

## Globalization and Technology Transfer: An Assessment of the Emerging Issues and Challenges for the New Societies

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### *Abstract*

*Globalization has significantly expanded access to advanced technologies for technological latecomers and emerging societies. Given the centrality of technology transfer to economic development, globalization offers developing and low-income countries a critical opportunity to enhance per capita income and improve overall standards of living. This paper examines the relationship between globalization and technology transfer, adopting Immanuel Wallerstein's World Systems Theory as its analytical framework. The study finds that, despite improved access to foreign technologies, technology transfer has not translated into commensurate improvements in living standards, labour productivity, or demand for skilled labour in many developing and low-income countries, including Nigeria. This disconnect suggests that technology transfer alone is insufficient to drive sustainable development without supportive domestic conditions. To maximize the developmental benefits of globalization-induced technology transfer, the paper recommends deliberate and simultaneous investments in both technological acquisition and human capital development. In particular, strengthening education and skills training systems to align with the requirements of imported or transferred technologies is essential for enhancing productivity, employment outcomes, and long-term economic transformation.*

**Keywords:** Globalisation, Technology Transfer, New Societies, Economic Development, Labour

### **Introduction**

Technology transfer refers to the movement of applicable knowledge, skills, capabilities, expertise, equipment, or facilities from one location to another within a specified time frame. It is closely linked to the process of industrialization and economic development. In other words, technology transfer is a complex and multidimensional process shaped by cultural, socio-economic, environmental, infrastructural, political, diplomatic, and institutional factors. It involves multi-level communication among diverse actors, including individuals, firms, institutions, and states, who serve as both senders and receivers of ideas, knowledge, and material resources.

As a response to market failure or as a deliberate effort to accelerate market-driven social and economic change, technology transfer may combine public and private mechanisms or rely solely on public institutions to identify, develop, and disseminate innovations. Key technology transfer institutions include universities, government ministries, research institutes, and what is often described as the "project sector." However, the central challenge confronting technology transfer efforts in developing countries lies in building indigenous capacity to generate, adapt, and effectively utilize imported technologies in ways that suit local conditions.

The technology transfer process operates along three main dimensions. First is the vertical dimension, which involves transfer between countries at unequal levels of technological development, such as Nigeria and advanced industrial economies like the United Kingdom, the United States, Germany, or Japan. Second is the horizontal dimension, which occurs between countries with relatively similar technological capacities, for example, Nigeria and other African economies such as Ghana or Kenya. Third is the sectoral dimension, which involves technology movement from firm to firm within a country. In Nigeria, the vertical pattern of technology transfer has been the most prevalent.

Technology transfer is conceptually distinct from technology acquisition (TA). While technology acquisition often leaves the choice, cost, and control of technology largely in the hands of foreign suppliers, technology transfer ideally involves strategic decision-making by major domestic stakeholders. The primary stakeholders in this process include the state, which provides the enabling regulatory and policy environment, and the Organized Private Sector (OPS), which controls the key factors of production. In Nigeria, technology transfer became a formal policy concern in 1983 following the promulgation of Decree No. 70 of 1979, which established the National Office for Industrial Property (NOIP). This was later amended by Decree No. 83 of 1983, leading to the creation of the National Office for Technology Acquisition and Promotion (NOTAP). In line with Nigeria's international obligations, NOTAP's mandate shifted from a purely regulatory role to a more developmental and promotional one, aimed at facilitating technology transfer and contributing to national economic development.

In today's knowledge-based economy and globalized business environment, the ability to absorb and utilize new technologies has become essential for organizational survival and competitiveness. At the national level, technological capability is widely regarded as a key indicator of a country's competitive standing in the global economy. Ideas and knowledge have increasingly become central elements in international trade relations, as reflected in the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement under the World Trade Organization (WTO), to which over 60 percent of developing countries are signatories.

The rate and effectiveness of technology transfer depend on numerous factors that vary across countries. Nigeria's efforts at economic development during the 1970s, following the discovery of crude oil, focused heavily on infrastructural expansion and industrialization through the adoption of diverse foreign technologies. However, many of these imported technologies were unsuitable for local conditions or already obsolete (Aggarwal, 1991). Technology transfer in Nigeria has largely been implemented through project agreements between Nigerian entities and foreign partners. These agreements are evaluated to ensure equity, fairness, and alignment with national socio-economic objectives, with approvals based on net sales or lump-sum payments in accordance with official guidelines enforced by NOTAP.

Despite these institutional arrangements, Nigeria's long-standing dependence on foreign technologies for industrial production continues to pose a serious challenge to sustainable development. Scholarly attention to technology transfer intensified in the 1970s, generating enduring controversies. While some scholars argue that technology, embedded in social and institutional contexts, cannot be transferred, others contend that no meaningful technological development is possible in the contemporary world without the transfer of appropriate technology. This debate gained international prominence in the late 1970s with the establishment of the journal *APPROTECH* in Ann Arbor, Michigan, which focused on the transfer of appropriate technologies

to developing countries. However, it was not until the 1980s that the debate began to acquire significant relevance within Nigeria.

Against this background, several critical questions arise: What constitutes technology transfer? What key issues and interests are involved in the process? What principles should guide technology transfer and technological growth in a developing country like Nigeria? Does Nigeria possess the basic infrastructural and institutional prerequisites for effective technology transfer? This paper addresses these questions by assessing the politics of technology transfer and the challenges of national development in Nigeria within the context of globalization.

### Globalization: A Conceptualization

The concept of globalization entered the social science academy with a bang rather than a whimper. Almost instantaneously, it assumed the status of a buzzword, permeating academic, political, and public discourses. These discourses became saturated with new idioms and syntactical expressions reflective of a rapidly transforming world. Inevitably, a fundamental question emerges: *What is globalization?* The answer is far from straightforward, as globalization is conceptually fluid and analytically multifaceted. It is at once historical, sociological, political, economic, ideological, and technological. Against this backdrop, this paper attempts a contextual conceptualization of globalization based on its multidimensional character.

Technological globalization refers to the convergence of information and communication technologies such as satellites, fibre-optic networks, and computer electronics that has dramatically reduced the cost and complexity of communication. This technological convergence has made global interaction easier and more efficient, thereby compressing time and space and bridging geographical distances. Beyond communication, new technologies have reshaped modes of production, trade, and economic relations, shifting emphasis away from dependence on natural resources and machinery toward knowledge, services, and communication infrastructures (Ameh, 2012).

Political globalization, on the other hand, reflects the ascendancy of neoliberal ideology. It is characterized by the dominance of market principles, the economization of social life, the expansion of mass communication, and the global diffusion of democracy as a preferred model of political decision-making. In this sense, political globalization represents a fusion of market logic and democratic governance (Ameh, 2012).

Seminal scholars have further enriched the conceptual understanding of globalization. Robertson (1992, p. 8) defines globalization as both “the compression of the world and the intensification of consciousness of the world as a whole,” emphasizing concrete global interdependence and a growing awareness of the world as a single social space. Similarly, Giddens (1990, p. 64) conceptualizes globalization as “the intensification of worldwide social relations which link distant localities in such a way that local happenings are shaped by events occurring many miles away and vice versa.” For Giddens, globalization is inherently dialectical: local transformations are as integral to globalization as the extension of social relations across time and space.

From an African-centered perspective, Ake (1995, pp. 22–23), in *The New World: The View from Africa*, describes globalization as a process of growing structural differentiation and functional integration in the world economy. It entails increasing interdependence among nation-states, heightened by the spread of global mass culture driven by advertising and advances in communication technologies. According to Ake, globalization simultaneously homogenizes and

diversifies, centralizes and decentralizes, universalizes while generating particularities, and simplifies even as it complexifies social relations always mediated by historical and contextual specificities.

Taken together, this range of perspectives reinforces the argument that globalization is inherently fluid and contested as a concept. In light of this, the paper conceptualizes globalization as the progressive dismantling of barriers to the free movement of people, goods, and services across national boundaries, facilitated primarily by unprecedented advances in information and communication technologies.

There are two dominant taxonomic traditions in the periodization and interpretation of globalization: the historical and the modern. The historical tradition traces the origins of globalization to as early as the fifteenth century (Nabudere, 2000; Robertson, 1992). Within this tradition, major epochs in the evolution of contemporary globalization include: (i) Christian universalism and the expansion of new trade routes (1492–1650); (ii) the Scientific Age; (iii) the Industrial and Capitalist Revolution; (iv) Capitalist Imperialism; and (v) Contemporary Internationalization and Globalization.

Several theoretical paradigms have been employed to interrogate the dynamics and consequences of globalization. Prominent among these are the classical and neoliberal theories (Rostow, 1976; Schumpeter, 1939) and the Marxist or structuralist perspectives (Galin, 1997; Ake, 1995). Central to these theoretical debates are enduring questions concerning the distributional outcomes of globalization: who benefits and who loses, particularly in relation to technology transfer, which is the primary concern of this paper? Is globalization a process of homogenization or heterogenization? These questions represent only a fraction of the broader intellectual debates surrounding globalization, yet they provide a critical entry point for scholarly self-reflexivity and philosophical inquiry.

Having established the conceptual contours of globalization, the next critical task is to examine the meaning and dynamics of technology transfer.

## **Technology Transfer**

Technology “transfer connotes the movement of knowledge, skill, organization, values and capital from the point of generation to the site of adaptation and application” (Mittelman & Pasha, 1997, p. 60). It is the useful exchange of ideas and innovations enabling the receiving region or country to expand on and utilize the knowledge received. This means that technology transfer also includes the knowledge of getting things done (Ofer & Polterovich, 2000). A critical test of technology transfers, therefore, is whether they stimulate further innovations within the recipient country. It is wrong to see technology transfer as an end in itself; rather, its importance derives from its ability to stimulate and strengthen the innovation process. In other words, it is an avenue with a great potential to increase the rate of technological innovation (Osman-Gani, 1999). For instance, the transmission of information about the invention of gunpowder and some basic gun-like devices in China stimulated the invention of the formidable cannon in Europe. Information about transistor technology from the United States America provoked the development of new kinds of consumer products in Japan (Pacey, 1990).

This is not happening in Third World Countries to the extent expected despite decades of massive importation of object-embodied technologies from the industrialized world. The intent here is not to imply that capital goods are not important. On the contrary, investment in capital assets is an

indispensable prerequisite of economic growth. However, the primacy of people; i.e. human capacity building as the ultimate basis for the wealth of nations is indisputable. As the active participants in any economy, human beings accumulate capital, exploit natural resources, build social, economic, and political organizations, and affect national development. Capital and natural resources, on the other hand, are passive factors of production that depend on human manipulation to be useful. In other words, the development of a nation significantly depends on the skills and knowledge of its human capital. The point is that many Third World Countries Nigeria inclusive, are not developing the human as well as the physical capital that they need to build and enhance the national stock of capital. Domestic capital development and investment is essential to a country's income generating capacity. Foreign ownership of capital has served foreign investors well, enabling them to repatriate large amounts of income or profit abroad at the expense of the host Third World Countries.

Aggarwal (1991) identified the direct or first order costs associated with the disadvantages of technology transfer to Third World Countries vis-a-vis the transferring firm to include the “outflow of dividends, profits, management and royalty fees, interest on loans, and other remittances by the firm including the possible use of high transfer prices” (p. 69). The transfer of technology as we know it has neither engendered domestic expansion of innovations nor done much to promote indigenous human as well as material capital development in most Third World Countries. When a country cannot on its own exploit imported technology to improve domestic production, let alone learn from it to further domestic innovation, it is inappropriate to speak of a transfer of technology taking place. The capacity to assimilate, adapt, modify, and generate technology is critical to an effective transfer of technology. It is perhaps appropriate to note the deficiency of the phrase “technology transfer”—it suggests a process in which the recipients of a new technique passively adopt it without modification. Pacey (1990, p.51) suggested differently: “transfers of technology nearly always involve modifications to suit new conditions, and often stimulate fresh innovations”. The capacity to make necessary adjustments to imported technology requires a superior level of skill, knowledge, and expertise of the recipients, which most Third World Countries are lacking. Without the benefit of absorptive capacity mostly achieved from capacity-transfers, Third World Countries cannot take advantage of the preponderant power of technology as an effective means of fostering sustainable socioeconomic development. The concept of absorptive capacity is not limited in meaning only to the acquisition or assimilation of knowledge, but also includes the ability to exploit it. The concept is similar to what the United Nations terms Indigenous Technological Capability (ITC), which has to do with the knowledge and skills of a country's human capital, and other absorptive provisions such as infrastructure, raw materials, and such things as the nature of the soil and climate. Among the attributes of a society with ITC are: an understanding of its technological needs; an effective policy on technology and its acquisition; effective global scanning and search procedures for identifying and selecting the most beneficial technology and supplier; the ability to evaluate the appropriateness of the technology to be imported; a strong bargaining or negotiating expertise needed for technological acquisitions; technical and organizational skills to use imported technology; the ability to adapt imported technology to local conditions; the availability of requisite infrastructure and raw materials; and the capacity to solve its problem using its resources, Pacey (1990). According to the United Nations (1983), ITC is not an alternative to a successful technology transfer but a necessary condition for it. The difficulty that most Third World Countries face in trying to build their ITC can be blamed on internal as well as external obstacles.

## Theoretical Framework

This paper adopts World System Theory as its framework of analysis. World-Systems Analysis was advanced and championed by Immanuel Wallerstein as a result of alleged limitations of Dependency Theory and an attempt to provide a holistic explanation of the developmental complexities among the Core, Semi-Peripheral and Peripheral Countries. According to Wallerstein (2004, p.33), the two components of World Capitalist System are world economy and capitalism. Defining what a world-economy is, he wrote: What we mean by a world-economy is a large geographic zone within which there is a division of labour and hence significant internal exchange of basic or essential goods as well as flows of capital and labour. To him, a world economy is not controlled by a single political structure but instead, has many “political units” which are bound together in an “interstate system”. Furthermore, although there is to be found a certain level of cultural and political homogeneity or “geo-culture” among the diverse social groups with different religions, languages and world perspective, what actually unifies the world-economic structure is the division of labour inherent in it (Wallerstein, 2004).

This shows that there had been several world-economies with varying characteristics in the past, what makes the current world-economy different, enduring and a true World System is Capitalism. This, according to Wallerstein (2004), is as a result of the “endless accumulation of capital” that characterizes modern capitalist system which was not present in former world economies like Mercantilism. Capitalism, in its nature, cannot be confined to the limited boundaries of a mini-system because it needs a very large market of capital, labour and consumption to function. Thus, apart from providing the present world-economy with a unifying feature, capitalism also benefits from the modern world-system a “Multiplicity of States” which means producers can create strong alignments with States that have favourable policies and snub those that are hostile to their activities (Wallerstein, 2004).

As a result of the large fluid market that characterizes the System, the actors involved in the activities of this System include the large fluid market, the firms, the multiple states, the households, the classes and the status-groups. Basically, however, the World Capitalist System is composed of three main features which are production, surplus-value and polarization. These three characteristics are not mutually exclusive but interwoven and the status position of each of these actors depends on the way they are able to position themselves on the categories (Wallerstein, 2004).

The last point of downward transfer of technology and most times outdated ones in the countries located in the periphery. Most importantly however, these countries are majorly the ones with abundant stock of human and natural resources but who couldn't adequately exploit these for indigenous societal development. Most, if not all African countries and some Asian and Latin-America countries including Nigeria belong to this category. They are the victims of neo-colonialism, colonialism, international slave trade, incessant wars; and now globalization. The core nations have so far been successful in turning these countries into a mining field and dumping ground, using all forms of technology transfer mechanism through globalization to achieve their aim. A common feature of these countries is the perpetual and overwhelming presence of giant multi-national companies who, through agreement with the government, exploit both the human and natural resources of these countries and at the end, fly all the surplus-value to their headquarters in the developed nations.

The above analysis fits into the Nigerian economic experience. Nigerian economy has continued to follow the dictates of the world capitalist system through the choices (policies and programmes)

made by the political leadership. Foreign firms, multinational and international financial institutions have continued to direct economic policies and programmes in Nigeria. These policies and programmes have promoted master-servant relationship. Utume (2014, p.115) argues that:

The phenomenal manifestation of the dependency syndrome can be placed in the Jumbo loan of 1978. This is because what was started in the 1960s was truncated by the oil boom of the late 1960s and early 1970s. But the same oil boom at the global level had piled up capital in the financial institutions of the west. It became wise business to invest such idle capital in some countries that needed it, for profit. The Nigerian Government under General Obasanjo became a good candidate for a Jumbo Loan, and the IMF successfully persuaded, virtually begged, Nigeria to take the loan.

The result of this dependency is what Utume (2014, p.115) refers to “unsalutary on the Nigerian economy”. Though there is no place for every detail, Nigeria has declined in every respect of economic life since SAP. This has also affected her social outlook. Industries have declined pitifully, unemployment has heightened, and poverty has deepened as well as spread, in Nigeria, in spite of technology transfer window through globalization.

### **An Assessment of Perspectives on Technology Transfer to New and Emerging Societies**

Pacey (1990) argues that technology encompasses both material and non-material components. Perceptions and assumptions about technology, he contends, significantly influence the outcomes of its transfer. A widely held but misleading perception equates technology solely with physical devices. The problem with this narrow view is that it obscures the complex social, institutional, and human elements embedded in technological systems. It is often assumed that if a machine or production technique functions efficiently in the country where it was developed, it should perform equally well in any other context. This assumption is fundamentally flawed.

First, technology does not operate in a social vacuum. Its effective use depends on prevailing social relations, human and physical infrastructure, organizational capacity, and the availability of appropriate raw materials. Second, it is frequently implied that the transfer of technology alone provides Third World countries with all that is required for technological, social, and economic development. This assumption is overly optimistic and empirically unfounded. As Lall (1992) notes, it is incorrect to assume that developing countries face no difficulty in absorbing transferred technologies, that adaptation is unnecessary, or that firm-specific learning and technical effort are irrelevant.

Capital goods may embody technology, but they do not, in themselves, constitute technology. They are object-embodied outcomes of technological processes that can be purchased on the international market. If the mere importation of machinery were sufficient for development, many Third World countries would today rival Europe and North America industrially. Saudi Arabia provides a useful illustration: despite its vast oil wealth and ability to purchase sophisticated equipment globally, aspects of its technological infrastructure such as telecommunications have remained comparatively underdeveloped. This demonstrates that technology transfer involves far more than the acquisition of physical assets.

Technology transfer is better understood as a learning process rather than a purchasing transaction. Just as buying a house does not transfer the architectural or construction expertise behind it,

acquiring machinery does not automatically confer the knowledge required to reproduce, adapt, or improve it. As Mittelman and Pasha (1997, p. 61) aptly observe, effective production requires not only tools but also the skills to use them and an understanding of how each stage of production interrelates. Without these, output quality and competitiveness suffer.

Accordingly, the mere possession of machines does not equip Third World countries with the scientific and technological knowledge necessary for local production or efficient operation. Some scholars therefore argue that material transfer is not, in itself, genuine technology transfer. Simon (1991) suggests that what is often transferred is not “know-how” but “show-how,” with core technologies remaining embedded within physical artefacts. Emmanuel (1982) similarly contends that exporting machinery substitutes for the transfer of the technology required to produce it locally, amounting to a form of “non-transfer.”

Despite these realities, many technology transfer models are premised on idealized assumptions that overlook asymmetries between technology senders and receivers. These models often presume equal technological endowments and absorptive capacities, thereby expecting Third World countries to integrate imported technologies independently. As Stolp (1993, p. 156) observes, such perspectives place recipients on an equal conceptual footing with technologically advanced Northern countries an assumption that is empirically untenable.

Technology transfer between firms in advanced economies often yields mutual benefits due to their comparable technological capabilities. Strategic alliances such as that between Motorola (USA) and Toshiba (Japan), where microprocessor and memory technologies were exchanged alongside market access (Simon, 1991), exemplify this parity-driven cooperation. Similar outcomes are rarely observed in technology transfers between industrialized and Third World countries.

The post-World War II recovery of Europe and Japan further illustrates this point. While often described as an “economic miracle,” their rapid reconstruction was made possible not merely by Marshall Plan funds but by the survival of the invisible dimensions of technology knowledge, skills, institutional organization, and human capital. These countries possessed the absorptive capacity that many Third World countries lack, enabling them to rebuild swiftly once physical capital was restored (Aharoni, 1991).

## **Mechanisms of Technology Transfer**

Having clarified the conceptual foundations of technology transfer, it is important to examine the primary channels through which it occurs. Anderson (1994) identifies four main mechanisms:

1. **Foreign Direct Investment (FDI)**
2. **Joint Ventures**
3. **Licensing Agreements**
4. **Turnkey Projects**

### **Foreign Direct Investment (FDI)**

Foreign Direct Investment is one of the most common channels of technology transfer. It involves long-term productive investment whereby multinational corporations (MNCs) exercise partial or full control over assets and production in host countries (Mallampally & Sauvant, 1999; Siddiqi, 2001). To attract FDIs, Third World countries often pursue liberalization policies, political stability, privatization, and reduced state intervention.

FDIs are motivated by factors such as market expansion, access to raw materials, cost advantages, and profit maximization (Kaynak, 1985). While some scholars highlight benefits such as managerial expertise and access to global markets, others argue that technological spillovers are largely unintended and minimal (Mittelman & Pasha, 1997). Empirical evidence suggests that FDIs rarely result in substantial capacity building or national capital formation in host countries.

### **Joint Ventures**

Joint ventures have gained prominence as MNCs seek to reduce risks associated with nationalization while retaining market access. A joint venture is a partnership between firms from different countries to pursue shared business objectives (Certo, 1986). These arrangements allow host-country partners to contribute local knowledge, land, and capital, while MNCs provide technical expertise (Kaynak, 1985).

Joint ventures also offer intangible benefits, including goodwill, reduced regulatory risk, and improved relations with host governments. However, MNCs often resist arrangements requiring substantial local equity participation, preferring licensing agreements where control is minimized.

### **Licensing Agreements**

Licensing involves granting rights to use technology, patents, trademarks, or expertise in exchange for fees or royalties (Griffin, 1990). Licensing is associated with higher levels of post-transfer innovation compared to other mechanisms (Larson & Anderson, 1994). As absorptive capacity improves, Third World firms increasingly adopt licensing to support domestic innovation. Japan's extensive use of licensing during its industrial transformation exemplifies this strategy.

### **Turnkey Projects**

Turnkey projects involve foreign firms constructing production facilities and handing them over to domestic entities once operational (Stewart & Nihei, 1987). While these projects may include operational training, recipients often lack the capacity to replicate or design similar facilities independently. Consequently, turnkey projects may facilitate production but do little to foster long-term technological self-reliance.

### **Emerging Issues and Challenges for New Societies (Nigeria Inclusive)**

Technology is inherently passive; its effectiveness depends on active human capital. Without sufficient absorptive capacity the ability to assimilate, adapt, and innovate technology transfer yields limited benefits. MNCs train local labor only to the extent necessary for-profit maximization and do not aim to foster self-reliance in host countries. Operating production facilities does not equate to developing the capacity to design or manufacture capital goods.

Sustainable development requires the accumulation of national capital, robust infrastructure, and skilled human resources. The production of technicians, technologists, engineers, scientists, and entrepreneurs is indispensable. Without this foundation, development efforts remain superficial and reinforce dependency. As Aharoni (1991, p. 80) aptly notes, a country's comparative advantage increasingly lies in its capacity to absorb and effectively utilize new technologies.

### **Obstacles to Indigenous Technological Capability**

While external constraints such as restrictive MNC practices and conditional foreign aid—are significant, internal factors also impede technological development. Third World elites have often

prioritized the importation of machinery over investments in education and skills development. Consequently, many countries are littered with idle or obsolete equipment due to maintenance failures and lack of spare parts.

Colonial-era educational systems emphasized literary education over technical and vocational training, reinforcing social stigma against technical skills (Akubue & Pytlik, 1990). Until educational curricula are reoriented toward technological and developmental needs, absorptive capacity will remain weak.

### Summary and Concluding Remarks

This paper has examined technology transfer within the context of globalization and found that improved access to modern technology does not automatically translate into higher productivity or improved living standards in Third World countries, Nigeria inclusive. While globalization facilitates the diffusion of technology and information, its benefits are unevenly distributed. Human capital development, supportive institutional frameworks, and coherent economic policies are critical determinants of whether technology transfer yields meaningful development outcomes.

In sum, technology transfer without absorptive capacity perpetuates dependency rather than development. Sustainable progress requires deliberate investment in education, skills, institutions, and innovation systems that enable new societies to internalize, adapt, and advance technology for their own development.

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