

ROLE OF INDIGENOUS TECHNOLOGY IN ENHANCING MANPOWER DEVELOPMENT IN EMERGING ECONOMIES TOWARDS INDUSTRIAL TRANSFORMATION

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Abstract

Despite government policy to promote indigenous technology in transforming industrial development, Nigerian still have different perspectives about the relevance of indigenous technology in emerging economies. Therefore, the paper set to find out the contributions of indigenous technology to manpower development and how domestic industries can be transform through indigenous technology in emerging economies. A descriptive survey research design was used. A duly validated structured questionnaire on 5 points rating scale was used for data collection. The population for the study consists of 105 manufacturers in construction and engineering industries. Data were analyzed using mean, standard deviation and independent sample t-test to test the null hypotheses at 0.05 level of significance. The findings revealed among other that through indigenous technology sufficient skilled workers will be able to satisfy the needs of domestic industries, indigenous technology enhances competency of local tradesmen; absence of importation duties on raw materials through indigenous technology improve domestic industries. Considering the nature of indigenous technology, Vocational Technical Education and research institutions should focus their research work on promoting indigenous technology using locally sourced materials

Key words: Indigenous Technology, Manpower Development, Domestic Industries, Merging Economies and Industrial Transformation

Introduction

In recent times, sustainable development has emerged as a powerful concept in both environmental and international development communities. It is widely accepted that for society at large to fully understand the issue and transform economically, technical vocational education teachers need to embrace environmental sustainability (indigenous technology) in their teaching approach. Technology actually means knowing how to do something. Technology is the processes by which human beings fashion tools and machines to increase their control and understanding of the material environment (Raymond, 2007) Technology has always been a major means for creating new physical and human environments. In contemporary times there are a number of different types of emerging technologies and these are centered on ways we live and how we make our lives more comfortable. Raymond, further explained that to many, technology simply means the use of machines to produce human needs. To others, technology implies the art and science of applying man's knowledge in all sorts of human endeavors such as engineering, technology, medicine, culture, music, agriculture among others so as to satisfy man's needs. In view of Adegoke and Olabiyi (2003) Technology is the application of scientific knowledge to provide basic needs of life such as shelter, transportation, food, communication, security, health and clothing; which are relevant to the cultural background of people. Technology involves acquisition of knowledge, skills, procedure and methods of making, using and carrying out things. Therefore, technology can be explained as the method and process developed by people to provide for themselves basic necessities which make life comfortable, and also improve methods of extracting the materials Adegoke & Olabiyi added. Technology is developed and not transferred, since the needs of each local community are different, so people develop technology when they discover improvement in their knowledge, skills and methods for making, using and carrying out things which involves habit formation, such as dedication to work, positive attitude towards work, interest, endurance, effort and disciplines. The dictionary of Science and Technology (2001) define

technology as the practice, descriptions and terminology of any or all of the applied sciences which have practical value and/or industrial use.

The word indigenous according to Merriam Webster learner's dictionary (2018) is defined as produced, growing, living, or existing naturally in a particular environment. Going by the definitions of the word technology and indigenous we can be rest assured that mans as God creation has been involved in technology for ages. Indigenous technologies could be described as technology employed by the native inhabitants of a country or nation and which constitute an important part of its cultural heritage and should therefore be protected against exploitation by industrialized countries. Warren, Slikkerveer & Brokensha, (2005) observed indigenous technology as local knowledge that is unique to a given culture or society. Focusing on the sources of indigenous technology, Grenier (1998) stressed that indigenous technology is the unique, traditional, local knowledge existing within and developed around specific conditions of women and men indigenous to a particular geographic area. A particular commonality to be noted is that indigenous technology generally refers to the matured long-standing traditions and practices of certain regional, indigenous, or local communities as well as the wisdom, knowledge, and teachings of these communities. Thus, whichever way it is perceived, four things according to Grenier characterize indigenous technology as it is centered on local or indigenous peoples and their beliefs or practices; bound by geography in that the knowledge, most often, does not transcend the locality where it originates; tacit in nature, being most times orally passed from person to person, for generations; not dated in the sense that the knowledge or practices do not necessarily have to be primordial.

Man, from the earliest time has interacted with his physical environment and made use of what he finds in the environment to tackle the problems posed by the same environment. These include the mechanisms for sourcing tools, food, shelter, medicine and other necessities of life for sustainable living. Consequently, an understanding of the procedural issues in traditional technologies would enhance our appreciation of people's beliefs and worldview. The proper understanding of the indigenous technologies of any given society would help locate the growth points for sustainable technological development in contra-distinction to the obsession for technological transfer (Ibeanu, & Emeka, 2015). However, lack of interest in traditional industries among the youths of today who prefer white collar jobs in urban centres to indigenous skills; poor attitude/religious bias against cultural artefacts when combined with the new educational system, which played down our traditional values among others constitute serious impediment to the growth of these technologies

Technology has affected society and its surroundings in a number of ways. In many societies, technology has helped to develop more in economies, one of the earliest indigenous technologies was the production of fire by rubbing stones together causing sparks used in igniting dry leaves/wood. And the fire produced was used for cooking food, lighting the environment and keeping the houses warm and comfortable. Man in order to improve his living condition and his environment and so thought of building houses using available raw materials like clay soils for the walls, palm leaves for the roofs and now dung for painting the interior walls and floors. Man also felt the houses had to be made more comfortable for living and so using indigenous technology available he introduced the ceiling which kept the rooms cool. In the day-by-day activities of human endeavour, genuine efforts have been made to harness whatever raw materials available locally to produce tools and equipment to assist man in making life more interesting and comfortable (Abuldkareem, 1992). In the agricultural sector, Abuldkareem stressed that, simple tools like hoes, axe and cutlasses were used for cultivating the land.

Furthermore, in some parts of the country animals were used to till the land. This was adapted in order to loosen the difficult task of farming and for higher productivity. Our blacksmiths, who manufactured the agricultural tools, also produced other simple items like door locks, chairs, and spoons, lamps among others in order to improve the living conditions of the immediate community. In the transportation/communication sectors, efforts were also made to use indigenous technology to reach far and wide. Footpaths gave way to horse tracks and messages were sent out to a wide audience by the use of the town crier. It is widely recognized that differences in productivity are a major source of cross country income variations and that technological change is a driver of productivity growth. Indigenous

technological improvement is, therefore, a key element of industrialization and catch-up in emerging economies.

Vocational and Technical Education (VTE) systems play a crucial role in the social and economic development of a nation. Owing to their dynamic nature, they are continuously subject to the forces driving change in the schools, industry and society. Mechanized farming requires technical skills that could be obtained in technical and vocational schools. The real tests of success of VTE are the employability of the graduates, personal development, opportunities for further education and career development, public acceptance and image. Ultimately, the effectiveness and responsiveness of a VTE system would be measured by its impact on the social and economic development of the nation. (Okafor, 2011)

Emerging economies is defined as an economy with low to middle per capital income; such countries constitute approximately 80 % of the global population and about 20% of the world's economies (Antione, 1981). Emerging economies are low-income, rapid-growth countries using economy liberation as their primary engine of growth. Although emerging economies may be able to look forward to brighter opportunities and offer new areas of investment for indigenous technology, local officials in emerging economy need to consider the efforts of an open economy in citizens. An emerging economy must weigh local political, social factors and indigenous technology as an attempt to open up its economy to the world. Moreover, open up emerging economy means that it will also be exposed not only to new work ethics and standards but also to new principles.

The observable difference in income and wealth between developed and emerging economy countries reflects essentially disparities in the level and degree of technical progress. As it is observed that economic development is the process of accumulation of real capital brought about by the application of advanced production methods and organization which raise productivity and, thus, income and investment possibilities. This in turn permits the application of new technological methods which are bound to lead to further increases in productivity, income and investment. Since rapid economic growth seems to imply a higher increase in capital stock than in labor supply, sustained economic growth depends on technological progress. Without the improvement of indigenous technology, it is difficult to imagine how the problem of economic, social and political development can be solved within a reasonable span of time. Substantial productivity increases cannot be achieved without labour adequately educated and motivated for indigenous technological and organizational methods. If the allocation of available capital favours the production and import of capital goods while neglecting indigenous technology the (marginal) productivity of invested capital likely falls considerably short of what otherwise could be attained relatively easily (Okafor, 2011). The Global Knowledge Conference (Toronto, June 1997) emphasized the urgent need to learn, preserve, and exchange indigenous technology for a new inclusive approach to development of indigenous technology. Indigenous technologies constitute an important aspect of people's culture. They represent the adaptive mechanisms through which people survive in any ecological position they find themselves. These include the mechanisms for sourcing tools, food, shelter, medicine and other necessities of life for sustainable living.

In today's globalized world, economic activities have shifted from largely domestic affairs to more complex international relationships; and that, in itself, poses new challenges. Consequently, one of the most significant challenges that developing economies have to face relates to the attainment of competitive advantages in key economic sectors. As the UN Millennium Project (2005) noted, despite the increasing globalization of technology, the involvement of developing countries in producing new technologies and innovations is almost negligible. The production of technological knowledge is concentrated in industrial countries and developing nations are still lagging behind as far as competition on the technological frontiers is concerned.

Statement of the Problem

Technologies employed by the native inhabitants of a country and which constitute an important part of its cultural heritage should be protected against exploitation by industrialized countries. The problem of indigenous technology according to Rajasekaran & Warren (1990) is that it does not receive much protection under the Biodiversity Convention. The prospective withdrawal of many indigenous

technologies in emerging economies has a negative effect primarily on those who have developed them and who make a living through them which result to closure of domestic industries and unemployment among youths (Davies & Ebbe, 1995). The consequence of this, results to unwanted acts such as ritual killings, kidnapers, car snatchers, thefts among others. A greater awareness of the important role that indigenous technology play in the development process is likely to help preserve valuable skills, technologies, artifacts, and problem solving strategies among the local communities. Often such local practices also have an impact on issues of global concern. Therefore, preserving the indigenous technology in emerging technology can enrich the global community, contribute to promoting the cultural dimension of economic development and reduce poverty. Also, it can help to protect the global environment.

Purpose of the Study

The purpose of the study was to investigate how manufacturers perceived the contributions of indigenous technology to manpower development and how manufacturers perceived the transformation of domestic industries through indigenous technology in emerging economies.

Research Questions

1. How do manufacturers perceived the contributions of indigenous technology to manpower development in emerging economies?
2. How do manufacturers perceived the transformation of domestic industries through indigenous technology in emerging economies?

Hypotheses

The following null hypotheses were tested at 0.05 level of confidence.

Ho₁: There is no significant difference between the mean perception of the construction and the engineering domestic industries regarding the contribution of indigenous technology to manpower development in emerging economies

Ho₂: There is no significant difference between the mean perception of the construction and the engineering domestic industries regarding the transformation of domestic industries through indigenous technology in emerging economies.

Literature Review

Indigenous technology is a local technology that is unique to a given culture or society. Indigenous technology is the systematic body of knowledge acquired by local people through the accumulation of experiences, informal experiments, and intimate understanding of the environment in a given culture (Borgmann, 2006). Nigeria is greatly blessed with gifted hands that are laboriously engaged in various types of indigenous technologies. There is hardly any part of the country that does not have a remarkable indigenous technology to show for its existence. The indigenous industries among others include the production of pots from clay and aluminum metal scraps, textile making, cloth weaving, bronze casting, leather tanning, and the like, in various parts of the country. The indigenous knowledge supporting these industries is generally passed on from generation to generation and hence it is a tradition in specific locations to produce specific products. The method of indigenous technology transmission and skills acquisition is largely through observation and apprenticeship (National Centre for Technology Management, 2008).

In Nigeria, the leather tanning, aluminum and bronze casting indigenous industries creates employment opportunities, promote effective resource utilization and thereby contributes to the process of industrialization and national development (Essien, 2011). In this new economic order, developing nations

can no longer compete based only on their natural resource endowments and location advantages. For a nation to withstand competition in this era of globalization there is need for such to identify its niche areas and build on it by the application of scientific methods. New technologies and industries may then be built around these areas of core competences. Indeed, the wealth of indigenous knowledge and technologies in Nigeria presents unique and inimitable opportunities for innovation to occur and significant avenues for growth

At its most basic level, technology is defined as the application of knowledge to provide solutions to problems, mostly of mankind. Some forms of traditional knowledge are expressed through stories, legends, folk-lore, rituals, songs, and even laws while other forms are often expressed through different means (Acharya, & Shrivastava, 2008). Willie, Abiodun, Isola, Olumuyiwa, Helen, & Mohammed (2012) explain that when indigenous knowledge finds applications in tools, techniques, processes and methods that help in solving problems, indigenous technologies arise. Notable examples include the making of talking drums in Oyo (South-Western Nigeria), the fabrication of aluminum pottery in Saki (South-Western Nigeria), the production of beads in Bida (North-Central Nigeria), leather works in Zaria (North-Central Nigeria) and the production/beauty applications of special skin-friendly dyes called *lalli* in Northern Nigeria. In many cases, certain families are known for certain indigenous technology. For instance, *talking drum* fabrication is traditionally associated with certain *ile onilu* families in Oyo. Outside Nigeria, one can talk of the *mummification* techniques for preserving the remains of dead Pharaohs in Egypt—the knowledge of which was restricted to the Egyptian palaces and the scientific basis of which till today remains incompletely resolved (Nemingha, 2012).

The role of traditional knowledge in economic transformation is emerging as an important foundation for community development. For example, in 2000 the Indian Department of Science and Technology helped establish the National Innovation Foundation, which focuses on scouting, spawning, sustaining, and scaling up grass-roots innovations of relevance to sustainable development. Indigenous technologies constitute an important aspect of people's culture. They represent the adaptive mechanisms through which people survive in any ecological niche they find themselves. These include the mechanisms for sourcing tools, food, shelter, medicine and other necessities of life for sustainable living. Consequently, an understanding of the procedural issues in traditional technologies would enhance our appreciation of a people's beliefs and worldview.

Indigenous technology is the local technology that is unique to a given culture or society (Butler & Waud, 1990). It is the basis for local-level decision making in industry, agriculture, healthcare, food preparation, education, natural-resource management, and a host of other activities in rural communities. The Global Knowledge Conference (Toronto, June 1997) emphasized the urgent need to learn, preserve, and exchange indigenous technology. In his recent call for a new inclusive approach to development, the President of the World Bank has stressed the need for framework that deals inter alia with indigenous people and their technology. There are different methods and technologies for production. Different technologies are specific to particular combinations of inputs (Basu & Weil, 1998). For a particular country, appropriate technology is a technology tailored to fit the psychosocial and biophysical context prevailing in a particular location and period (Stewart, 1983; Willoughby, 1990).

Enhancing the competitive value of indigenous technology cluster rests on two distinct needs. Firstly, there is an urgent need to preserve the integrity of the knowledge surrounding the technology by ensuring that the knowledge is organized. At present, despite the high level of artistic and tourism attention that the cluster has generated, not much has been done to systematically transform the underlying knowledge from its largely oral form to organized or documented forms. Besides the preservation of knowledge, such efforts would remove entry barriers and encourage increased participation in the work. Knowledge centres, government and the private sector have significant roles to play along these lines. Secondly, the deployment of modern science and technology (S&T) is required. As with the Saki cluster, the National Agency for Science and Engineering Infrastructure (NASeni's) rotary furnaces would also find applications here as much as the need for an organized source of raw materials. The need for government to show commitment through the provision of adequate infrastructure in terms of modern

equipment, energy, adequate transportation, funding and access to market goes without saying. Again, these would be greatly facilitated in the presence of organized associations, co-operatives or training schools

Methodology

The research employed descriptive survey research design. One hundred and five (105) domestic and foreign manufacturers in Lagos state, Nigeria participated in the study. The instrument for data collection was a structured questionnaire. The instrument had three sections A to C. Section “A” sought information on personal data of the respondents such as nature of manufactured products. Section B & C sought information on the two research questions. The questionnaire was subjected to face and content validation by three experts. The internal consistency of the instruments was determined using Cronbach Alpha. The reliability coefficient was $\alpha = .86$. The instrument was administered to the respondents through research assistants, and personal contact. Out of 105 questionnaires administered, 97 were duly filled and returned. These represented 92% rate of return. Data generated from the questionnaire were analyzed using mean, and t-test statistics at .05 level of significance.

Results

How do manufacturers perceived the contributions of indigenous technology to manpower development in emerging economies?

Table 1:

Mean and SD of Respondents’ Responses Regarding How Manufacturers Perceived the Contributions of Indigenous Technology to Manpower Development in Emerging Economies =97

S/No	Item Statements	\bar{X}	SD
1	Through indigenous technology sufficient skilled workers are prepared to satisfy the needs of domestic industries.	4.14	.88
2	Indigenous technology leads to poverty reduction among citizens	3.97	.95
3	Indigenous technology reduce unemployment rate among the youths	3.81	.73
4	It raises awareness of the value/potential of workers in use of domestic natural resources for domestic industries	4.37	.65
5	Indigenous technology enhances competency of local tradesmen working in domestic industries	4.02	.59
6	Through indigenous technology waste of human resources in local communities is reduced	4.40	.72
7	Indigenous technology reduces youths restiveness	3.97	.92
8	Indigenous technology enhances effective utilization of natural resources by workers in domestic industries.	4.00	.90
9	It increases employment generation among youth community	4.12	.80
10	Domestic industries have prepared sufficient semi-skilled workers to satisfy the needs of industries through indigenous technology	4.20	.59
	<i>Overall mean</i>	3.86	.98

Table 1 above present respondents’ average means score and SD on how manufacturers perceived the contributions of indigenous technology to manpower development in emerging economies. The overall means score of 3.86 shows that domestic manufacturers indicated that indigenous technologies have major roles to play in manpower development in emerging economies, among items include: through indigenous technology sufficient skilled workers are prepared to satisfy the needs of domestic industries.; indigenous technology leads to poverty reduction among citizens, indigenous technology reduces unemployment rate

among the youths; reduces youths restiveness; enhances effective utilization of natural resources; through indigenous technology waste of human resources in local communities is reduced and domestic industries have prepared sufficient semi-skilled workers to satisfy the needs of industries through indigenous technology, with means values ranging from 3.81 to 4.20 above the cut-off point of 3.50.

How do manufacturers perceived the transformation of domestic industries through indigenous technology in emerging economies?

Table 2:

Mean and SD of Respondents' Responses on Manufacturers perceive the Transformation of Domestic Industries through Indigenous Technology in emerging economies =97

S/No	Items Statements	\bar{X}	SD
1	Development of local minerals resources increases performances of domestic industries through indigenous technology.	3.58	.52
2	Indigenous technology improves competency of tradesmen required of transforming domestic industries	4.34	.73
3	Through indigenous technology domestic industries make use of local human resources.	3.71	.61
4	Lack of importation duties on raw materials through indigenous technology improve domestic industries	3.71	.61
5	Indigenous technology helps to prepare competitive workforce for improving productivity of domestic industries	3.82	.48
6	Domestic industries have prepared sufficient semi-skilled workers to satisfy the needs of industries through indigenous technology	3.56	.86
7	Through indigenous technology workers with entrepreneurial skills are prepared to work in domestic industries	4.08	.63
8	Strategies and techniques developed by indigenous technology help domestic industries cope with global economic changes	4.70	.51
	<i>Overall mean</i>	4.35	.47

Results, as can be seen in the data presented in Table 2 above, show the mean responses of respondents' on how manufacturers perceived the transformation of domestic industries through indigenous technology in emerging economies. The overall mean of 4.35 shows that manufacturers agreed that indigenous technology can transform domestic industries through: development of local minerals resources increases performances of domestic industries through indigenous technology; indigenous technology improve competency of tradesmen required of domestic industries; through indigenous technology domestic industries make use of local human resources; lack of importation duties on raw materials through indigenous technology improve domestic industries; domestic industries have prepared sufficient semi-skilled workers to satisfy the needs of industries through indigenous technology and strategies and techniques developed by indigenous technology help domestic industries cope with global economic changes, With means values ranging from 3.56 to 4.70 above the cut-off point of 3.50.

Hypotheses

There is no significant difference between the mean perception of the construction and the engineering domestic industries regarding the contribution of indigenous technology to manpower development in emerging economies

Table 3:
Difference between the Mean Perception of the Construction and the Engineering Domestic Industries Regarding the Contribution of Indigenous Technology to Manpower Development in Emerging Economies

Variables	N	\bar{X}	SD	t	ρ
Construction Industries	62	3.64	.50		
				.258	.797
Engineering Industries	35	3.57	.61		

As shown in Table 3, there were no statistically significant differences between manufacturers' in construction and engineering industries means scores regarding how manufacturers perceived the contributions of indigenous technology to manpower development in emerging economies. ($t=.258, \rho>.05$) In order words, indigenous technologies have major contribution in manpower development in emerging economies.

There is no significant difference between the mean perception of the construction and the engineering domestic industries regarding the transformation of domestic industries through indigenous technology in emerging economies.

Table 4:
Difference between the Mean Perception of the Construction and the Engineering Domestic Industries Regarding the Transformation of Domestic Industries through Indigenous Technology in Emerging Economies.

Variables	N	\bar{X}	SD	t	ρ
Construction Industries	62	4.63	.48		
				.659	.512
Engineering Industries	35	4.20	.38		

As seen in Table 4, manufacturer in construction industries had relatively higher mean scores than the manufacturers in engineering industries regarding how manufacturers perceived the transformation of

domestic industries through indigenous technology in emerging economies. However, there were no statistically significant differences between the construction' and engineering' domestic manufacturers mean scores on transformation of domestic industries through indigenous technology in emerging economies ($t=.659, p>.05$). The results show that indigenous technology influences transformation of domestic industries in emerging economies.

Discussion

With regards to how manufacturers perceived the contributions of indigenous technology to manpower development in emerging economies. The findings from the data presented in Table 1, revealed that domestic manufacturers in construction and engineering industries believed that indigenous technology contribute to manpower development. They emphasized that indigenous technology enhances competency of local tradesmen; through indigenous technology sufficient skilled and semi-skilled workers are prepared to satisfy the needs of domestic industries. This finding is consistent with the perception of Abdulkareem (1991); Davies & Ebbe (1995) who observed that indigenous technology has role to play in contributing to manpower development. Abdulkareem explained that a number of indigenous machines, big and small have been produced by different organizations, private and public locally. Technical students in colleges of education, polytechnic and universities have produced and are capable of producing equipment, machines and other things which can help in making life a little easy and more comfortable. The implication of these findings is that there is an urgent demand on Federal Government and domestic manufacturers to step up efforts to upgrade the quality of TVET programmes in Nigeria to have more qualified personnel who will make maximum use of local mineral resources and also TVET institutions to further deploy and strengthen their commitment toward training and producing technology capable graduates that will meet up with the challenges of workplaces.

In terms of how manufacturers perceived the transformation of domestic industries through indigenous technology in emerging economies, respondents believe that indigenous technology are essential in transforming domestic industries in emerging economies. Respondents held the opinion that: development of local minerals resources increases performances of domestic industries; lack of importation duties on raw materials through indigenous technology improve domestic industries and through indigenous technology workers with entrepreneurial skills are prepared to work in domestic industries these findings is in support of Aitken & Harrison (1999); Hu & Jefferson (2002) who explained that foreign technology have significantly negative effects on indigenous technological in the domestic firms. This according to Aitken & Harrison (1999) due to: first, foreign technology make the competing domestic firms worse off, and even crowd them out from the market. The implication of these findings is that there is an urgent demand on research and vocational technical institutions to focus their research work on promoting indigenous using locally sourced materials.

This study found no statistically significant differences between the domestic manufacturers in engineering and construction industries means scores on the contributions of indigenous technology to manpower development. These results suggest that engineering and construction industries were of the same opinion with regards to the roles of indigenous technology. The obvious implication of this finding is that those domestic manufacturers are aware of the contribution of indigenous technology in emerging economies. The findings of this study revealed no significant difference between domestic manufacturers in engineering and construction industries mean score. This would suggests that engineering and construction industries have the same perception on how domestic industries can be transformed through indigenous technology in emerging economies.

Conclusion

Indigenous technology has affected society and its surroundings in a number of ways. In many societies, technology has helped develop more advanced economies. The study investigated the role of

indigenous technology in enhancing manpower development in emerging economies towards industrial transformation in Nigeria. It was concluded that through indigenous technology sufficient skilled and semi-skilled workers are prepared to satisfy the needs of domestic industries, indigenous technology enhances competency of local tradesmen working in domestic industries; lack of importation duties on raw materials through indigenous technology increase domestic industries.

Recommendations

It was recommended that: Federal Government should devise policy measures to stimulate indigenous research institutes should be properly funded and their research works should lay more emphasis on practical and result oriented

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