ICT TOOLS AND INDIGENOUS KNOWLEDGE MANAGEMENT IN NIGERIA

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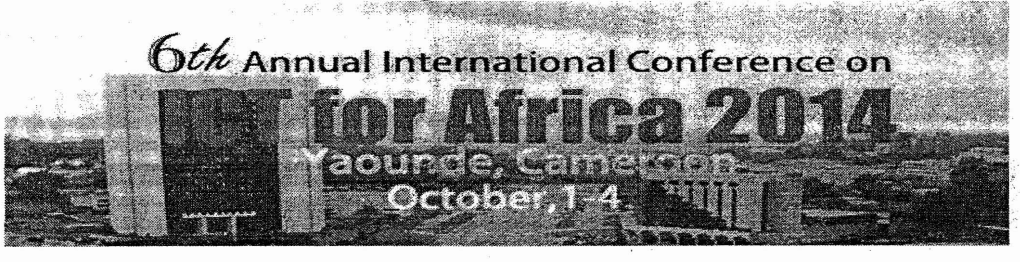

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ICT tools and Indigenous Knowledge Management in Nigeria

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Abstract. *This paper examined use of Information and Communication Technology in management of indigenous knowledge in archives, public libraries and museums in Nigeria. Four objectives and one hypothesis guided the study. The study is a descriptive survey. The population consists of eleven knowledge centres, one (1) archive, five (5) public libraries, and five (5) museums. The instrument for data collection was a questionnaire, it had four clusters. Content analyses, means and t-test were used in the analysis. Findings showed that historical event is the only indigenous knowledge system existing in the archive. Microfilms and DVD's are used in very high extent in archives and museums, while scanners are of high extent use in libraries. The study concluded that. ICT tools are of high extent use in Nigerian cultural institutions. It was recommended that archives and museums should replace microfilms with DVDs and CD-ROMs respectively, since microfilm technology is becoming outdated.*

Keywords: ICT, Indigenous knowledge, Software quality and South-East Nigeria,

INTRODUCTION

South-East Geo-political Zone is one of the six geo-political zones in Nigeria. Others are South South, South East, North East and North Central. The South East Geo-political zone is made up of five states- Abia, Anambra, Ebonyi Enugu and Imo States. South East Geo-political Zone, popularly known as Igboland is located between 6^0 and 8.5^0 East and 7.25^0 North Latitude (Nwala, 1985). Igboland has a rich tradition and culture that make up the peoples' indigenous knowledge system. Uwechue (1996) stated that archeological and linguistics evidence analysis of the region occupied by the Igbos showed that pioneering groups of early Iron Age people transferred the knowledge of iron-working from the Igbo regions into distant lands of the Congo basin. Gradually, indigenous knowledge (IK) is rapidly disappearing as its transfer from generation to generation is mostly done through oral tradition and demonstrations (Ngeobo & Obono, 2013). Indigenous knowledge is mainly preserved in the memories of elders whose knowledge disappears at death (LWoga, Ngulube & Stilwell, 2010 & Chikonzo, 2006). Recently, there is a reawakening among local communities worldwide to document and showcase

indigenous culture using ICT, with facts gathered from stories, songs, medicines and artworks that have been part of indigenous communities' lives from time immemorial. Moreover, the appreciation of the value of indigenous knowledge to governments and modern industries has helped to rekindle the interest of indigenous communities in indigenous heritage (Anyira, Onoriode & Nwabueze, 2010). Furthermore, local communities have realized that non-documentation of indigenous knowledge is a major hindrance to its preservation. This reawakening has forced many developing nations to devise means of preserving and managing their indigenous Knowledge which had hitherto been relegated to the back ground in favor of Western knowledge. In developing nations like India, Ethiopia, Ghana and Kenya, cultural institutions like public libraries, archives and museums have risen up to the responsibility. Thus, there are projects aimed at managing and disseminating IKS using ICT such as the honey bee Network in India, community mapping projects in Australia, Malaysia and Mozambique to mention a few. In African countries like Tanzania , Ghana, and Kenya, cultural institutions such as public libraries, archives and museums have risen up to the challenge Gbenda (n.d). These cultural institutions have developed projects for capturing, storing, protecting and projecting indigenous knowledge globally. Unfortunately, the efforts of Nigeria cultural institutions in managing indigenous knowledge through ICT equipment, to the best knowledge of the researchers have not been documented. It is this gap that this research sets out to bridge.

The objective of this work was to examine the use of ICT tools in managing indigenous knowledge systems in cultural institutions in South East Geo-political Zone of Nigeria. Specifically, the study sets out to identify, indigenous knowledge resources available in archives, museums and public libraries in South East Geo-political Zone of Nigeria; the extent of use of ICT in managing indigenous knowledge systems in archives, libraries and museums; the qualities of ICT software required by archives, museums and public libraries to manage IKS and challenges encountered by archives, public libraries and museums in using ICT equipment in managing indigenous knowledge. The study had one null hypothesis which states that there is no significant difference in the mean scores of the extent of ICT use in the management of IKS in libraries and archives.

Literature Review

Indigenous knowledge has been defined in various ways by various authors. Ntsoane (2002) defined indigenous knowledge as local knowledge that is unique to a given culture or society. The author went on to say that such knowledge is the basis for decision making on agriculture, health care, food preparation, education, environmental conservation and a host of other activities. The author further observed that indigenous knowledge is culture based and practised in ways that are effective, efficient and functional in those communities that hold them. Adam (2007) defined it as a profound, detailed and shared beliefs and rules with regard to the physical resources, social norms, health, ecosystems, culture, livelihood of the people who interact with environment both in rural and urban settings.

Indigenous knowledge has many forms. It includes cultural heritage in the form of traditional stories, songs, dances and ceremonies that reflect beliefs related to spirituality, family, land and social justice. It includes potentially patentable knowledge about traditional medicines, foods, farm practices, architecture and construction, handicrafts, artwork and folk music. It includes knowledge about people, places, plants, animals, historical events associated with a particular community (Hunter, 2006). Nwokoma (2012) posits that indigenous knowledge is different from knowledge generated from or within universities; while university based knowledge is

documented, indigenous knowledge is transferred orally from generation to generation and is seldom, if ever documented. Jain (2008) opined that indigenous knowledge falls under a group of knowledge called tacit knowledge. The author defined tacit knowledge as knowledge that is hard to put into words, expressed through action based skills and not rules based.

In today's world observed World Bank (1998) indigenous knowledge systems are at risk of becoming extinct because of rapidly changing natural environments and fast pacing economic, political and cultural changes on a global scale. The failures of technology transfer and many imported ideas on sustainable development, fear of extinction and lost of the benefits of IKS have forced governments and International bodies, to reconsider their stand on IK and devise ways of managing it (Aina, Mutula, & Tiamiyu,2008). ICT lends itself easily as a tool that can be used to manage IKS successfully. Akinde (2008) observed that with the aid of ICT, much of the invaluable traditional knowledge can be saved, documented, improved upon, digitized and transmitted for the use of communities within and outside a particular country. Adam (2007) listed the following as some of the ICT equipment that can be used in managing IKS. These include telecommunication technologies such as telephony, cable, satellites and radio as well as digital technologies such as computers, information networks and software. Hunter (2006) posits that because of the oral tradition of IK, audiovisual digital recording devices such as digital video cameras and audio recorders are primary tools for capturing stories, songs and dances. Scanners continued the author, can be used to digitize photographs, manuscripts, maps and historical documents. The author further observed that 3D scanners can be used to generate 3D digital surrogate of physical artifacts such as tools, shields, carvings, clothing and baskets in museums and cultural institutions. On Software for managing IKS, Adam (2007) stated that though there is no specific software designed for IKS, different software tools and platforms ranging from database management systems, geographic information systems to text, speech and character recognition tools, graphical touch screens, audio and video editing tools may be considered for the management and dissemination of indigenous knowledge. Hunter, Koopman and Sledge (2002) observed that many software used in managing IKS were developed on the premise of modern intellectual property law regimes and the notions of individual property ownership for a limited duration, which were alien and detrimental to indigenous cultures. The authors recommend that in designing software for the preservation of IKS, that effort should be made to accommodate customary laws and values which affect access. Hunter (2006) gave the following as qualities to be considered before developing or procuring software for the management of IKS. They are security: simple user interface, robustness, low cost, interoperability, portability, flexibility, adaptability and scalability. The author went on to say that the software should be capable of efficiently performing fine-grained search and retrieval across very large sets of resources.

Though the use of ICT in managing IKs looks appealing, it is not without problems. Hunter (2006) observed that managing IK with ICT creates ample opportunities for illicit access to and misuse of traditional knowledge. The author went on to say that ICT interferes with the rights of traditional owners to control the benefits and access to their resources. Adam (2007) enumerated some of the problems that inhibit use of ICT in managing IKS:

According to Adam (2007), not all aspects of living traditions of indigenous knowledge can be captured as 'artifacts' using digital technology and the collection of information from diverse indigenous sources is often laborious, time-consuming and costly. The author opined that those with knowledge may not be willing to share their actual knowledge. The author also believes that efforts to capture indigenous knowledge by ICTs and set up databases may not be as

successful as hoped due to inadequate frameworks for capturing and making the knowledge available in usable formats to the people who need them and who often do not have access to ICTs. The author includes intellectual property right as another serious challenge, particularly if indigenous knowledge leads to profit for transnational corporations as in the case of medicinal plants and therefore observes that documenting and publicizing IK could immediately lead to their appropriation by others without returns to innovators. The author then suggests that the intellectual property rights of the individuals and communities have to be protected and benefits have to be generated for the innovators as well as local communities.

Research Methodology

a. Research Design

The research design used in this study was descriptive survey design. This entails the systematic collection and presentation of data to give a clear picture of a particular situation Eboh, (1998). The area of the study is South East Geo-political Zone of Nigeria. The zone is made up of five states namely Abia, Anambra, Eboyi, Enugu and Imo States. There are one archive, five museums and five public libraries in the zone.

Population: The population of the study comprised all the eleven (11) indigenous knowledge centres in South East Geo-political Zone. They are archives, public libraries and museums.

Sampling: here was no sampling. Since the research involved small number, (eleven), the whole population was used (Eboh, 1998).

b. Research Methods

The Instrument for data collection was a questionnaire titled "ICT tools for IKS". The questionnaire was developed by the researchers through an extensive review of literature based on the objectives of the study. The questionnaire had 4 clusters. Cluster one was on availability of IKs. Clusters 2,3 and 4 were structured on four point scale of Strongly Agree (SA) 4, Agree (A) 3, Disagree (D) 3 and Strongly Disagree (SD) 1 and Very High Extent (VHE) 4, High Extent (HE) 3, Low Extent (LE) 3 and Very Low Extent (VLE) 1.. The instrument was validated by three lecturers in archives, libraries and museums management in two Federal Universities in the zone. Comments from these lecturers were incorporated in the questionnaire and returned for final vetting. The lecturers found the questionnaire highly valid. The questionnaire was also trial tested on Cross River State Central Library Board, Calabar and Calabar Museum. The trial test was computed by the Cronbach's alpha method of internal consistency and reliability. The reliability coefficient was 0.87 which showed that the instrument was highly reliable. The questionnaire was administered personally to the heads of indigenous knowledge centres (the respondents). All eleven copies of the questionnaire were properly filled and returned.

Analysis of Data: The units of analysis were the indigenous knowledge centres. For cluster one (1) which was based on availability of IKs, nominal level of measurement was used and the cluster was analyzed using content analyses. This involved sorting the responses, coding, tallying and converting to percentages. For clusters 2,3 and 4, ordinal level of measurement was applied and they were analyzed using descriptive statistics involving mean and t-test. Mean score of 2.50 and above were accepted while below 2.50 were rejected. Percentages of 50 and above were considered general opinions. One hypothesis was postulated for the study and was tested with t-

test @ 0.5 level of significance. T-test was conducted between two independent sample means of the extent of use of ICT tools in the management of indigenous knowledge resources in libraries and archives. Testing of hypothesis was based on the grand mean scores of Libraries and Museums only, as both of them had the same number of respondents.

Findings

Characteristics of Respondents

The returned copies of the questionnaire showed that the respondents possessed Masters Degrees and have worked in their various institutions for not less than 21 years.

Cluster 1. Table 1. Availability of Indigenous Knowledge Systems in Archives, Libraries and Museums.

s/n	Available Indigenous Knowledge System	Archives n=1			Libraries N=5			Museums N=5		
		A	NA	% avail.	A	NA	% avail.	A	NA	% avail.
a	Stories	-	1	0	4	1	80	3	2	60
b	Songs	-	1	0	3	2	60	3	2	60
c	Dances	-	1	0	3	3	60	3	2	60
d	Ceremonies	-	1	0	3	2	60	4	1	80
e	Medicinal plants	-	1	0	2	3	40	2	3	40
f	Artworks	-	1	0	2	3	40	5	-	100
g	Artifacts	-	1	0	-	5	0	5	-	100
h	Historical events	1	-	100	5	-	100	5	-	100
i	Land Mappings	-	1	0	2	2	40	3	2	60

Table 1 revealed that Historical events is the only indigenous knowledge material that is available in the archive in South East Geopolitical zone of Nigeria.100% of the libraries in the zone have historical events, 80% have stories while 60% have songs, dances and ceremonies.

100% of the Museums have historical events, artifacts and artworks, 80% have ceremonies and 60% have stories, songs dances and land mappings.

Cluster 2. Table 2 Extent of use of ICT Tools in Managing Indigenous Knowledge

s/n	Items	Archives n=1		Libraries n=5		Museums n=5	
		Mean	Remark	Mean	Remark	Mean	Remark
1	Video Cameras	1	Reject	2.80	Accept	2.80	Accept
2	Scanners	1	Reject	3.20	Accept	2.80	Accept
3	DVD's	1	Reject	2.60	Accept	4.00	Accept
4	CD-Rom's	3	Accept	2.80	Accept	2.20	Reject
5	Recorders	1	Reject	2.80	Accept	2.60	Accept
6	Internet	1	Reject	2.60	Accept	3.20	Accept
7	Microfilms	4	Accept	2.50	Accept	2.60	Accept
8	Computers	1	Reject	2.60	Accept	3.20	Accept
	Grand Mean			2.77		2.73	

Table 2 shows that microfilms and DVD's (with mean scores of 4.00) are used in a very high extent in the management of Indigenous knowledge in archives and museums respectively. Scanners are also of high extent use in libraries. All other listed items are of high extent use in libraries. The table also shows that DVD's, Internet and Computers (with mean scores of 4.00-3.20) are of very high extent use in museums. All the other listed tools are used in high extent in Museums except CD-ROM which mean rating is below 2.5.

Cluster 3. Table 3.Qualities of Software used in Managing Indigenous Knowledge

s/n	Qualities of software	Archives. N=1		Libraries. n=5		Museums=5	
		Mean	Remark	Mean	Remark	Mean	Remark
1	Simple user interface	3	Accept	4.00	Accept	3.20	Accept

2	Robustness	2	Reject	2.80	Accept	3.00	Accept
3	Interoperability	2	Reject	1.60	Reject	1.30	Reject
4	Portability	3	Accept	3.80	Accept	3.60	Accept
5	Flexibility	3	Accept	3.80	Accept	3.40	Accept
6	Adaptability	2	Reject	1.20	Reject	3.20	Accept
7	Scalability	1	Reject	1.40	Reject	2.40	Reject
8	Low Cost	3	Accept	3.60	Accept	3.20	Accept
				2.78		2.95	

Table 3 shows that Simple user interface, portability, flexibility and low cost are the qualities of software used in managing indigenous knowledge in archives. In libraries, simple user interface, robustness, portability, flexibility and low cost are qualities of software needed for managing indigenous knowledge in libraries while in museums, simple user interface, robustness, portability, flexibility, adaptability and low cost are the expected qualities of software needed for managing indigenous knowledge.

CLUSTER 4. Table 4. Challenges of Using ICT to Manage Indigenous Knowledge Resources

s/n	Items	Archive n=1		Libraries n=5		Museums n=5	
		Mean	Remark	Mean	Remark	Mean	Remark
1	ICT creates opportunities for illicit access to indigenous knowledge	4	Accept	1.60	Reject	3.40	Accept
2	It denies local communities the opportunity to control the use of their resources.	3	Accept	3.60	Accept	3.00	Accept
3	It robs local communities the enjoyment of the dividends of their	3	Accept	2.60	Accept	1.80	Reject

	invention						
4	Not all aspects of indigenous knowledge can be managed.	3	Accept	2.60	Accept	3.20	Accept
5	It is laborious to manage indigenous knowledge with ICT	3	Accept	3.60	Accept	2.40	Reject
6	It is time consuming to manage indigenous knowledge with ICT	2	Reject	2.40	Reject	2.40	Reject
7	IT is costly to manage indigenous knowledge with ICT	2	Reject	2.00	Reject	2.60	Accept
8	Those who have the indigenous knowledge may not be willing to make the knowledge public.	3	Accept	1.80	Reject	2.60	Accept
9	ICT creates problems of compensating indigenous communities.	3	Accept	3.20	Accept	3.40	Accept
	Grand Mean			2.61		2.80	

Table4 shows that in the archive, items 1, 2, 3, 4, 5, 8 and 9 are challenges encountered in using ICT to manage indigenous knowledge. Among libraries items 1, 6, 7 and 8 failed to meet the criterion mean of 2.5, they are therefore not among the challenges encountered in managing indigenous knowledge using ICT equipment. Table 4 also shows that items 3, 5and 6 failed to meet the criterion mean of 2.5 too, as such, they are not among the challenges encountered in using ICT to manage indigenous knowledge.

Test of hypothesis.
Difference between libraries and museums in the extent of use of ICT in managing IK.

Table 5. Summary table showing t-test result between two independent sample means of the extent of use of ICT tools in the management of indigenous knowledge in libraries and archives.

$\bar{X}_1$	$\bar{X}_2$	S^2_1	S^2_2	N	N	Df	P	t-cal	t-critical
2.77	2.73	1.147757	1.116143	5	5	8	<0.05	0.053169	2.306

Table 5 shows that t-test result is not significant since t-calculated is less than t-critical. So the null hypothesis which states that there is no significant difference in the mean scores of the extent of ICT use in the management of IKS in libraries and archives is accepted.

Summary of findings

The following information was gathered from the analysis of data used for the study.

1. Historical events are the only indigenous knowledge system existing in the only archive in South East geopolitical zone of Nigeria.
2. Historical events, stories, songs, dances and ceremonies are major IKS existing in libraries in South East geopolitical zone of Nigeria.
3. Historical events, Artifacts, Artwork, Ceremonies, Dances, Songs and Stories are major IKS existing in Museums.
4. Microfilms and DVD's are used in very high extent in the management of indigenous knowledge in archives and museums respectively. Scanners are also of high extent use in libraries.
5. The qualities of software's needed to manage IK in archives are simple user interface, portability, flexibility and low cost. The same qualities are expected of software's used in managing indigenous knowledge in libraries, in addition to the quality of robustness. The quality is applicable to museums too with the addition of the quality of adaptability.
6. The common challenges faced by archive, libraries and museums in managing indigenous knowledge using ICT are three folds, these include coping with the pressure from local communities who are denied the opportunity of controlling the use of their resources, managing aspects of indigenous knowledge that cannot be captured using ICT and ICT creates problems of meeting the insatiable demands of local communities for compensation.
7. There is no difference in the extent of ICT use in the management of indigenous knowledge systems in libraries and archives.
8. Managing IK using ICT is not time consuming but laborious

Discussion

Table 1 revealed that indigenous knowledge systems in South East geopolitical zone of Nigeria include songs, stories, ceremonies, artworks, artifacts, historical events and land mappings. This finding is consistent with Hunter (2006) classification of indigenous knowledge. The finding is also consistent with the observation of Uwechue in which it was posited that the people of South East geopolitical zone of Nigeria have rich knowledge systems which they export to other regions of the continent.

Of all the ways, enumerated by Greyling (2010) through which libraries can gain access to indigenous communities (table 2), only one method was employed by archive and public libraries in South East Nigeria while museums in the same zone exploited all the avenues. This might not be unconnected with the assertion of Ranganathan (2004) that the process to employ depends on the knowledge itself, the prevailing structures of knowing and available ICT facilities.

Table 3, revealed that public libraries make use of ICT's tools in a very high extent in managing IK compared to museums and archives. This may be as a result of the audience of each institution. The audience of public libraries are more of youths who enjoy interaction with ICT facilities and who are likely to volunteer for library work in order to have access to ICT facilities. Moreover, recently, Nigerian Government efforts to promote library use among school children by refurbishing and re-equipping existing libraries; and ensuring that libraries contain materials with local content might be a reason while libraries are more equipped with ICT tools than archives and museums. The table also revealed that ICT tools that are used for the management of IK in archive, libraries and museums include video camera's. scanners and DVDs.This is consistent with the findings of Hunter (2006) which listed video cameras and scanners as ICT tools that can be used in the management of indigenous knowledge.

The study revealed that there was not much difference in the quality of software needed to manage indigenous knowledge (Table 3). Though, all the respondents were of the opinion that the software for managing indigenous knowledge should be of low cost, low cost at times, is not a very good criteria for measuring a good quality. A product might be of low cost, yet not durable or even lack the ability to perform the require function. Hunter (2006) & Hunter, Koopman & Sledge (2002) suggested that indigenous knowledge information centers should have software of commendable qualities.

Responses from table 4 show numerous challenges affecting management of indigenous knowledge using ICT. This finding partly confirms and partly contradicts the findings of Adam (2007) . The study confirms the part of Adam (2007) study which states that it is not all aspect of indigenous knowledge that can be captured as artifacts using ICT and that those with knowledge may not like to share it. On the other hand, the study contradicts part of the authors work which stated that indigenous knowledge is often laborious, time consuming and costly to process.

Conclusion

A variety of indigenous knowledge systems exist in archives, libraries and museums in South East Geo-political Zone of Nigeria. A variety of ICT tools are also used in their management. These tools include video cameras, scanners, DVD's and recorders. Microfilms and DVD's are used in very high extent in the management of indigenous knowledge in archives and museums. Scanners are also of high extent use in libraries. The qualities of software needed to manage indigenous knowledge in the three institutions are simple user interface, portability, flexibility and low cost. In the course of managing IKS with ICT, institutions are confronted with challenges. These include the problem of managing the pressure from local communities who are denied the opportunity of controlling the use of their resources, managing aspects of indigenous knowledge that cannot be captured using ICT and problems of meeting the insatiable demands of local communities for compensation.

- **Implications to practice**. ICT tools are of high extent use in Nigerian cultural institutions and will continue to be if appropriate strategies are employed to address its challenges.

- **Implications to policy.** There is no government policy in Nigeria standardizing software and tools that can be used in managing indigenous knowledge systems. There is need for standardization in order to ensure versatility of use.

- **Future Research Directions**. There is need for further research on more suitable ICT software to host indigenous knowledge systems.

Recommendations

Government should come to the aid of archives libraries and museums by standardizing the qualities of the soft ware used for indigenous knowledge management so that one soft ware can serve any of the institutions.

Government as a matter of urgency should devise a viable method of compensating local communities for giving out their knowledge for public use.

Archive, library and museums should find another quality ICT tool to replace use of microfilms in documenting indigenous knowledge as the microfilm technology is fast becoming outdated.

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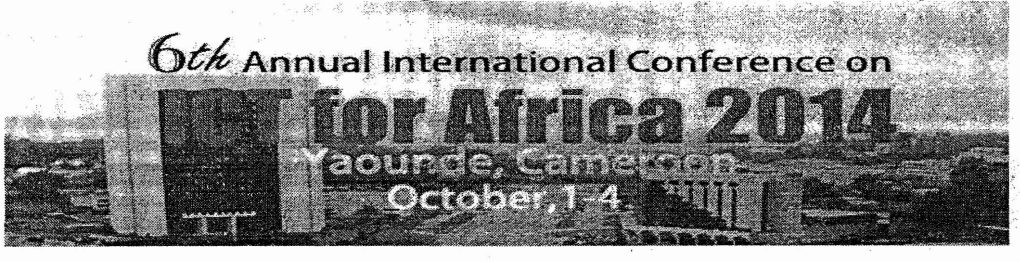

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Keywords: ICT, Indigenous knowledge, Software quality and South-East Nigeria,

INTRODUCTION

South-East Geo-political Zone is one of the six geo-political zones in Nigeria. Others are South South, South East, North East and North Central. The South East Geo-political zone is made up of five states- Abia, Anambra, Ebonyi Enugu and Imo States. South East Geo-political Zone, popularly known as Igboland is located between 6^0 and 8.5^0 East and 7.25^0 North Latitude (Nwala, 1985). Igboland has a rich tradition and culture that make up the peoples' indigenous knowledge system. Uwechue (1996) stated that archeological and linguistics evidence analysis of the region occupied by the Igbos showed that pioneering groups of early Iron Age people transferred the knowledge of iron-working from the Igbo regions into distant lands of the Congo basin. Gradually, indigenous knowledge (IK) is rapidly disappearing as its transfer from generation to generation is mostly done through oral tradition and demonstrations (Ngeobo & Obono, 2013). Indigenous knowledge is mainly preserved in the memories of elders whose knowledge disappears at death (LWoga, Ngulube & Stilwell, 2010 & Chikonzo, 2006). Recently, there is a reawakening among local communities worldwide to document and showcase

indigenous culture using ICT, with facts gathered from stories, songs, medicines and artworks that have been part of indigenous communities' lives from time immemorial. Moreover, the appreciation of the value of indigenous knowledge to governments and modern industries has helped to rekindle the interest of indigenous communities in indigenous heritage (Anyira, Onoriode & Nwabueze, 2010). Furthermore, local communities have realized that non-documentation of indigenous knowledge is a major hindrance to its preservation. This reawakening has forced many developing nations to devise means of preserving and managing their indigenous Knowledge which had hitherto been relegated to the back ground in favor of Western knowledge. In developing nations like India, Ethiopia, Ghana and Kenya, cultural institutions like public libraries, archives and museums have risen up to the responsibility. Thus, there are projects aimed at managing and disseminating IKS using ICT such as the honey bee Network in India, community mapping projects in Australia, Malaysia and Mozambique to mention a few. In African countries like Tanzania , Ghana, and Kenya, cultural institutions such as public libraries, archives and museums have risen up to the challenge Gbenda (n.d). These cultural institutions have developed projects for capturing, storing, protecting and projecting indigenous knowledge globally. Unfortunately, the efforts of Nigeria cultural institutions in managing indigenous knowledge through ICT equipment, to the best knowledge of the researchers have not been documented. It is this gap that this research sets out to bridge.

The objective of this work was to examine the use of ICT tools in managing indigenous knowledge systems in cultural institutions in South East Geo-political Zone of Nigeria. Specifically, the study sets out to identify, indigenous knowledge resources available in archives, museums and public libraries in South East Geo-political Zone of Nigeria; the extent of use of ICT in managing indigenous knowledge systems in archives, libraries and museums; the qualities of ICT software required by archives, museums and public libraries to manage IKS and challenges encountered by archives, public libraries and museums in using ICT equipment in managing indigenous knowledge. The study had one null hypothesis which states that there is no significant difference in the mean scores of the extent of ICT use in the management of IKS in libraries and archives.

Literature Review

Indigenous knowledge has been defined in various ways by various authors. Ntsoane (2002) defined indigenous knowledge as local knowledge that is unique to a given culture or society. The author went on to say that such knowledge is the basis for decision making on agriculture, health care, food preparation, education, environmental conservation and a host of other activities. The author further observed that indigenous knowledge is culture based and practised in ways that are effective, efficient and functional in those communities that hold them. Adam (2007) defined it as a profound, detailed and shared beliefs and rules with regard to the physical resources, social norms, health, ecosystems, culture, livelihood of the people who interact with environment both in rural and urban settings.

Indigenous knowledge has many forms. It includes cultural heritage in the form of traditional stories, songs, dances and ceremonies that reflect beliefs related to spirituality, family, land and social justice. It includes potentially patentable knowledge about traditional medicines, foods, farm practices, architecture and construction, handicrafts, artwork and folk music. It includes knowledge about people, places, plants, animals, historical events associated with a particular community (Hunter, 2006). Nwokoma (2012) posits that indigenous knowledge is different from knowledge generated from or within universities; while university based knowledge is

documented, indigenous knowledge is transferred orally from generation to generation and is seldom, if ever documented. Jain (2008) opined that indigenous knowledge falls under a group of knowledge called tacit knowledge. The author defined tacit knowledge as knowledge that is hard to put into words, expressed through action based skills and not rules based.

In today's world observed World Bank (1998) indigenous knowledge systems are at risk of becoming extinct because of rapidly changing natural environments and fast pacing economic, political and cultural changes on a global scale. The failures of technology transfer and many imported ideas on sustainable development, fear of extinction and lost of the benefits of IKS have forced governments and International bodies, to reconsider their stand on IK and devise ways of managing it (Aina, Mutula, & Tiamiyu,2008). ICT lends itself easily as a tool that can be used to manage IKS successfully. Akinde (2008) observed that with the aid of ICT, much of the invaluable traditional knowledge can be saved, documented, improved upon, digitized and transmitted for the use of communities within and outside a particular country. Adam (2007) listed the following as some of the ICT equipment that can be used in managing IKS. These include telecommunication technologies such as telephony, cable, satellites and radio as well as digital technologies such as computers, information networks and software. Hunter (2006) posits that because of the oral tradition of IK, audiovisual digital recording devices such as digital video cameras and audio recorders are primary tools for capturing stories, songs and dances. Scanners continued the author, can be used to digitize photographs, manuscripts, maps and historical documents. The author further observed that 3D scanners can be used to generate 3D digital surrogate of physical artifacts such as tools, shields, carvings, clothing and baskets in museums and cultural institutions. On Software for managing IKS, Adam (2007) stated that though there is no specific software designed for IKS, different software tools and platforms ranging from database management systems, geographic information systems to text, speech and character recognition tools, graphical touch screens, audio and video editing tools may be considered for the management and dissemination of indigenous knowledge. Hunter, Koopman and Sledge (2002) observed that many software used in managing IKS were developed on the premise of modern intellectual property law regimes and the notions of individual property ownership for a limited duration, which were alien and detrimental to indigenous cultures. The authors recommend that in designing software for the preservation of IKS, that effort should be made to accommodate customary laws and values which affect access. Hunter (2006) gave the following as qualities to be considered before developing or procuring software for the management of IKS. They are security: simple user interface, robustness, low cost, interoperability, portability, flexibility, adaptability and scalability. The author went on to say that the software should be capable of efficiently performing fine-grained search and retrieval across very large sets of resources.

Though the use of ICT in managing IKs looks appealing, it is not without problems. Hunter (2006) observed that managing IK with ICT creates ample opportunities for illicit access to and misuse of traditional knowledge. The author went on to say that ICT interferes with the rights of traditional owners to control the benefits and access to their resources. Adam (2007) enumerated some of the problems that inhibit use of ICT in managing IKS:

According to Adam (2007), not all aspects of living traditions of indigenous knowledge can be captured as 'artifacts' using digital technology and the collection of information from diverse indigenous sources is often laborious, time-consuming and costly. The author opined that those with knowledge may not be willing to share their actual knowledge. The author also believes that efforts to capture indigenous knowledge by ICTs and set up databases may not be as

successful as hoped due to inadequate frameworks for capturing and making the knowledge available in usable formats to the people who need them and who often do not have access to ICTs. The author includes intellectual property right as another serious challenge, particularly if indigenous knowledge leads to profit for transnational corporations as in the case of medicinal plants and therefore observes that documenting and publicizing IK could immediately lead to their appropriation by others without returns to innovators. The author then suggests that the intellectual property rights of the individuals and communities have to be protected and benefits have to be generated for the innovators as well as local communities.

Research Methodology

a. Research Design

The research design used in this study was descriptive survey design. This entails the systematic collection and presentation of data to give a clear picture of a particular situation Eboh, (1998). The area of the study is South East Geo-political Zone of Nigeria. The zone is made up of five states namely Abia, Anambra, Eboyi, Enugu and Imo States. There are one archive, five museums and five public libraries in the zone.

Population: The population of the study comprised all the eleven (11) indigenous knowledge centres in South East Geo-political Zone. They are archives, public libraries and museums.

Sampling: here was no sampling. Since the research involved small number, (eleven), the whole population was used (Eboh, 1998).

b. Research Methods

The Instrument for data collection was a questionnaire titled "ICT tools for IKS". The questionnaire was developed by the researchers through an extensive review of literature based on the objectives of the study. The questionnaire had 4 clusters. Cluster one was on availability of IKs. Clusters 2,3 and 4 were structured on four point scale of Strongly Agree (SA) 4, Agree (A) 3, Disagree (D) 3 and Strongly Disagree (SD) 1 and Very High Extent (VHE) 4, High Extent (HE) 3, Low Extent (LE) 3 and Very Low Extent (VLE) 1.. The instrument was validated by three lecturers in archives, libraries and museums management in two Federal Universities in the zone. Comments from these lecturers were incorporated in the questionnaire and returned for final vetting. The lecturers found the questionnaire highly valid. The questionnaire was also trial tested on Cross River State Central Library Board, Calabar and Calabar Museum. The trial test was computed by the Cronbach's alpha method of internal consistency and reliability. The reliability coefficient was 0.87 which showed that the instrument was highly reliable. The questionnaire was administered personally to the heads of indigenous knowledge centres (the respondents). All eleven copies of the questionnaire were properly filled and returned.

Analysis of Data: The units of analysis were the indigenous knowledge centres. For cluster one (1) which was based on availability of IKs, nominal level of measurement was used and the cluster was analyzed using content analyses. This involved sorting the responses, coding, tallying and converting to percentages. For clusters 2,3 and 4, ordinal level of measurement was applied and they were analyzed using descriptive statistics involving mean and t-test. Mean score of 2.50 and above were accepted while below 2.50 were rejected. Percentages of 50 and above were considered general opinions. One hypothesis was postulated for the study and was tested with t-

test @ 0.5 level of significance. T-test was conducted between two independent sample means of the extent of use of ICT tools in the management of indigenous knowledge resources in libraries and archives. Testing of hypothesis was based on the grand mean scores of Libraries and Museums only, as both of them had the same number of respondents.

Findings

Characteristics of Respondents

The returned copies of the questionnaire showed that the respondents possessed Masters Degrees and have worked in their various institutions for not less than 21 years.

Cluster 1. Table 1. Availability of Indigenous Knowledge Systems in Archives, Libraries and Museums.

s/n	Available Indigenous Knowledge System	Archives n=1			Libraries N=5			Museums N=5		
		A	NA	% avail.	A	NA	% avail.	A	NA	% avail.
a	Stories	-	1	0	4	1	80	3	2	60
b	Songs	-	1	0	3	2	60	3	2	60
c	Dances	-	1	0	3	3	60	3	2	60
d	Ceremonies	-	1	0	3	2	60	4	1	80
e	Medicinal plants	-	1	0	2	3	40	2	3	40
f	Artworks	-	1	0	2	3	40	5	-	100
g	Artifacts	-	1	0	-	5	0	5	-	100
h	Historical events	1	-	100	5	-	100	5	-	100
i	Land Mappings	-	1	0	2	2	40	3	2	60

Table 1 revealed that Historical events is the only indigenous knowledge material that is available in the archive in South East Geopolitical zone of Nigeria.100% of the libraries in the zone have historical events, 80% have stories while 60% have songs, dances and ceremonies.

100% of the Museums have historical events, artifacts and artworks, 80% have ceremonies and 60% have stories, songs dances and land mappings.

Cluster 2. Table 2 Extent of use of ICT Tools in Managing Indigenous Knowledge

s/n	Items	Archives n=1		Libraries n=5		Museums n=5	
		Mean	Remark	Mean	Remark	Mean	Remark
1	Video Cameras	1	Reject	2.80	Accept	2.80	Accept
2	Scanners	1	Reject	3.20	Accept	2.80	Accept
3	DVD's	1	Reject	2.60	Accept	4.00	Accept
4	CD-Rom's	3	Accept	2.80	Accept	2.20	Reject
5	Recorders	1	Reject	2.80	Accept	2.60	Accept
6	Internet	1	Reject	2.60	Accept	3.20	Accept
7	Microfilms	4	Accept	2.50	Accept	2.60	Accept
8	Computers	1	Reject	2.60	Accept	3.20	Accept
	Grand Mean			2.77		2.73	

Table 2 shows that microfilms and DVD's (with mean scores of 4.00) are used in a very high extent in the management of Indigenous knowledge in archives and museums respectively. Scanners are also of high extent use in libraries. All other listed items are of high extent use in libraries. The table also shows that DVD's, Internet and Computers (with mean scores of 4.00-3.20) are of very high extent use in museums. All the other listed tools are used in high extent in Museums except CD-ROM which mean rating is below 2.5.

Cluster 3. Table 3.Qualities of Software used in Managing Indigenous Knowledge

s/n	Qualities of software	Archives. N=1		Libraries. n=5		Museums=5	
		Mean	Remark	Mean	Remark	Mean	Remark
1	Simple user interface	3	Accept	4.00	Accept	3.20	Accept

2	Robustness	2	Reject	2.80	Accept	3.00	Accept
3	Interoperability	2	Reject	1.60	Reject	1.30	Reject
4	Portability	3	Accept	3.80	Accept	3.60	Accept
5	Flexibility	3	Accept	3.80	Accept	3.40	Accept
6	Adaptability	2	Reject	1.20	Reject	3.20	Accept
7	Scalability	1	Reject	1.40	Reject	2.40	Reject
8	Low Cost	3	Accept	3.60	Accept	3.20	Accept
				2.78		2.95	

Table 3 shows that Simple user interface, portability, flexibility and low cost are the qualities of software used in managing indigenous knowledge in archives. In libraries, simple user interface, robustness, portability, flexibility and low cost are qualities of software needed for managing indigenous knowledge in libraries while in museums, simple user interface, robustness, portability, flexibility, adaptability and low cost are the expected qualities of software needed for managing indigenous knowledge.

CLUSTER 4. Table 4. Challenges of Using ICT to Manage Indigenous Knowledge Resources

s/n	Items	Archive n=1		Libraries n=5		Museums n=5	
		Mean	Remark	Mean	Remark	Mean	Remark
1	ICT creates opportunities for illicit access to indigenous knowledge	4	Accept	1.60	Reject	3.40	Accept
2	It denies local communities the opportunity to control the use of their resources.	3	Accept	3.60	Accept	3.00	Accept
3	It robs local communities the enjoyment of the dividends of their	3	Accept	2.60	Accept	1.80	Reject

	invention						
4	Not all aspects of indigenous knowledge can be managed.	3	Accept	2.60	Accept	3.20	Accept
5	It is laborious to manage indigenous knowledge with ICT	3	Accept	3.60	Accept	2.40	Reject
6	It is time consuming to manage indigenous knowledge with ICT	2	Reject	2.40	Reject	2.40	Reject
7	IT is costly to manage indigenous knowledge with ICT	2	Reject	2.00	Reject	2.60	Accept
8	Those who have the indigenous knowledge may not be willing to make the knowledge public.	3	Accept	1.80	Reject	2.60	Accept
9	ICT creates problems of compensating indigenous communities.	3	Accept	3.20	Accept	3.40	Accept
	Grand Mean			2.61		2.80	

Table4 shows that in the archive, items 1, 2, 3, 4, 5, 8 and 9 are challenges encountered in using ICT to manage indigenous knowledge. Among libraries items 1, 6, 7 and 8 failed to meet the criterion mean of 2.5, they are therefore not among the challenges encountered in managing indigenous knowledge using ICT equipment. Table 4 also shows that items 3, 5and 6 failed to meet the criterion mean of 2.5 too, as such, they are not among the challenges encountered in using ICT to manage indigenous knowledge.

Test of hypothesis.
Difference between libraries and museums in the extent of use of ICT in managing IK.

Table 5. Summary table showing t-test result between two independent sample means of the extent of use of ICT tools in the management of indigenous knowledge in libraries and archives.

$\bar{X}_1$	$\bar{X}_2$	S^2_1	S^2_2	N	N	Df	P	t-cal	t-critical
2.77	2.73	1.147757	1.116143	5	5	8	<0.05	0.053169	2.306

Table 5 shows that t-test result is not significant since t-calculated is less than t-critical. So the null hypothesis which states that there is no significant difference in the mean scores of the extent of ICT use in the management of IKS in libraries and archives is accepted.

Summary of findings

The following information was gathered from the analysis of data used for the study.

1. Historical events are the only indigenous knowledge system existing in the only archive in South East geopolitical zone of Nigeria.
2. Historical events, stories, songs, dances and ceremonies are major IKS existing in libraries in South East geopolitical zone of Nigeria.
3. Historical events, Artifacts, Artwork, Ceremonies, Dances, Songs and Stories are major IKS existing in Museums.
4. Microfilms and DVD's are used in very high extent in the management of indigenous knowledge in archives and museums respectively. Scanners are also of high extent use in libraries.
5. The qualities of software's needed to manage IK in archives are simple user interface, portability, flexibility and low cost. The same qualities are expected of software's used in managing indigenous knowledge in libraries, in addition to the quality of robustness. The quality is applicable to museums too with the addition of the quality of adaptability.
6. The common challenges faced by archive, libraries and museums in managing indigenous knowledge using ICT are three folds, these include coping with the pressure from local communities who are denied the opportunity of controlling the use of their resources, managing aspects of indigenous knowledge that cannot be captured using ICT and ICT creates problems of meeting the insatiable demands of local communities for compensation.
7. There is no difference in the extent of ICT use in the management of indigenous knowledge systems in libraries and archives.
8. Managing IK using ICT is not time consuming but laborious

Discussion

Table 1 revealed that indigenous knowledge systems in South East geopolitical zone of Nigeria include songs, stories, ceremonies, artworks, artifacts, historical events and land mappings. This finding is consistent with Hunter (2006) classification of indigenous knowledge. The finding is also consistent with the observation of Uwechue in which it was posited that the people of South East geopolitical zone of Nigeria have rich knowledge systems which they export to other regions of the continent.

Of all the ways, enumerated by Greyling (2010) through which libraries can gain access to indigenous communities (table 2), only one method was employed by archive and public libraries in South East Nigeria while museums in the same zone exploited all the avenues. This might not be unconnected with the assertion of Ranganathan (2004) that the process to employ depends on the knowledge itself, the prevailing structures of knowing and available ICT facilities.

Table 3, revealed that public libraries make use of ICT's tools in a very high extent in managing IK compared to museums and archives. This may be as a result of the audience of each institution. The audience of public libraries are more of youths who enjoy interaction with ICT facilities and who are likely to volunteer for library work in order to have access to ICT facilities. Moreover, recently, Nigerian Government efforts to promote library use among school children by refurbishing and re-equipping existing libraries; and ensuring that libraries contain materials with local content might be a reason while libraries are more equipped with ICT tools than archives and museums. The table also revealed that ICT tools that are used for the management of IK in archive, libraries and museums include video camera's. scanners and DVDs.This is consistent with the findings of Hunter (2006) which listed video cameras and scanners as ICT tools that can be used in the management of indigenous knowledge.

The study revealed that there was not much difference in the quality of software needed to manage indigenous knowledge (Table 3). Though, all the respondents were of the opinion that the software for managing indigenous knowledge should be of low cost, low cost at times, is not a very good criteria for measuring a good quality. A product might be of low cost, yet not durable or even lack the ability to perform the require function. Hunter (2006) & Hunter, Koopman & Sledge (2002) suggested that indigenous knowledge information centers should have software of commendable qualities.

Responses from table 4 show numerous challenges affecting management of indigenous knowledge using ICT. This finding partly confirms and partly contradicts the findings of Adam (2007) . The study confirms the part of Adam (2007) study which states that it is not all aspect of indigenous knowledge that can be captured as artifacts using ICT and that those with knowledge may not like to share it. On the other hand, the study contradicts part of the authors work which stated that indigenous knowledge is often laborious, time consuming and costly to process.

Conclusion

A variety of indigenous knowledge systems exist in archives, libraries and museums in South East Geo-political Zone of Nigeria. A variety of ICT tools are also used in their management. These tools include video cameras, scanners, DVD's and recorders. Microfilms and DVD's are used in very high extent in the management of indigenous knowledge in archives and museums. Scanners are also of high extent use in libraries. The qualities of software needed to manage indigenous knowledge in the three institutions are simple user interface, portability, flexibility and low cost. In the course of managing IKS with ICT, institutions are confronted with challenges. These include the problem of managing the pressure from local communities who are denied the opportunity of controlling the use of their resources, managing aspects of indigenous knowledge that cannot be captured using ICT and problems of meeting the insatiable demands of local communities for compensation.

- **Implications to practice**. ICT tools are of high extent use in Nigerian cultural institutions and will continue to be if appropriate strategies are employed to address its challenges.

- **Implications to policy.** There is no government policy in Nigeria standardizing software and tools that can be used in managing indigenous knowledge systems. There is need for standardization in order to ensure versatility of use.

- **Future Research Directions**. There is need for further research on more suitable ICT software to host indigenous knowledge systems.

Recommendations

Government should come to the aid of archives libraries and museums by standardizing the qualities of the soft ware used for indigenous knowledge management so that one soft ware can serve any of the institutions.

Government as a matter of urgency should devise a viable method of compensating local communities for giving out their knowledge for public use.

Archive, library and museums should find another quality ICT tool to replace use of microfilms in documenting indigenous knowledge as the microfilm technology is fast becoming outdated.

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