

**UTILIZATION OF INDUSTRIAL WASTE MATERIAL FOR THE DEVELOPMENT
OF INDIGENOUS TECHNOLOGY IN NIGERIA**

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ABSTRACT

This research work is to find out the roles of local craftsmen in the use of waste materials to boost technology development in Nigeria, used as case study to local manufacturing center in Minna and Suleja, Niger state. The study is also intended to assist in identifying craftsmen's contribution to national development and the problems hindering there operations. A 39 items was used to collect data on the roles of indigenous technology in National Development and the hindrance of indigenous technology development in Niger State with respect to waste recycling. Four research questions were drawn, one hypothesis was formulated and the statistics tools use for the analysis of the result were mean, standard deviation and t-test. The result among others shows that majority of the craftsmen have no formal education, lack enough spaces in the workshop, poor rate of development as a result of lack of recognition by the Government and the Society and lack of enough capital (finance) but at least they admire their job and contributed to the reduction of both domestic and industrial waste in the society as well as creating employment opportunities. In conclusion, suggestions and recommendations were made on how to improve the teaching and learning process on the subject. The country should evaluate and improve our traditional technology as well as develop for a comprehensive frame work from the conduct of technology transfer activities. The setting up of indigenous technology promotion commission that will take care of local manufactures will be a great importance. Our craftsmen should be properly recognized in development of indigenous technology and the local entrepreneurs should be educated on the availability of relevant locally fabricated process and plants.

Keywords: utilization, industrial waste, technology, development

INTRODUCTION

Many developing countries are increasingly placing priority on industrial development in order to facilitate the achievement of their social and economic goals. The various factors are responsible for a country to industrialize, which includes its trades policy, size, natural resources, the skill of its people, the stability of its government and institutions, and their ability to promote changes, (Yakubu, 2018).

The change that is mostly necessary for the developing nation is to embrace the need for developing their indigenous technology using their available human and material resources and not solely depending on foreign or imported technology. Since technology has been and will remain the major stimulus for change in the world developing a formidable indigenous -based technology is most need in developing nation like Nigeria (FRN, 2014).

There are so many areas of development that are not yet been given adequate attention. The most important aspect in focus is the areas of introducing and developing indigenous - based technology utilizing the aspect of waste recycling (Omojola, 2017).

"Waste is an unwanted or undesired material or substance. It may consist of the unwanted materials left over from a manufacturing process (industrial, commercial, mining or agricultural operation) or from community and household activities. The material may be discarded or accumulated, stored, or treated (physically, chemically or biologically), prior to begging discarded or recycled. It is also used to describe something we use inefficiently or inappropriately

The fact remains that, to every product used by man, there bound to be waste at the end of it all. One important aspect of life over which man is yet to have adequate success is how to recycle the waste generated through the application of adequate indigenous technology, thereby using such means to create employment (Osifo, 2016). Therefore the solution to this problem is to employ the details of appropriate technology to be used all over the developing nation to recycling waste generated. According to Akinsehinde (2017), it has already been established that a competent indigenous manpower with the experience and analytical skills to undertake engineering and industrial design for the various branches of industry are in short supply in this country.

However, from our natural resources, Nigeria as a developing nation is one of the countries of the world where large quantity of waste is been generated and the development of significant indigenous and appropriate technology which can create employment is possible and highly needed.

Recycling industry is one of those industries that have been ignored, but it has a lot of roles to play in our development both in the use of appropriate technology and the product development from it. Going by the activities of both skilled and unskilled personnel's in Nigeria, a glance at our traditional form of technology applied in carving, blacksmithing, weaving, carpentry, pottery etc, will reveal that only little of our raw materials, and waste form textile, rubber, wood, ceramic, glass, metals, chemicals, minerals, agriculture, and oil have been used then this called for development of appropriate technology that will utilized these materials as compared to developed world.

In this process, the important role of the people of the nation toward waste recycling cannot be over-emphasized and the focus toward our industrial raw materials and waste product cannot be under estimated. This is because, it is people who generated the waste through human and industrial activities, and the same people will make use of the waste as a source of raw material for the indigenous industry and finally use the product. Therefore, it is obvious that the same people will be in best position to appropriate the technical skills of local technologist (craftsmen) in solving domestic and economic problems.

Research Questions

The study is designed to answer the following research question:-

1. What are the methods/strategies that improve development of indigenous technology for national development?
2. What are the roles of craftsmen in the development of indigenous technology using waste materials?
3. What are the constraints in recycling industrial waste?
4. What are the contributions of imported technology to the development of indigenous technology in Nigeria?

Research Hypothesis

The following hypothesis were formulated and tested at 0.05 level of significance.

H_{01} There was no significance difference in the mean responses of craftsmen on methods/strategies that improve the development of indigenous technology for national development.

H_{02} There was no significance difference in the mean responses of craftsmen on what are the roles of craftsmen in the development of indigenous technology using waste materials

METHODOLOGY

Survey research design was used for this study. The study is carry out in Minna and Suleja Manufacturing Centre respectively. The total population of this study consisted of two hundred and sixty five (265) craftsmen at local manufacturing centre in Minna and Suleja. Simple random sampling was used to select the Local craftsmen in the Local manufacturing in Minna and Suleja represents the tradesmen in Niger State to be used for this study. Simple random sampling - here every element in the population has equal probability being elected or rejected. Five workshops in each trade and in each, town of the research area have been selected, making a total of forty workshops used for the study. The instrument for data collection was a structured questionnaire.

The instrument for this study was validated by three experts in the department of industrial and technology education, federal university of technology Minna. In analyzing the data collection, the researchers made used of frequency counts, standard deviation and mean. A four point rating scale was employed.

Research Question 1

What are the problems confronting in recycling industrial waste?

Table 1

S/NO	ITEMS	X ₁	X ₂	X _t	Remarks
1.	Indigenous technology development is highly needed in Nigeria.	2.80	2.86	2.83	Agreed
2.	Indigenous technology is recognized in the national development programmed.	2.79	2.98	2.88	Agreed
3.	Indigenous technology does not necessary promote water recycling	2.16	2.14	2.15	Disagreed
4.	Materials that can be recycles cannot be found in Nigeria waste.	1.93	2.01	1.997	Disagreed
5.	Wastes recycling promote job creation.	3.23	2.92	3.08	Agreed
6.	Waste materials in Nigeria if well recycled can lead	3.32	3.11	3.21	Agreed
7.	Indigenous technology promotes improvisation method.	3.06	2.91	2.98	Agreed
8.	Industrial development can be promoted through indigenous technology.	2.76	2.80	2.78	Agreed
9.	Promotion of indigenous technology can be regarded as a waste of time and resources.	1.86	2.80	4.83	Disagreed
10.	Maintenance culture can be encouraged through waste recycling.	3.33	3.05	3.19	Agreed
11.	Waste recycling using indigenous technology method will reduce environmental pollution.	2.18	2.82	2.82	Agreed

Research Question 2

To what extent are the craftsmen important in actualizing the development of indigenous technology using waste materials?

Table 2: Roles of craftsmen in indigenous technology with repeat to waste recycling.

S/NO	ITEMS	X ₁	X ₂	X _t	Remarks
1.	Waste can best be recycled using indigenous technology method.	2.79	3.00	2.89	Agreed
2.	Craftsmen have no role to play in indigenous technology promotion.	2.16	2.14	2.15	Disagreed
3.	Waste recycling through the use of indigenous technology requires skills.	3.08	3.00	3.04	Agreed
4.	Nigerian craftsmen are not skillful enough to promote waste recycling processes.	2.15	1.79	1.97	Disagreed
5.	Recycling of waste can be encouraged through local and technical training workshops.	2.82	2.97	2.89	Agreed
6.	Craftsmen creates job in the society.	2.79	2.96	2.87	Agreed

Table 2 shows the responses of the respondents to the roles of craftsmen in actualizing the development of indigenous technology with respect to waste recycling. The respondents disagreed with items 13 and 15 which state that, craftsmen have no role to play in indigenous technology promotion and that Nigerian craftsmen are not skillful enough to promote waste recycling processed respectively.

The disagreement of the respondents expressed the fact that the respondents maintained the fact that indigenous technology promotion can best be enhance through the use of local craftsmen, therefore, craftsmen have the greatest roles to play In indigenous technology promotion. This finding is in agreement with the view of who observed that, craftsmen has greater freedom of expectation, they work to satisfied their most suitable materials with their local method of construction which cannot always be produced by machine. The negative responses to the issue of craftsmen skills shows that the craftsmen has their own acquired skill using their local tools and materials which may not necessarily be compared with that of western knowledge using western materials.

Research Question 3

What are the problem confronting the craftsmen in recycling industrial waste?

Problem of Craftsmen in Waste Recycling

S/NO	ITEMS	X ₁	X ₂	X _t	Remarks
1.	Craftsmen are not recognized in the society.	2.77	3.12	2.95	Agreed
2.	Craftsmen are looked down upon as compared to government workers.	2.71	3.04	2.87	Agreed
3.	Those who source for waste materials for recycling do feel inferior to their people in the society.	2.75	3.04	2.89	Agreed
4.	Waste recycling industry is too expensive to start and maintain	1.88	1.78	1.83	Disagreed
5.	Non-specific payment for waste recyclers.	1.93	2.29	2.1	Disagreed
6.	Workshop of local craftsmen not standard.	2.82	3.03	2.93	Agreed
7.	Products of local manufacturers not marketable.	2.15	1.94	2.05	Disagreed
8.	Used or applied for waste recycling in Nigeria has not yet been discovered.	2.13	2.09	2.11	Disagreed
9.	Lack of enough finance for the craftsmen.	3.07	3.05	3.06	Agreed
10.	Lack of adequate modern technological training affects the local manufactures.	3.16	2.88	3.02	Agreed
11.	Insufficient government assistance.	3.06	2.99	3.02	Agreed
12.	Lack of western education affects the local manufactures products.	1.96	2.02	1.99	Disagreed
13.	Inadequate skill in modern waste recycled.	2.80	2.94	2.87	Agreed
14.	Insufficient solid waste that can be recycled.	1.91	2.01	1.96	Disagreed
15.	End product of the craftsmen not meeting manufacturing standard.	1.95	2.05	2.00	Disagree
16.	Rationales for subsection the manufactured material into finished product are lacking.	1.84	2.00	1.92	Disagreed

Table 3 shows the indigenous encountered by craftsmen in waste recycling invariably return the development of indigenous technology. The table shows the respondents greatly agreed to such issue which includes poor recognition of craftsmen, lack of enough finance for the craftsmen and insufficient government assistance. This founding agrees with the view of which identified problems of industrial technology as one of the most serious problems inhibiting the development of industry in Nigeria is shortage of financial capitals.

The respondents also disagree with item 31, 32 and 33 which state that, the solid waste which can be recycled are not sufficient in Nigeria Society, that end product of the craftsmen is not meeting manufacturing standard and that rationale for subjecting the manufactured materials into finished product are lacking respectively.

However, this shows that waste materials to be recycled, manufactured standard and rational for subjecting the manufactured materials into finished product are not regarded as problem by the craftsmen,

Research Question 4

How well has imported technology adopted contributes to the development of indigenous technology in Nigeria?

TABLE 4: The roles of important technology on indigenous Technology

S/NO	ITEMS	X1	*2	*3	Remarks
1.	Indigenous technology can be generated locally	2.84	3.12	2.98	Agreed
2.	Indigenous technology is more costly than imported technology	2.15	1.95	2.05	Disagreed
3.	Imported technology promotes indigenous technology	1.93	1.79	1.86	Disagreed
4.	Importation of technology has no negative effect on the local manufactures	1.72	1.78	1.75	Disagreed
5.	Imported technology has no negative effect on the national economy	1.73	2.03	1.88	Disagreed
6.	Product from indigenous technology are substandard as compared with product of western technology	1.90	2.91	1.95	Disagreed

Table 4 shows the response of the respondents to the effects of imported technology on indigenous technology. The respondents disagreed, with item 35, 36, 37, 38, and 39 respectively. The item is stated as follows that indigenous technology is more costly than that of imported technology, of Nigeria has no negative effect on local manufacture and no Nigeria economy, and finally, that product from indigenous technology cannot be compared with that western technology.

The disagreement of the respondent of the' above stated item shows that imported technology has little or no benefit to contribute to our indigenous technology. In other word, it means that the respondents generally agreed that indigenous technology is more does not promote indigenous technology and that over dependent on importer technology has a lot of set back on both indigenous technology and nation's economy. This finding shows that-importation of technology has generated a number of problems for the economy. This is an agreement with the view of that imported of technology has generated such problem which includes developing nation's continued technological under-development which is traceable to the years multinational corporations started transferring technology to Nigeria which shows the country mobility to develop its absorptive capacity in such a way as to be able to generate technology ' locally on any significant scale.

The finding also agreed with the view of, that the importation of technology into Nigeria has had its foreign- exchange implication, with the growing accumulation of foreign debts and continued dependence of foreign technology.

Test of Hypothesis

Statement of hypothesis:-

There will be no significant difference between the mean responses of local craftsmen concerning the development of indigenous technology in Minna and Sulga,

Table 5: Table of cumulative mean responses of local craftsmen in Minna and Suleja

Group	Location	Number craftsmen	Cumulative	Standard Deviation	Calculated t.	Table value t.	Decision
1	Minna	N ₁ = 130	X ₁ = 2.80	S ₁ = 1.34	0.5	1.960	Not significant
2	Suleja	N ₂ = 135	X ₂ = 2.80	S ₂ = 1.34	0.5	1.960	Not significant

Table 5 shows the cumulative mean responses of local craftsmen in Minna and Suleja. The values are analyzed as follows:-

N_1 = Number of craftsmen used in Minna = 130

X_1 = Cumulative mean respondent of Minna craftsmen = 2.80

S_1 = Standard deviation calculated from the variance of Minna respondent = 1.34

N_2 = Number of craftsmen used in Suleja = 135.

X_2 = Cumulative mean respondent of Suleja craftsmen = 2.80

S_2 = Standard deviation calculated from variance of Suleja a respondent = 1.34

Calculated t = 0.5 (obtained using the, t-test formula).

Table value t = 1.960 (obtained from standard table of value),

df = degree of freedom $N_1 + N_2 - 2 = 130 + 135 = 265 - 2 = 263$.

Calculated t - 0.5, df = 263, table value = 1.960. The hypothesis can be rejected because the calculated t. (0.5) does not equal to or exceeds the table value (1.960). Hence, it is concluded that there is no significant difference between the mean responses of local craftsmen concerning the development of indigenous technology in Minna and Suleja.

Discussion of the Findings

The position and contribution of indigenous technology in national development, the roles of craftsmen in waste recycling as a means of actualizing the development of indigenous technology the problems of, craftsmen and the effect of imported, technology on indigenous technology are the essential element in this project.

Technology is one of the major important factors that brings about development, and changes in any society. This can simply mean that, no society can have both industries, social and economic development without a well developed indigenous technology.

In Table 1, the data collected shows that 73% percent of the respondents agree that Nigeria as a Nation can develop her social, economy and industrial sectors, if and only if her indigenous technology is given adequate attention it requires. The finding then agreed with the view of which stated that technology has been and will remain the major stimulus for change in the world and that the competent indigenous manpower needed to undertake engineering and

industrial in Nigeria are in short supply. The finding also agrees with the research of which shear the view that "technology is the only way to industrial development".

The result, therefore indicate that development of indigenous technology .has no substitute in Nigeria must expensive industrial development. One of the noticeable problems facing Nigeria society is the problem of waste recycling, Nigeria government through Environmental protection Board into waste control and waste recycling has yearly voted lots of money, It is paratactic to that most Nigeria cities, towns and villages are been threatened by, solid and liquid waste in their environment. Some tools, equipment and household items that have little faults, which could still be required, serviced and put back to use, becomes domestic waste just the new imported one product is in the market.

In table 2, majority of the respondents i.e. about 67 percent agreed, with the issue of craftsmen's importance in waste recycling which can constitute a lot of advantages to the Nigeria society, study advantages may include the reduction in importation of technology, reduction or eradication of environmental pollution, industrial developed and importation of maintenance culture into the mind of Nigerians and provision of employment.

This finding agreed with tile view of an American chartered engineer, who stated that when employment is so difficult to create in other aspect of life, it should not be so in waste business, because it has provided adequate activities in which hundreds of thousands of people are securing a living.

The result therefore indicates that craftsmen are very importance in waste recycling and in actualizing the development of indigenous technology. The setback in indigenous through the craftsmen are traceable to several problems.

Respondents agree that craftsmen face a lot of problems in waste recycling, such problem are finance, education, skill workshop training etc. This finding agreed with the view of when he said that indigenous engineering capacities of Nigeria is defectiveness has trade to the prevailing educational system which lacks the relevant tools to property train the manpower needed the indigenous sector. The financial institutions in Nigeria are concerned with project lending, which requires adequate credit worthiness and rate of returns thereby giving no attention to local manufacturers.

The findings have shown that the craftsmen have many problems to cope with in respect of recycling in Nigeria society. The importation of technology into Nigeria by multinational corporations has had its effect on indigenous technology and foreign exchange implications,

These findings have shown both the positive and negative implication of imported technology on our nation's indigenous technology.

In table 3, 84 percent of the respondents agreed that imported technology does more harm than good to indigenous technology. This finding agreed with the view of. This finding agreed with the view of Oyedeji, (2013) when he said that indigenous engineering capacities of Nigeria is defectiveness has trade to the prevailing educational system which lacks the relevant tools to properly train the manpower needed the indigenous sector. The financial institutions in Nigeria are concerned with project lending, which requires adequate credit worthiness and rate of returns thereby giving no attention to local manufactures.

The findings have shown that the craftsmen have many problems to cope with in respect of recycling in Nigeria society. The importation of technology into Nigeria by multinational corporations has had its effect on indigenous technology and foreign exchange implications. These findings have shown both the positive and negative implication of imported technology on our nation's indigenous technology.

To identify the roles of indigenous technology and some hindrances that are responsible for the poor the state of indigenous technology in Nigeria. Among the identify problems are finance, education, training, societal disrespect for waste recyclers, destructive criticism to Nigerians product (made in Nigeria), poor government policy formulation and implementation on indigenous technology.

The result of the findings has shown that indigenous technology is needed for national development and for job creation, craftsmen should be well financed, and finally, the national over-reliance on imported technology should be discouraged, There is no doubt that this research work has resented some relevant ingredients for developing appropriate indigenous technology policies, which are expected to be logically implemented, in order to elevate Nigeria to the class of industrial nation.

CONCLUSION

It is pertinent to conclude this study by emphasizing that Nigeria as a developing nation needs to develop her, indigenous technology.

Indigenous technology is highly needed in order to, develop her industries and economy. Materials that can be recycled are very much available in Nigeria waste and that indigenous technology will promote waste recycling.

Recommendation

Based on the conclusion of the study, the following recommendations are made:-

- The country should evaluate and improve her traditional technology as well as develop for a comprehensive framework from the conduct of technology transfer activities. The setting - up of indigenous technology promotion commission that will be taken care of local manufacturers will be of great importance.
- Our craftsmen should be properly recognized in the development of indigenous technology and the local entrepreneurs should be educated on the availability of relevant locally fabricated process and plants.
- There, should be redefinition of our local standards to reflect our level of development. Simply copying standard from developed countries will date the growth of indigenous technology.
- Since indigenous technology has been seen as the catalyst for industrialization of such country as India and America, there is need for the integration of indigenous technology in the nations planning policy for industrial and economic development.
- The transfer of technology from develop nations to the country should not be left uncontrolled, since this can pose a lots threat to the development of indigenous technology which do create other economic disturbance. Appropriate financial structure must be put in' place to encourage the growth of indigenous technology. This can be done by given the local manufactures long term loan scheme through the Nigeria Industrial Development Bank to cater for cottage industries.
- Waste recycling venture should be incorporated into the activities of the family economic advancement programmed so as to create job for the mass unemployed members of the society which will definitely alleviate the poverty of many families.
- Research and development of indigenous technology should be encouraged

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