

## Technology Transfer in Construction and Management: A Case for Nigeria Construction and Management Sectors

Iroegbu Udochukwu Frank<sup>[a],\*</sup>; Du Rong<sup>[b]</sup>; Hira Batool<sup>[a]</sup>; Iroegbu Ikechukwu Paul<sup>[a]</sup>; Chia Emmanuel Tungom<sup>[a]</sup>

<sup>[a]</sup>Xidian University, Xi'an, China.

<sup>[b]</sup>Professor, Xidian University, Xi'an, China.

\*Corresponding author.

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### Abstract

The main aim of the study is investigating the trends in partnership between China and Nigeria, the contribution of partnership for economic development and technology transfer. In addition, the study will investigate the challenges to effective technology transfer associated with the construction and management sectors. The data for the research was retrieved from secondary data. Some of the sources of data comprise of publications, peer-reviewed journals, reports by government agencies, published books and trusted websites such as Nigerian Bureau of Statistics. From the research, it was stated that the partnership between Nigeria and China encourages growth of innovation and technology sharing. In addition, technology transfer allows the effective performance of the local talents and skills that are crucial in the expansion of the industry. However, despite these benefits, there are still challenges that limit the effective transfer of technology. The challenges cited comprises of high corruption cases that limit the effective implementation of policies, poor commitment of Chinese firms in hiring local management and professionals in management and construction, and Chinese firms acquiring raw products from China that are cheap and of different characteristic making it difficult for efficient transfer of technology from China to Nigeria. Future research should seek effective methods of increasing technology diffusion in Nigeria.

**Key words:** Nigeria; China; Technology transfer; FDI; Government policy; Construction and industry; Construction and management

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### INTRODUCTION

One cannot overemphasize the commitment of African countries, especially Nigeria to acquire technical skills in construction from the foreign countries (Velasquez, 2010). For years, Nigeria there has been commitments by the Nigerian government to improve local productivity, especially in construction and manufacturing industries through the integration of foreign technologies into the country's manpower (Ayodeji & Adebayo, 2015). Some of the prominent projects that have been on impact include the establishment of import substitution industries policy that has been operational between 1970s and 1980s. Unfortunately, Nigeria just like other developing countries has not achieved the desirable level for technology consumption in manufacturing and engineering. According to a study conducted by Mansfield (1975) there are fundamental factors that determine technological advancement and economic performance through technology transfer.

Similar views are expressed by Ramanathan (2009) who approved the concept of technology transfer to Nigeria in an economic view expressing that technology transfer is the heart of innovation and economic development and growth. There has been a technology breakthrough for a number of Asian and Latin American countries. These technology development has resulted in high growth in the economic sectors in these countries. These developments in Asian countries have been achieved through concerted efforts that encompass

highly aggressive Research and Development investment resulting in the establishment of effective innovative plans for businesses. The main focus of this research is critically examining technology transfer from China to Nigeria.

The paper argues that Nigeria's commitment to acquire knowledge in engineering through technology transfer will have serious implications that will increase the capability of the Nigerian workforce in the sector. In order to hold an effective position in country's improvement of its workforce, it must take serious measures to embrace technology transfer from China. The recent Abuja-Kaduna Railway project is an indication of fresh commitment by Nigeria to embrace technology transfer in the engineering sector from China.

#### Objective of the Research

The current study aims at critically analyzing the influence of technology transfer from China to Nigeria and identify its effectiveness. To impact positive performance, the current research will create a holistic view of the socio-economic impact of technology transfer. To achieve this aim, the following objectives will be considered.

- a) Identify trends in technology transfers into Nigeria's construction and management industry.
- b) Evaluate the impact that technology transfer has on Nigeria's economic development.
- c) Analyze the challenges faced during technology transfer in Nigeria.
- d) Suggest measures that could enhance technology transfers.

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## 1. LITERATURE REVIEW

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Technology transfer is normally defined as high-level manpower through scientific, engineering and technical areas that influences the growth of skills, technology and innovation in the receiving country (Ake, 1984). The technology normally involves the development of a country through promoting research and innovation, which are key drivers of competitiveness of a county. Transfer of technology involves the use and application of a foreign technology to improve the status of a country through mutual trade agreements. According to a research conducted by Bozeman (2000), transfer of technology involves the movement of the know-how technology and technology knowledge and skills from an organization to another. This is an indication that it concerns the transfer of not only products, but also to transfer the knowledge and skills used in the development of the product.

Mittleman and Pasha (1997) reviewed that the concept of technology transfer, which is expressed in terms of moving technology, skills, values and capital from one country to another. Adopting the technology

by host country is the main objective that the country aims at. Manfield (1975) highlighted that transfer of technology, both horizontal and vertical technology locations. Manfield (1975) defined vertical technology as the know-how that is derived from basic research in an applied research from development phase to production. On the other hand, Manfield (1975) involve the transfer of technology from one place, context and organization to another organization or country. Ramanathan (2009) concerted investment essential in technology transfer involves both manpower and research. Vertical transfer of technology involves internal transfer of technology while horizontal transfer involves is the external transfer.

In addition, technological transfer would be regarded as the movement of managerial processes from one phase to another phase of its lifecycle. Ramanathan (2009) elaborated further that it is vital in reinforcing existing frameworks in technology integration in performing various economic and development projects. Therefore, the technology could be transferred in any of its stages in its development. The methodology used in technology transfer normally depends on a number of factors such as sector, discipline and mode of transfer appropriately. Carl (1985) argues that there are two of technology transfer according to existing literature. The first method comprises of transfer from one country to another. The second form of technology transfer involves transfer between a supplier and buyer.

According to Chun (2007), study focuses on the analysis of technology transfer from Taiwan to China. The study identified that technology transfer takes different concepts depending on the direction that the organisation takes. Therefore, it is identified that different dimensions are taken in meeting quality of innovation especially in developing countries. In addition, it was indicated that technology transfer is normally influenced by dynamics in technology advancement hence there is need for sustainable technology transfer. Understanding the challenges and opportunities of technology transfer will facilitate in the effective transfer process through knowledge acquisition.

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## 2. RESEARCH METHODOLOGY

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The structured approach of this study will involve assessment and critical analysis of existing literature findings regarding technology transfer to Nigeria's construction and management sectors (Egbula & Zheng, 2011). The source of information will comprises of published journals and reports from reliable sources. Grey literature and peer-reviewed journals were the main source of information that present the necessary information relating to technology transfers to developing countries by evaluating the case of Nigeria construction

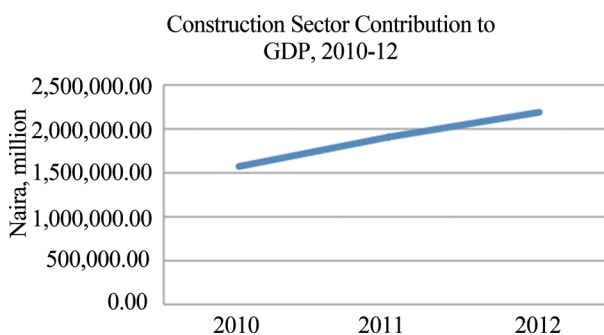
and management sectors (Monimah, 2013). The search for peer-reviewed journals was performed using the databases to retrieve crucial information regarding technology transfer (National Bureau of Statistics, 2015).

More general search used the Google Scholar in retrieving related sources. The search criteria will involve the use of key phrases comprising of technology transfer, foreign domestic investment in Nigeria's construction and management (Egbula & Zheng, 2011). The inclusion criteria comprise of information relating to technology transfer in developing countries, in Africa and Nigeria as specific areas of interest for the research. According to research conducted by Chen et al. (2016), secondary research is an effective source of data that is easier to retrieve and analyze. Therefore, this research method will enhance the collection and analysis of relevant literature relating to positive growth technology transfer into Nigeria.

### 3. RESULTS AND ANALYSIS

#### 3.1 Trends in Construction Industry

Basing on National Bureau of Statistics survey, construction industry in Nigeria plays a critical role in the economic development of the country (*National Bureau of Statistics, 2015*). For instance, the graph below indicates that the growth in the sector is resulting in improvement in a country's GDP after the initiation of the standard gauged railway projects across the country to improve infrastructural networks.



**Figure 1**  
**Contribution of Construction Industry**  
Source: National Bureau of Statistics, 2015.

The main reasons associated with increased growth in GDP are associated with development achieved after initiation of economic sensitive sector in the construction industry. In addition, expansion of the industry from the traditional buildings and constructions of railway and road networks has been expanded greatly. Furthermore, the commencement of Construction of Abuja-Kaduna Railway in Nigeria by the China Railway Construction Cooperation Limited has improved the railway network,

increasing its significance in the growth of the sector and creation of employment opportunities (*National Bureau of Statistics, 2015*). One major remarkable trend in employment opportunity creation through China-Nigeria partnership is shown in the diagram below. The increased growth in employment opportunities has improved and has resulted in increased earnings by Nigerian population. Foreign Domestic Investment from China is major contributors of improvement in the local economy and increased employment opportunities (National Bureau of Statistics, 2015).

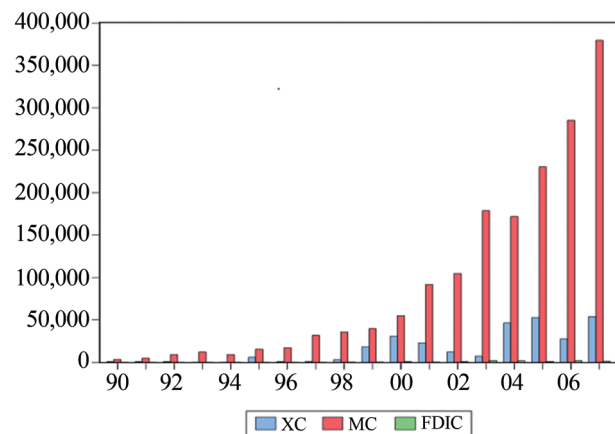
**Table 1**  
**Employment Opportunities in Construction Industry**

Employment size	2010	2011	2012
NO.Of Persons Engaged (Nigerian Male)	5,816,845	6,065,033	6,327,377
NO.Of Persons Engaged (Nigerian Female)	398,403	396,602	420,779
NO.Of Persons Engaged (Non-Nigerian Male)	147,633	150,719	157,664
NO.Of Persons Engaged (Non-Nigerian Female)	7,202	8,488	7,716
Total	6,415,082	6,620,842	6,913,536

Source: National Bureau of Statistics, 2015.

#### 3.2 Nigeria's Foreign Domestic Investments From China

According to Djeri-Wake (2009), there has been increased Chinese investment in Nigerians technology, construction and management areas that influence economic growth and development in Nigeria. The studies on the emerging partnership model between the two countries are a major concern for scholars in evaluating the significance of this form of partnership in technology transfer. The figure below indicates the trends in FDI inflow into Nigeria from China an important platform for technology transfer.



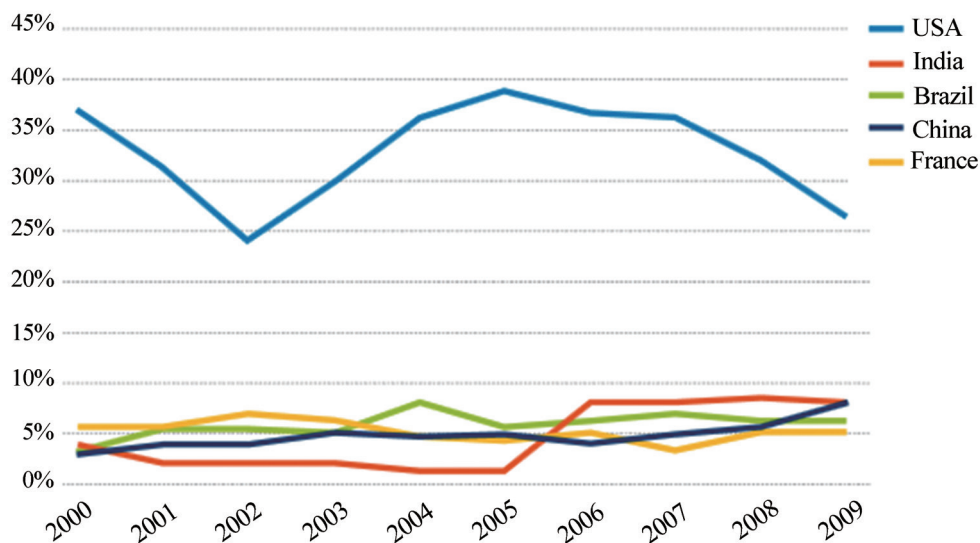
**Figure 2**  
**Trends in FDI Growth in Nigeria**  
Source: Djeri-Wake, 2009.

Increased debate has emerged regarding the contribution of this relationship on the transfer of technology and management knows how from China to Nigeria through trade partnership and FDI inflow. Critical analysis conducted by Nurudeen (2013) noted that bilateral trade between Nigeria and China has risen from \$2-13 billion between 2002 and 2012 with the establishment of more than 200 Chinese corporations operating in Nigeria. The researchers added that China increased presence in Nigeria should contribute to positive growth in terms of technology transfer. These findings were confirmed by the reporting by Channels Television (2016), which claimed that 1,000 Nigerian engineers were offered scholarships to study in Chinese Universities to improve their knowledge, especially in the field of the space development sector. Therefore, Chinese commitment to transfer technology to Nigeria is visible through the provision of

scholarship opportunities, especially in construction and management to improve infrastructural developments through knowledge, skills and technology acquired from China.

### 3.3 Trade Trends Between Two Countries

Oyeranti et al. (2011) investigated the impact of the relationship between China and Nigeria, where it was established that the construction and management sectors are of great interest to China. An engagement between China and Nigeria was found to have positive and negative impacts, but depends wholistically on policies that are established and institutions set in place. The research found that there was disconnected that did not match the Chinese interests in Nigeria. To understand the implications of the interaction between China and Nigeria, it is important to highlight some common trends relating to trade partnership between the two countries as shown in the diagram below.



**Figure 3**  
Nigeria's Trading Partners Between 2000 and 2009s  
Source: Egbula & Zheng, 2011.

### 3.4 Technology Transfer Between China and Nigeria

Structural transformation is crucial in the development of construction and infrastructure sectors of the economy. In the same way that FDI has transformed China's economic state and performance, Nigeria is experiencing a slower, but constant growth in its economy following the technology transfer from China to Nigeria following increased FDI inflow from China to Nigeria. The study conducted by Monimah (2013), Chinese investment in the construction industry in Nigeria is expected to transfer construction technology enhancing its competitiveness and integration. In addition, the research found that introduction of Chinese partnership in African countries is evidently being viewed as a way of transforming technology into

the construction and management levels increasing Nigeria's competitiveness in terms of manpower. To explain the significance of interaction between Nigeria and China in technology transfer, it is important to review a number of agreements between the two countries.

Chen et al. (2016) conducted a study aimed at investigating how Nigeria is learning from China through technology transfer. The report was triggered by an increasing need for innovation through technology transfer in African countries as a way of increasing comparative advantage. The report explored areas of interest such as manufacturing, investment, and technology. These are critical areas for establishment of creativity and innovation that result to industrialisation of a country. Measures that address structural transformation was a

**Table 2**  
**Nigeria's Agreement With China**

Type of agreements	Year
Agreement on trade, investment promotion and protection	2001
Agreement for the avoidance of double taxation and prevention of fiscal evasion with respect to tax and income	2002
Agreement on consular affairs	2002
Agreement on cooperation on strengthening management of narcotic drugs, psychotropic substances and diversion of precursor chemical	2002
Agreement on tourist cooperation	2002
Strategic partnership agreement	2005
A memorandum of understanding on investment cooperation between the Federal Ministry of Commerce of Nigeria and Ministry of Commerce of India	2006
Economic cooperation agreement between Nigeria and Xinguang international group of China	2006

Source: Oyeranti, et al., 2011.

major consideration in the debate that fosters sustainable growth in a country that reduces extreme poverty in Nigeria. Focusing on China's transformational path to development through Foreign Domestic Investment opportunities, the study found that Chinese investment in Nigeria can be a critical path to technology transfer. The research indicated that there are significant cases of potential technology transfer into Nigeria's investment areas, especially in the technical partnerships between the firms. However, it was concluded that it is dependent on the initiatives that Nigeria takes into account in leveraging Chinese investment to favor their interests.

## 4. DISCUSSION

### 4.1 Benefits of Technology Transfer

Technology transfer between China and Nigeria has both opportunities as well as expose the two countries to serious challenges. The China-Nigeria partnership in investment aimed at influencing positive growth to technology transfer indicates that the object is faced with unexploited opportunities and challenges that should be addressed. However, a partnership between two countries has facilitated transformational of Nigerian management and construction industries immensely following increased know-how transfers in terms of technical expertise and skills. According to a study conducted by Egbula and Zheng (2011), technology advancement, growth and development in developing countries can significantly be transmitted through technology transfer. In addition, it is noted that the joint partnership form of investment has shown a higher value in terms of technology transfer. In addition, research indicates that the involvement of Nigerian managers and construction experts in Chinese projects in Nigeria presents an effective platform for studying the Chinese technology, which can be adopted to suit the Nigerian economy and innovation promotion.

In addition, technology experts through scholarship opportunities for Nigerian students will effectively enhance technology transfer and development in management and innovation practices. From the study conducted by Odeh (2013) found that Chinese imports are cheaper than the equivalent products from other markets increasing the population's disposable income. In addition, noted that the transfer of technology into these countries results to improve productivity and efficiency through integrating new advanced technology into production processes for Nigeria. Such initiatives and developments will enhance the development of more innovative products, increased innovation and economic performance of Nigeria. Therefore, technology transfer will improve the infrastructural development in the country and enhance innovation, resulting in improvement in the country's economic and business environment through transfer of knowledge and innovation.

### 4.2 Problems of Technology Transfer in Nigeria From China

Following the increased commitment of Nigeria and China for technology transfer to Nigeria, there are barriers or challenges that are inhibiting the process of knowledge transfer. There are prospects that still emerge from the analysis. Despite the cited benefits, challenges are facing Nigeria in technology transfer in the management and construction sectors. Despite the development in Nigeria as a result of improvement in knowledge through technology transfer, the foreign domestic investment from Nigeria to China remains constant or stagnated from 1999 to 2000. The majority of the effort in technology transfer is majoring on the oil and energy sector forgetting other critical sectors such as construction. According to the report compiled by Monimah (2013), the appetite for Chinese increasing industrialisation is resulting in the unsustainable flow of resources from Africa affecting sustainability in the production process.

Technology transfers have challenges that should be overcome. The first challenge is the unwillingness of the

Chinese government that does not fully embrace a model that is sustainable and recommended where the transfer takes in an organised process. The transfer of technology challenge is associated with failure to employ the local workers, especially where experts are required. These firms employ the local employees where casual labour is needed. Furthermore, in cases where these companies hire local employees, research indicates that the net-gritty associated with the production and construction is hidden. Another challenge is failure to use local materials, but depend on products manufactured by Chinese companies. This is a clear focus that Chinese firms are not embracing the technology transfer in construction and management. Another crucial challenge faced in technology transfers is that the quality associated with Chinese firms is sometimes of questionable quality. In addition, the firms claim that the Nigerian authority, influences Chinese firms in the production and construction work resulting in products that are of low quality in making them affordable.

Despite technology transfers being an effective framework for exchanging innovations, there is another challenge where Chinese products are cheaper than products and services offered by local firms, which result in ineffective competition by the local firms. The penetration of Chinese products that are cheaper than local products into the Nigerian market has exposed local firms in unworthy competition. Furthermore, rampant corruption in Nigerian authorities has also resulted to compromise of set standards and policies meant to protect local consumers. These challenges leave so many Nigerian employees lacking essential skills due to poor technology transfers increasing unemployment in the country.

## CONCLUSION

The research has defined technology transfers as the process that involves the utilization of technology produced from one part of the world is enjoyed in another part through technology diffusion. Technology transfer has both benefits and challenges in the Nigerian setting. Critical analysis of the benefits reveals that technology transfers improve technology capability of local firms encouraging effective performance through improvement in technology use and innovation that spurs competitive advantage in the country (Chun, 2007). In addition, technology transfer also increases the productivity in the country by allowing technology diffusion by a less developed country. In the Nigerian case, it is found that the country is experiencing significant challenges associated with poor integration of the technology transfer method applied (Monimah, 2013). There are barriers in an effective transfer due to unwillingness of foreign firms to employ Nigerian employees in high ranking opportunities to encourage effective technology transfer. Corruption has been cited as another critical challenge that is resulting to

compromise of set standards and regulations in meeting the agreed technology transfer methods (Chun, 2007). Therefore, it is important to revisit the agreement and conduct mutual agreements between the two countries.

## RECOMMENDATIONS AND FUTURE RESEARCH

Based on the analysis and discussion presented regarding technology transfer from China to Nigeria in construction and management disciplines, there are opportunities and challenges that are facing the initiative. Address these challenges to maximize the benefit will require effective focus on policy. Basing on the findings, China and Nigerian partnership should enhance technology transfers through policy considerations by embracing mutual agreements regarding employment of local managers and construction professionals. In addition, it is important to consider the use of local materials in the development of the construction needs. In addition, the mutual agreement between the two countries should engage in negotiations to promote technology transfer in product technology, management practices, business model and strategic planning processes. Inclusion of local experts in development of Nigeria's structural projects will be a more productive way to encourage skills transfer. Future research should focus on conducting studies to identify specific policies that would enhance the technology transfers between the two countries.

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