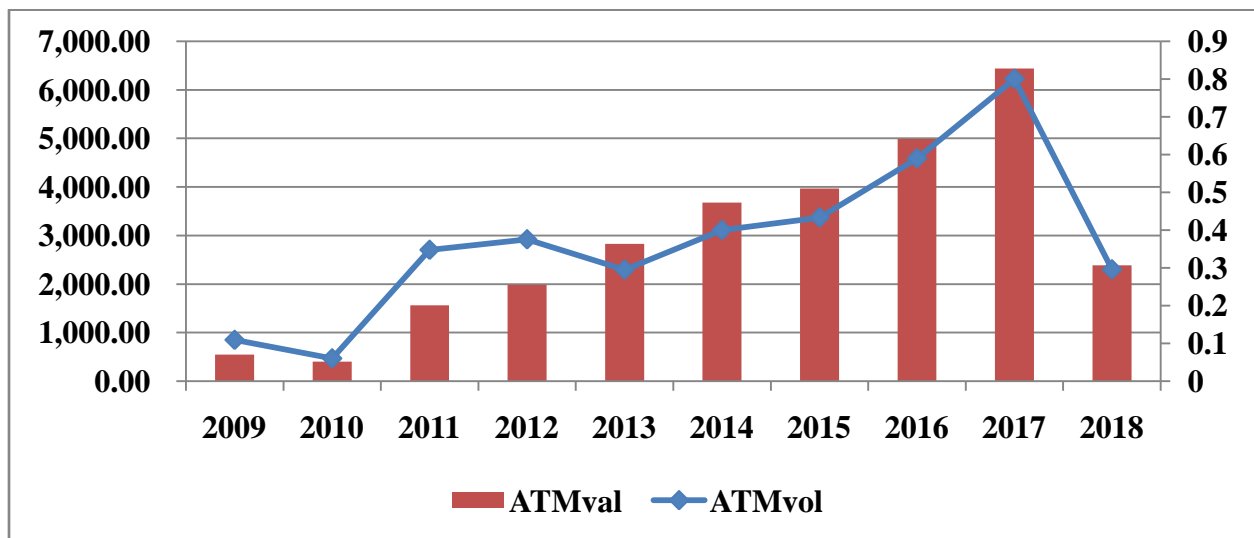Source: Author's computation from NDIC Annual Reports (Various Years).

Figure 1 reveals a sharp contrast between pre- and post-financial innovation frauds and forgeries statistics in the Nigerian banking sector. Both on the average and cumulative cases of frauds and forgeries were significantly higher in post-financial innovation compared to the pre-financial innovation. For instance, the average number of reported fraud cases in post-financial innovation was 8,735.22 compared to 1,127.67 representing about 674.63% increase in number of frauds and forgeries case from pre to post-financial innovation. Similarly, the total amount involved also increased by 53% from ₦127,119.29 million in pre-financial innovation to ₦195,041.77 million in post-financial innovation. Likewise,

total expected loss due to frauds and forgeries increased by 34.20% from ₦35,549.66 million in pre-financial innovation to ₦47,706.23 million in post-financial innovation. These facts indicate that fraud and forgeries in the banking sector is more prevalent with the advent of financial innovation.

Figures 2–8 present graphical movements in the volume and value of the ATM, POS, WEBP, MOBP and CHQ, respectively, for the period of the study, 2009-2018. Each graph is followed by its analysis.

3.7.1   Trend Analysis of ATM transaction

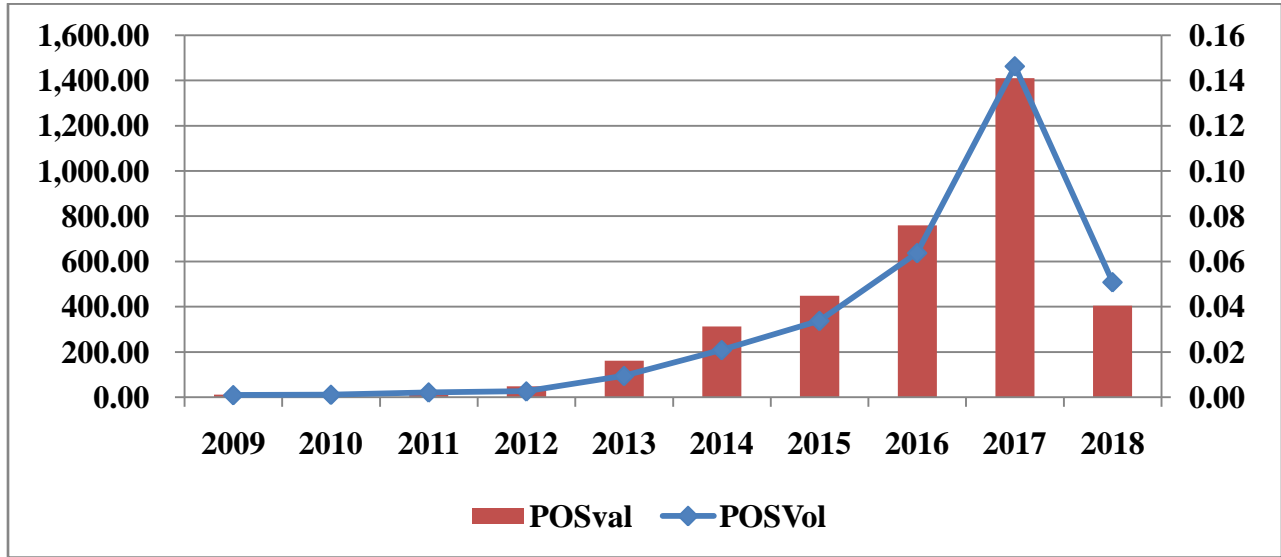Figure 2: Trend Analysis of movements in ATM transaction activities

Source: Author's computation from CBN Statistical Bulletin(2018).

Figure 2 reveals that value of transaction through ATM ranged between 399.71billion and 6,437 billion. The average value of transaction was 2,878.26 billion between 2009 and 2018 while the volume of transaction ranged between 60,133,610 and 800,549,099 during the reference period. The highest transaction value of 6,437 billion was recorded in 2017 while the lowest value stood at 399.71 billion which was

recorded in 2010. We also observed from Figure 1 that there seem to be direct correlation between volume and value of transaction over time. Moreover, the value of transaction maintained a steady increase from 2010 to 2017, and saw a sharp decline in 2018.

3.7.2   *Trend Analysis of Point of Sale (POS) Transaction*

Figure 3: Trend Analysis of movements in point of sale (POS) transaction activities

Source: Author's computation from CBN Statistical Bulletin (2018).

Figure 3 shows that the growth trajectory in volume and value of POS transactions was slow but on a steady year-by-year increase. The co-movements observed depict a positive correlation. The upward trend was, however, halted and nose-dived in 2018. The volume of transaction ranged between

918,256 and 146,246,156 between 2009 and 2018.The rise in value of transaction was from ₦11.03 billion in 2009 to ₦1,409.81 billion in 2017. The value of transaction averaged ₦359.78 billion over the period.

3.7.3   *Trend Analysis of Web Pay Transaction*

Figure 4: Trend Analysis of movements in Webpay transaction activities
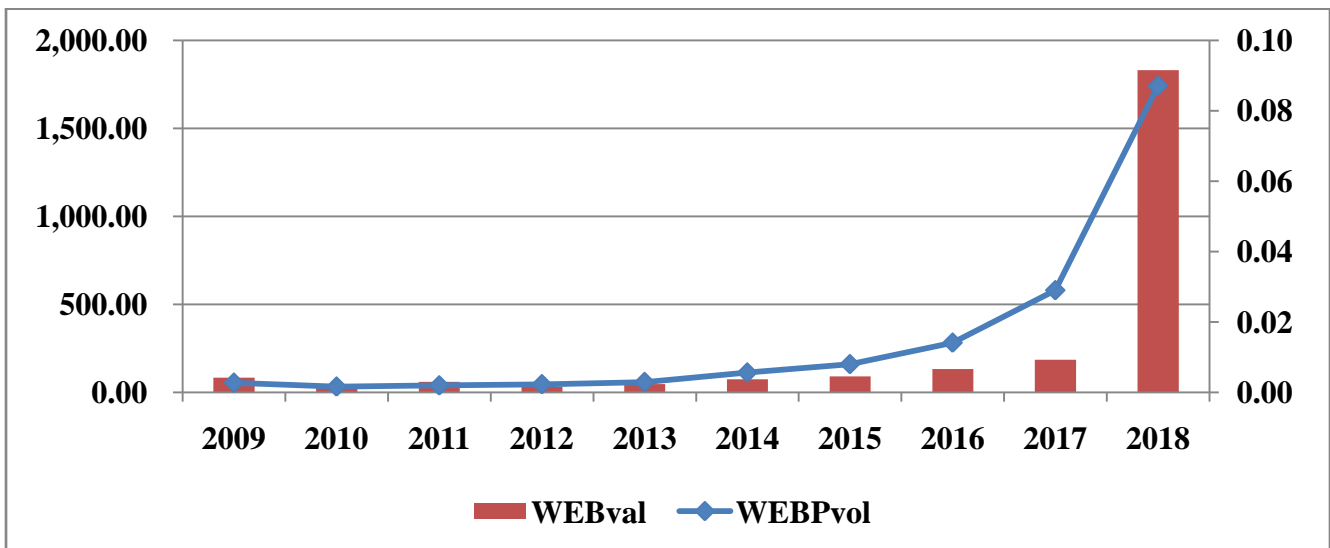
Source: Author's computation from CBN Statistical Bulletin(2018).

We can observe from Figure 4 that the value and volume of transactions through Web Pay channel was on low trends and both stagnated between 2009 and 2013. Marginal upward movements in activity set in in 2014 and continued to through 2018 when it reached the peak. Average value of transaction the web channel stood at₦256.10 billion and ranged between ₦25.05 billion and ₦1,830.70 billion, between 2009 and 2018; while the volume of transaction ranged between 1,601,086 and 87,086,260 during the reference period with an average transaction volume of 15,514,794 on annual basis. The highest transaction value of ₦1,830.70 billion was attained in 2018 while the lowest value stood at ₦25.05 billion which was recorded in 2010.

3.7.4 Trend Analysis of Mobile Pay Transaction

Figure 5: Trend Analysis of movements in mobile pay transaction activities.
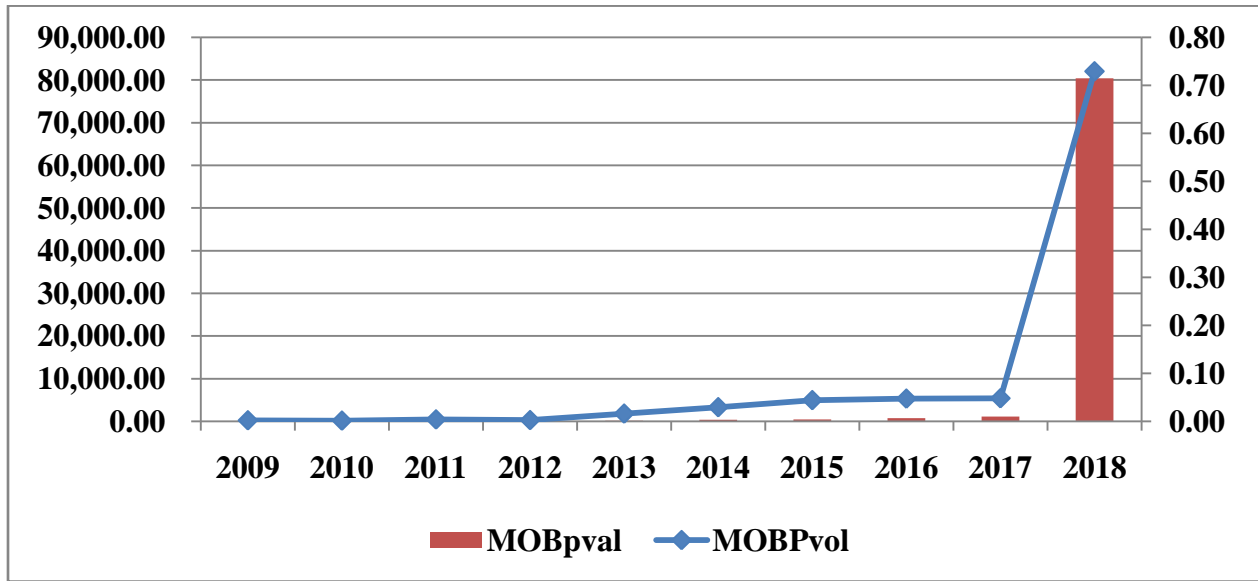
Source: Author's computation from CBN Statistical Bulletin (2018).

In Figure 5, the trend of Mobile Pay transaction witnessed lowest activity between 2009 and 2012. Both volume and value of transactions remained flat and averaged 2,228,212 and ₦14.60 billion, between 2009 and 2012. The increase in volume of transaction between 2013 and 2017 seem not to have resulted to a significant transaction value. However, a sharp and geometric increase in activity was observed in 2018. Generally, the value of transaction via Mobile Pay averaged ₦8,327.19 billion and ranged between ₦1.27 billion in 2009, and ₦80,423.03 billion in 2018. The average volume of transaction over the period was 92,210,992 with lowest activity witnessed in 2010 at 1,156,533 volumes of transaction.

3.7.5 Trend Analysis of Cheque Transaction

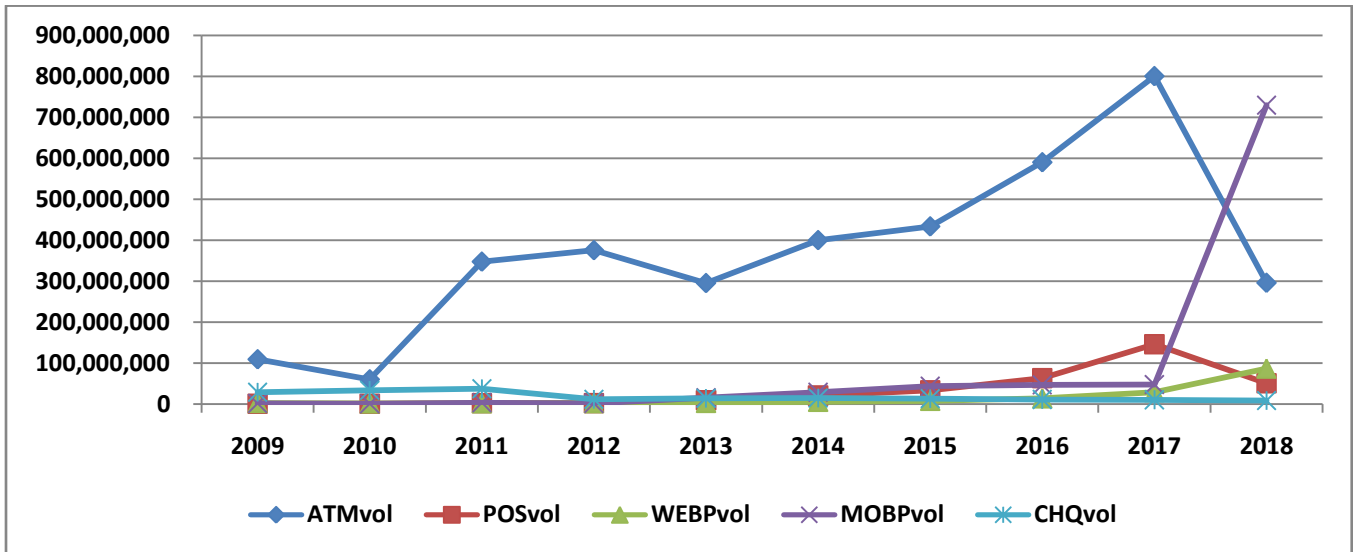Figure 6: Trend Analysis of movements in cheque transaction activities.
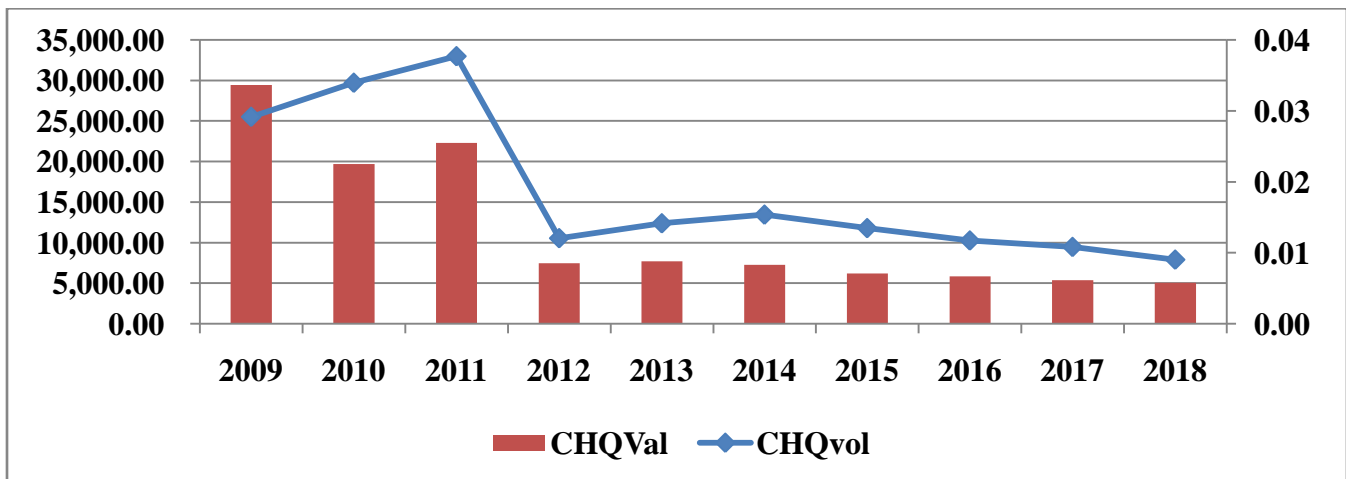
Source: Author's computation from CBN Statistical Bulletin (2018).

Cheque transactions represent the traditional medium of financial settlement as against the preceding selected financial innovations channels. As shown in Figure 6, the 10-year rolling window associated with cheque reveals a reverse trend compared to the digital channels. We can observe that cheque transactions were on a relative decline in both volume and value. Average volume of transaction was 18,743,109 which is less than all the innovative channels with the exception of

Web Pay transaction that averaged 15,514,794 in volume over the same period (See Table 6). However, the value of transactions in cheque remains significantly above the entire financial innovation medium. On the average, the value of cheque transactions was ₦11,626.20 billion whereas ATM was ₦2,878.26 billion, POS ₦359.78 billion, Web Pay ₦256.10 billion and Mobile payment terminals ₦8,327.19 billion (see Table 6).

Figure 7: Trend analysis of movements in volume of transaction activities for all channels
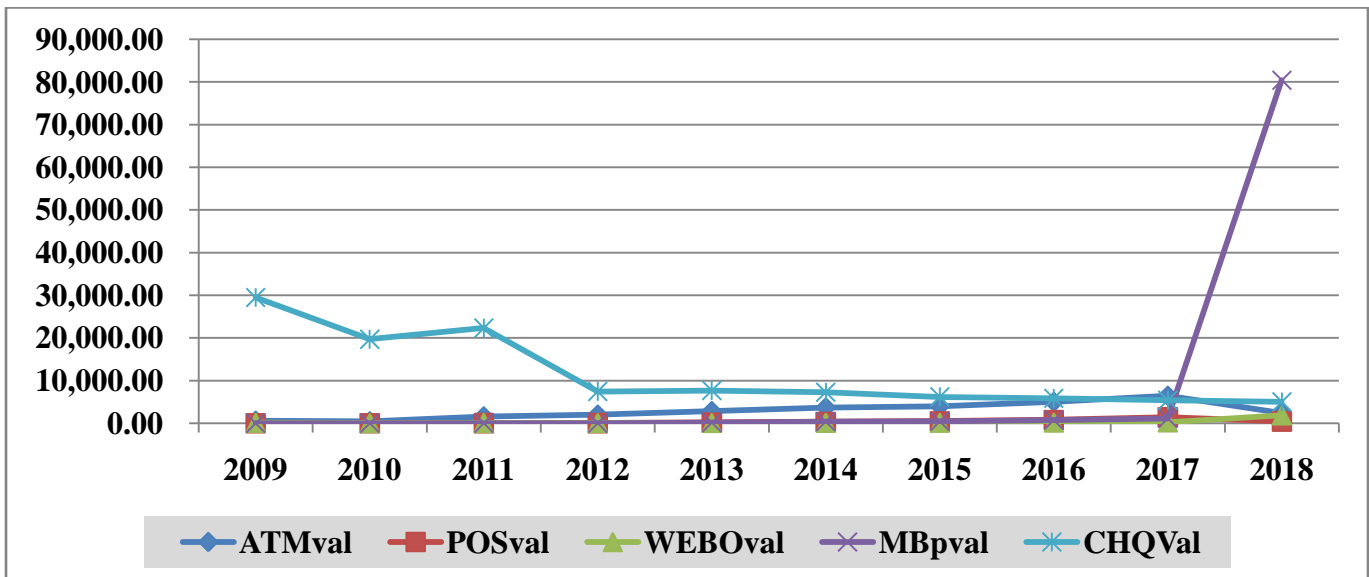

Source: Author's computation from CBN Statistical Bulletin(2018).

The period under study shows that cheque payment transactions maintained a steady decline, but for 2011, trailing significantly behind ATM, though higher than others. By2014, POS and MOB joined ATM in overtaking cheque,

and by 2016 all others have overtaken cheque payment system. This tempo was maintained till the end of the study year. This is an indication that usage of cheque as payment system is moving into extinction like bank cheque and draft

. Figure 8: Trend analysis of movements in value of transaction activities for all channels
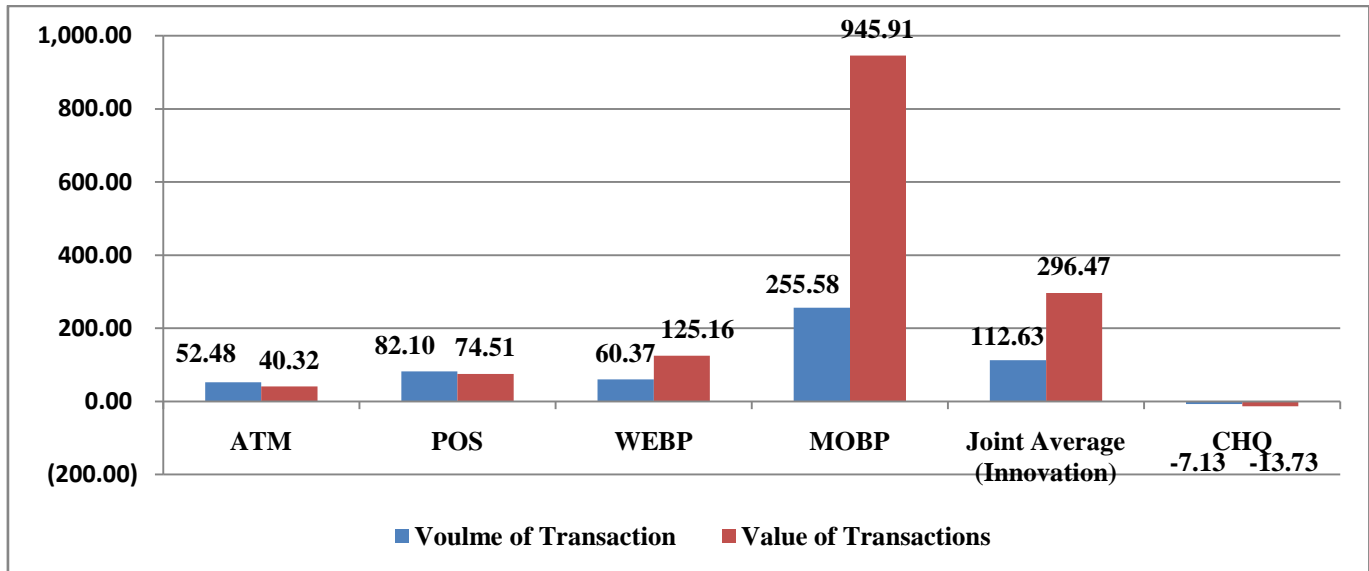

Source: Author's computation from CBN Statistical Bulletin (2018).

The relative significance of demand deposit transactions remain fairly strong despite declining from ₦29,436.02 billion in 2009, to only ₦5,035.33 billion in 2018 (see also Table 5). For instance, on year-on-year basis, as presented in Figure 6, it is evident that value of cheque transactions remained higher than the electronic channels and only trailed ATM transactions in 2017 and Mobile payments terminals in 2018.

The visible continuous decline in the volume and value of settlements via the traditional medium entails imminent substitution effect in favour of electronic channels, with ATM and Mobile pay more likely to eclipse the age long dominance of cheque transaction.

Figure 9 shows the trend of analysis of movements in transaction activities of all the channels.

Figure 9: Average change in volume and value of transaction

Source: Author's computation from CBN Statistical Bulletin(2018).

Figure 9 presents that volume and value of transaction activities via all channels considered in average terms. A joint representation of financial innovation channels is represented and compared with the traditional medium as proxied by cheque. It can be observed that while joint average of volume and value of financial innovation channels are substantially on the positive trajectory over the reference period, the average volume and value in cheque transactions are both on the negative trend. The contrast between the two media reveals that financial innovation is evidently crowding out the traditional transaction channels.

IV. SUMMARY AND CONCLUSION

The trend analyses as shown in Tables 4 and 5 indicated continuous increase in both volume and value, respectively, for ATM transactions during the period of study 2009-2018 except in 2010 and 2018 which registered very significant drop in both volume and value.

The POS maintained continuous rise only to nose-dive in 2018 in both volume and value, within the period of study. On the other hand, WEB payment system maintained steady increase in volume during the period 2009-2018. However, the trend was interrupted in 2010 with respect to value.MBP was on the increase with a drop in 2010 in terms of volume. It however, registered an astronomical increase in 2018. For the value, it maintained steady rise with a leap-frog in 2018.The

volume of cheque as payment system was cascading during the period, except for 2011 and 2014. For value, it was also declining except for 2011 and marginally, 2013.

The trend analysis of movements, in value, of transaction activities for all the channels (Fig. 7) shows significant margin between the cheque payment and the four others as at the beginning of study period (2009). However, the figure dwindled but was never overtaken until 2017 when ATM marginally over-shot. By 2018, mobile banking payment systems astronomically over-took all other payment systems, including cheque. This corresponds with the increase of the users from 1.5million in 2016 to 3.3million in 2018, as shown in paragraph 2.1.4. Correspondingly, there were increments in mobile money remittances, air time purchases and payment of bills in 2018, as shown also in the same paragraph.

Financial innovation has revolutionized the banking sector in Nigeria. However, it has also brought increased hardship to the sector. There are increased cases of frauds and forgeries in post-financial innovation compared with pre-financial innovation (see Tables 2 and 3).

V. RECOMMENDATIONS

Technological innovation has shrunk the world into a village such that what happens in one part of the globe is simultaneously viewed by the rest of the world. Against this backdrop, this paper analysed the developments of financial

innovation in the context of the Nigerian banking sector. Based on the findings of the study, we make the following recommendations:

i.   Banking sector in Nigeria has to vigorously leverage on technology by adapting to cutting-edge financial innovation. It should also appropriately educate and develop its manpower on the implementation.

ii. The banking public should be adequately educated on various products churned out by financial innovation, in the sector in order to ensure they are fully maximized.

iii. The Regulatory Authorities should upper their game with adequate and relevant regulations to monitor the sector and reduce the impact of financial malfeasance on the sector, also nip the loopholes for such occurrences.

iv. Finally, banks should be circumspect in the adoption of some financial innovations to avoid a repeat of the circumstances of the global melt down of 2007 – 2009.

REFERENCES

[1]. Adeniji   C.   (2015) http://barcode.stillwaterslaw.com/1.1/2015/12/21/a-guide-to-the-nigerian-mobile-money-market-in-2015/

[2]. Adeoti, O. O. (2013). Challenges to the efficient use of point of sale (POS) terminals in Nigeria. *African Journal of Business Management*, 7(28), 2801-2806.Doi: 10.5897/AJBM12.1129.

[3]. Baicu, C. G. (2011). The impact of financial innovation and banking regulation: Evidence from the global financial crisis. http://www.researchgate.net/227489705.

[4]. Berger, A. N. (2003). The economic effects of Technological progress: Evidence from the banking industry. *Journal of Money, Credit and Banking, 35*, 141-176.

[5]. Casu, B., Claudia, G., & Philip, M. (2006).*Introduction to Banking*, Pearson Education Ltd. Edinburgh, 52.

[6]. Chiesa and Frattini (2011); Commercializing Technological Innovation: Learning from Failures in High-Tech Markets.*Journal of Product Innovation Management* 28(4):437 – 454 DOI: 10.1111/j.1540-5885.2011.00818.x

[7]. Curwen, P. and Whalley, J. (2015), "The licensing of mobile operators in European markets and the consequences of new entry for competition", *Info-Tech* 17(3), pp. 16-37. https://doi.org/10.1108/info-01-2015-0014

[8]. EFInA   (2018)   https://www.efina.org.ng/wp-content/uploads/2019/01/A2F-2018-Key-Findings-11_01_19.pdf

[9]. Frame, W.S., & White, L.J. (2004). Empirical studies of financial innovation: Lots of talk, little action? *Journal of Economic Literature*, *42*(1), 116-144.

[10]. Frame, W.S., & White, L.J. (2018).Technological change and financial innovation in banking: Some implication for Fintech. *Federal Reserve Bank of Atlanta, Working Paper Series*. www.frbatlanta.org.

[11]. https://www.bankmycell.com/blog/how-many-phones-are-in-the-world

[12]. https://www.centerforfinancialinclusion.org/where-are-the-financially-excluded

[13]. http://www.gsmintelligence.com

[14]. Jegede, C.A. (2014). Effects of Automated Teller Machine on the Performance of Nigerian Banks. *American Journal of Applied Mathematics and Statistics*, *2*(1), 40-46.

[15]. Johnson, S., &Kwalk, J. (2012). Is financial innovation good for the economy? http://www.nbr.org/chapters/c12450.

[16]. Krugman, P.R. (2007). Innovating our way to financial crisis. New York Times, December 3, 2007. Available at http://www.nytimes.com/2007/12/3/opinion/03krugmanhtml

[17]. Lanzolla G. and Suarez F.F (2007). The role of environmental dynamics in building a first mover advantage theory. *Academy of Management Review*, 32, 377-392.

[18]. Lerner, J. (2006). The new financial things: The origins of financial innovations. http://www.sciencedirect.com

[19]. Merton, R. C. (1992). Financial innovation and economic performance. *Journal of Applied Corporate Finance, 4*(4), 12-22.

[20]. Miller, M.H. (1986). Financial innovation: The last years and the next. *Journal of Finance and Quantitative Analysis, 21*(4), 459-471.

[21]. Miller, M.H. (1992). Financial innovation: Achievements and prospects. *Journal of Applied Corporate Finance, 4*(4), 4-12.

[22]. Miller, M.H. (1995). Financial innovation and the management and regulation of financial institutions.*Journal of Banking and Finance, 19*(3-4), 461-481.

[23]. Muhammad, A. K. (2010). An empirical study of automated teller machine service quality and customer satisfaction in Pakistani banks. *European Journal of Social Sciences*, 13(3), pp. 333-344.

[24]. Okafor, I.G. (2012). ₦5000 note will move corruption into super highways. The New African Press, The Hague, Netherlands.

[25]. Okafor, I.G, Ezeaku, H.C., &Anyalechi, K.C. (2017). Does financial innovation drive growth? Empirical analysis of the Nigerian case.*British Journal of Economics, management & Trade, 16*(3),1-10.

[26]. Piazza, R. (2010). Financial innovation and risk: The role of information. *IMF Working Papers*, WP/10/266.

[27]. Rogers, E. M. (1962). *Diffusion of Innovations.*New York, NY Free Press.

[28]. Shin, H.S. (2010).Financial intermediation and the post crisis financial system.*BIS Working Paper*, (March), 304

[29]. Stiglitz, J. E. (2010). Financial innovation: The Economists debates. http://www.economist.com/debate/days/view/471

[30]. Tufano, P. (2003). Financial innovation in Handbook of the Economic of Finance. (1) A Corporate Finance.

[31]. Van Home, J.C. (1985). Financial innovation and excesses. *Journal of Finance, 40*(3), 621-636.

[32]. Volcker, P.A. (2009). Paul Volcker: Think more boldly. Wall Street Journal, December 14, 2009.