

Full Length Research Paper

Technology acquisition and technology learning in banking industry: Lessons from Nigerian banking sector

Mirabel Godswill Ukpabio^{1*}, Titilayo Olaposi² and Willie Owolabi Siyanbola³

¹National Centre for Technology Management (NACETEM), Obafemi Awolowo University, Ile-Ife Osun State, Nigeria.

²African Institute of Science Policy and Innovation (AISPI), Obafemi Awolowo University, Ile-Ife Osun State, Nigeria.

³Center for Energy Research and Development (CERD), Obafemi Awolowo University, Ile-Ife Osun State, Nigeria.

Received 31 August, 2015; Accepted 9 October, 2015

Firms' ability to effectively exploit technologies acquired is largely hinged on their technology learning capabilities. However, most firms in developing countries that acquire technology lacks sufficient skills to effectively acquire, learn and exploit acquired technologies. The objective of this study is to assess technology acquisition and technology learning in Nigeria's commercial banks. The paper also considered the impact of technology learning on the technological performance of the banks. The study sampled 18 out of 21 commercial banks in Nigeria and responses were gotten from 14 banks. As a sample, 112 questionnaires were administered with a 54.5% response rate. Data were analysed using descriptive statistics and linear regression model, and results shows that the surveyed banks acquired various types of technology but with less emphasis on the know-how (tacit) aspect of technology. Banks engagement in technology learning activity such as perform in-house R&D was about 50%. About 50.8% of the respondent had attended training on technology duplication, improvement and development. The study suggests that banks should lay more emphasis on acquiring the know-how aspect of technology, and engage more internal R&D to boost their technology learning capability since technology learning have impact on the technological performance of banks.

Key words: Technology acquisition, technology learning, technology, learning, technological performance.

INTRODUCTION

The rising quest for technology development amongst developing nations has made technology acquisition (TA) and technology learning (TL) an essential tool for sustainable economic development. Economic advancement in developing countries can be linked to several factors that are vital and interconnected which include; the increasing capabilities in the industrial sector,

increased investments in technology acquisition and proficient use of technological opportunities stemming from globalization (UNCTAD, 2012). The acquisition of technology has fostered high productivity growth amongst firms in developing nations (Hoekman et al., 2004).

Without any doubt, technology is at the centre of most of today's organisations' operations. It is the platform on

*Corresponding author. E-mail: mimi4christ148@yahoo.com.

which the activities, functions and objectives of firms are driven.

Even the largest and most technologically self sufficient organisations require knowledge from beyond their boundaries. Besides doing own research and development, firms typically are engaged in the external acquisition of technology on the technology market and corporately active in R&D with other firms and research organisations. The acceleration of R&D efforts and the development of internal innovative capabilities are no longer enough to cope with the increase in speed, cost and intricacies involved in technology development (Harrison et al., 2001). In the case of developing countries or less-developed countries, acquiring technology from developed countries is the major route of sourcing technology, especially when the R&D capabilities are limited (Lin, 2003).

TA entails acquisitions that provide technological inputs to the acquiring firm which aids the expansion of the acquiring firm's knowledge base thus making available scale, scope, and other integration benefits (Henderson and Cockburn, 1996; Fleming, 1999). TA is important to firms in that it helps firms to obtain technological know-how and develop technical capabilities (Ahuja and Katila, 2001). The technological capability of a country describes its effectiveness in using different technologies to produce different products and services. Technology can be acquired internally through firms engagement in R&D and external acquisition modes such as; strategic alliances, joint venture, direct purchase, license agreement, merger and acquisitions (Allen and Hevert, 2007), corporate venture capital investment, technology exploration in cooperation with research laboratories and universities, etc. (George et al., 2002).

TA though has some inherent cost such as; cost for acquiring technology, cost of integrating the acquired technology into the acquiring organization and the diversion of top management time and attention from other activities (Hitt et al., 1996), is of utmost benefit to the acquiring firm.

Technology acquisition helps firms to; overcome barriers to entering a new or existing market, gain greater market power, acquire new resources and knowledge, revitalizes acquiring firm and ensure its long-term survival (Vermeulen and Barkema, 2001). Therefore, TA has become necessary for firms to remain flexible, complex and open to changes around its environment. Excessive reliance of firms on its knowledge base and non-engagement in external acquisition over time hampers its adaptability to external conditions thereby resulting in "competency trap". Technology acquisition though may lead to cultural clashes and tensions when they are implemented but will augment the knowledge bases and reduce the inflexibility of acquiring firm (Vermeulen and Barkema, 2001).

The ability of firms to effectively exploit technologies

acquired largely depends on their technology learning capabilities. These capabilities can be developed by firms through investment and engagement in internal R&D (Cohen and Levinthal, 1989). These investments in R&D enable firms to properly assimilate and utilize knowledge acquired. The technology learning capability of a firm increases as its R&D efforts increases (Cohen and Levinthal, 1989). TA helps to expand the acquiring firm's knowledge base and increases its innovation output by providing span in research, economies of scale, and enhances the acquiring firm's abilities for inventive recombination (Henderson and Cockburn, 1996; Fleming, 1999). For technology acquisition to have impact on the firm, the knowledge elements that such acquisition brings to the firm become very crucial. Technology acquisition aids technology learning in that firms' acquisition of technology grants the acquiring firm access not only to the internally created knowledge of the acquired technology but also to a larger external domain of knowledge that is understood and used by the acquired firm. Thus, TA helps to increase the number of elements of both internal and external knowledge that are available to the acquiring firm.

Technology learning spurs the improvement of technologies available to mankind and subsequent reduction of production costs. Many of the conventional technologies in use today have been improved upon over decades (Junginger et al., 2008). Specifically for the banking sector, banking technologies have been built and improved upon over the years including the core banking software that constitute a large part of banks' investment in technology. Interestingly, the continual improvement of these technologies mainly leads to incremental improvements and associated cost reductions. Technology learning involves the ability of a firm to understand the content and value of the acquired technology assimilate it and exploit such technology gainfully. Therefore, for technology learning to be achievable a firm needs to be systematic in its technology acquisition process. For any firm to engage in technology acquisition such a firm must have an end goal in mind. One of such goals must include learning, exploitation, duplication and possibly improvement of such technology so as to ease challenges associated with expansion, improved work processes and increased productivity, etc. More so, the process of TA involves interaction between the acquired and the acquiring firm and therefore include teaching from the acquired firm and learning from the acquiring firm (Haspeslaph and Jemison, 1991).

For technology learning to be effective in technology acquisition process, the process of technology acquisition must include the following; integration teams, meetings within and between both firms R&D departments and extensive face-to-face communication between both firms in order to learn about each other's technology and processes (Gerpott, 1995). Most importantly, acquisition

process must include the acquisition of the know-how of technology development, maintenance, repair and operation. The knowledge of the interworking of the different components of the technology must be assimilated by the acquiring firm for adequate exploitation and absorption of such technology. Common skills, shared languages and similar cognitive structures enable technical communication and learning (Lane and Lubatkin, 1998). However, different learning mechanisms play a role in the improvement of the technology acquired by firms and this consequently results in increased efficiency, reliability and reduced operation and maintenance costs. These learning mechanisms have been discussed by several authors (Grübler et al., 1999; Kamp, 2002; Dannemand, 2004). These learning mechanisms include Learning-by-searching, (that is, improvements due to R&D), Learning-by-doing (Arrow, 1962) (the repetitious manufacturing of a product leads to improvements in the production process), Learning-by-using (Rosenberg, 1982) (responses from users regularly results in improvement of the product design), Learning-by-interacting (network of interactions amongst actors of the national innovation system usually result in improvement in technology (Kamp, 2002).

The possibility for firms in Nigeria to learn and improve on existing technologies depends majorly on investment in R&D, training on technology development, technology acquisition and investment across a range of activities that support overall industrial development as well as in infrastructure and learning activities. This will result in increased absorptive capacity to adapt and apply existing technologies (that is, products and processes technologies) by means of indigenous innovations.

Although several studies have examined relationship between firms' investments in knowledge and their innovation output (Hall et al., 1986; Griliches, 1990), relatively little research has focused on the role of acquisitions in growing the firm's knowledge base (Granstrand and Sjolander, 1990; Huber, 1991; Gerpott, 1995). This paper assesses the technology acquisition and technology learning in Nigeria's commercial banks. In addition, the study considered the impact of technology learning on the technological performance of the banks. This study is divided into four sections; section 1 discusses the concept and relevance of TA and TL to organizations' performance as well as the background to TA in Nigeria and the banking sector. In section 2, the sample, method of data collection and variables used in this study are explained. Section 3 presents and discusses the findings of the study, and section 4 draws conclusion on the study.

Background to technology acquisition in Nigeria

The acquisition of technology in Nigeria started as far

back as 1970s during the era of indiscriminate importation of various technologies into developing countries with specific reference to Nigeria. Industrialization efforts were mainly of turnkey packages with no technical connection to the environment. There were a lot of clumsy technology inflows due to lack of international code of conduct (ICC) to developing countries. Technology transfer agreement terms consist of conditions that were very unjust which includes: restriction on export, restriction on business practices, high royalty cost, monopoly pricing, tie-in clauses, little comprehension programs and weak indigenous R&D activities. This therefore led to the need for a national mechanism for transfer of technology.

The lack of organized system to coordinate technology acquisition and transfer agreement led to the establishment of national office for technology acquisition and promotion (NOTAP). The functions and activities of NOTAP include; registration of all contracts for the transfer of foreign technology to Nigerian companies, development of negotiating skill of Nigerians to ensure best contractual terms and conditions in any agreement for transfer of foreign technology and the monitoring and execution of registered technology transfer contracts through: information technology dissemination, collation and documentation of R&D outputs and innovation, promotion of innovation and intellectual property right awareness among researchers and inventors, and commercialization of useful R&D outputs.

According to NOTAP (2006), the country has witness a total number of 3,918 technology agreement/contracts submitted by all industrial sectors between 1983 and June, 2006 out of which 2,427 have been registered. Considering all the agreement submitted by the various sectors, the service industry which is inclusive of the banking sector submitted about 632 agreements from which 427 were registered.

Overview of Nigeria banking sector

The Nigerian banking sector plays a key and sensitive role in the nation's economy. Hence their performance directly affects the growth, efficiency and stability of the economy (Oladejo and Oladipupo, 2011). Since the establishment of the first bank in Nigeria in 1892, the sector has undergone several reforms (Iganiga, 1998). These reforms were aimed at achieving several objectives such as; market liberalization, improvement of the regulatory and surveillance framework, fostering healthy competition in the provision of services and laying the basis for inflation control and economic growth. The sector has witnessed remarkable growth since the deregulation of financial service sector in 2005. Following the consolidation, prominent achievements were recorded in the sector amongst which was the reduction of the

number of banks to 25 and currently to 21 well capitalized banks from the initial 89 banks. During this period, banks raised N406.4 billion from the capital market (Anyanwu, 2010). In addition, the process attracted foreign capital inflow of US\$652 million and £162,000 pound sterling (Anyanwu, 2010). Between 2006 and 2009, total credit to the economy from the banking sector rose from N2, 535.4 billion to N8, 769 billion averaging N5, 830.7 billion during the period. Funding from the banks accounted for only 14.4% of total funds in 2006, 13.4% in 2007, 18.7% in 2008 and 49.7% in 2009 (Anyanwu, 2010). The consolidation process impacted positively on the economy as employment in the sector rose from 50,586 in 2005 to 71,876 in 2010 (Sanusi, 2011). More so, the dawn of democratic governance in Nigeria in the year 1999, brought a new phase of sanitisation, including organisational and ethical reforms and recapitalisation for the sector. Ever since, technology has remained the key driver of the Nigerian banking sector. The banking sector has invested substantially on acquiring foreign technology especially the core banking software which has made it possible for banks to withstand competition in the global financial system and as well strengthened development in the sector.

METHODOLOGY

This study was conducted in Lagos state Nigeria. The study examined the Nigerian banking sector. From the sector, commercial banks were selected for this study. The study examined 18 commercial banks out of a total of 21 commercial banks in the sector from which responses were gotten from 14 banks. From the banks, 112 respondents were sampled for this study. These respondents consisted of top management staff, R&D staff and engineering staff/IT staff. Personal interviews and structured questionnaire eliciting information on the socio-economic characteristics of the banks, socio-economic characteristics of employees, technology acquisition and technology learning activities of banks were administered. The study recorded 54% response rate from the 112 respondents sampled. Secondary data was obtained from journals, banks' annual reports, internet, publications and textbooks. The data collected was analysed using both descriptive and inferential statistics.

Variable definition

Technological performance

Technology duplication (TECH-DUP) was used to determine the technological performance of the banks which served as the dependent variables for this study.

Technology Learning

Variables such as, engagement in in-house R&D (EIHR&D), years of experience of R&D department (YER&DD), investment in in-house R&D (IIHR&D), training on the development of new or improved technology (TODNIT), amount expended on technology

acquisition (AETA), engagement in routine technological operation (ERTO), usage of cross-firm patent technology (UCFPT) and usage of technology produced by other banks (UTPBOB) were used as independent variables for this study.

RESULTS AND DISCUSSIONS

Surveyed banks' profile

The commercial banks surveyed have about 3,083 branches and cash centres across Nigeria. The banks ownership structure comprised of publicly owned (78.57%), privately owned (14.29%) and government owned (7.14%) banks. Highest educational qualification of respondents was masters' degree which signified 40.7% of banks staff surveyed. About 59.3% of employees surveyed had bachelors' degree and its equivalent as highest academic qualification. Most of the surveyed banks operational levels were mainly international (71.43%), about 21.43% of the surveyed banks have their presence limited to the borders of Nigeria with branches in each state and 7.14% of the surveyed banks only operate regionally. Interestingly, the capital base of the surveyed banks was far beyond the N25 Billion minimum stipulated by Central Bank of Nigeria (CBN) (Yauri et al., 2012). About 57.14% of the banks have capital base ranging between over N1 trillion to N5 trillion. 21.43% of banks surveyed have capital base that ranges between N100 billion to N500 billion while 14.29% of the banks have capital base that ranges between N501 billion to N1 Trillion, and about 7.14% of the banks have capital base that is above N5 trillion. This robust capital base amongst the surveyed banks is a signal to the fact that Nigerian commercial banks have sufficient financial strength to compete globally with other banks.

Technology acquisition activities of banks

The study revealed that all surveyed banks engage in technology acquisition as it enhances technology learning in the banks. According to the study, the reasons for banks engagement in technology acquisition were attributed to the following; improve efficiency, expansion, quality of local equivalent below expectation and cost reduction. Interestingly, the surveyed banks have invested substantial funds on technology acquisition within the last three years. About 18.0% of the surveyed banks have invested above N1 billion in acquiring technology. About 11.5% of the banks had invested between N501 million and N1 billion on technology acquisition and 23.0% of the banks has invested between N1 Million and N500 million to acquire technology. This substantial investment in technology has led to improved products and service quality of banks. This huge

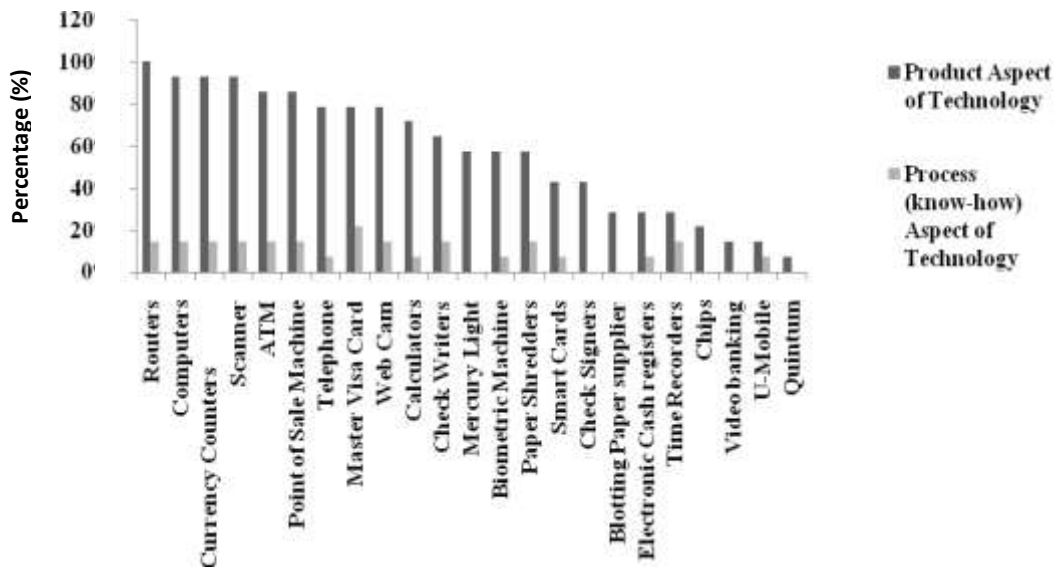


Figure 1. Hardware technology acquired by surveyed banks.

investment in technology has also led to increased profit and expansion in banks which resulted in the enlistment of banks such as; Zenith bank (287th), First Bank (338th), GT Bank (417th), Access Bank (506th) and UBA (553th) amongst the top 1000 banks in global ranking (The Bankers Magazine, 2013). The banks surveyed acquired various types of hardware and software technologies.

Hardware technology acquired by banks

The major hardware technologies acquired by commercial banks include; routers (100%), computers (92.9%), currency counters (92.9%), scanners (92.9%), ATM (85.7%), POS machines (85.7%), telephone (78.6%), master visa cards (78.6%), web cam (78.6%) and calculator (71.4%). Also, only a few out of the listed hardware were acquired alongside their process (know-how) aspect. The study revealed that most commercial banks acquired hardware product technologies with little emphasis on the process (know-how of technology development and maintenance). Some technologies like; master visa card (21.4%), currency counters (14.3%), computers (14.3%), ATM (14.3%), POS machine (14.3%), etc., had both the products and process aspects of technology acquired by the surveyed banks (Figure 1).

Software technology acquired by banks

The study also revealed the types of software technology acquired by the surveyed banks. The various banking software used by the surveyed banks include; flexcube, finacle, eBBs, equinox, basis, phoenix and globus/T24.

About 42.9% of the surveyed banks acquired flexcube banking software while 21.4% of the banks acquired finacle banking software product. Also, 14.3% of the banks acquired basis software, 14.3% of the surveyed banks acquired phoenix banking software, 7.1% of the banks acquired globus/T24 banking software and 7.1% acquired equinox banking software. Of the software used by the banks, the eBBs banking software was the only software manufactured by banks in-house (Figure 2). Only a few out of the banking software acquired were acquired alongside their process (know-how) aspect. This indicates a weakness on the enhancement of banks' technology learning capability as the acquisition of the know-how (tacit knowledge) aspect of technology enhances the technology learning capability of firms. As pointed out by Intarakunerd and Virasa (2004), the process of technological learning capability is built mainly by considering both product and process (know-how/tacit knowledge) aspects of technology in acquisition process. They asserted that to reduce the initial investment cost and to develop acquisitive capability, firms can attempt to unpack the process technology from the very beginning or acquire packaged technology and unpack it later. Also, as stated in NOTAP (2011), technology transfer agreement should contain plans for skill (knowledge) building, training and development on the technology acquired for absorption, diffusion and domestication of such technology by the licensee.

Country and firm sources of technology acquired by banks

More so, the about 71.3% of the banking software used

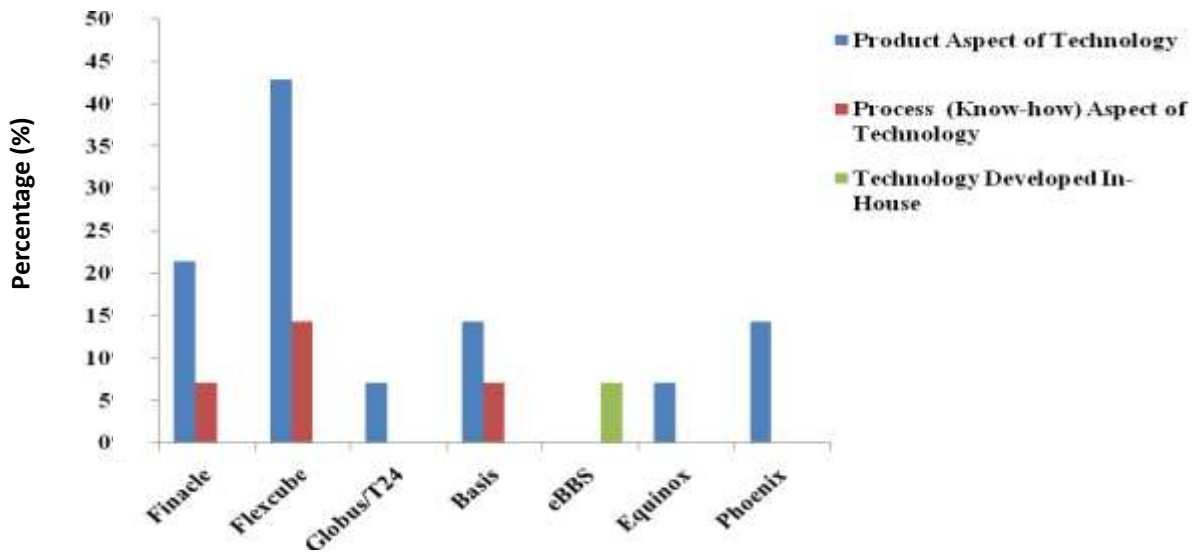


Figure 2. Banking software acquired by surveyed banks.

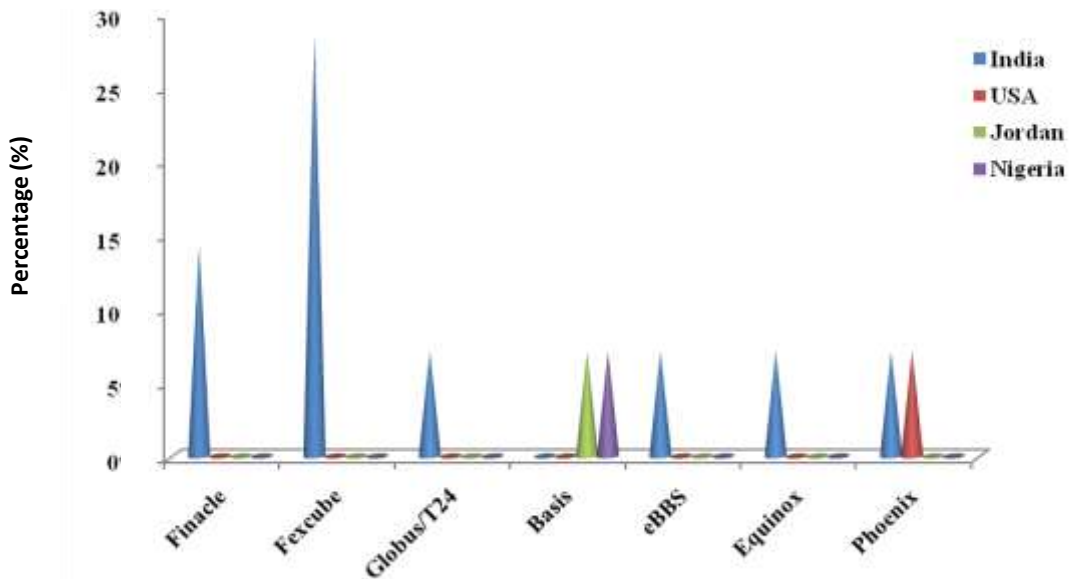


Figure 3. Country sources of software technology acquired by banks.

by the commercial banks were sourced from India, with a few from USA (7.1%), Jordan (7.1%) and Nigeria (7.1%) (Figure 3). In general, the surveyed banks sources technology (hardware & software) mainly from private firms (57.1%), public firms (50%), individual firms (35.7%) and a few from government (14.3%) in India. Other countries where technology is sourced include: USA, United Kingdom, Nigeria, Dubai, Jordan, Belgium and South Africa (Figure 4). A study by Olowe (2011), confirmed that commercial banks in Nigeria source their software technology from India with specific reference to

the finacle and flexcube banking software.

Modes of technology acquisition

The study revealed that the two commonly used modes of technology acquisition by commercial banks are direct purchase (67.2%) and licensing arrangement (62.3%). Other modes used by the banks include; technology alliance (41.0%), joint venture (32.8%), mergers and acquisition (31.1%), corporate development (29.6%),

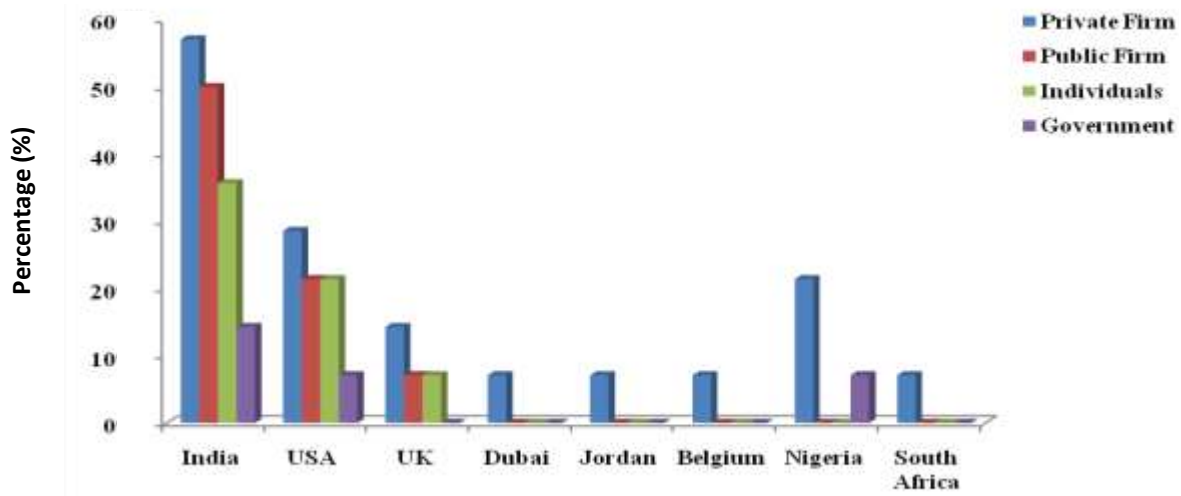


Figure 4. Firm and country sources of hardware and software technology acquired by banks.

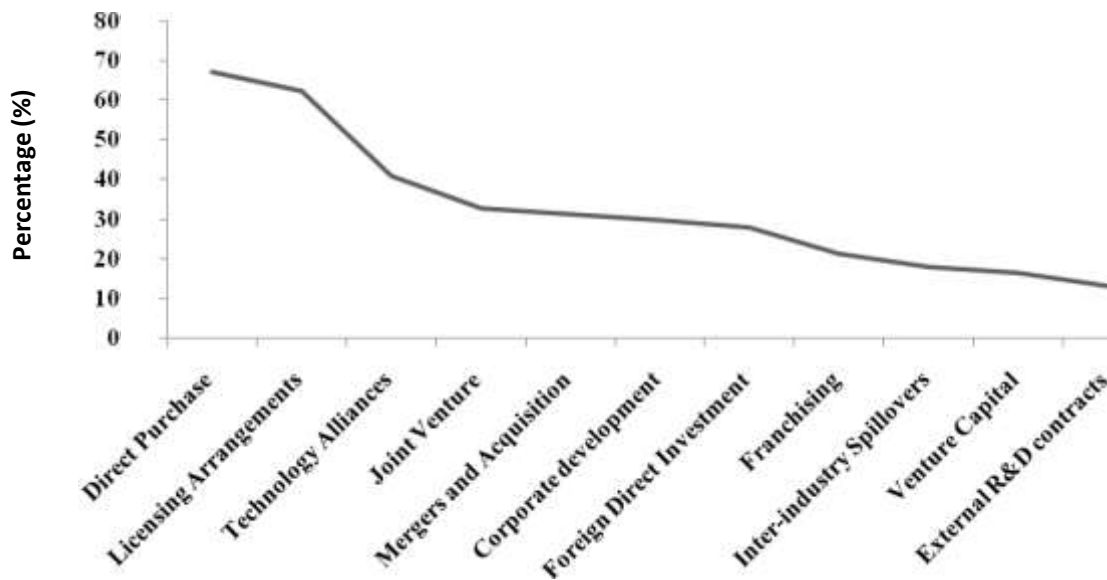


Figure 5. Modes of technology acquisition used by surveyed banks.

foreign direct investment (27.9%), franchising (21.4%), inter-industry spillover (18.0%), venture capital (16.4%) and external R&D contracts (13.1%) (Figure 5).

Technology learning activities of the banks

The study further considered the technology learning activities engaged in by the banks. In achieving this, the study considered the bank’s engagement in in-house R&D and years of experience of the R&D department, training attended by staff on technology improvement or

development and the exact skills acquired from such training, staff engagement in routine technological operations, bank’s in-house R&D expenditure, banks’ usage of cross-firm patent technology, banks’ usage of technology produced by other banks, banks’ production of significantly improved product/processes, exact product/process improved upon by banks and banks’ engagement in technology duplication. Result shows that about 50% of the surveyed banks engage in in-house R&D, and has in-house R&D department with an average of 10 years experience. About 50% of the banks do not engage in in-house R&D and so outsources their R&D.

Table 1. Technology learning activities of surveyed banks.

Technology learning activities	Percentage (%)
Engagement in In-house R&D	50
Training on development of improved technology	50.8
Engagement in routine technological operations	65.6
Banks usage of cross-firm patent TECHNOLOGY	49.7
Banks Usage of technology produced by other banks	7.1
Engagement in production Improved technology	100
Banks engagement in technology duplication	21.3

[†]Multiple response table (n=61).

Table 2. Correlation between technology acquisition and technology learning in banks.

Variable	1	2	3	4	5	6	7	8	9
TECH-DUP	1	-	-	-	-	-	-	-	-
AETA	0.209	1	-	-	-	-	-	-	-
TODNIT	0.081	-.048	1	-	-	-	-	-	-
EIHR&D	0.341**	0.020	0.022	1	-	-	-	-	-
IIHR&D	0.148	0.089	0.054	-.032	1	-	-	-	-
YER&DD	0.329**	0.153	0.083	-.068	.166	1	-	-	-
ERTO	0.166	-.195	0.067	-.020	0.000	0.149	1	-	-
UCFPT	0.236*	-.020	0.125	.111	-.154	-.004	0.171	1	-
UTPBOB	0.258*	-.031	0.226*	.024	0.053	-.062	0.170	0.289*	1

** Significant at $P \leq 0.01$ level, * Significant at $P \leq 0.05$ level.

About 50.8% of the respondents had attended training on technology improvement or development. Skills acquired from such training include; project management skill, software development skill, competency upgrade skill, microsoft platform skill, engineering skill, network security/networking skill among others. About 65.5% of the respondents (banks' staff) engage in routine technological operations. The surveyed banks' investment in in-house R&D between 2010 and 2012 was about N500, 000,000. This was not too high as some of the surveyed banks do not engage in in-house R&D but rather these banks outsource their R&D.

Furthermore, the study revealed that about 49.7% of the surveyed banks use cross-firm patent technology and about 7.1% of the banks use technology produced by other banks. From the study, all the banks surveyed have engaged in the production of significantly improved product/process. The products (technologies) improved upon by the banks include; Nigeria Inter-Bank Settlement System (7.1%), In-house application, electronic bulletin board service (eBBS), software development, global collection payment, phoenix software, card security, cleaning application, kastle application, transaction monitoring application, etc. About 21.3% of the banks engages in technology duplication and the technologies duplicated include; business intelligence, credit

application, data warehouse technology and E-solutions (Table 1).

Correlation and regression results

Table 2 presents a summary of statistics for correlations between the dependent variable technological performance and the independent variable technology learning. Technological performance was measured using technology duplication (TECH-DUP) and technology learning was measured using variables such as; engagement in in-house R&D (EIHR&D), years of experience of R&D department (YER&DD), investment in in-house R&D (IIHR&D), training on the development of new or improved technology (TODNIT), amount expended on technology acquisition (AETA), engagement in routine technological operation (ERTO), usage of cross-firm patent technology (UCFPT) and usage of technology produced by other banks (UTPBOB). There exists positive correlation between TECH-DUP all independent variables. Particularly, independent variables such as; UCFPT, YER&DD, EIHR&D and UTPBOB have a significant positive correlation with technological performance of the banks. This therefore implies that banks that engage in in-house R&D with experienced R&D department, uses

Table 3. Regression model summary.

Model	R	R ²	Adj. R ²	Std. error of the estimate
1	0.560 ^a	0.313	0.257	0.415

^aPredictors: (Constant), UCFPT, YER&DD, EIHR&D, UTPBOB.

Table 4. ANOVA.

Model	Sum of squares	DF	Mean square	F	Sig.
Regression	3.856	4	0.964	5.584	0.001 ^b
Residual	8.459	49	0.173	-	-
Total	12.315	53	-	-	-

^aDependent variable: TECH-DUP; ^bPredictors: (Constant), UCFPT, YER&DD, EIHR&D, UTPBOB.

Table 5. Coefficients of the statistical package for the social sciences (SPSS) regression result.

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. error	Beta		
(Constant)	-.052	0.305	-	-.169	0.866
EIHR&D	0.245	0.116	0.253	2.119	0.039
YER&DD	0.053	0.017	0.364	3.057	0.004
UTPBOB	0.308	0.147	0.260	2.097	0.041
UCFPT	0.174	0.119	0.181	1.456	0.152

^aDependent Variable: TECH-DUP. Source: author's SPSS output result.

cross-firm patent technology and technology produced by other banks are likely to perform better technologically. From the underlying variables, the positive correlation implies that increase in the banks' technology learning activities may result in technology duplication ultimately and possibly improvement of existing technology.

Table 3, the regression model summary shows $R=0.560$ and $R^2 = 0.313$ which suggests an average correlation. From the R^2 , the result therefore indicates that only a 31.3% change in the technological performance of the surveyed banks can be explained by the predictor variables. This also suggest that an increase in the independent variables (predictor variable) will influence the technological performance by 31.3%. The adjusted coefficient of determination is 25.7%. The ANOVA table, Table 4 indicates that the regression model predicts the outcome significantly as indicated by a F-value of 5.584 at 0.001 level of significance. Thus, the model is significant at 1% significant level since $0.001 < 0.01$. Table 5 reveals information on each predictor variable which is required to predict the technological performance of the banks. The regression relationship is thus stated as follows:

$$\text{TECH-DUP} = -.052 + .245_{\text{EIHR\&D}} + .053_{\text{YER\&DD}} + .308_{\text{UTPBOB}} + .174_{\text{UCFPT}}$$

Table 5 further indicates that engagement in in-house R&D, years of experience of R&D department, usage of technology produced by other banks and usage cross-firm patent technology contributes positively to technological performance of banks. Banks engagement in in-house R&D, years of experience of R&D department, use of technology produced by other banks are positively related with technological performance and are highly significant.

CONCLUSION

This paper examined technology acquisition and technology learning in the banking industry with reference to commercial banks in Nigeria. The study established that the banks acquire various types of technology (hardware and software) but with little emphasis on the process (know-how/tacit knowledge) aspect of technology which is essential in enhancing technological learning capability of firms. India was revealed to be the major source of

banking technology for the banks particularly the banking software. Most of the technologies used by the banks were acquired from private firms in India. The two commonly used acquisition modes by the banks were direct purchase and licensing.

More so, the banks engage in technology learning activities such as; in-house R&D, staff training on technology duplication, improvement and development, routine technological operations, use of cross-firm patent technology, use of technology produced by other banks, technology duplication and technology improvement. Result shows that surveyed banks engage in the production of improved technology and average number of the surveyed banks engages in in-house R&D, and about fifty percent of the respondents had attended training on technology duplication and improvement and investment in in-house R&D within 2 years period was about half about half a billion naira. The technologies duplicated and improved upon by the banks were majorly process technologies and a few product technologies.

The correlation analysis revealed that technology learning has a positive relationship with technological performance of the banks, and the regression model suggests that technology learning has impact on the technological performance. The study therefore concludes that technology learning influences technological performance of the banks.

SUGGESTIONS

Having assessed technology acquisition and technology learning in commercial banks in Nigeria, it is suggested that banks should place more emphasis on acquiring the process (know-how) aspect of technology during the acquisition process as this aids the transfer of technological knowledge and encourages technology learning. Also, investment in and engagement in internal R&D and staff training on technology duplication, improvement and development should be improved upon as they are means in which technology learning can be enhanced in commercial banks.

Conflict of interests

The authors have not declared any conflict of interests.

REFERENCES

- Ahuja G, Katila R (2001). Technological Acquisitions and the Innovation Performance of Acquiring Firms: A Longitudinal Study. *Strat. Manage. J.* 22(3):197-220.
- Allen SA, Hevert KT (2007). Venture Capital Investing by Information Technology Companies: Did It Pay? *J. Bus. Ventur.* 22:262-282.
- Anyawu CM (2010). An Overview of Current Banking Sector Reforms and the Real Sector of the Nigerian Economy. *Central Bank of Nigeria, Econ. Financ. Rev.* 48(4):31-56.
- Arrow KJ (1962). The Economic Implications of Learning by Doing. *Rev. Econ. Stud.* 29:155-173.
- Cohen WM, Levinthal D (1989). Innovation and Learning: The Two Faces of R&D. *Econ. J.* 99(397):569-596.
- Dannemand AP (2004). Sources of Experience-Theoretical Considerations and Empirical Observations from Danish Wind Energy Technology. *Inter. J. Energy Technol. Policy* 2(1/2):33-51.
- Fleming L (1999). "Recombinant Uncertainty in Technological Search". Working Paper, Harvard Business School.
- George G, Zahra SA, Wood DR (2002). The Effects of Business-University Alliances on Innovative Output and Financial Performance: A Study of Publicly Traded Biotechnology Companies. *J. Bus. Ventur.* 17:577-609.
- Gerpott T (1995). Successful Integration of R&D Functions After Acquisitions: An Exploratory Empirical Study. *R&D Manage.* 25(2):161-178.
- Granstrand O, Sjolander S (1990). The Acquisition of Technology and Small Firms by Large Firms. *J. Econ. Behav. Organ.* 13(3):367-386.
- Griliches Z (1990). Patent Statistics as Economic Indicators: A Survey. *J. Econ. Literature* 28:1661-1707.
- Grübler A, Nakicenovic N, Victor DG (1999). Dynamics of Energy Technologies and Global Change. *Energy Policy* 27(5):247-280. (ISSN 0301-4215). Reprinted as RR-99-7, International Institute for Applied Systems Analysis, Laxenburg, Austria.
- Hall B, Griliches Z, Hausman J (1986). Patents and R&D - Is There a Lag? *Int. Econ. Rev.* 27:265-283.
- Harrison JS, Hitt MA, Hoskisson RE, Ireland RD (2001). Resource Complementarity in Business Combinations: Extending the logic to Organizational Alliances. *J. Manage.* 27:679-690.
- Haspeslagh PC, Jemison DB (1991). *Managing Acquisitions: Creating Value Through Corporate Renewal.* Free Press: New York.
- Henderson R, Cockburn I (1996). Scale, Scope, and Technological Acquisitions and Innovation 219 Spillovers: The Determinants of Research Productivity in Drug Discovery. *RAND J. Econ.* 27(1):32-59.
- Hitt MA, Hoskisson RE, Johnson RA, Moesel DD (1996). The Market for Corporate Control and Firm Innovation. *Acad. Manage. J.* 39(5):1084-1119.
- Hoekman BM, Maskus KE, Saggi K (2004). Transfer of Technology to Developing Countries: Unilateral and Multilateral Policy Options. Research Program on Political and Economic Change Working Paper No. 0003, pp. 1-34.
- Huber G (1991). Organizational Learning: The Contributing Processes and a Review of the Literatures. *Organ. Sci.* 2(1):88-117.
- Iganiga BO (1998). "Contemporary Issues in Money and the Nigerian Financial System". Lagos: Amfitop Books.
- Intarakumnerda P, Virasa T (2004). Government Policies and Measures in Supporting Technological Capability Development of Latecomer Firms: A Tentative Taxonomy. *J. Technol. Innov.* 12:2.
- Junginger M, Lako P, Lensink S, van Sark W, Weiss M (2008). "Climate Change Scientific Assessment and Policy Analysis: Technological Learning in the Energy Sector". Report 500102017. Bilthoven: Netherlands Environmental Assessment Agency.
- Kamp L (2002). Learning in Wind Turbine Development. A comparison between the Netherlands and Denmark. PD Thesis, Utrecht University, P. 244.
- Lane PJ, Lubatkin M (1998). Relative Absorptive Capacity and Inter-organizational Learning. *Strat. Manage. J.* 19:461-477.
- Lin BW (2003). Technology Transfer as Technological Learning: A Source of Competitive Advantage for Firms with Limited R&D Resources. *R&D Manage.* 33(3):327-341.
- NOTAP (2006). Nigeria's Experiences in Technology Collaboration. National Workshop on Developing Intellectual Property Policies and Establishing Intellectual Property and Technology Transfer Offices in Tertiary and Research Institutions.
- NOTAP (2011). Revised Guidelines for the Registration and Monitoring of Technology Transfer Agreements in Nigeria.
- Oladejo M, Oladipupo A (2011). Capital Regulation and the Performance of the Nigerian Banks: Need for Review. *J. Emerg. Trends, Econ. Manage. Sci.* 2(3):215-224.

- Olowe A (2011). Core Banking Software in Nigeria. Accessed online November 9th 2012.
- Rosenberg N (1982). Inside the Black Box: Technology and Economics, Cambridge University Press P. 304.
- The Banker (2013). The Top 1000 World Banks. Financial Times Group London, United Kingdom. Retrieved February 12th, 2014.
- UNCTAD (2012). Technology and Innovation Report 2012: Innovation, Technology and South-South Collaboration. United Nations.
- Vermeulen F, Barkema H (2001). Learning through acquisitions. *Acad. Manage. J.* 44(3):457-476.
- Yauri MN, Musa J, Koaje AN (2012). Bank Recapitalization in Nigeria: Resuscitating Liquidity or Forestalling Distress. *International J. Bus. Soc. Sci.* 3(10):298-305.