

# When Technology Transfer Enables Sales Growth

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## Abstract

Increasing sales performance in any organization requires refinement in product quality, agility in service delivery, innovation, internal flexibility, rareness, and lowest cost of operations. This paper investigated the effect of technology transfer on sales growth of selected agroprocessing companies in Lagos State, Nigeria. The cross-sectional survey research design was adopted. The population was 1,150 managers and engineers of selected three agro-processing companies in Nigeria. A sample size of 675 was determined using Krejcie and Morgan formula. A proportionate stratified random sampling technique was adopted in selecting the respondents. A validated questionnaire was administered for data collection. Cronbach's alpha reliability coefficients for the constructs ranged from 0.72 to 0.97. A response rate of 93

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**Index terms**— technology transfer, sales growth, technology infrastructure, technology adoption, agro-processing companies

## 1 Introduction

Managers across the globe are confronted with the gale of unstable business environment, product imitation, mass production, and substandard products in the market space. Achieving and sustaining sales growth by many organizations is becoming extraordinarily difficult as the competition among organizations are fierce and imitators are quick to replicate product and service innovation from other organization. Therefore, increasing sales performance requires refinement in product quality, agility in service delivery, innovation, internal flexibility, rareness, and lowest cost of operations. These have necessitated the agro-processing companies in Nigeria to shift from transaction-based business activities to value-added business activities which seems to have placed company's survival on its ability to successfully adapt and adopt the concept of technology transfer dimensions such as knowledge transfer, skill acquisition, technology innovation, technology adoption, and technology infrastructural development in response to these changes in demand.

Many scholars had conducted studies on the impact of technology transfer on sales growth in the agro-allied sector, telecommunication sector, SMEs, iron, and steel sector (Ajobola, Safe & Ercam, 2011). However, some of the studies found a significant positive effect, while others found a negative effect. Studies on technology transfer in the agro-processing industry in Nigeria are not comprehensive enough to address the low level of investment, low technical capabilities, infrastructural development deficit, low sales turnover by local producers, and poor market share experienced in that sector (PWC, 2017; Oyeniran & Onikosi, 2016). According to Nyanwu and Kponnouon (2017), poor technology transfer between research institutions and organizations; declining infrastructural development (power) affected the operational capabilities of the agroprocessing companies in Nigeria. Furthermore, policy inconsistency on tariff and importation, lack of patronage of Nigerian products by the Government at the highest-level and high taste for foreign products affect sales growth in the agro-processing sector. This gap was contrary to the Nigerian Government policy on the agro-processing industry, which states that government must protect and patronize products from their local industries except where such capabilities and products are not available locally (Ogiagbe, George, & Owoyemi, 2012). Unfortunately, government reneged on his policy and allows continuous importation of agroproducts such as textile, tomato, flours milling, Wine, Fish, Process Meat, fruit juice, ginger oil, grape wine, vegetable oil, honey, pesticide formulation, rice mill, furniture's,

rubbers, chemical, and many other agroallied products, rather than patronizing Nigerian made products (Onimole & Olaiya, 2018).

Furthermore, the poor state of technology capabilities and infrastructure have affected the agroprocessing industry and many other industries in Nigeria (Oyeniran & Onikosi, 2016). Report from the National Bureau of Statistics (2018) shows about N220 Billion Naira is spent annually to import Rice, Sesame Seeds, Crude Palm Kernel, Cashew Nuts, Fish, Wine, Soya Beams, and many other agro-allied products into Nigeria despite having arable land, good raining season, water and human capacity to process those agro-allied products (Houeninvo, 2018).

In wood making and furniture production sector; Nigeria with one of the finest land that produces strong and enduring woods; harvest and export those wood to China, India and other foreign countries, and in turn import with Millions of Dollars, Doors, Tables, Bed, Chair, Paper, and other bye products of wood into Nigeria(National Bureau of Statistics [NBS], 2018).

## 2 a) Literature Review

The power of technology transfer to stimulate sales growth in a global business environment that is uneven has stirred academic debate. Othman, Mohamad, and Abu (2017) and The United Nations Conference on Trade and Development [UNCTAD] (2014) opined that for any attempt directed towards construing the term technology transfer to be accepted, such definition must be functional rather than formal, this has accounted for the lack of consensus among scholars on a general definition of technology transfer. To aid clarity to the concept, the United Nations, in a document designed to help countries plan their technological development, has adopted a broader view of technology, referring to it as a combination of equipment and knowledge transfer for corporate performance measured in term of knowledge transfer, skill acquisition, technology infrastructure, technology innovation, and technology adoption (UNCTAD, 2014).

Adebayo, Olagunju, Ogundipe, and Salman (2017) defined technology transfer as the process by which science and technology are diffused throughout the human activity. Similarly, Murad and Thomson (2011) refer to technology transfer as the process by which basic science research and fundamental discoveries are developed into practical and commercially relevant applications and products (Sonmez, 2013). Byukusenge, Munene, and Orobia (2016) defined technology transfer as a process by which knowledge or technology developed in one place is applied and exploited in another place for some other purpose. The movement of technology, according to Bilgin, Lau, and Karabulut (2012), can be horizontal and or vertical; it is vertical when the movement is from a basic research to applied research through development and then to production. The movement is horizontal when the technology in used in one organization is moved to another organization. Also, it is widely acknowledged that most technology transfers take place through investment contracts with multinational corporations, since multinationals are the sources of most of the world's technology capabilities (Keller & Yeaple, 2009). Technology is primarily transferred in three forms. First, it can be transferred via machinery or other intermediate goods. This is normally adequate for manufacturing purposes where the nature of the technology is not complex, and where no proprietary techniques or processes are involved (Sonmez, 2013). Technology can also be transferred through individual experts. Although this technique is employed relatively often, it normally goes unpublicized (UNCTAD, 2018). Transferring technology via a competent expert has the advantage of cost-savings to the recipient, but it is generally suitable only for small and medium-sized projects where the technology is simple and unpatented. Finally, technology can be transferred through technical know-how, patented or unpatented, or other information subject to proprietary rights (Ovadia, 2013). 2016 study found that technology infrastructure and adoption have a positive effect on sales growth ratio measured by gross profit margin, Furthermore, Mappanyuki and Sari (2017) found a significant and positive relationship between knowledge transfer and sales growth and profitability, which is closely linked with corporate performance outcomes. However, no negative association was found between technology transfer and sales growth. Given the aforementioned problems enumerated earlier, this study investigated the effect of technology transfer (Knowledge transfer, technology innovation, skills acquisition, technology infrastructure, and technology adoption) on sales growth of selected agro-processing companies in Lagos State, Nigeria. akin to exploration, where people generate new ideas and concepts together with existing knowledge for innovation of products, services and or method. Consequently, knowledge transfer and technology transfer are used interchangeably in innovation and developmental studies (Ngwiri et al., 2016). Nonetheless, the term differs as such, "technology transfer" has to do with the transfer of capital goods such as machinery and equipment, in contrast, "knowledge transfer" has to do with the transfer of tacit and explicit knowledge such as know-how, management, and technical skill (UNCTAD, 2018).

Technology innovation according to (Berraies & Chaher, 2014; Carlos, 2013; Choi & Lim, 2017) include a new design, new systems, new applications, new market, and new operating system. Technology innovation is a process that transforms users or manufacturer ideas into outputs, which increases customer value. The ability to innovate is considered a vital aspect of any business organization (Jonathan et al., 2017). Technology innovation from the perspective of the European Commission has three definitions; it is the successful production, assimilation and exploitation of novelty in the economic and social spheres; it is the renewal and enlargement of the range of products and services and the associated markets; it is the establishment of new method of production, supply, and distribution; the introduction of changes in management, work organization, and the working conditions and skills of the workforce.

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Skill acquisition is a dimension of technology transfer, and according to Santhosh (2014), is the capability to be trained on a particular task or function and become an expert in it. It is a form of prolonging learning about an event that is not innate (Umunadi, 2010). Skill acquisition is an important strategy for an individual and the organization (Ezeani, 2015). According to Sule (2015), acquiring technology skills requires technical education, where employees are equipped with the necessary skill, competencies, and values required to succeed in their industry. Okoli and Binuomote (2015) defined skill acquisition as a form of knowledge and technical know-how transfer and the ability to adapt new method and technology in the field of manufacturing. The researchers went further to measure skill acquisition with variables such as technical skill, vocational skill, strategic skill, software application development skill, automation skill, business development skill, and intellectual skill. They argued that only an individual or group that obtained technical workforce could operate effectively. Jacqueline and Joshua (2016) emphasized that technical education contributes to creativity in the agro-processing industry in the developed countries and employees acquiring technical skills are the practical and dependable option for economic recovery and survival of any nation's economy.

Technological infrastructure is construed to entail the enabling foundation of shared technology capabilities upon which the entire business depends (Oyeniran & Onikosi, 2016). Infrastructure in this context is seen as a set of shared and physical technological resources that constitute the foundation for business applications (Ogun, 2010). Similarly, Link, Oliver, and O'Connor (2016) opined that the availability of a flexible technological infrastructure, when duly tapped into, gives an organization competitive edge, which is an essential ingredient required in the building of a sustainable competitive advantage and achieving sales growth, which accounts for the much emphasizes placed on technological infrastructure by many researchers (Othman et al., 2017). Nwankwo, Ibeta, and Nwaogbe (2013) maintained that globally, the creation and sustenance of an effective technological infrastructure has become a key requirement for venturing into business, this information dissemination and knowledge are vital in the global market.

According to Aromolaran, Akerele, Oyekunle, Sotola, and Taiwo (2017), technology adoption is the extent to which a given technology becomes accepted and incorporated into approved social practices. The criteria that could contribute to technology adoption is information, where manufacturing companies need certain information on how a technology works, where a particular data is stored, how is protected, who has access to the data, which of the data is registered and who is operating the data. Consequently, Rogers (1995) diffusion of innovation theory focuses on the adoption of innovation by individual users and the organizations and the factors that affect the rate of adoption of technology which include, relative advantages of the technology, which suggest its rate of adoption as it relates to the degree to which an innovation is perceived.

### 3 b) Sales growth

Sales growth is the dependent variable of this study, and according to Hansen and Mowen (2012), is an increase in sales from year to year or from time to time. Hansen et al. (2012) further defined sales growth ratio as a mechanism of measuring the difference in the value of sales over some time. Massem (2015) defined sales growth as a metric that measures the ability of a company's sales team to increase revenue over a fixed period of time. Similarly, Mappanyuki and Sari (2017) describe sales growth as a measurement of organization's profitability and its business performance. Mappanyuki and Sari (2017) further expressed that sales growth shows the company growth opportunities in the future. According to Jonathan et al. (2017), sales growth is a strategic indicator that entrepreneur used in making decision and measuring the ability of sales personnel over some period. The researchers went further to express that without revenue growth; business enterprises are at risk of being overtaken by ??018), the phenomenon of sales growth was best explained as an increase in sales, which is scored on either monthly, quarterly, and annually or from time to time. Sales growth is a yardstick for gauging corporate performance and its productivity. Researchers such as Hansen and Mowen (2012) opined that the phenomenon of sales growth connotes an upsurge in sales which may be measured annually. Mappanyuki and Sari (2017) view corroborates Hansen and Mowen (2012), understanding that firms with a history of increased sales growth rate, stand the chance of achieving and sustaining high liquidity, saving, and re-investment in assets and securities. Similarly, Massem (2015) emphasized that sales growth is believed to be influenced by the introduction of a new product line as well as the marketing strategies adapted by an organization.

In Nigeria, many agro-processing companies have closed down their business while some had been taking over by another due to their poor sales performance (Abu et al., 2018). Academic discussion has now refocused on how agro-processing companies can increase their sales performance through investment in technology infrastructure, product/service innovation, procedural innovation, and marketing innovations which are novel. Mappanyuki and Sari (2017) maintained that for any organization to achieve sales turnover, market share, gross earning and profitability, such organization must continue to be innovative in terms of their technological design, applications, systems, marketing, and operations. Similarly, Berraies and Chaher (2014) argued that the decline in many organizations sales growth cuts across developed and developing countries, and further identified strategies for strong sales growth which include increasing penetration in existing markets, extending the product line to a new complementary product that existing clients would be pleased with; focusing on new segments and targeting new export client; aggressively opening up new channels of distribution and offering new services to clients, so they become more enamored with firm products and services could increase sales.

#### 4 c) Technology transfer dimensions and sales growth

Several authors have carried out studies on technology transfer and sales in the manufacturing and agro-processing industry in Europe, Asian and Africa, and found a significant positive relationship between technology transfer and sales growth. Ajibola, (2012) findings that productivity was higher among the male farmers in Nigeria than the female farmers which lead to their sales growth. Similarly, Kai (2014) found that improved quality of domestic chemical production and the acceptance of lower profit margins are the likely two most important reasons for the higher sales growth of domestic chemical companies in China. Moreover, Kathy (2017) found a significant positive relationship between penetrating a bigger market and sales growth of products innovation. Similarly, Bilgin et al. (2012) found that foreign-owned firms performed better than their domestically owned counterparts, and this finding is consistent with the findings of Kathy (2017). Mappanyuki and Sari (2017) study revealed that UK corporations owned by foreigners perform much better in terms of sales turnover compared to domestically owned firms. The findings of Mappanyuki and Sari (2017) corroborated the results of Bilgin et al. (2012) that found that foreign-owned firms performed better than their domestically owned counterparts, because of their technical capabilities.

Similarly, Da Silva, Carlos, Baker, Shapherd, and Jenane (2009) found that global trends have encouraged the growth of agro-processing sectors and offered a competitive opportunity for SMEs through the development of new and growing markets. The study further found that agro-processing companies contribute to more-efficient use of resources and offer improvements in food safety. These findings concurred with the findings of Ngwiri et al. (2016). Ngwiri et al. (2016) found that knowledge sharing on technology activities among industries producing similar products largely improve the innovation performance of most industrial firms, which translated to their sales growth. The result of the study corroborated with the findings of Ngwiri et al. (2016). An empirical study conducted by David and Xiong gliang (2015), found that technology activities largely improve the innovation performance of most industrial firms translating to their sales growth. Theoretically, the diffusion of innovation theory supported this study and other findings from previous studies, characterized by relative advantage, compatibility, and simplicity that cumulated to sales growth (Mappanyuki & Sari, 2017). The theory further revealed that the attitude of staff in an organization remains critical, as it influences the willingness of the organization to adopt or reject technology transfer to achieve and sustain their sales growth (Byukusenge et al., 2016).

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#### 6 Methodology

This study adopted a cross-sectional survey research design to examine the effect of technology transfer on sales growth of selected agro-processing companies in Lagos State, Nigeria. The design was adopted because of its economic and scientific advantages, as evident in the works of other scholars (Griffiee, 2012; Greene, 2008). The sector was selected due to its strategic importance to knowledge warehousing, technology innovation, dissemination, and its economic contribution to the growth and the development of Nigeria. Managers and engineers were selected from the selected three agro-processing companies (Dangote Industries Limited, Honeywell Flour Mills Limited, and UAC Foods) located in Lagos State Nigeria with a population of 1,150. The managers and engineers were selected due to their technical and operational knowledge regarding technology transfer. The targeted respondents were 675 staff of agroprocessing companies in Nigeria located in Lagos State.

A structured questionnaire was adapted and its construct, content, and criterion validity were established before its usage. The construct and content validity were established through factor analysis by the use of Kaiser-Meyer-Olkin and the Bartlett tests of sphericity. The KMO test results were greater than 5% and Bartlett test of Sphericity results were less than 5% showing that statements contained in the instrument actually measured what were intended. The reliability of the research instrument was ascertained based on the Cronbach alpha measure of reliability, which is not below 0.7 (Owino, Kibera, Munyoki, & Wainaina, 2014).

#### 7 a) Model Specification

In order to investigate the effect of Technology Transfer (X) on Sales Growth (Y), a mathematical model was established. That Y is a function of X;  $Y = f(X)$ . As such, X is assumed to exhibit a profound effect on Sales Growth.

Hence the model was structured as such;  $SG = \alpha_0 + \beta_1 KT_i + \beta_2 SA_i + \beta_3 TI_i + \beta_4 TI_i + \beta_5 TA_i + \mu_i$   
 (i) Wherein; SG = Sales Growth (Y) KT = Knowledge Transfer TI = Technology Innovation  
 SA = Skill Acquisition TI = Technology Infrastructure TA = Technology Adoption Therefore, Technology Transfer is hypothesized to drive Sales Growth ( $p < 0.05$ ; will be rejected).

### 8 III.

#### 9 Results and Discussion

The study investigated the effect of technology transfer dimensions on sales growth of selected agroprocessing companies in Lagos, State Nigeria. The respondents were requested to rate their perception of various items

about technology transfer dimensions (knowledge transfer, technology innovation, skills acquisition, technology infrastructure, and technology adoption) and sales growth. The findings of sales growth (sales turnover, market share, profitability, and gross earning) was presented, compared with the findings of technology transfer dimensions.

## 10 Summary of multiple regression analysis

### 11 a) Interpretation

The coefficient of multiple determination, Adjusted R<sup>2</sup> is 0.200,  $F(5, 669) = 34.632$ ,  $p < 0.05$ , which indicates that technology transfer dimensions explained 20% of the changes in the sales growth of selected agro-processing companies in Lagos State Nigeria, while the remaining 80% could be attributed to other factors not included in this model. Also, the F-statistics ( $df = 5, 669$ ) = 34.632,  $p < 0.05$  indicates that the overall model is significant in predicting the effect of technology transfer dimensions on sales growth. This means that technology transfer dimensions have a significant effect on sales growth of selected agro processing companies in Lagos State, Nigeria. The multiple regression model is thus expressed as:  $SG = 0.716 + 0.162SA + 0.170TI + 0.180TA$  ?? eq. i

### 12 Where: SG = Sales Growth SA = Skills Acquisition TI = Technology Infrastructure TA = Technology Adoption

The results of the multiple regression analysis indicate that when skills acquisition, technology infrastructure, and technology adoption are improved by one unit, sales growth would be positively affected by an increase of 0.162, 0.170 and 0.180, respectively. This implies that an increase in skills acquisition, technology infrastructure, and technology adoption would lead to an increase in sales growth of the selected agroprocessing companies in Lagos State, Nigeria. The result shows an overall statistical significance with  $p < 0.05$ , which implies that technology transfer dimensions are important determinants of sales growth of selected agro-processing companies in Lagos State, Nigeria. The result suggests that agro-processing companies should pay more attention to improving skills acquisition, technology infrastructure, and technology adoption to increase their sales growth. Therefore, the null hypothesis, which states that technology transfer dimensions have no significant effect on sales growth of selected agro-processing companies in Lagos State Nigeria, was rejected.

### 13 b) Discussion of Findings

The results of the multiple regression analysis between technology transfer dimensions and sales growth of selected agro-processing companies in Lagos State Nigeria, are statistically significant. It means any increase in skill acquisition, technology infrastructure, and technology adoption will have a corresponding increase in sales growth of selected agro-processing companies in Lagos State, Nigeria.

Several authors in their work on technology transfer dimensions and sales growth, found a positive relationship between technology infrastructure, technology adoption, and sales growth; while other found a negative relationship between skill acquisition and sales growth, which confirmed this study results ??Ajibola, Mappanyuki and Sari (2017) confirmed that sales growth increases economies of scale of business with a greater possibility of market share, sales turnover, gross earning, and profitability. Similarly, sales growth results in generating more profit, reduce external risks, influence market price, and increases the financial viability of an agro-processing companies.

simplicity that cumulated to sales growth (Rogers, 1995). The theory further revealed that sales growth is in tandem with the attitude of staff in an organization and such remains important to corporate performance. These assumptions were supported by ??appanyuki The results revealed that out of all the dimensions of technology transfer, only skill acquisition, technology infrastructure, and technology adoption had a significant effect on sales growth of selected agroprocessing companies in Lagos State, Nigeria. The results showed that skill acquisition ( $\beta = 0.162$ ,  $t = 3.668$ ,  $p < 0.05$ ), technology infrastructure ( $\beta = 0.170$ ,  $t = 4.177$ ,  $p < 0.05$ ) and technology adoption ( $\beta = 0.180$ ,  $t = 4.840$ ,  $p < 0.05$ ) had a positive and a significant effect on sales growth. Furthermore, the results revealed that technology innovation ( $\beta = 0.034$ ,  $t = 0.825$ ,  $p > 0.05$ ) had a positive and insignificant effect on sales growth, in comparison, knowledge transfer ( $\beta = -0.010$ ,  $t = -0.347$ ,  $p > 0.05$ ) had a negative and insignificant effect on sales growth of selected agro-processing companies in Lagos State, Nigeria. This implies that skill acquisition, technology infrastructure, and technology adoption are important determinants of sales growth of selected agro-processing companies in Lagos State, Nigeria. Furthermore, technology transfer dimensions were argued to have meaningfully benefited businesses and e-commerce enterprises such as Amazon, eBay, Etsy, Newegg, Facebook, Konga, Jiji, Alibaba, and many other conventional and online marketing and sales companies across the globe and have improved production processes in the agro-processing industry space in America and most Asian countries with a significant relationship with labor productivity and sales growth (Mappanyuki & Sari, 2017; Nyori & Ogola, 2015).

Theoretically, the diffusion of innovation theory underpinned this study through the assumption of relative advantage, observability, compatibility, and IV. onclusion and ecommendation reviewed on technology transfer to clarify what the term means, how it can contribute to building technological capabilities and promote sales turnover in any organization. This article outlines the various approaches that have been pursued to measure

technology transfer variables gaps that exist in the agroprocessing companies. Our findings support the fact that technology transfer dimensions are an important driver of sales growth and overall firm performance and should be developed and executed as an integral part of the business strategy. Managers should recognize and manage business innovations to boost their operational performance. Having a clear understanding of the exact nature of knowledge transfer, skill acquisition, technology innovations, technology adoption, and technology infrastructure will help firms to achieve sales growth and profitability.

The study recommended that an organization should invest more in developing their technology infrastructure to support their operations. Also, policy makers should address the challenges of policy inconsistency on tariff and importation, and lead by example through the patronage of made in Nigerian products.

## 14 Global

Abu et al. (2018),

Figure 1:

Figure 2:

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