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Lessons from 'archaeotecture': Analysing variations in vernacular architecture using methods from archaeology

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Abstract

With the architecture of prehistoric sites and ancient civilizations constantly requiring new methodologies and forms of analysis, a new field of research the Archaeology of Architecture or 'Archaeotecture' has been designed to merge theory and method for that purpose. It combines aspects of ethnography, anthropology, archaeology and architecture to understand the material context of human social relations, culture and production as seen via architecture through time. Similarities have been drawn between prehistoric architecture and contemporary vernacular architecture of hunter-gatherer societies. This paper takes advantage of these similarities by employing methods used in 'archaeotecture' to ascertain cross-spatial and cross-temporal variations in the vernacular architecture of Ijo migrant fishermen in Nigeria. The Principal Co-ordinate Analysis which is a quantitative technique adopted from archaeology was applied in the analysis of architectural data to ascertain variations in vernacular built forms. The results indicated the existence of variations as well as the cultural transmission mechanisms that may have influenced these variations. The paper concludes by discussing and recommending the use of interdisciplinary cross-pollination of methods in examining variations in both vernacular and contemporary architectural studies.

Keywords
Variations, Archaeotecture, Vernacular architecture, Archaeology, Cultural transmission.

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1. Introduction

Variation involves a level of change, shift or deviation from a pre-established norm or standard. It comes about where alterations, additions or subtractions have been made to an existing model or standard over time. Variations in architecture may entail making slight and sometimes unnoticeable changes to building designs or materials used, or could involve a complete change of architecture with little or no notable semblance to the previous dwelling type (Steadman, 2004; Wills, 2001; Byrd, 2000; Saidel, 1993; Gilman, 1987; Flannery, 1972). This paper examines architectural variations across space and over time in the dwelling types of Ijo migrant fishermen in Nigeria. Ijo fishermen are aquatic hunter-gatherers who are known to migrate seasonally mainly following fish movement. Over time, daughter colonies of Ijo migrant fishing settlements have been formed in other countries along the West African coastline other than their ancestral homeland in Bayelsa State, Nigeria as a result of transnational migration.

The study from which this paper is derived examined variations in the base camp designs of Ijo migrant fishermen in Bayelsa State, Nigeria and the Bakassi Peninsula, Cameroon. Statistical data and analyses from that study has been obtained and used in this paper as well. Migrant fishermen have been categorized as aquatic hunter-gatherers based on their nomadic lifestyle and reliance on aquatic resources (Brisibe 2011). Because of similarities in the material analogues, structure and activities of prehistoric and hunter-gatherer societies as discussed in the middle-range theory, some scholars propose that human societies could be studied in the present to discern material analogues with which to understand societies in the past and vice versa (Buchli 2013, Binford 1978). Smith and Schreiber (2005) also emphasized the importance of "Ethnoarchaeology" in the study of artefacts and culture of current societies to make comparisons or parallels with past ones. Jarzombek (2013) in his comprehensive work on the architecture of first societies looks at how indigenous societies build today in order to help inform the past.

This paper also considers that "Archeotecture" as stated earlier, combines aspects of ethnography, anthropology, archaeology and architecture to understand the material context of human social relations, culture, production and spatial organisation through architecture, over time. Over the years quantitative techniques have been developed in archaeology to analyse cross-cultural and cross-temporal variations in material culture between prehistoric sites. As such, borrowing a methodology from archaeology to ascertain architectural variations in the vernacular built form of migrant fishermen is worth exploring.

2. "Archaeotecture" -The archaeology of architecture

Buchli (2013) states that "with the rise of heritage as a national resource and means of establishing social and cultural inclusion, archaeologists whose primary analytical context is architectural, find themselves actively producing the object of such claims for heritage through their constitution of archaeological records and in particular the architectural objects of that record: buildings have had to move from being just dwellings to functional and ritual objects of heritage" (pg 61).

As such, with the study of architecture being seen as an integral part of the field of archaeology, particularly settlement archaeology, Ayan Vila et al (2003) proposed an inter-disciplinary and multi-dimensional approach that views architecture as an active, living entity. They termed this study of architecture in archaeology as "archaeotecture". Archaeology is traditionally concerned with the remains of all forms of material culture but archaeotecture focuses on the 'monumental' and 'material' remains of built forms. It seeks to decipher what prehistoric built forms and settlements looked like using monumental and material remains.

Investigating domestic architecture from an 'archaeotectural' perspective involves an integration of methods and theories from several disciplines. In fields such as art history and history, the study of artefacts focuses on identification and systemization of features

and their variations which is change through time. Drenan (2010) suggests that studying a house as with any other artefact requires description and classification so as to understand typology, patterns and sequence. Steadman (1996) observes that architecture in archaeology is in itself inspiring new methodologies with which to study built forms.

3. Reviewing methodologies in assessing architectural variations in archaeology

The concept of variation suggests that a model had existed before a change was made. This has led to studies on how standardization can be assessed and differentiated from variations in most material cultures including architecture. Cutting (2006) identified continuity and standardization of dwellings as one of six approaches to the study of prehistoric built space. He emphasized that architectural continuity and standardization was used to identify aspects of socio-economic change over time, and standardization could be measured by studying repetitive design patterns within sites (Cutting, 2006).

Other researchers who looked at variations in vernacular architecture over time and the methods they used include; (Cochrane, 2002) who sought to separate chronological (time) variation from spatial (place) variation in surface architecture. He used Social Settlement Analysis (SSA) which assumes that artefact similarities are mainly a product of cultural transmission of information within a population. Data was analysed using seriation technique that is, the presence or absence of a combination of variables which generate classes of the building type. The spatial distribution of the building types should then represent the spatial structure of transmission according to shared ideas of building type design among groups.

Dawson (2001) used the principal components analysis (PCA) method in studying variability or variations in Thule Inuit architecture. Romanou (2007) employed space syntax as a way of studying spatial distribution patterns. She compared spaces in terms of their integration values and architectural attributes to ascertain the functions they were used for. These functions were then compared between and within dwellings of different phases to observe similarities or differences which are indicative of change or variation over time.

Bailey (1990) used a more qualitative approach by examining architectural continuity or change over time using the layering technique. This method involved placing plans for one horizon or phase over those of another phase and recording similarities based on wall alignments. If more than 75% of the walls in the preceding house aligned with those of the succeeding house, then the succeeding house was termed a repeated house (continuity). If on the other hand there was less than 75% of matching walls in the succeeding house, the house was termed unrepeated (variation). Pfalzner (1996) also employed this method to ascertain social and household organisation on the basis of change in internal building configuration in the prehistoric site of Tell Bederi, North-East Syria. Continuity was also observed over four phases at sites in Qermez Dere in northern Iraq, by layering or super-imposition (Watkins, 1996). Rollefson (1997) examined architectural records of four different Neolithic phases in the same region spanning over 2500 years. Showing how people divided the space around and between them following rules that changed to cope with evolving social and livelihood conditions (Rollefson, 1997).

4. What constitutes vernacular architecture?

Although the use of the term 'vernacular' has been popularly subscribed to by most scholars, there is no commonly accepted definition. Oliver (2006) suggests that the term has as many meanings as the cultures and languages that there are. Aysan (1988) is of the opinion that "the definition of vernacular is infinitely variable" (1988:X). Taking several factors into consideration Oliver (1997) defines vernacular architecture as architecture that,

> Comprises the dwellings and all other buildings of the people, related to their environmental contexts and available resources, they are customary or community built, utilizing traditional technology. All forms of vernacular architecture are built to meet specific needs, accommodating the values, economies and ways of living of the cultures that produce them (1997:1)

In a study on vernacular architecture compiled two decades ago, vernacular architecture was viewed as a product, a process and as knowledge. As a product he examines the information about the form and the idea behind it; as a process it focuses on the relation of complex man-environment interaction; and as knowledge it looks at the natural and built environment (Turan, 1990). But since there are no set rules, scholars began focusing more on categorisation than on a single definition. Aysan, focused primarily on three things; firstly, a critical analyses of the process by which definitions of the 'vernacular' were made; secondly, the process by which methodologies for the study of the vernacular was chosen; and thirdly, the criteria by which buildings were considered to be vernacular or not (Aysan, 1988).

However, it was Rapoport (1990) that actually looked at the definition of vernacular design in detail. His definition is not based on a single characteristic; rather it is a form of characterization that fits between extremes of a continuum but tending towards an ideal type. Within this continuum is a wide range of attributes of which, a dwelling type may possess some but not necessarily all of these attributes. He sub-divides these attributes into process and product characteristics. Product in this case describes the nature and qualities of the environment, while process looks at how the environment is formed and the various factors that combine to bring it to be.

Seventeen attributes make up the process characteristics, while twenty attributes make up the product characteristics. The product characteristics include the relationship between culture, environment, climate, natural resources within the geographical location and the eventual architectural product. It highlights the role all these aspects play in the realisation of the product. The process is obtaining and harnessing the intuitive know-how required in blending these different facets into achieving a built form. Within these process/product characteristics is the aspect of variations of the built model, the existence of which adds to the characterisation of vernacular architecture.

Attributes 10 and 14 of the product characteristics and 15 of the process characteristics have been italicised and highlighted as these focus on variation. Attributes 10 and 14 suggests that vernacular designs often emanate from single models that undergo changes, which result in variations over time. This is the product but the process described in attribute 15, shows that one of the characteristics of a vernacular dwelling is the degree or extent of change from the original model when variation occurs, as well as the rate or speed with which this change occurs. However rate or degree of change is not considered in isolation but often linked to factors that influence them. This study is therefore not just about vernacular dwellings of a particular culture but about the aspects of being vernacular. In one way it tests a certain aspect of the vernacularism of a dwelling type – variation or the tendency of dwellings to either evolve or change.

Although table 1 provides a list of attributes providing a range or continuum within which the vernacular exists in its barest form to its most ideal form, what ultimately distinguishes vernacular designs from other forms of architectural designs is the relationship to culture. Rapoport emphasizes this when discussing the importance of culture for house form (Rapoport, 1969) and for design (Rapoport, 2005) and in the later volume he offers an explanation of the concept of culture. However, I believe a deconstruction of this concept will be more justified from an anthropological and sociological perspective, as studies in culture and cultural theory have been pioneered and spearheaded by scholars from these two disciplines.

Table 1. *Polythetic classification of vernacular design attributes (Adapted from Rapoport 1990).*

S/No	PROCESS CHARACTERISTICS	PRODUCT CHARACTERISTICS
1	Identity of designers	Degree of cultural and Place-specificity
2	Intention and purpose of Designers	Specific model, plan forms, morphology, shapes, transitions
3	Degree of anonymity of Designers	Nature of relationship among Elements and the nature of underlying rules
4	Reliance on a model with Variations	Presence of specific formal qualities
5	Presence of a single model or many models	Use of specific materials, textures, colours, etc
6	Extent of sharing of model	Nature of relation to landscape, Site, geomorphology, etc
7	Nature of schemata underlying the model	Effectiveness of response to climate
8	Consistency of use of a single (same) model for different parts Of the house-settlement system	Efficiency in use of resources
9	Types of relationships among models In different types of environments	Complexity at largest scale due to place specificity
10	Specifics of choice model of design	*Complexity at other scales due to use of a Single model with variations*
11	Congruence of choice model and its Choice criteria with shared ideals of users	Clarity, legibility and comprehensibility of the environment due to the order expressed by the model used
12	Degree of congruence and nature of the relation between environment and Culture/lifestyle	Open-endedness allowing additive, subtractive and other changes
13	Use of implicit/unwritten vs. Explicit/ Legalistic design criteria	Presence of 'stable equilibrium' (vs. the 'unstable equilibrium' of high style)
14	Degree of self-consciousness/unself-Consciousness of the design process	*Complexity due to variations over time (changes to model not of model)*
15	*Degree of constancy/invariance vs. change/originality (and speed of change over time) of the basic method*	Open-endedness regarding activities
16	Form of temporal change	Degree of multisensory qualities of environment (large range of non-visual Qualities)
17	Extent of sharing of knowledge about design and construction	Degree of differentiation of settings
18		Effectiveness of environment as a setting for Lifestyle and activity systems and other aspects of culture
19		Ability of settings to communicate Effectively to users
20		Relative importance of fixed-feature element Vs. semi-fixed feature element

4.1. Ascertaining variations in vernacular architecture

With the preceding argument made by Rapoport, we can say that change in itself is one of the characteristics of being vernacular or vernacular architecture. Blier (2006) also emphasized that change is one of the main issues dominating the vernacular architecture discourse, with questions regarding the staticity, evolutionary changing patterns or purposeful dynamism of vernacular built forms resurfacing time and time again. Asquith (2006) suggests that in approaching housing studies in general, lessons can be learned from the vernacular in the recording and documentation of building traditions and typological changes with time and in assessing changing

needs of its occupants through time. As such, they suggest that in order to understand variations resulting from change in architecture over time lessons ought to be borrowed from the vernacular.

However, this paper goes a step further to suggest that in the study of change and variation in dwellings, vernacular architecture has derived and can derive more lessons from 'archeotecture' and so can housing studies. For variation or change over time to be fully understood, especially as it relates to architecture, Gilman (1987) argued that architecture ought to be studied as an artefact. Turan (1990) also suggested that vernacular architecture be studied as a product and an artefact. This is because most of the techniques for assessing standardization and variations have been developed mainly in the field of archaeology for studying variations in artefacts of material culture. However, these techniques have been applied not only to artefacts, but to architecture as well (Jordan and Shennan 2009; Eerkens and Lipo 2005; Cochrane 2002; Wills 2001; Gilman 1987).

4.2. Variations and the theories of cultural transmission

Three main avenues by which change or variations can be introduced into architecture over time will be discussed when examining various theories on cultural transmission. The concept was originally referred to as diffusionism and was popular among anthropologists until the 1960s. It is now commonly referred to as cultural transmission with several theories developed around this concept. The main difference being that while diffusionists focused only on change, transmissionists expanded their research into rates of change, rates of error, conditions that affect the varying rates of change and different transmission mechanisms (Eerkens and Lipo, 2007).

Expressions of culture such as craft, music, folklore, language and art are traditions that are handed-down through generations. In some cultures, patterns of production are carefully guarded secrets (Sandrisser, 1998) but even in such cultures, where there are standardized forms of production processes, cultural evolution brings about certain changes in the transmission process or product through time. Eerkens and Lipo (2005) examined how variations in material culture evolve over generations through cultural transmission. Although time has been accredited as the main vehicle of change, time in itself does not necessarily effect change on material culture. Other factors often acting in conjunction with time have been identified as the main agents of change. The authors suggest that there are two main mechanisms by which variation is produced in material culture: variations generated unintentionally as a result of copying errors or borrowing other ideas during the production process; and variations produced intentionally by cognitive mechanisms. Either way, such inaccuracies or deliberate changes could occur during production and an accumulation of these could result in significant variations.

Cognitive mechanisms are deliberate or intentional modifications made to an original pattern that brings about variations. They can also be innovations necessitated by production of material culture in a different context or through changing "worldviews" of the society in question (Gabora, 2004; Gabora, 2000). The change may also come about as a response to new challenges posed by a different climate or location. Several studies carried out in this area have all attempted to answer questions relating to variation or change. Such as, how much change can be attributed to copying errors when reproducing material culture? (Eerkens and Lipo, 2005); how much change can be attributed to cognitive mechanisms effected by the expansion or splitting of a society into daughter populations, with each introducing modifications into what was originally the cultural norms? This is also known as phylogenesis or 'branching' (Collard and Shenan, 2008; Gray et al., 2007; Lipo et al., 2006; Mace et al., 2005); and lastly, how much change can be attributed to lateral borrowing of other cultural traits from adjacent groups through inter-community contacts? This concept is referred to as ethnogenesis or

'blending' (Diaw, 1992); (Terrell, 2001; Terrell, 1988); (Jordan, 2007); (Jordan and Shennan, 2009). Scholars in the field of archaeology, cultural anthropology, linguistics and evolutionary biology have examined these issues using mainly quantitative methods adopted from evolutionary biological studies.

Although the forces or mechanisms that bring about variations have been identified, the question of which areas or at what point in the cultural transmission process, these forces tend to act still remains. This information is vital to this study as it helps to ascertain the points where variations are most likely to occur during the transmission of cultural information.

In relation to migration, this paper examines how much change can be attributed to cognitive mechanisms brought about by the expansion or splitting of a society into daughter populations during migration. Also, how much change can be attributed to lateral borrowing of other cultural traits from other groups encountered during migration? The former is known as phylogenesis or 'branching' (Collard and Shenan 2008); (Gray et al. 2007); (Lipo et al. 2006); (Mace et al. 2005), while the latter is referred to as ethnogenesis or 'blending' (Diaw 1992); (Terrell 1998, 2001); (Jordan 2007); (Jordan and Shennan 2009).

This paper shows how quantitative methods borrowed from archaeology are employed to test the influence of immanent forces such as 'phylogenesis or branching' and/or externalistic forces such as 'ethnogenesis or blending' in architectural variation. The aim is to ascertain the effect of migration on the migrant fisher base camp dwellings of the Ijo ethnic group in Bayelsa and Bakassi.

4.3. Identifying causes of architectural variations quantitatively

The study was initiated, based on the supposition that issues relating to migration, could result in changes that constitute significant variations between the dwelling models. These changes may either be developed from within the society itself or brought about by external influence from other neighbouring groups. In this research four of the neighbouring fishing groups namely; the Ibibios, Andonis, Ilajes and Urhobos were selected for comparative study. Also, these groups practice migrant fishing and build base camp dwellings. Only architectural data involving external features of the base camp dwellings which were collected have been used. These external features or traits are required to produce the dichotomous or binary data used in the analysis.

In addition to the architectural data obtained from the neighbouring ethnic groups, corresponding data from the migrant fishing dwellings in Bayelsa state was also included. Firstly, to serve as a basis for comparison between the base camp dwellings in Bayelsa and in Bakassi and secondly, it serves as a control to indicate if any of the other ethnic groups have any form of relatedness to the parent Ijo ethnic group in Bayelsa, which could then suggest phylogenetic (common ancestry) possibilities between them. A list of all exterior features of base camp dwellings in Bakassi and Bayelsa are presented as dichotomous data below.

4.4. Dichotomous/binary data

The main architectural traits in the base camp dwellings are listed from 1 through to 14 but there are sub-traits as well. These sub-traits are known as multistate variables and have been treated as individual traits. The digit '1' records that a trait is present amongst a particular ethnic group, while '0' records traits that are absent. The use of the '1' and '0' digits are the reason this form of data is being referred to as 'Dichotomous' or simply 'Binary' data (Shennan 1997). The building traits recorded include: construction elements, house components or other associated features.

4.5. Measuring similarity: Coefficients and dichotomous data

To represent the data in dichotomous or binary form, a total of 32 external architectural features or traits were first identified. These traits are a compilation of the external features of base camp dwellings in the Bakassi peninsula common to all the five groups being compared, including the

Table 2. *Presence/Absence (dichotomous) data showing external architectural traits of each ethnic group (adapted from Brisibe 2011).*

Trait	**External Features**	**Migrant Ethic Neighbours in Bakassi**					
Trait No.	General Category& Trait description	Ijo(Bayelsa)	Ijo(Bakassi)	Ibibio	Andoni	Ilaje	Urhobo
1	**Main entry and other openings**						
I	Main entry through side of house	1	1	1	1	0	1
Ii	Use of doors	0	0	1	1	1	0
Iii	Use of smoke exits	1	1	0	1	1	0
2	**Shape**						
	Rectangular	1	1	1	1	1	1
3	**Roof**						
I	Gable with closed sides	1	1	1	1	1	1
Ii	Gable with open sides	1	1	0	0	0	0
4	**Roof overhang**						
I	Extended	0	0	1	0	0	0
Ii	Reduced	1	1	0	1	1	1
5	**Roof Materials**						
I	Woven raffia palm (Thatch)	1	1	1	1	1	1
Ii	Zinc sheets	1	0	0	0	1	0
6	**Wall CladdingMaterial**						
I	Planks: Horizontal	1	0	1	1	1	0
Ii	Thatch: Diagonal	1	1	0	1	0	1
Iii	Thatch: Vertical	1	1	1	1	1	1
Iv	Whole palm fronds: Horizontal	1	1	0	1	0	1
V	Palm frond stems: Vertical	1	0	0	0	0	0
7	**Bathing facility**						
I	Separate unit	0	1	0	0	0	1
Ii	Unit connected to main building	0	0	1	1	1	0
Iii	No bathing facility	1	0	0	0	0	0
8	**Verandah**						
I	Large and spacious	0	0	1	0	0	0
Ii	Small	1	1	0	1	0	1
Iii	No verandah space	0	0	0	0	1	0
9	**Hearth space**						
I	Connected to main building	1	1	1	0	0	0
Ii	Separated from main building	0	1	0	1	1	1
10	**Communal building**						
I	Religious purposes	1	1	0	0	1	0
Ii	Social purposes	1	1	0	0	0	0
11	**Roof material for religious hall**						
I	Zinc sheets	0	1	0	0	1	0
Ii	Thatch	1	0	0	0	0	0
12	**Connecting walkways**						
I	Between Kinsmen	0	1	0	0	0	0
Ii	Between non-kin	0	0	0	0	0	0
13	**Mini Jetty**	1	1	0	0	0	0
14	**Embankments**						
I	Horizontal logs	1	0	0	0	0	0
Ii	Vertical timber stakes	0	1	1	1	0	1

Ijos. The technique which used in analysing dichotomous data to ascertain similarity between the groups is the Coefficients. Shennan (1997) examined the use of coefficients for the purpose of measuring similarity. However, in this study Coefficients were used simply to derive the matrix for the Principal Coordinates Analysis, which is the quantitative method employed to analyse the data. The Coefficients used are the Simple Matching Coefficient, the Jaccard Coefficient and the Alternative to the Jaccard Coefficient.

An average of the three coefficients of the matrices was taken and the results show a range of between 0.4 to over 0.7 (see table 3). At 0.5 the result could be interpreted such that, half the attributes of the external architectural features of one group are present in another group. These matrices were then used in the Principal Coordinates Analysis to ascertain similarities between groups and ultimately the source of the variations.

4.6. Interpreting principal co-ordinate analysis: Similarities between ethnic groups

To analyse the data matrix and derive two dimensional scatter diagrams that indicate similarities between the ethnic groups, the XLSTAT software was used. Three different matrix data were used in this analysis and these are the matrices of the Simple Matching Coefficient, the Jaccard Coefficient and the alternative to the Jaccard Coefficient. The three different matrices were analysed separately to see if the results of the various scattergrams they generate would be similar.

The scatter diagram or scattergram is a simple two-dimensional representation of the results with the ethnic groups indicated as points in the space. The distance between these points on the scatter diagram represents the similarity between the ethnic groups.

Table 3. *Average of all three coefficients (Source: Brisibe, 2011).*

	Zs	Zj	Za	AVG.
1&2	0.73	0.67	0.80	**0.73**
1&3	0.43	0.29	0.49	**0.41**
1&4	0.63	0.52	0.70	**0.62**
1&5	0.57	0.43	0.63	**0.55**
1&6	0.53	0.39	0.60	**0.51**
2&3	0.43	0.29	0.49	**0.41**
2&4	0.70	0.59	0.76	**0.68**
2&5	0.50	0.38	0.57	**0.48**
2&6	0.73	0.60	0.80	**0.71**
3&4	0.67	0.44	0.63	**0.58**
3&5	0.60	0.33	0.50	**0.48**
3&6	0.63	0.35	0.52	**0.50**
4&5	0.73	0.56	0.72	**0.67**
4&6	0.83	0.69	0.83	**0.78**
5&6	0.57	0.32	0.48	0.45

4.7. Discussion on matrix of coefficients and principal co-ordinate analysis

The interpretation of the results obtained from the matrix of coefficient is as follows; for any coefficient below the threshold of 0.5, in which a group bears less than half the attributes of the other group, it suggests that there are fewer similarities between both groups. But for coefficients with values of over 0.7, it shows that there are strong similarities between the two groups. This result does not indicate if the two groups share a common ancestry (branching) or if borrowing (blending) occurs between them. To ascertain if the similarities are due to 'blending' or 'branching', the Principal Co-ordinates Analysis (PCA) was used and the result represented in two-dimensional scatter diagrams or scattergrams.

4.8. Interpretation of scatter diagram generated from all three coefficient matrices

Based on the simple matching coefficient where negative matches are considered, the list show that t3 (Ibibio), t4 (Andoni) and t6 (Urhobo) are the groups with the strongest similarities in terms of external architectural features in their base camp buildings. This is supported by the clustering of the points within the bottom-right quadrant in the scattergram. This only partly supports the results of the simple matching coefficient by indicating strong similarities between t4 (Andoni) and t6 (Urhobo), since the distance between these two points is the short-

est. However, the fact that negative matches have been considered in the build up to this scatter diagram has to be considered.

The scatter diagram derived from the alternative to Jaccard Coefficient matrix suggests that Ijos in Bakassi bares strong similarities to both Ijos in Bayelsa and Urhobos. This supports the initial findings that phylogenetic or branching forces exist between Ijos in Bayelsa and Bakassi, while ethnogenetic or blending forces exist between Ijos in Bakassi and Urhobos. The results further show that the strongest similarities exist between the Ijo in Bakassi and their Urhobo neighbours. Similarities between the Ijo and the Urhobos in Bakassi show that there are variations between the Ijos and their parent group in Bayelsa.

5. Discussions and conclusions

The PCA analysis therefore reveals that one of the causes of variations between the Ijo base camp dwellings in Bakassi and Bayelsa is due to the Ijos in Bakassi borrowing cultural traits from the Urhobos, whom they had more contact with during migration. However, it is important to note that the traits borrowed from their neighbouring group relates more to building components and external architectural features as listed in table 1 and not to spatial configuration.

Furthermore, from table 1 the data shows that the use of connecting walkways to indicate kinship ties and the use of living areas was used only by Ijos in Bakassi, which suggests that some of the architectural traits were not borrowed but cognitively developed. This means that in addition to lateral borrowing of traits, variations in Ijo base camp dwellings in Bakassi also resulted from cognitive modifications made by successive generations of fishermen over the years. Hence, the causes of variations in Ijo migrant fisher architecture can be traced to two sources or factors: lateral borrowing of traits from neighbouring groups as well as cognitive modifications made by the Ijos in Bakassi over time.

Another important link made in this study is that between culture and change. This link is an attestation of

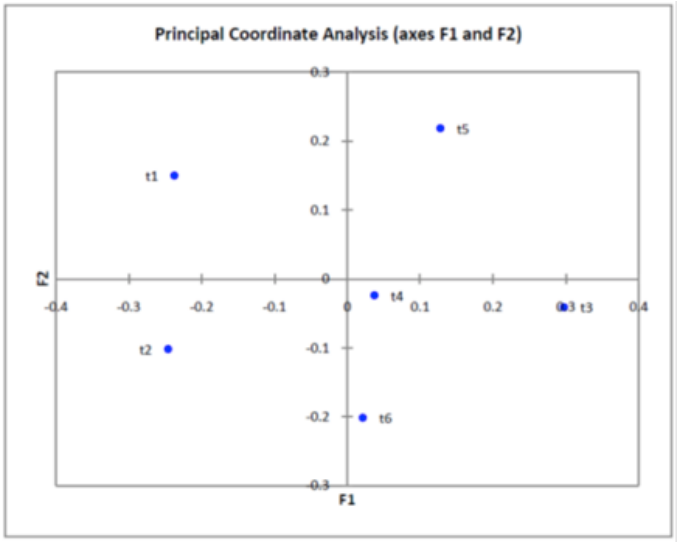

Figure 1. *Scattergram showing the similarity of the groups from simple matching coefficient (Source: Brisibe, 2011).*

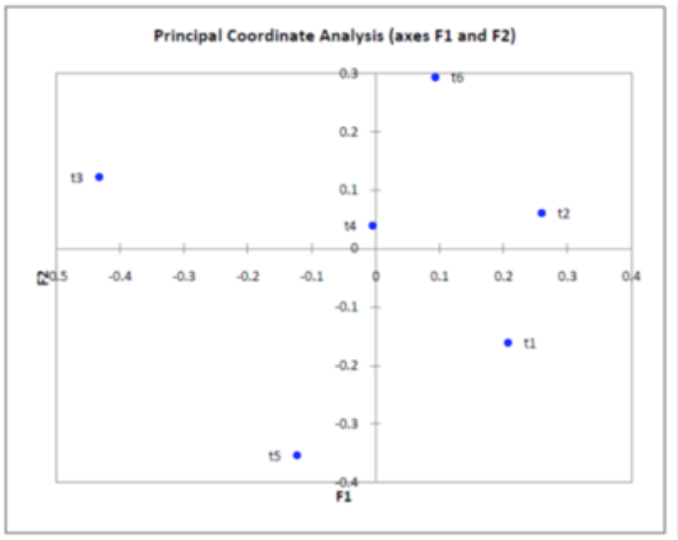

Figure 2. *Scattergram of group similarity generated from Jaccard Coefficient Matrix (Source: Brisibe, 2011).*

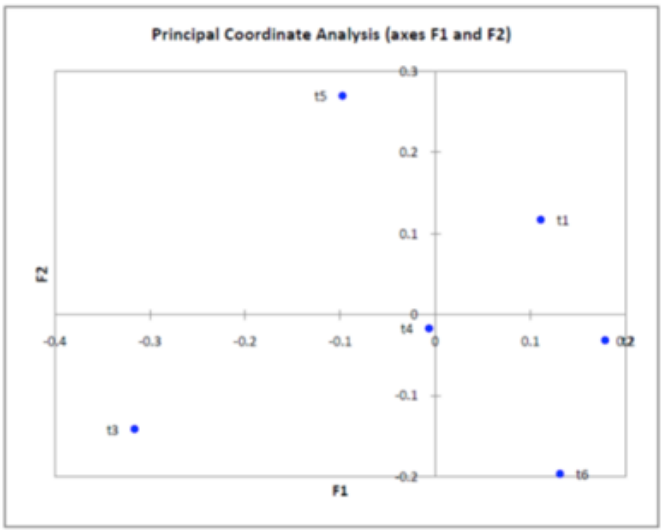

Figure 3. *Scattergram of group similarity generated from Alternative to Jaccard Coefficient Matrix (Source: Brisibe, 2011).*

the advantage of interdisciplinary research, combining sociological and anthropological theories in the more practical fields of architecture and archaeology. Social and cultural change can be regarded as the 'domino effect' of cultural transmission, following the theories of cultural transmission discussed in this review. But what is evidently the biggest contribution by archaeologists in this interdisciplinary union is the development of methodologies to facilitate the understanding of cultural transmission and variations in material culture. With current studies on architectural variation over time mostly involving longitudinal spatial classification methods, these are methodological and theoretical contributions that both vernacular and contemporary architectural studies could learn from, in ascertaining effects and causes of variations in dwelling.

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