Preservation of indigenous wood carving knowledge of African traditional people through the use traditional wood carvers database framework (Twcdf)

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Indigenous wood carving in Africa is a vital practice which provides answers to the origins and ancestry of many African people. The question of where we come from, transfer of cultural practices, historical artifacts and how to preserve the knowledge emanating from these, have become a cause of concern to many African people especially when indigenous wood carvers die or migrate from their communities of origin. This study investigated how knowledge from African Traditional wood carvers (ATWC) are transferred and preserved for future use in Africa. A case study approach was used. Participants were selected from 10 communities in Sub-Saharan Africa based on their historical background in Africa sculpture. Semi-structured, open ended interview questions were used to gather evidence from the participants regarding their methods of wood carving process and how knowledge is share with younger people and preserved. The interviews were recorded, transcribed and coded. The findings revealed that carved sculptures are kept by chiefs and important dignitaries in communities to express their history through events like fertility, birth, and death. The challenges indicated by the woodcarvers’ point to the perishability of wood carvings due toits vulnerability to decay, insect damage, and fire. The results further indicated that knowledge of African Traditional wood carvers (ATWC) need to be transferred and preserved for future use in Africa. Based on the findings, this paper offered a new Traditional wood Carvers Database Framework (TWCDF) to collate, protect and preserve all artistic knowledge on wood sculptures and skills which are transferred through apprenticeship.

Keywords: Indigenous wood, Carvers, Apprenticeship, Knowledge, Database management

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Many African societies often seek to provide answers to their origins (genesis) and ancestry through oral traditions, poetry, and sculptures. The idea of “genesis”, thus the origins of human beings have been made tangible through rich expressive traditions of oral history, poetry, and sculpture1. In Sub-Saharan Africa, sculptures are made and used to tell traditional history and to celebrate events of life, like fertility, birth, transition and death. Among the Yoruba in Nigeria, Ibeji twin-figurines (from ibi meaning “first born” and eji meaning “two”) are produced at the birth of twins, which is a common occurrence in this ethnic group. Among the Ashantes in Ghana, fertility figurines are carved and called “Akuaba doll” (akua meaning born on “Wednesday” and ba meaning “child”), which is worn by a young female in order to ensure her fertility. Ikenga figures found in Southern Africa, is believed to embody protective spirits for worldly success and to protect a house-hold. Ancestor figures are always carved to remind the people, of those who have passed on. Other carvings are used for initiation of rituals, relating to harvest festivals and celebrations of funeral occasions. Some of the sculptures found in Africa are usually made of clay, metal, ivory and most often wood. The wood carving has become the most commonly produced sculpture because of the forest vegetation in Sub-Sahara Africa which has strong trees suitable for calving. Therefore, this research paper will focus on wood carvings in Sub-Sahara Africa. Wood carving is a form of shaping a piece of wood by means of a cutting tool like knife or chisel. The cutting tool is applied with the help of a mallet, resulting in a wooden figure, or a sculptural ornamentation of a wooden object.

The making of sculpture from wood has been widely practiced in Africa but wooden sculptures do not survive long compared to other sculptures made from other materials such as stone and bronze. Wooden sculptures are vulnerable to decay, insect damage, and fire. However, wooden sculptures or carvings form an important hidden element in the art
history of many cultures and therefore, knowledge regarding the carving practices must be preserved. The application of knowledge and skills in wood curving rely exclusively on practical experiences, observations and skills which had been transferred from parents to younger generation through apprenticeship. Parents and grandparents who have knowledge in curving disseminate this knowledge through family lines and it continues from older family members to younger generation\(^2\). Such precious knowledge resides within individuals minds and can be classified as tacit knowledge. The problem is, this tacit knowledge on curving is lost when that individual becomes disabled, dies or leaves his country of origin. This affects the conservation of curving skills and deprives the African continent of its precious heritage. However, Information and Communication Technology has the potential of converting and preserving this knowledge for future use\(^4\). There cognition ICT in knowledge preservation is not an end unto itself but a means to an end. This, therefore, informs the objectives set for writing this paper.

**Objectives**

**The objective of the paper is two-fold**

Examined how contemporary knowledge of African Traditional wood culvers (ATWC) is transferred and preserved for future use in Africa, and based on the findings, proposes Traditional Wood Carvers Database Framework (TWCDF) to collate, protect and preserve all artistic knowledge of wood sculptures.

The remaining section of the paper will then examines related work, methods, and results, and ends with a discussion and a proposed ICT database framework.

**Theoretical framework and Literature study**

This research is informed by Cognitive Apprenticeship theory of which the philosophers, Collins, Brown and Newman are the chief proponent\(^6\). The theory postulates that apprenticeship highlights methods of carrying out different tasks in a specific domain. In this research, the domain under investigation is wood carving in Africa and how the skills of word carving is learned and transferred through apprenticeship. Apprentices learn skill and knowledge through a combination of what Lave calls observation, coaching, and practice, or what we, from the teacher's point of view, call modelling, coaching, and fading\(^5\). In this sequence of activities, the apprentice repeatedly observes the master executing (or modelling) the target process, which usually involves a number of different but interrelated sub skills. The apprentice then attempts to execute the process with guidance and help from the master (coaching). A key aspect of coaching is the provision of scaffolding, which is the support, in the form of reminders and help that the apprentice requires to approximate the execution of the entire composite of skills. Once the learner has a grasp of the target skill, the master reduces his participation (fades), providing only limited hints, refinements, and feedback to the learner, who practices by successively approximating smooth execution of the whole skill. Several points are worth emphasizing here. The interplay between observation, scaffolding, and practice aids the apprentice to develop self-monitoring and correction skills. Observation again plays surprisingly key role to make the apprentice learn better. Lave hypothesizes that it aids learners in developing a conceptual model of the target task or process prior to attempting to execute it. Having a conceptual model is an important factor in apprenticeship's success in learning complex skills without resorting to lengthy practice of isolated sub skills, for three related reasons. First, it provides the learners with an advanced organizer for their initial attempts to execute a complex skill, thus allowing them to concentrate more of their attention on execution than would otherwise be possible. Second, a conceptual model provides an interpretative structure for making sense of the feedback, hints, and corrections from the master during interactive coaching sessions. And third, it provides an internalized guide for the period of relatively independent practice by successive approximation. Moreover, development of a conceptual model, which can be continually updated through further observation and feedback, encourages autonomy in what we call reflection\(^6\). Reflection is the process that underlies the ability of learners to compare their own performance, at both micro and macro levels, to the performance of an expert. Such comparison said learners in diagnosing difficulties and incrementally adjusting their performance until they reach competence. A conceptual model serves as an internal model of expert performance, and, thus, as a basis for development of self-monitoring and correction skills.

A second key observation about apprenticeship in general concerns the embedding social context in
which learning takes place. Apprenticeship derives many (cognitively important) characteristics from its embedding in a subculture in which most, if not all, members are visible participants in the target skills. As a result, learners have continual access to models of expertise-in-use against which to refine their understanding of complex skills. Moreover, it is not uncommon for apprentices to have access to several masters, thus, to a variety of models of expertise. Such richness and variety helps the apprentices to understand that there-may be multiple ways of carrying out a task and to recognize that no one individual embodies all knowledge or expertise. The transferring of knowledge and skills in wood sculpture in early times in Africa was through apprenticeship. However, as globalization and migration of people from one place to the other has become the other of our contemporary world, both the master and apprentice travel or leave the vicinity where such knowledge has been acquired creating a loss of indigenous knowledge to the community.

**History of Sub-Sahara Africa sculpture**

West Africa terracotta sculptures and carvings date back to the 20th century BC and 2nd century AD. Terracotta which is a reddish clay soil was the medium which sculptures were made in Africa. Even though terracotta was used for sculptures, most African sculpture was historically in wood and other organic materials. As sculptures in African society had a practical purpose, they were made for occasions only, i.e., on commission from a patron. Most sculptures in Africa have a limited life span due to the climate (humidity, dampness, heat) and insect attack (woodworms, termites). This, therefore, made carvings to be replaced frequently. Even though carvers need to replace destroyed wooden sculpture, these carvers are not passive copyist of destroyed works. In fact, the carver represents and links his generation with the past. In other words, each carver has its particular reason for being among the people that supported it. Each culture developed its own sculptural style, which thus had a limited geographical distribution. Hence, in terms of style, most Africans would have known little of what was produced at any distance from their home areas. African patrons of sculptures make no evaluation of quality. To them all carvings associated with their culture are good and beautiful because they are accepted and consecrated in the codes of their cultures. A carver is expected to produce a sculpture in the style, size, color and material expected of him by his clientele. Skills rather than creativity were recognizable and acceptable in a community. Talent in a carver was recognized but if a piece was well carved it was associated with high status. Such carvers ended up working exclusively for Royal households, chiefs and the privileged in that kingdom. Below are some few Kingdoms whose artistic works have been recognized.

Apart from sculptures made in West Africa, Nubian Kingdom of Kush in modern Sudan also produced monumental sculptures which were mostly derived from the styles of North Africa. In West Africa, the earliest known sculptures were from the Nook culture which thrived between 500 BC and 500 AD in modern Nigeria, with clay figures which had elongated bodies and angular shapes. Later West African cultures developed bronze casting for reliefs to decorate palaces like the famous Benin Bronzes, and very fine naturalistic royal heads from around the Yoruba town of Ife in terracotta and metal from the 12th–14th centuries. Akan gold weights are a form of small metal sculptures produced over the period 1400–1900, some apparently representing proverbs and so with a narrative element rare in African sculpture, and royal regalia included impressive gold sculptured elements. Many West African figures are used in religious rituals and are often coated with materials placed on them for ceremonial offerings. The Mande-speaking peoples of the same region make pieces of wood with broad, flat surfaces and arms and legs are shaped like cylinders. In Central Africa, however, the main distinguishing characteristics include heart-shaped faces that are curved inward and display patterns of circles and dots. On the other hand, Eastern Africans are not known for their sculpture, but one style from the region is pole sculptures, carved in human shapes and decorated with geometric forms, while the tops are carved with figures of animals, people, and various objects. These poles are, then, placed next to graves and are associated with death and the ancestral world. The culture known from Great Zimbabwe left more impressive buildings than sculpture but the eight soapstone Zimbabwe Birds appear to have had a special significance and were mounted on monoliths. Modern Zimbabwean sculptors in soapstone have achieved considerable international success. Southern Africa’s oldest known clay figures date from 400 -
600 AD and have cylindrical heads with a mixture of human and animal features. Unfortunately many of these extremely highly developed African traditional sculptures become extinct because they are bought and transported to European countries. Again most sculptures in Africa have a limited life span due to the climate (humidity, dampness, heat) and insect attack (woodworms, termites) and these accelerate the extinction periods. African carvings, therefore, had to be replaced frequently by people who have the skills and knowledge.

Knowledge management of sculptures through ICT

The preservation of this knowledge can be ensured through the application of information and communication technology (ICT). Early research suggests that a successful knowledge management effort needs to convert internalized tacit knowledge (knowledge embodied in individuals) into explicit knowledge (embedded in organizations) in order for this knowledge to be shared. However, at the same time this process should also permit individuals to internalize and make any codified knowledge retrieved from the knowledge management effort personally meaningful\(^\text{10}\). As a result of further research into knowledge management, an SECI (socialization, externalization, combination, internalization) model is proposed\(^\text{11}\). This model considers a spiralling knowledge process interaction between explicit knowledge and tacit knowledge. In this model, knowledge follows a cycle in which implicit knowledge is “extracted” to become explicit knowledge, and explicit knowledge is then “re-internalized” into implicit knowledge. An active strategy for creating and managing explicit knowledge occurs when individuals strive to explicitly encode their knowledge into a shared knowledge repository, such as a database, as well as retrieving knowledge they need that other individuals have contributed to the repository\(^\text{3}\). Another strategy for knowledge management involves individuals making knowledge requests from experts associated with a particular subject on an adhoc basis. In such an instance, expert individuals can provide their insights to the particular person or people\(^\text{12}\). This is also commonly known as the personalization approach to knowledge management. This strategy is used in many African countries where people with expert knowledge in African traditional medicine transfer their skills in this way. However, when these individuals die or leave the country this precious knowledge is unfortunately lost forever.

Methods

The research study was conducted in four rural communities in Sub-Saharan Africa. The communities selected were Dunkwa in Ghana; Ilé-Ífẹ in Nigeria; Chililabombwe in Zambia and Kwekwe in Zimbabwean the continent of Africa. These communities were selected because of their historical background in Africa sculpture\(^\text{9}\). Secondly they are traditional communities which are still governed by traditional chiefs and which are strongly rooted in traditional practices especially calving of sculptures for living. And finally they are geographically located on the African continent at different regions (West, central, East and Southern Africa) to represent Africa. Given the nature of the study, a case study approach provided the most effective method for data collection. The term case study pertains to the fact that a limited number of units of analyses are studied intensively. Welman, Kruger and Mitchell confirm that in a case study we are directed towards understanding the uniqueness and the idiosyncrasy of a particular case in all its complexity\(^\text{13}\). In this study the group studied was highly representative or typical of a particular population; in this case some of the wood carvers in the selected communities in Africa. Two participants were selected from each community based on their profession as wood carvers. A total of eight participants constituted the entire population of this study. According to Polite and Beck, a population is an aggregate of cases having a common and designated criterion that is accessible as subjects for a study\(^\text{14}\). A purposive sampling technique was used in selecting the participants. All eight participants (N=8) voluntarily agreed to take part in the study. Table 1 indicates the number of participants according to their country, community, gender and age.

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of participants selected from communities</th>
<th>Average Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghana</td>
<td>Dunkwa</td>
<td>+58</td>
</tr>
<tr>
<td>Nigeria</td>
<td>Ilé-Ífẹ</td>
<td>+50</td>
</tr>
<tr>
<td>Zambia</td>
<td>Chililabombwe</td>
<td>+51</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>Kwekwe</td>
<td>+56</td>
</tr>
<tr>
<td>Total</td>
<td>N=8</td>
<td></td>
</tr>
</tbody>
</table>

Table 1—No of participants according to their country
Data was collected using semi-structured, open-ended interviews. This data collection method was used because a structured interview does not allow any flexibility to explore interesting issues that arise, and an unstructured interview does not provide enough focus; and therefore, a semi-structured interview was used. The interviewees represented different types of ethnic group. The interviewees were asked to tell in their own words:

1. The work process during carving and the tools involved.
2. How he/she acquired the skills as a wood carver?
3. How they share their knowledge with colleges and younger people?
4. Integrity of data entry from the study was checked by another researcher. Transcripts were coded using Wolcott method of case study analysis techniques\textsuperscript{15}. After the initial coding, broad categories were identified by searching for patterns in the participants’ responses.

Results and discussion

The analysis of the interview was done through content analysis which identified common themes, issues and words that recurred in the interviews. The transcripts of the interviews were analyzed to determine the overall picture of the cases as well as integrating the meanings of issues in typical experience. Some few responses from individual members were translated verbatim to capture their experiences and feelings. In presenting the results, the researcher categorized the findings into three: Work process and techniques of wood carving; Acquisition of traditional carving skills and, knowledge conversion and preservation in wood carving.

Work process and techniques of wood carving

When the respondents were asked to tell in their own words the work process and techniques of wood carving, the responses were as follows: “A wood carver begins a new carving by selecting a chunk of wood the approximate size and shape of the figure he or she wishes to create”. If the carving is too large, several pieces of wood are joined together to create the required size. One respondent said “we use latex from tree to join pieces of wood before we carve and the type of wood is important. They further indicated that hardwoods are more difficult to shape but have greater luster and longevity. However, softer woods may be easier to carve but are more prone to damage and insects attack. This is supported by Roese who indicate’ s that most sculptures in Africa have a limited life span due to the climate (humidity, dampness, heat) and insect attack (woodworms, termites) and because of this, carvings had to be replaced frequently\textsuperscript{16}. Any wood can be carved but they all have different qualities and characteristics. The choice will depend on the requirements of carving being done: for example a detailed figure would need a wood with a fine grain.

Once the traditional carver has selected their wood, he begins a general shaping process using gouges of various sizes. The gouge is a curved blade that can remove large portions of wood smoothly. For harder woods, traditional carver uses gouges sharpened with stronger bevels, about 35 °C, and a mallet similar to a stone. Smaller sculptures may require the wood carver to use a knife, and larger pieces might require the use of a saw. No matter what wood is selected or tool used, the wood carver always carve either across or with the grain of the wood, never against the grain.

Once the general shape is made, the carver may use a variety of tools for creating details. For example, a “venire” can be used to make deep gouges into the surface, or a “v-tool” for making fine lines or decorative cuts. Once the finer details have been added, the wood carver finishes the surface. The method chosen depends on the required quality of surface finish. The texture left by shallow gouges gives 'life' to the carving's surface and many carvers prefer this finish. If a completely smooth surface is required general smoothing can be done with tools such as “rasps,” which are flat-bladed tools with a surface of pointed teeth. After the carving and finishing is completed, the artist may seal & colour the wood with a variety of natural oils, such as walnut or linseed oil which protects the wood from dirt and moisture. Oil also imparts sheen to the wood which, by reflecting light, helps the observer 'read' the form. Carvers seldom use gloss varnish as it creates too shiny a surface, which reflects so much light it can confuse the form.

Acquisition of traditional carving skills

The interviewed wood carvers indicated that they acquired their skills informally from old relatives or through training by another carver. This knowledge and skills are passed down informally from a close family member such as a father, uncle, a mother or aunt\textsuperscript{7}. Others stated that they learned the trade through personal experience while be at home with
elderly parents. This is a conversion of tacit knowledge to tacit knowledge as indicated by Nonaka & von Krogh\(^{11}\). Others added that their traditional carving skills came as a result of "spiritual calling" and, therefore, their carving knowledge is through the supernatural. Apprenticeship was mentioned by one interviewee. Apprenticeship to an established carver, who formally teaches the trade over a long period of time and is paid for their tutoring, is another route to becoming a carver. One of the interviewee indicated “training under another carver is complex and it depends on o the kind of carving practices that the aspiring carver wants to be a part of, e.g. wood carver, metal sculpture or clay sculpture”.

Knowledge acquisition to become a wood carver is through person to person. Ashok, termed it as tacit to tacit knowledge transfer\(^3\). Snowden reiterates that this strategy to Knowledge management involves individuals making knowledge requests from experts associated with a particular subject on an adhoc basis. In such an instance, expert individual(s) can provide their insights to the particular person or people\(^{12}\). This is also commonly known as the Personalization approach to Knowledge management\(^{12}\). The problem with this form of knowledge management emanates when the expert individual passes away or migrates to another country or become incapacitated.

Knowledge exhibited by expert carvers, therefore, needs to be transformed from tacit knowledge to explicit knowledge. This will provide systematic collection of ideas, and orderly extraction of carving ideas from generation to generation. Ashok, stress that an active strategy for creating and managing explicit knowledge can be established for every society where individual carvers can be encouraged to explicitly encode their knowledge into a shared knowledge repository, such as a database\(^3\). This will assist other new carvers as well as older one to retrieve knowledge needed to keep the trade alive. Not only has this but the created repository will safeguard indigenous knowledge aid collaboration between carvers and improve carving practiced of the carvers.

**The need for Traditional Wood Carvers Database Framework (TWCDF)**

From the findings it became evident that knowledge of carvers regarding their skill is disseminated from individual to individual. The transfer of this knowledge according to Ashok is a conversion of tacit knowledge to another tacit knowledge. Therefore, knowledge gab is created when an ATWC dies or leaves his country of origin. Therefore, a traditional wood carvers database framework (TWCDF) indicated below is of paramount importance to systematically collect data on ATWC skills, types of wood required for carving and indigenous tools use by them. Again the data base will assist the country in scientific validation of all claimed sculptures of ATWC (Fig. 1).

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![ Traditional wood Carvers Database Framework](image-url)
This framework discusses techniques for knowledge management with an application for database interoperability. This section includes: a framework for managing knowledge in a distributed, heterogeneous, autonomous environment for Africa wood carver.

The schemas of component database systems are transformed into data model and exported to the Integration/Knowledge Reconciliation site for the creation of federated schemas and views for querying the schema transformation phase resolves conflicts caused by the different data models of component databases labeled database 1, 2 and n. Also, a data model provides a uniform query facility for each component site. This allows for less complex query processing techniques at the Integration/Knowledge Reconciliation site. At the Integration/Knowledge Reconciliation site, users are presented with integrated views/schemas for accessing multiple data sources in a uniform data model and query language. The resolution of conflicts at component and integration sites requires acquiring and managing knowledge and meta-data. At the component site, schemas and relevant meta-data are imported and transformed into the canonical data model for local use.

These meta-data and schema mapping information are stored in the Knowledge Base. The Integration/Knowledge Reconciliation Engine component interacts with the DBA for advanced knowledge acquisition and conflict resolution processing. The transformed schemas including the relevant meta-data are exported to the Integration/Knowledge Reconciliation site. Query decomposition component translates queries posed on the transformed schema of the data model into semantically equivalent queries of the component database schema.

Conclusion

Having reviewed the concept of African traditional wood carving in rural towns in Africa, unpacked the history of wood carving, investigated the work process and knowledge sharing among wood carvers, it was revealed that wood carvers start their work by selecting hardwood from Africa forest. They then begin a general process by shaping the wood using gouges and chisels’. These carved sculptures are then kept by chiefs and important dignitaries in communities to express their history through events like fertility, birth, and death. The challenges indicated by the woodcarvers’ point to the perishability of wood carvings due to vulnerability to decay, insect damage, and fire.

These challenges lead to the question of “how does knowledge from African Traditional Wood carvers (ATWC) transferred and preserved for future use in Africa if these valuable wood carvings perish?” Furthermore, the interviewees were asked to indicate how they acquire their wood carving knowledge and skills. The respondents indicated that they acquired their skills through apprenticeship from old relatives or friend. However, migration and death of these carvers had become a problem where such knowledge is loss from the community. These challenges do not only affect the individual wood carvers but also hinder the preservation of African culture and the history of the communities. Based on the findings, this paper offered a new Traditional Wood Carvers Database Framework (TWCDF) to collate, protect and preserve all artistic knowledge on wood sculptures and skills which are transferred through apprenticeship.

References

11. Nonaka I & von Krogh G, "Tacit Knowledge and Knowledge Conversion: Controversy and Advancement in


16 Roese H, African Wood Carvings, the sculptural art of West Africa. 2011, URL: http://web.onetel.net.uk/~herbertroese/index.html with addenda [Accessed 12/05/2015]