REVITALIZING THE NIGERIAN INDIGENOUS TECHNOLOGIES THROUGH CRAFT-DESIGN COLLABORATION

Akintayo, WoleLateef
Tai Solarin University of Education, Ijebu-Ode

E-mail: akintayo2002@gmail.com

Phone No: 08033569358

Abstract
Recently, there have been criticisms passed on poor quality of indigenous hand woven and other resist fabrics by the consumers which have led to decline in the demand for the fabrics. This is due to poor craftsmanship, ineffective production process and poor quality of dye in use. This situation is a bad omen since it could lead to irreparable loss of this vital cultural artistic heritage, loss of economic reward to the producers and financial setback to the nation at large. A major reason deduced for this is that the local craftsmen lack the technological knowledge of dyes application as well as the dyeing process and this has resulted in low colour fastness of the fabrics. Weaving and dyeingis a traditional local handcraft practiced by generations of Nigerian artisans using indigenous materials to make functional and decorative items. This study would therefore explore how designers may make technological collaboration with artisans to unearth new opportunities for a local craft and how designers can make contributions to the Artisan's community. This paper would highlights the outcome of the technological alliance between craft and design as a mutual learning mechanism, where both sides can exchange knowledge and enhance their professional capabilities, for global acceptance.

Word Count: 202

Keyword: Technological collaboration, Industrial Design, Indigenous Technologies, Craft-Design collaboration

.

Revitalizing the Nigerian Indigenous Technologies through Craft-Design collaboration

1. Introduction

Economic activities in today's globalised world have shifted from largely domestic affairs to more complex international relationships; and this poses new challenges. For instance, due to the abundance of knowledge, the unprecedented cross-border transferability of information and the removal of trade barriers, the occurrence of externalities within nations has significantly increased (Adetola, Gouldin&Liyanage (2011). Consequently, one of the most significant challenges that developing economies have to face relates to the attainment of competitive advantages in key economic sectors. The UN Millennium Project (2005) noted that, despite the increasing globalization of technology, the involvement of developing countries in producing current 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.

Given the foregoing, it stands to reason that poor developing economies may be better positioned in the game of global competition if, rather than exclusively focusing on catching-up at the frontiers, they look inwards to deploy science, technology and innovation (STI) in specific areas where they have comparative advantage. These comparative advantages could then be developed to achieve competitive advantage. This situation can be realized by creating an environment possible to create a synergy between industrial designers and artisan groups to stimulate the development and preservation of a local craft in a sustainable and commercially viable way.Indigenous craft is a reflection of the relationship between humans and their environment within their historical, cultural, and social contexts. Pre-industrial artisans were skilled craftspeople who used locally available materials to create products and generate income. Similar products manufactured with alternative or new materials were introduced to the market the demand for traditional or indigenous craftsmanship sharply declined. This was the case with the indigenous dyed Aso-Okewoven fabrics in recent times.

Recently, it was discovered that there have been criticisms on poor quality of indigenous dyed Aso-Oke hand woven and other resist fabrics produced in Nigeria fabrics by the consumers. This traditional crafts, whose practices are deeply rooted in local knowledge and accumulated over time, are part of our monumental cultural heritage and should be preserved and revitalized. It is however regrettable that, the patronage appears to be dwindling which might not be unconnected with quality problem in terms of colour bleeding and colour fading on the fabric within a short period of use.

This situation is a bad omen since it could lead to irreversible loss of this vital cultural artistic heritage, loss of economic benefit to the producers and financial setback to the nation at large. Due to the negative qualities enumerated above, public patronage and demand for these locally produced fabrics has raised serious concern.In order to bring back the quality of the fabrics and increase the public patronage and demand by the consumers designers are called upon to bridge the gap between idea and practice, and to link artistic and creative elements with practical and realizable outcomes (Dodgson, Gann, & Salter, 2005). Accordingly, organizations like the United Nations Educational, Scientific and Cultural Organization (UNESCO), the World Crafts Council (WCC), and Aid to Artisans (ATA) have made efforts to bring traditional crafts into mainstream life. Such efforts include engaging designers to work with artisan groups to develop new product lines for new markets.It is worthy of note that Nigeria's indigenous technologies can present significant opportunities for local economic transformation and, to some extent, for global competitiveness. This

would happen when these technologies are improved and standardized through the deployment of science and technology. With a focus on cottage, small and medium-sized enterprises, businesses could be developed around these technologies which would foster national innovativeness, create employment and generate wealth.

This study therefore, aims to explore how designers may collaborate with artisans to unearth new opportunities for a local craft and how designers can make contributions to the artisan community. Aso-Oke weaving is a traditional local handcraft practiced by generations of Nigerian artisans using indigenous materials to make functional and decorative items. To research the possibilities of a craft-design collaboration, a monitored project was conducted, where indigenous weavers and design students worked together to create new quality Aso-Oke fabrics that is adjudged to be colour fast and which is expected to expand this traditional craft into contemporary markets.

2. Literature Review

Indigenous Knowledge, Indigenous Technologies and Innovation

As is the case with several key concepts like science and technology, innovation and entrepreneurship, there seems to be no single universal definition of indigenous knowledge (IK) {UN Millennium Project (2005)} but the fundamentals are clear. Contrasting Indigenous Knowledge with globalised knowledge, Warren et al. (1995) noted that it is the indigenous knowledge that is unique to a given culture or society. Focusing on the sources of Indigenous Knowledge, Afuah (2012) defined it as 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 Knowledge 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 defined, four things characterise Indigenous Knowledge as stated by Willie, Abiodun, Isola, Olumuyiwa, Olamade& Mohammed (2012) are that it:

(1) Centred on local or indigenous peoples and their beliefs or practices;

(2) Generally bound by geography in that the knowledge, most often, does not transcend the locality where it originates;

(3) Generally tacit in nature, being most times orally passed from person to person, for generations;

(4) Not dated in the sense that the knowledge or practices do not necessarily have to be primordial.

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, folklore, rituals, songs, and even laws while other forms are often expressed through different means (Dykes, Rodgers & Smyth (2009). When Indigenous Knowledge finds applications in tools, techniques, processes and methods that help in solving problems, indigenous technologies arise. Notable examples include the weaving of various designs of fabrics such as Aso-Okeand Itagbe in Iseyin, Ondo and Owo, Akwete fabrics in Okene and dyeing techniques in Abeokuta, Oshogbo and Iseyin; the fabrication of aluminium pottery in Saki (SouthWestern 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 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. What has been achieved in China and India with herbal medicine is a useful case in point (Acharyaand Shrivastava (2008)..

Innovation is regarded as the use of new knowledge to offer a new product or service that consumers want Ratnam (2011).Egbetokun&Siyanbola (2008) stressed the fact that the application of that knowledge is to be emphasised rather than its acquisition. In less developed countries, Woolley (2011) has suggested that innovation must be thought of as a process of adoption, absorption and diffusion of available technology. When talking of innovation in a less developed economy like Nigeria, McIntyre (2010). noted that it matters much more for countries to focus on the adaptation, diffusion and upgrading of technologies that already exist rather than pushing (or even attempting to push) the global knowledge frontier further. It follows, then, that Indigenous Technologies offer significant opportunities for innovation in Nigeria. This is so for two main reasons: they are already available and they are already acceptable. As earlier noted, most Indigenous Knowledge and Indigenous Technologiesare tacit in nature and are transferred in unwritten manners and most practitioners involved in them are usually dependent on family and apprentices for manpower

There is the challenge of standardisation that has always been an issue with Indigenous technologies and practices. The poor colour fastness issues which resulted into colour bleeding and colour fading of dyedAso-Oke fabrics produced by the traditional dyers and weavers was as a result of the problem of standardization Essien(2011). For instance, their dyeing activities are done without adequate washing of the fabric surface to properly remove the oil and industrial starch applies on the fabrics surface; they used guesses to determine the quantity of dye to quantity of chemicals, without adequate measurement and so on. If standardisation is achieved, enterprises that are more organised could evolve around these technologies.

The dynamics of Craft Practices in today's world

Today's consumers are viewed as different groups pursuing various goals, better served with more differentiated and higher quality products. Accordingly, consumer demand has shifted from products which compete with each other solely on the basis of price and availability to products which compete through their individuality, design value and aesthetic appeal. This shift has steered the production system to focus on small batches of high quality products that target niche markets (Creative and Cultural Skills, 2009). The emerging craft markets suggest that the potential for traditional crafts to be considered careers in the modern world is promising. However, there is a long way to go and several issues need to be addressed especially the issue of quality and standardization before it becomes possible for craftsmanship to become a viable career option nowadays.

Craft practices are not static, but are dynamic toward continuous evolution, transformation and adaption to modern society. The existence of multiple modes of production produces a hybrid production system, which celebrates craftsmanship and the human touch as well as the performance of technologies. Industrial production and modern technologies may provide opportunities for craft practitioners to create unique crafted objects while being able, at the same time, to produce sufficient quantities of product to achieve sustainable models of practice. Craft practitioners have seen an increasingly positive alliance between crafts and technology (Harris, 2012; Yair& Schwarz, 2011). Modern methods of production such as casting, laser cutting, and rapid prototyping have been adapted to craft processes in an effort to foster new ways of developing and refining one-off or small batch work. The ability of designers to elucidate modern techniques for local artisans can create many potential opportunities. Designers can galvanize local artisans to exploit production

techniques through collaboration, and thus enable them to cope with the processes and consequences of industrialization (UNESCO 2005).

Co-creation as an Approach to the development of indigenous Craft

Design innovation relies on reusing existing knowledge or recombining existing knowledge in new and innovative ways (Pannozzo, 2007). The existing knowledge of a craft is viewed as tacit, where specialized skills are embedded in a person or within a local community. Tacit knowledge is described as "we can know more than we can tell" (Polanyi, 1997). The tacit knowledge possessed by the indigenous artisans is acquired through extensive experience of working with materials and processes and it can primarily be acquired by practical and personal contact between master and apprentice. Specific techniques and craft styles may be passed generationally within families or a close knit community. Chuenrudeemol, Boonlaor, and Kongkanan (2012) propose two models in retrieving indigenous crafts peoples' knowledge to develop new products for the purpose of commercialization. These two models are the master/apprentice model and the co-creation model. Design practitioners attempting to develop indigenous crafts should directly engage themselves in a local context by interacting and co-creating with the artisan community. In these situations collaborative innovation is recognized and several cases show how the designer and artisan group work together to develop new products which have potential to reach out to new markets (Barker & Hall, 2009; Murray, 2010). Reubens (2010a) argues that designers and indigenous crafts people can both benefit from the development of indigenous craft. One of her projects (2010b), where designers worked with local bamboo artisans in India, demonstrates that the skill and knowledge set that each party brings to the innovation process is maximized through collaboration.

Co-creation by artisans and designers employs collective creativity as an approach to the development of indigenous craft. This is in agreement with Sanders and Stappers's (2008) observed that, designers are invited to tackle the challenges which cannot be addressed by individuals alone.

3. Craft-design collaboration process conducted by the Indigenous craftsmen and Technologist from the Education Institution

METHODOLOGY

The research designs adopted for this study are survey and experimental research designs. The survey design involved administering questionnaires on the respondents (Aso-Oke weavers/Dyers) to assess their knowledge on the dyeing process adopted by the practitioners in the dyeing ofAso-Oke fabrics and also collection of fabrics samples made by them while the experimental design involved conducting standard studio dyeing experiment on Aso-Oke fabrics together with the weavers (practitioners) and subjecting the two fabrics samples (Aso-Oke fabrics sourced from the weavers and Aso-Oke fabrics made in the studio) to quality assessment test in order to determine the colour fastness properties of the two fabrics samples.

The study involved examining the dyeing activities of Aso-Oke weavers/dyers (practitioners) who were the targeted population for this study inIseyin cottage weaving centres in Oyo State, Nigeria. Iseyintown is known as the industrial hub of Aso-Oke fabric making in South Western part of Nigeria. To get more facts for this study, a purposive sampling technique was adopted as questionnaires were distributed to a number of practitioners available at this study location. Sixty-one (61) questionnaires were distributed to weavers and dyers at the study areas. This figure was collected from the association of traditional weavers registration book. The structure of the questionnaires required that the respondents supply information regarding such areas as demographic characteristics of the aso-oke weavers/dyers and the method involved in the application of dyes on the Aso-Oke fabrics made by them.

Data collected through the questionnaire were analysed using descriptive statistics such as percentage count, mean and standard deviation, while the studio dyed Aso-Oke fabrics samples and those fabric samples collected from the study area were subjected to Quality assessment tests of colour fastness property in line with standards set by the International Standard Organization (ISO) and adopted by the Nigerian Industrial Standard (NIS) Adetuyi, (2005). As the leader of the collaborative team, the author was in charge of guiding the collaboration process.

Studio Experimentation

Quality assessment (Colour Fastness) tests on the two traditional textiles

1. **Studio Dyeing Experiment on Aso-Oke fabric samples**

The studio dyeing experiments was conducted by using convenient sampling technique to select Ten Aso-Oke weavers to take part in the exercise and the experiment was anchored by two Industrial Technologist who are colourist. The unprocessed 100% cotton aso-oke woven fabrics was subjected to scoured in 2 g/l Lissapol ND soap solution at a liquor ration of 30:1. This process was carried out to remove traces of weaven finish such as oil and possibly dirt acquired during production, storage and handling which may have interfering effect on the dye application results of this study. The fabric sample was then dried at 105^0C for 2hrs in an oven to "dry bone" mass or constant weight. The weight of the fabric was taken in order to know the appropriate quantity of dye and chemicals (hydrogen sulphite and caustic soda) to be applied during dyeing. These two important preliminary activities (washing of fabric and weighing of fabrics was found not to be done by the Aso-oke weavers. The dyes and chemicals were equally weighed.

Before the fabrics was dyed, it was rinsed in sterilized water in order to bring about quick absorption of the dye with the fabrics. The dye was then mixed using hot water whose temperature reached boiling point to dye the Aso-Oke fabric. The fabrics were allowed to stay inside the dye-bath for a period of 60 minutes while it was turned at an interval of 10minutes during the dyeing periods.

At the end of the dyeing periods, the Aso-Oke fabric samples was removed and spread out for oxidation reaction period. This period allowed the true colour of the dye applied to come out. The fabrics samples were then subjected to soaping by rinsing in water and washed in soap for

several times in order to remove excess dye that were not taking up by the fabrics. He fabrics were later dried. All these activities were conducted

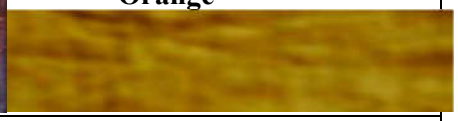
S/N	Aso-Oke fabrics from study area	Aso-Oke samples from the Laboratoty
1		**Orange** 
2		**Purple** 
3		**Yellow** 
4		**Blue** 

Plate 1: Shows the Aso-Oke fabric samples collected from the study area and the dyedAso-Oke fabric samples produced in the studio through experiment

Source: Author's studio laboratory work

2. Quality assessment (Colour Fastness) tests on the two sets of Aso-Oke fabrics samples

Each of the Aso-Oke materials was prepared for the following quality assessment tests of fastness properties namely: washing in detergent and toilet soap, exposure to light, both to xenon arc light and sunlight and perspiration. The assessment was carried out according to the International Standard Organization (ISO) procedures as described by the Society of Dyers and Colourist (1999). Each test was carried out for 3 weeks running. Prior to the next test per week, the fabrics samples were subjected to conditions similar to their usage in real life such as exposure to atmosphere, and rough handle to induce creases.

a. Colour Fastness to Washing with Detergent and bar soap

Five (5) specimens of each type of aso-oke fabrics samples from study area and that from the studio measuring 4cm x 10cm had a pure bleached white cotton fabrics each sown to it along its four sides to make it one adjacent fabric. Each set of the specimen was mechanically agitated separately at 40^0C for 30mins in dye-tubes of 150ml detergent and

soap solutions (liquor-ratio-50:1) containing 3ml of detergent (blue omo) and 5gl of toilet soap (Lux) respectively. The dyetubes were mounted on a single-bath dyeing machine. The specimens were removed, rinsed thoroughly in distilled water and squeezed. The fabrics were opened out and dried in air at a temperature not exceeding 60^0C. The change in colour of each specimen was assessed with the grey scale and the mean value of each result obtained taken as the fastness rating for the test. The washing was done twice per week.

b. Colour Fastness to Artificial Light (Xenon arc) and Daylight (Sun)

Five (5) specimens from each of the fabrics samples measuring 5cm x 10cm, and the eight (8) blue wool light fastness testing standards of the same dimensions, were mounted lengthwise on specimen holders of Light Fastness Tester model 225. Both were exposed simultaneously for 6hours, 3 days per week for 3 weeks to the artificial light generated within the instrument. A 65% relative humidity was generated within the instrument.

Another five (5) set of the textile specimens and the blue wool standards were also prepared and mounted on white cardboards and exposed to daylight (sunlight) by hanging on a line in an open place for 3 days per week for 3 consecutive weeks at the following time intervals: 9.am t0 1.00 pm (First week); 1.00p.m to 3.00 p.m (Second week); 2.00 p.m to 5.00 p.m (Third week) and 5.00 p.m to 7.00 p.m (Fourth week). These selected time frames corresponds to the periods that the fabrics materials are usually worn and therefore exposed to sun in Africa. The fabrics samples were then assessed for colour fastness by comparing the change in colour of the specimens with that of the references standard (Blue wool).

c. Colour Fastness to perspiration

Five (5) specimens of each fabric samples measuring 5cm x 10cm in contact with another fabric (called composite specimens) were laid out in a flat- bottomed dish. The specimens were then covered with prepared perspiration solution. (separate sets for each solution) at a liquor ratio of 50:1 and were allowed to remain in the solution at room temperature for 30mins. During this time, the composite specimens were pressed and moved from time to time to ensure good and uniform liquor penetration. The solutions were drained off and excess liquor wiped off the composite specimens between two glass rods. Thereafter, they were placed in oven for 4hours at 37^0C, after which the specimen were dried in air at 60^0C. The change in colour of the fabric samples were assessed with the grey scale. The mean value of the results obtained taken as the fastness rating for the test.

4. Results andDiscussions

The analysis of the demographic characteristics of the aso-oke weavers/dyers reveals that hand woven Aso-Oke fabric weaving/ dyeing craft is still very much popular in the study area among the middle age group between 26-45years who are still in their active productive age while those above 56 years are getting to retirement leaving the art of active weaving to their children. The craft of hand woven aso-oke fabrics in Southwestern Nigeria is men dominated and the craft is predominated among the male gender with low level of education. That art of yarns dyeing by the traditional dyers is no longer in active practice by people in the study location as most of the aso-oke fabric dealers are weavers/dyers. This means that, the weavers are the same people who also dyed the yarns they need for weaving by themselves.

On the assessment of the process of dye applications on hand woven Aso-Oke fabrics,The results as presented on table 1 indicates that for an ideal dye absorption on fabrics, the following steps must be followed: the fabrics must be properly wet with water followed by mixing of the dye and chemicals (sodium hydrogen sulphite and caustic soda) with hot water of which its temperature must reach boiling point; the fabrics must stay in the dye bath for considerable length of time; the dye to chemical quantity must be measure in accordance with the weight of the fabrics and the fabrics should be given proper sopping in other to remove the excess dye that was not taking-up by the fabrics. The result of this study is in line with Adeakin, (2009) It was based on this result that prompted the studio laboratory experiment, to find out why there are still complain of low quality on the dyed Aso-Oke fabrics by the consumers.

Table 1: **Process of dye applications on hand woven Aso-Oke fabrics**
Key: Strongly agree(SA)=5 , Agree(A)=4, Strongly disagree(SD)=3, Disagree(D)=3, Undecided(UD)=1

S/N	ITEMS	RESPONSES					Mean Score	Remark
		SA 5	A 4	SD 3	D 2	UD 1		
A1	Fabric to be dyed should be wet with water before dipping into dye-bath	57	32	14	12	16	3.59	A
A2	I dip the fabric into dye-bath directly without prior wetting	21	17	35	46	12	2.91	D
A3	One should mixed the dye and chemicals using warm water	17	11	62	29	12	3.49	D
A4	It is ideal to allowed the water temperature meant for mixing of the dye and chemicals to reach boiling point	59	34	20	10	8	3.77	A
A5	It is necessary to allowed the fabrics to stay inside the dye-bath for longer period of time before removing it	42	48	16	11	14	3.70	A
A6	One should ensure that dye and chemicals dissolves properly before immersing the fabrics into the dye-bath	62	29	17	11	12	3.90	A
A7	I use guesses to determine the quantity of dye to chemicals during the dyeing operation	42	59	21	4	5	3.98	A
A8	It is not necessary to wash off the excess dye from the fabrics after removing the fabric from the dye-bath	21	17	35	46	12	2.91	D

Source: Author's field work

It was based on this result that prompted the collaborative study wasconducted and to find out why there are still complain of low quality on the dyed aso-oke fabrics by the consumers. The studio dyeing experiment was conducted in line with the standard set by the Nigerian Industrial Standard (NIS) guidelines. The result of the quality assessment test on the fabrics samples are as presented below:

Table 2: The mean fastness rating for the fabric samples collected in the study area and those produced in the studio to Washing, Light and Perspiration

Test Times	Washing		Light		Perspiration	
	Iseyin	Studio	Iseyin	Studio	Iseyin	Studio
1	2.25	5.00	3	7.5	2.5	4.5
2	2.13	4.50	2.5	7	2.5	4.5
3	2.13	4.50	3	7	2.5	4.5
Mean of mean	2.17	4.67	2.9	7.5	2.5	4.6

Source: Author's field work

The result of the washing over a scale rating of 5 after three successive washing shows that the fabric samples collected from the study area had moderate mean fastness rating to washing of (2.25/5.0; 2.13/50; 2.13/5.0) compare to the result of the experiment on the studio dyed asso-oke fabric samples which shows very good to excellent wash fastness with a rating of above 4.5 on a scale of 5.0 and 5.0 on a rating of 5.0 respectively. The very good to excellent washing fastness of sample dyed in the studio was due to the strong bonds between the dye molecules and the fabric. The reason for this may not be unconnected with the fact that, studio dyed experiment by the participants and the technologist had adhered strictly to the process of dyeing especially the aspect of proper measurement of dyes to chemicals ratio and proper soaping of the fabrics after dyeing whereby unattached/ unanchored dye are removed which is usually absent with the dyers and weavers in the study areas as discovered during the field work of this study.

The result of light fastness shows that, the mean fastness rating of 2.5 to 3.9 obtained on a scale of 8 for the aso-oke fabrics samples collected from the study area to artificial and sunlight, can be considered as being poor to moderate as opposed to good to very good result obtained with mean fastness rating of 6.0 to 7.4 recorded on a dyed Aso-Oke fabric made in the studio.

The result of the fastness properties of the fabrics samples (specimen) made in the studio shows mean fastness ratings that can be considered as good to excellent fastness, 4.5 to 4.6 on a fastness of 5 as compared with the aso-oke fabric samples from the study studio that show mean fastness ratings which can be considered as been moderate 2.5 based on a scale of 5 for both change of shade and staining.

The result of the collaborative study experimentation tallies with the standard set by the Nigerian Industrial Standard for dyed textile fabrics. The capabilities of design professionals have expanded and design skills are widely applied to various process of this collaborative study. The issue of revitalizing indigenous industry requires design knowledge. A designer's capabilities can become more socially effective and can contribute to solving real challenges in today's society. Acting as catalysts of change, designers have the ability to help industrial craft industries by applying their knowledge to create new innovative business scenarios. Manzini (2009) argues that design schools and their students can be socially effective and can contribute towards problem-solving in real situations.

5. Revitalizing the Nigerian Indigenous Technologies: Policy Issues and Strategies for Action

There are reasonable arguments in favour of a position to upgrade and implementa new frontiers for the Indigenous Technologies. This can be achieved through the following:

(1) The role of government as the provider of the initial impetus in the deployment of Indigenous Technologies for national innovativeness and development cannot be substituted. While mechanisms may vary by country, it is important to note that government has to demonstrate sufficient commitment and will power for any meaningful achievement to occur by putting in place adequate mechanism in the form of policy and conducive environment to drive the development of these Indigenous Knowledge and Indigenous Technologies. In India, for instance, government created strong institutions to harness the power of Indigenous Knowledge and Indigenous Technologies while opening up new frontiers for their application. Tung (2012).

(2) Indigenous-Technologies practitioners were open to knowledge, particularly as is available in knowledge centres such as contemporary textile industries. As was demonstrated in China, achieving a convergence between state-of-the-art in modern scientific and technological knowledge and the traditional knowledge and practices will go a long way in enhancing the impact of Indigenous Technologies.

(3) The role of institutions such as Universities, Polytechnics and other research centres is critical. Strong research, development and brokerage institutions are required to move the Indigenous Technology sector forward on the learning curve, assist in the codification of knowledge and facilitate product development and standardisation. The role played by the National Innovation Foundation in India is of note in this regard. This is basically because they support grassroot innovation and move them to the next level by scouting and documentation of the Indigenous Technologies and innovations; conduct of value addition Research and Development (R&D); engagement in business development around the Indigenous Technologies; Intellectual property protection; dissemination and diffusion of innovations around the Indigenous Knowledge and Indigenous Technologies.

(4) Synergy should be created between industrial designers and indigenous artisan (Indigenous Technologies) groups to stimulate the development and preservation of a indigenous craft in a sustainable and commercially viable way. This could be achieved through collaboration between the artisans and the tertiary educational institutions and research institutes to unearth new opportunities for a indigenous craft.

6. Conclusion

In Nigeria, the dyeing and cottage weaving indigenous industries creates employment opportunities, promote effective resource utilization and thereby contributes to the process of industrialization and national development. These Indigenous Knowledge and Industrial Technologies presents particular opportunities for small and medium (SME) exploitation and development. They can be leveraged upon to provide comparative advantage for the country as is the case with India and China. This can be achieved through institutional and policy frameworks which include systematic documentation, involvement of research institutions in value addition R&D, provision of adequate funding mechanism for exploitation particularly in business development around the Indigenous Knowledge; Intellectual property protection, upgrading, and in particular engagement in collaboration with tertiary educational institutions and research institutes located around for dissemination and diffusion of innovations around the Indigenous Knowledge and Indigenous Technologies.

7. Recommendations

(1) There is the need for government, particularly at the grassroot, to acknowledge and support Indigenous Technology development. Several ways by which this could be done includes the facilitation of capacity development; creation of specialised markets which would serve as product outlets and possibly evolve to secure international interest Kälviäinen (2000); the recognition of outstanding individuals who has made the industry to grow; and the provision of venture funding.

(2) Institutions are identified as critical; thus the existing ones, especially research institutes, need to be funded and equipped to conduct value added Research and Development (R&D) for the development of the Indigenous Technologies. The activities of existing institutions like Nigerian Industrial Standards (NIS), International Standards Organization (ISO) and National Centre for Technology Management (NACETEM) are acknowledged; however, they need to broaden their horizon and focus on the development of the country's Indigenous Technologies.

(3) In the area of capacity building, existing tertiary institutions and research institutes located around Indigenous Knowledge and Indigenous Technology clusters could play the role of creating specific training programmes for the Indigenous Technology practitioners to facilitate knowledge transmission. The institutions could also assist in upgrading and formalising the current apprenticeship system of capacity building.

(4) Knowledge centres, especially tertiary educational institutions located around identified Indigenous Technology clusters have a significant role to play by exploring how designers in these institutions could collaborate with artisans to unearth new opportunities for a indigenous crafts/ technologies and how designers can make contributions to the artisan community

(5) Researchers from such institutions could be involved in mapping the Indigenous Knowledge system, and help in the codification of knowledge, standardizing procedures, improving processes and facilitating knowledge transfer. Students of such institutions,

particularly those undertaking related studies (and undergraduate or postgraduate research) could be made to work with Indigenous Knowledge and Indigenous Technology practitioners for stipulated periods. Besides the benefit of knowledge transfer, such arrangements would encourage practitioners to embrace formal knowledge and improve their skills levels.

REFERENCES

Acharya, D andShrivastava, A. (2008). "Indigenous Herbal Medicines: Tribal Formulations And Traditional Herbal Practices," Aavishkar Publishers and Distributor, Jaipur.

Adetuyi, A.O. (2005). A comparative study of the fastness properties of decorative African textiles – Kampalas and Ankaras to various servicing agents. Global journal of Pure and Applied Sciences. 12 (3), 351-354.

Adetola, A, Gouldin , J and Liyanage, C. (2011). "Collaborative Engagement Approaches for Delivering Sustainable Infrastructure Projects in the AEC Sector: A Review," International Journal of Construction Supply Chain Management, 1(1). 1-24.

Afuah, A. (2012). "Innovation Management," Oxford University Press, New York, 2003, 1-390.

Barker, T., & Hall, A. (2009).GoGlobal: How can contemporary design collaboration and e-commerce models grow the creative industries in developing countries? In *Proceedings of the 3rd IASDR Conference on Design Research* (pp. 2227-2236). Seoul, Korea: Korean Society of Design Science.

Chuenrudeemol, W., Boonlaor, N., &Kongkanan, A. (2012). Design process in retrieving the local wisdom and communal identity: A case study of Bangchaocha's bamboo basketry crafts. *Proceedings of the 6th International Conference of Design Research Society* Bangkok, Thailand: Chulalongkorn University.

Creative and Cultural Skills. (2009). *The craft blueprint*. Retrieved February 15, 2011, from http://www.ccskills.org.uk/LinkClick.aspx?fileticket=6cMoZSIdVOA=&tabid=81

Dodgson, M., Gann, D., & Salter, A. (2005).*Think, play, do: Technology, innovation, and organization*. Oxford, UK: Oxford University Press.

Dykes, T., Rodgers, P., & Smyth, M. (2009). Towards a new disciplinary framework for Contemporary design practice. *CoDesign*, *5*(2), 99-116.

Egbetokun, A.A and Siyanbola, W. O. (2008). "Linking Science, Technology and Innovation (STI) For Development,". http://www.africanexecutiv e.com/modules/magazine/artic les.php?article=3043

Essien, C.F. (2011). "Empowering Indigenous Industries for National Development," *Journal of Industrial Design*, 9 (1) 10-16.

Harris, J. (2012). Digital practice in material hands: How craft and computing practices are Advancing digital aesthetic and conceptual methods? *Craft Research*, *3*(1), 91-112.
Kälviäinen, M. (2000). The significance of 'Craft' qualities in creating experiential design products. *The Design Journal,3*(3), 4-15.

Manzini, E. (2009). New design knowledge. *Design Studies*, *30*(1), 4-12.

McIntyre, M. H. (2010). *Consuming craft: The contemporary craft market in a changing economy*. London, UK: Crafts Council.

Murray, K. (2010). Outsourcing the hand: An analysis of craft-design collaborations across the
global divide. *Craft + Design Enquiry*, *2*, 1-23.

Niedderer, K. (2009).*Sustainability of craft as a discipline?*In *Proceedings of the 1st Making Futures Conference* (pp. 165-174). Devon, UK: Plymouth College of Art.

Pannozzo, A. (2007). The (Ir)relevance of technology: Creating a culture of opportunity by design. *Design Management Review*, *18*(4), 18–24.

Polanyi, M. (1997).The Tacit Dimension.In L. Prusak (Ed.), *Knowledge in Organizations* (pp.
135-146). Newton, MA: Butterworth-Heinemann.

Ratnam, A. (2011).Traditional occupations in a modern world: Implications for career guidance
And livelihoodplanning. *International Journal for Educational and Vocational Guidance*, *11*(2), 95-109.

Sanders, E. B.-N., &Stappers, P. J. (2008).Co-creation and the new landscapes of design. *CoDesign*, *4*(1), 5-18

Tung, F. W. (2012). Weaving with rush: Exploring craft-design collaborations in revitalizing a
local craft. *International Journal of Design, 6*(3), 71-84.

UNESCO. (2005). *Designers meet artisans*. New Dheli, India: Craft Revival Trust.

UN Millennium Project (2005). "Innovation: Applying Knowledge in Development," Task Force
on Science, Technology and Innovation, Earthscan, Vancouver.

Warren, D. M, Slikkerveer, L. J. and Brokensha, D. (1995). "The Cultural Dimensions of Development: Indigenous Knowledge Systems," *Intermediate Technology Publications*,
London.

Willie O. S, Abiodun A. E, Isola, Ol, Olumuyiwa, O. Olamade, H. O. A , Mohammed, N. (2012). Indigenous Technologies and Innovation in Nigeria: Opportunities for SMEs. American Journal of Industrial and Business Management. 2, 64-75.

Woolley, M. (2011). Beyond control: Rethinking industry and craft dynamics. *Craft Research,*
2(1), 11-36.