

Breaking Impediments to Technology Transfer through Foreign Trained Nationals

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Abstract

Developing nations need to be aware of the increased pace of technological changes and their effects on global competitiveness that has necessitated the struggle for technological development among developed and the developing nations. Similarly, some of the problems faced today by developing countries due to the economic implications of the technology transferred such as increased dependency on external decisions, the dynamic increase in the monetary cost, and the competitive edge supposedly obtained by foreign firms should be minimized or stopped completely. This could be achieved by transferring the needed technology through the utilization of foreign trained nationals. In this paper, (a) the socio-economic situation of Nigeria, (b) the need for technology transfer, (c) barriers to technology transfer, and (d) the need for foreign trained nationals in transferring appropriate technology to developing nations are discussed and elaborated.

Keywords: Technology transfer, appropriate technology, foreign trained nationals, developing nations, cultural barrier, expatriation, expatriate

1. Introduction

In order to enjoy the benefits from technological advancement, African countries need to be aggressive like the developed countries that have advanced technologically and are still scanning the globe for the latest information about technological development and the changes it brings. "Nevertheless, it is important to understand that technology is not a panacea; that it does have limitations" (Fawson & Smellie, 1990, p. 19). Any society that continues to adopt any technology without full understanding of the technology to be adopted is at the risk of compounding her societal problems. It is necessary for nations adopting technology to be aware of the effect of the technology's complexities, including its pros and cons. This could be achieved by determining the appropriate technologies that are useful, controllable, and are needed by a society rather than by adopting them carelessly (Samli, 1985). Natives know the technology that will be appropriate for their societies. Therefore, it is essential to utilize their efforts in transferring the appropriate technology needed in their societies. This should be done in conjuncture with their foreign trained nationals.

2. Socio-Economic Situation of Nigeria

Nigeria, Africa's most populous nation of nearly 155 million people, which has been ruled by the military for more than two thirds of the time since independence from Britain in 1960 is a multi-ethnic (250) nation with 3 principal languages (Yoruba, Ibo (Igbo) and Hausa) and up to 500 dialects (Oladele, 2007). Nigeria as a nation derives more than 95 percent of its foreign exchange earnings from crude oil exports (The World Fact-book; Onoh, 1983). However, the government continues to face the daunting task of reforming a petroleum-based economy, whose revenues have been squandered through corruption, mismanagement and institutionalizing democracy (The World Fact-book). More important, according to Oladele (2007):

"Nigeria is a primary energy store house accommodating such resources as coal and lignite, natural gas, crude oil, solar, hydro, nuclear, wood fuel, geothermal, tide, biogas and biomas[s]."

In spite of the vastness of these resources in Nigeria, only four sources (coal, crude oil, natural gas and hydro) are currently being utilized in processed forms while two others (wood fuel and solar) are used in their crude forms for heating, cooking and lighting” (Oladele, 2007).

In November 2005, Paris Club approved a debt-relief deal to eliminate \$18 billion of Nigeria’s debt in exchange for \$12 billion in payments - a total package worth \$30 billion of Nigeria's total \$37 billion external debt. As far back as 2008, the government began to show the political will to implement the market-oriented reforms urged by the International Monetary Fund (IMF), such as modernizing the banking system, curbing inflation by blocking excessive wage demands, and resolving regional disputes over the distribution of earnings from the oil industry. In addition, the GDP rose strongly in 2007 – 10 due to the increased oil exports and high global crude prices in 2010. On a positive move, the government has pledged to continue the economic reforms with emphasis on infrastructure improvements to include a power sector blueprint that includes privatization of the state-run electricity generation and distribution facilities. Arguably, infrastructure is the main impediment to growth in Nigeria.

With this view in mind, diversifying its economy to increase its sources of foreign exchange earnings should be focused sharply. Many non-oil exports, particularly cocoa which used to be the second to oil in foreign exchange earnings, had sharply fallen. "The record shows that exports for cocoa between January and August 1995 were only 2,735 tons as against 8,604 tons for the same period in 1994" (Onuah, 1995). Cocoa exports business dropped because the quality of the crop is poor and supply has been unreliable.

Nigeria is an import-dependent country where a variety of goods attract different levels of import duties. Local manufactures for example are suffering yearly from the rise in the Naira cost of import duties, especially the devaluation of the local currency. In addition, annual inflation that runs at nearly 100 percent put pressure on most families who depend on low and fixed incomes. Mismanagement of fund has hurt the economy of Nigeria greatly. Each time a loan is acquired from the finance agency, it is mostly misused without any accountability (Ayodele, 2001; Oladele, 2007). The IMF and the World Bank have been persuaded for loans, aimed at mending an economy hurt by low productivity and over-dependence on oil exports but in return for this favor, the IMF team wanted the following conditions to be met by the Nigerian government: to lift the ceiling on interest rates, raise domestic fuel prices, and close the gap between official and autonomous foreign exchange rates (Oladele, 2007). Notably, Nigeria’s debt to some creditors with arrears makes it difficult for international businesses to flourish in Nigeria. Improving the economic situation in Nigeria calls for the transfer of appropriate technologies, those that are needed to improve the standard of living of the masses and that will help maintain global competitive edge.

3. What is Technology Transfer?

Technology transfer has been defined in different ways, all of which may be appropriate for a given situation (Chen, 1996; Bozeman, 2000). When any technology is transferred, it means it is cost effective and appropriate. Thus, an "appropriate technology represents a less capital-intensive, more human-oriented form of technological innovation that can act as an impetus for development and improve the standard of living in economically disadvantaged areas and developing countries" (Linnell, 1995, p. 83).

According to Markert (1997), the term “technology transfer” has been loosely interpreted to mean “the development of a technology in one setting which is then transferred for use in another setting” (p. 231). Al-Ghamdi, (1987) and Ramanathan (1994) assert that transferring technology is moving it from one set of users to another in such a way that enables the transferee to absorb it and adopt it to the local conditions. According to Carpentier (1990), technology transfer is defined as "the exchange of technical knowledge of know-how that may be embodied in technical equipment (machines), in people (engineers, scientists, technicians) or in publications (including a patent) (p. 6). For this article, technology transfer is defined as “the process by which technology developed for one purpose is employed either in different application or by a new user” (Markert, 1997, p. 231).

4. The Need for Technology Transfer

Most African countries that are still using old technologies that are almost obsolete for production will find it difficult to compete with developed countries using advanced technology. For African countries to enjoy the benefits of technological advancement, they need to be aggressive like the developed countries that have advanced technologically and are still scanning the globe for the latest information about technological development and the changes it brings.

A nation that seeks new technological advancement and achieves the purpose of its application is considered one of the nations with "foresight as opposed to muddlers" (Shaw, 1992, P. 1). Nigeria for example need to adopt automation technology (high-tech) to reduce human labor, increase efficiency and quality productivity (Ku, 1994). However, all countries embracing new technologies should be aware of the effect of technology's complexities, including pros and cons.

Many of the problems that developing countries face because of the economic implications of the technology transferred are increasing dependence on external decisions, the dynamic increase in the monetary cost, and the competitive edge supposedly obtained by foreign firms (Rubio, 1984). Therefore, while technology is deemed crucial to economic development, the acquisition of technology by third world countries is often partial, incomplete, and problematic (Milcarek, 1989).

5. Some Barriers to Technology Transfer

The transfer of appropriate technology to African nations will definitely contribute to the improvement of the crumbled economic situations if well harnessed (Carpentier, 1990; Odesina, 1992; Ejiwale, 2011). Any society that continues to adopt technology without full understanding of the technology to be adopted is at risk of compounding its societal problems. It is essential to find means of preventing those problems associated with technology transferred inappropriately by determining the appropriate technologies that are useful, controllable, and needed by a society rather than by adopting them carelessly (Samli, 1985; Ejiwale, 2011).

Since the transfer of technology is not without its barriers that may add to the cost of implementation, it is necessary to identify and reduce the barriers to the adoption of new technologies successfully so as to realize their potentials (Samli, 1985; Carpentier, 1990; Odesina, 1992). Samli (1985) identified the following as barriers to technology transfer to developing nations: Culture, government, geography, economy, people, business, technical know-how, population, and corruption.

5.1 Cultural Barrier

Bearing in mind that culture is a way of people (values, beliefs and morals), this impediment should not be taken lightly. It is the greatest among challenges that may face a successful transfer of technology. For example, if a culture is tradition-oriented, it may be closed to new technologies. On the other hand, futuristic cultures are open to new technologies and breakthroughs (Odesina 1992; Ejiwale, 2011).

5.2 Government's role

It is essential for recipient government to relax its grips on export policy while maintaining the checks and balances necessary on the technology transfer. The government of a nation with strict export policy might make it difficult to assimilate the appropriate technology (Stewart & Ninei 1987).

5.3 Geography

If there are no natural resources to manufacture a certain product, this will definitely affect the application of that type of technology. On the other hand, a solution to this problem may be the importation of such materials or a total decline in transferring that technology. More important, it is necessary for the nation to have a database showcasing the types, quantity and location of natural resources available for the potential consumers' accessibility (Mutume, 2003).

5.4 Economic Differences

The economy of a nation dictates to substantial extent the appropriateness of the technology to be transferred. A nation's economy determines the type and amount to be spent on acquiring advance technology. If a country is poor, the needs will far exceed its capability of absorbing the transferred technology.

5.5 People

People according to Odesina (1992) are "classified as inner-directed, other-directed, and tradition-directed. While inner-directed people are not opposed to new technologies, they believe in developing them themselves. Other-directed people oppose technology transfer" (p. 6). More important, language as a medium of communication plays significant role in transferring technology by the non-indigene. The effects from poor communication or language impediments are "the feelings of alienism, fear and lack of control which frequently accompany culture and role shock" (Scott-Stevens, 1987, p, 117). It is necessary to note that "culture shock affects the ability of people to work with and their adaptability to other culture" (Odesina, 1992, p. 6).

5.6 Business

Another important vehicle of technology transfer is through business. In this medium, the Multinational Corporations (MNC) plays significant roles that may have positive and negative impacts (expatriation). On the positive side, the needed technology is supplied at a very low cost by supplementing the local capital, jobs and industries are created. On the other hand, the MNC are profit oriented and they may care less about the impact of the transferred technology. Importantly, since the transferred technology may not be appropriate, the technology transferred by the MNC "must be closely scrutinized" (Odesina, 1992, p. 7).

5.7 Lack of Technical Know-How

Local people in developing nations are not used to modern technology and in most cases, the application of technology is very limited, if there is any. Given this situation, there is lack of technical know-how to maintain and sustain most of the technologies that are available. If modern technology is transferred, the implication here is to revamp the local people's maintenance culture so as to be able to sustain the new technology. In addition, some local people are stuck with "obsolete technology" because they still function, could be maintained and are not very expensive. But it limits their production capability when compared to developed nations where the use of modern technology that can produce in high volume with quality is available.

5.8 Population

Some nations have taken the advantage of their population density to produce cheap labor. The availability of this cheap labor has made it difficult to transfer the needed technology. In a sense, this cheap labor is economical but with limits to the quality of their production, especially with the competition in the global market.

5.9 Corruption

Corruption is another big problem that hinders technology transfer to developing nations. It is difficult to get what is needed without paying a price for it. Some basic materials that should be made available for free to the public could only be secured by bribing those in charge. Sometimes, loans from the banks are made with unbearable interest rates. Unless there is reformation of loan service to the poor masses, the situation will continue to degenerate. As such, banks should be modernized and inflation should be curbed by blocking excessive wage demands.

6.0 Basic Model of Technology Transfer

Samli (1985) introduces a basic model for technology transfer that provides insights into the key components of technology transfer. The five key components considered in this model (figure 1) are: "the sender, the technology, the receiver, the aftermath, and the assessment" (Samli, 1985, p. 8).

The sender must have knowledge of receiver's background, sensitive to the needs of the receiver, and be willing to send the technology. The technology to be sent must be appropriate and meet the receiver's needs with consideration of other factors like market, raw materials, economies of scale, labor, and machinery.

For a smooth and successful transfer of a technology, there should be congruence among the sender's needs, understanding of the recipient's needs, the nature of the technology, and the receiver's priority ordering regarding the most immediate economic needs. The readiness and background of the receiver are also important. The aftermath of the technology transferred should not be neglected. Its identification will help to conduct an overall assessment of the technology transferred. According to Samli (1985), "the direct and indirect impact of the transferred technology must be singled out and evaluated so that future attempts will be more successful" (p. 13).

In the present time, the mechanisms of transferring technology are many from which choices could be made based on the technological needs, affordable cost, and the policy of the host country. Some of these transferring mechanisms are: "licensing, turnkey operations, the enclave, joint ventures, patents, and multinational corporations" (Odesina, 1992; Markert, 1997). Irrespective of the mechanism chosen, expatriates are sent directly from a donor country to monitor the implementation of the technology transferred. This is also due to the absence of skilled labor in the accepting nations. In the past according to Edkins (1995):

Indigenous managers with the right blend of experience and training in western management techniques [were] hard to find; so many companies have initially preferred to manage their local operations with foreign trained staff. In some cases they have opted for "tandem management", using the expatriates to transfer know-how and train a local successor who will, in time, take over the management of the local entity (p. 34).

This approach is not completely beneficent to the host country. In most cases, the disadvantages that result from using these mechanisms outweigh its benefits. As such, transfer of technology through foreign trained nationals is at best. These individuals have been immersed in the host country from where the technology will be imported. In addition, their familiarity with the technology has given more strength to their competence. "Competence" in the discourse of transferring appropriate technologies means the foreign trained national is considered able to identify and transfer appropriate technological techniques needed to add values to the identified and available natural resources. In this sense, the role of the foreign trained national in dealing with various techniques suitable for these natural resources is viewed to be occupational and in a broader capacity.

In transferring and sustaining appropriate technology, there is the need to be able to perform competently, both theoretically and in the application of knowledge. Mansfield (1990) asserts that "to perform competently, we need knowledge, understanding and skills" (p. 15). In as much that this project will involve people with differing backgrounds, experiences, and skills, we should not narrow our scope of understanding of skills to "practical and active", and knowledge as "theoretical and passive." Further more, knowledge is not always an abstraction from behavior, nor are skills always practical or outcome oriented (Barrow, 1987). More important, competence should be viewed as outcome, content or process evidences which can be inferred from one's actions (Mansfield, 1990, p. 19; Bartram 1990, p. 55).

In this capacity, the foreign trained nationals being able to know and to understand should be able to follow and practice particular kinds of investigative procedures, weigh evidence, make judgments and decide what to believe and what not to believe, to decide how to see things and how not to see things (Bailey, 1989). Therefore, when we need to evaluate competent performance, we should not only evaluate "doing" but also "thinking then doing". This is evaluation or appraisal as a whole.

7.0 Some of the Effects of Expatriation to the Host Country

In the first place, the host country is new to these expatriates. They have to go through some preparation to make them fit for the "new home". Though, this assignment is temporary, regardless, "they experience particular pressures when assigned..., careful selection, preparation and ongoing support and counseling for them and their family" (Inwood, 1995, p. 36).

Secondly, expatriates are "high risk" and expensive to maintain. High risk in the sense that they are going to a new environment they are not used to, and can not predict what the future holds for them there. There could be violence due to resentment of the host or other social ills, culture shock, and lack of the infrastructures that they need to exist. In addition, it is expensive to maintain the expatriates as their expenses range from the cost of housing, allowance and some other licensing agreements.

Since the expatriates are working to protect and serve the interest of the company they work for, it is not clear if the needed and appropriate technology will be transferred. If this is the case, then, their interest may be to exploit and not to transfer the needed technology that will make the receptor more competitive than them. They are more successful in their venture when the host country has no specialist who understands and can question them when they are not doing the right things. In some situations, the utilization of "rotators" - [people who go out from the home country and work back-to-back on a 28- day, seven-day-week, 12-hour-day cycle" (Inwood, p. 3)] is not cost effective but rather a waste of time, efforts, and money.

Edkins (1995) noted that "language ability and cultural awareness are also the key considerations in expatriate's selection"(p. 34). Short times of language training and cultural orientation for these expatriates are inadequate to get them prepared to be able to understand and work with people of different languages or cultures. Basically, the type of training in language is limited to "communication and/or negotiation skill", which is the most needed instrument for short time survival. This short term preparation is not enough to be able to penetrate and understand society's culture and tradition. Even, with immersion language training, only little could be covered about these people's culture for this training which is not more than three weeks prior to their departure (Inwood, 1995, p. 36). In his opinion, Edkins (1995) stated that:

"It is prudent to invest in a short cultural awareness course,... and, where necessary, language training. This should be supplemented by an initial orientation visit to the country. It may be wise to allow an expatriate and their partner to accept or decline the assignment after such a visit, especially for assignments to more remote hardship locations" (p. 34).

In some cases, the working and living conditions in some parts that need transfer of the needed technology are not as pleasant as the home country of the donor. This is another crucial problem that could make the expatriate "rush" his project and leave no room for trouble shooting or to be able to do a very thorough evaluation of the work done. This is done in an effort to get out of the situation they are not familiar with. This is a waste of both labor and capital resources.

The compensation for the expatriate is sometimes very expensive for the host countries. This may be in the form of benefits with fabulous salaries that are not comparable to that of local employees which is very low. Their salary standard is based on expatriate's home-base salary with other payments for "mobility/or hardship." This is the cost for the anticipated inconveniences that the foreign trained may encounter like "poor sanitation, substandard housing and medical facilities, problems with communication, shortages of essential goods and services, inadequate education facilities, crime and harassment, and pollution" (Edkins, 1995, p. 35).

According to Edkins (1995), expatriates continue to enjoy other benefits that are not provided to local employees. They are assisted with education costs for their children, paid rest and recuperation leave, medical insurance, cars and domestic staff (p. 37). This is considered expensive despite the fact that they are being paid for their services. At the same time, it worth noting that these conditions might have been spelt out in the contract as mandatory. These kinds of treatment are never accorded to the local employees, an experience that is not favorably looked upon by the indigenous employees. Therefore, this "special treatment" that is not extended to the home-based or local employees may cause resentment and poor personnel relationships (Edkins, 1995).

Having stated all these problems with the use of expatriates as the transferring medium of a technology-know-how to African countries, it is understood from the literature reviewed that its disadvantages outweighed the advantages. Since the expatriate is aware that s/he is going to a new land, they should anticipate culture shock. This new environment constitutes people with differing backgrounds, differing needs, ways of life, aptitudes and culture. Therefore, "expatriate must try to avoid looking at everything through western eyes and being swamped by negative impressions" (Pottinger, 1995, p. 35).

Since these problems have been identified, the appropriate solution would be the utilization of foreign trained nationals to transfer the appropriate technology to African countries. As a result, a foreign trained national who have equal quality, qualification, and experience as the other expatriates from donor country could serve the purpose better. These are the people with the zeal, dedication to their country's needs, skills, and knowledge about their environment. They are the people with the skills needed to transfer the appropriate technology. They possess "the perfect match of technical and "softer" skills for expatriate assignments" (Inwood, 1995, p. 36). Being indigenous, their efforts would help greatly in breaking the barriers to technology transfer to African countries. In addition, Pottinger (1995) asserts that "expatriates must be flexible, adaptable and capable of dealing with ambiguity" (p. 35). This is the description that fits these foreign trained nationals.

Industrialists in developed countries like the United States of America, France, Germany, Japan, China, Korea, and Canada to mention a few, scan the globe to identify emerging technologies and new ideas because of the fact that they "have moved from the industrial era to post industrial or information age" (Kiglinger, 1989, p. 1). They have moved from low-tech labor intensive industries to high-tech industries which are characterized by automation. Automation requires less human interaction with the equipment, to produce quality products.

According to (Mazzoleni et al., 2007) "all successful cases of accumulation of technological capabilities have relied extensively on cross-border flows of people. These flows reflected a combination of citizens from the then backward country going abroad to learn and then returning." These nations believe "that the key to development lays in the transfer of already tested and known technologies from developed nations, ...sent their students abroad to get the know-how" (Odesina, 1992, p. 6). This served two purposes. On the one hand, they gained both the intellectual and practical knowledge of the technology. On the other hand, they have helped filter the technology to determine its appropriateness and what could be the likely problem on the society as a whole. Importantly, when these students returned to their countries they were able to help perfect and sustain the transferred technology. According to Odesina (1992), "trained personnel from developed countries who are indigent of the host countries would be able to anchor the technology" (p. 7).

8.0 The Role of Foreign Trained Nationals

Foreign trained national (FTN) is defined as an indigenous professional, trained and working abroad or in diasporas, has gained both the intellectual and practical knowledge of the technology, and specializes in a relevant discipline that could enhance effective technology transfer, possess competence to filter, modify and tailor technologies and practices purposely for his/her country's conditions. FTNs are highly skilled people with short supply in their home countries, they are potential assets for "transferring skills through networks of professionals and intellectuals" (Mutume, 2003), if well harnessed. However, the success of the utilization of their efforts depends largely on their commitment and the provision of necessary infrastructure to accomplish the anticipated technology transfer successfully.

Most important is the fact that tapping the knowledge and skills of these professionals that are based overseas does not require interested participants to relocate to their home countries. This is important because they were educated and are working in foreign countries and their years of experience on the job gave them familiarity with selection and application of modern technologies. It is important to foster collaboration between Africans abroad and those at home. This is an effort already initiated by New Partnership for Africa's Development (NEPAD) with the priority of developing Africa's human resources aimed at reversing the brain drain (Mutume, 2003).

It could be argued favorably that foreign trained nationals' competency in their fields has led to 'brain drain syndrome' in the country where they have trained (Mutume, 2003; Quentin Fiore, 1961). This is true because their experiences are tailored to the needs of that particular society and to suit the culture of the people. On the other hand, these individuals find it difficult to perform in the same way they do when they were abroad for some reasons. Some of the reasons that foreign trained nationals find it difficult to perform when they get back to their home countries are:

1. Fear by home based colleagues not to lose their jobs to the new challenge.
2. Resentment to some foreign influence that may impact their culture negatively.
3. Conflicts of ideas based on different grounds of training (British and American educational systems).
4. Ideas and approaches that are suitable only for the foreign land and not yet blended to favor their own local needs.
5. Lack of funds for research program.

FTNs with the desired competencies, if well harnessed, could help reduce the increased risks and costs of implementing inappropriate technologies that may cause new problems to their society. The benefit of been trained abroad could be utilized to "filter" these technologies before transferring them. This and many other conditions have made them suitable for the task of transferring technology appropriately to their countries.

The foreign trained nationals have full knowledge about their society and could help identify the needed technology to be transferred. Coupled with this is the fact that these individuals are experts in the areas that these technologies are needed and they have had contact or used the technology to be adopted. Some of the advantages of incorporating the efforts of these experts are:

- their ability to identify the technology that will work and those that may not as opposed to foreign businesses that may be profit oriented;
- the knowledge gained by studying and/or working in foreign countries that will be the donor of these technologies is another significant factor;
- the knowledge of international policies regarding technology transfer;
- the skills and the training that will help bring the domestically trained technicians and educated colleagues to the desired/required standard; and
- knowledge to help filter the technology to determine its appropriateness and what could be the likely problem on the society as a whole.

Similarly, the efforts of the foreign trained nationals could be used to overcome cultural, regulatory, linguistic and other barriers which make it difficult to transfer the appropriate technology easily to Africa. They will also help to develop products that will be able to satisfy demand and technical standards in today's global market that is very competitive. These activities when accomplished will attest to the fact that the foreign trained nationals are a "cost effective mechanism" that will serve as a linkage with other specialized technology-transfer intermediaries in different regions of African countries (Mutume, 2003).

This approach is an advantage against non-indigenous expatriates because the foreign trained nationals will generate a self-sustaining transnational technology transfer with a lasting effect.

Therefore, if the service of the FTNs is to be effectively garnered, there should be focus on the following three elements to increase the quantity and improve the quality of technology transfer:

- develop adequate human and organizational capacity,
- create an appropriate enabling environment, and
- establish effective mechanisms.

The function of this transnational networking of technology transfer intermediaries and of industrial research association would be to link up contact-research organization and university-industry technology-transfer and liaison services (Carpentier, 1990, pp. 18-19). This will help to accelerate the adoption of both new and proven existing technologies by industries in the regions. Also, it will serve as a means to exploit the technical expertise of these regions, and their privileged relations with the industries that will help the rapid dissemination of new available technologies to industries. Importantly, their efforts will help diffuse appropriate technologies in African industries. The joint efforts of these experts in close liaison with industries will also help identify key technological deficits in each region and to find the appropriate solutions to solve them. This could be achieved by attending "conferences and seminars to disseminate scientific and technical information and to provide training in innovation management and technology transfer techniques" (Carpentier, 1990, p. 18).

According to Balcomb (1983) "the improvement of traditional technologies, rather than their replacement by expensive imported alternatives, has become widely accepted as the most "appropriate" way to respond to people's need for technological advance" (p. 3). This approach will help the nation in need of technological development to avoid the embarrassment of bankruptcy, expensive maintenance, sophisticated, foreign debt, etc. All these cost saving efforts is not a means of accumulating "second-rate" or "inferior" technology but the improvements to better from what they used to be. However, transferring technology from the rich countries to the poor has been a way of getting technical assistance to the needy countries. "But the results in terms of improving living standards for the great majority have [sometimes] been spotty to say the least" (Balcomb, 1983, p. 3).

9.0 Conclusion and Recommendations

The main goal of appropriate technology, therefore, is its ability to improve the quality of life of people, especially the economically depressed areas. These conditions are prominent in some developed nations. Through the strength of their economy and technological advancement, they could identify and purchase the appropriate technology to favor their needs without "a negative effect on the natural environment or the health and well-being of the indigenous population" (Linnell, 1995, p. 85). Researching the most efficient low impact, durable or introduced technological solution available will help the foreign trained nationals "understand different technological possibilities and limitations" (Linnell, 1995, p. 85).

Any nation planning to introduce any form of technology needs to "weigh the pros, cons, and the appropriateness of the technology" (Linnell, 1995, p. 85). African countries can do better by learning from other people's mistakes before making decisions. This would be the starting point. At this juncture, the need to utilize the foreign trained nationals to transfer the needed technology makes it easier to describe them as "appropriate technology pioneers." In this capacity, they will help identify and select appropriate technology in complement to alternatives from the industrialized world or a need for replacement where recommended. This is the significant role expected of foreign trained nationals that are expected to transfer appropriate technology to African countries. However, there is the need to provide for continuing education and re-training that will help renew the skills of the experts to be able to maintain their competitive edge in technological development.

To sustain the efforts of foreign trained nationals, factors that lead to migration should be dealt with by providing conducive environment which is amenable to positive criticism, free of harassment and persecution. More important is the need to make African countries to be politically, economically and socially attractive to their citizens. In addition, the creation of local jobs which utilize the innovative capacity in support of qualified professionals is necessary when trying to either repatriate African professionals from abroad or retain them in African countries. Without the necessary domestic infrastructure and future employment opportunities, repatriation may be difficult.

In this regard, more significant investment in local academic research as an incentive to bring foreign-trained nationals home is suggested. Equally important is the need to invest in local scientific training in the applied research area with the aim of creating new capacity for the development of new products and services in the private sector.

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Appendix

Figure 1: The Basic Model of Technology Transfer (Samli, 1985, P. 9). This Figure Illustrates How to Transfer Technology Successfully to Developing Nations

