BUILT HERITAGE, COMPUTERS AND NIGERIAN DESIGN EDUCATION

by

IFEYINWA DOMINICA OKANY- DIMORIAKU

B.Sc. [Hons.], University of Nigeria, 1994
M.Sc., University of Nigeria, 1996

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ADVANCED STUDIES IN ARCHITECTURE

in

THE FACULTY OF GRADUATE STUDIES

(School of Architecture)

We accept this thesis as conforming to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA

April 2004

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Name of Author (please print) Date (dd/mm/yyyy)

Title of Thesis: BUILT HERITAGE, COMPUTERS AND NIGERIAN DESIGN EDUCATION

Degree: MASTER OF ADVANCED STUDIES IN ARCHITECTURE Year: 2004

Department of ARCHITECTURE
The University of British Columbia
Vancouver, BC Canada
ABSTRACT

Nigerian traditional architecture is becoming extinct. Unfortunately, the generation that would have saved the situation is passing away very fast. This calls for an urgent campaign of revival by documentation of the remaining architectural treasures, simulation of those that no longer exist and the dissemination of this material on a national basis. The objective of this research is to lay a foundation for Information Technology based studies in contemporary Nigerian traditional architecture to be conducted in schools of architecture in Nigeria. The aim of this work is to increase the emphasis laid on traditional architecture in the curriculum and to facilitate this study by introducing computers into Nigerian design.

To this end, I conducted research in Nigeria in order to ascertain the level of incorporation of traditional Nigerian architecture in curricula of schools of architecture in Nigeria. Further, as part of my field study, I examined the obstacles to the computerization of schools. I also solicited for suggestions towards improving the situation. For this aspect of my research I combined the use of questionnaires and interviews. Heads of departments of architecture, faculty members, practising architects and students, either filled questionnaires, or were interviewed. In addition, I took pictures of interesting examples of Nigerian architecture — traditional, colonial and contemporary — for documentation purposes.

The data from my field study was processed using the qualitative analysis method. I found from my investigation of the data that there was majority support for the incorporation of tradition into the studio design courses in Nigerian schools of architecture and that up till now, this area has not been sufficiently dealt with. I also found out that schools of architecture in Nigeria are at various stages in adopting this concept. In the area of computerization I was only able to find out the condition of two out of the three universities visited. This was a result of the fact that the Head of one of the schools I visited was not available to provide me with these details. The other two schools visited had acquired some computing facilities; however, these facilities were not adequate to cater for their educational needs. More effort needs to be made in the area of acquisition of computer facilities. The main obstacle to computerizing schools of architecture in Nigeria is funding. However, my respondents felt that by the joint effort of the school authority, students, the Nigerian Institute of Architects, architectural firms and philanthropists, the dream of computerizing schools of architecture in Nigeria can become a reality.

Following the research a series of guidelines were developed, one for documenting traditional Nigerian architecture, another for system selection for schools of architecture in the process of incorporating computers into their curriculum. During the research, a sample studio design assignment which lays emphasis on traditional Nigerian architecture was acquired and forms part of the thesis. Finally, a collection of pictures depicting the historical stages through which Nigerian architecture has passed was compiled. This corpus will form a background for further research towards documenting traditional Nigerian architecture and propagating its cultural importance with the aid of digital media.

The expected result of the introduction of tradition in design studio courses is that this will motivate in-depth study of traditional Nigerian architecture since the present generation does not know much about their architectural heritage. Hopefully, the outfall will be the creation of an identity for traditional Nigerian architecture in the 21st century. Furthermore, an awareness of the built heritage may be created among the next generation of young architects and students. To a large extent, this work can be accomplished by taking advantage of forthcoming introduction of the information technology and intelligently structured curriculum in design schools. This might equip the next generation of architects to be informed while contributing to building the new architecture which will not be based on imported international models.

In addition, I hope that the result of my study on traditional Nigerian architecture will be made available on websites thereby making this information available both locally and internationally. In
this age of globalization, the Internet is central to this campaign of popularising traditional Nigerian architecture. The expected outcome of this endeavour is that Nigerian Architecture will become culturally relevant again.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>ii</td>
</tr>
<tr>
<td>Table of Contents</td>
<td>iv</td>
</tr>
<tr>
<td>List of Tables</td>
<td>vi</td>
</tr>
<tr>
<td>List of Figures</td>
<td>vii</td>
</tr>
<tr>
<td>List of Plates</td>
<td>viii</td>
</tr>
<tr>
<td>Acknowledgement</td>
<td>ix</td>
</tr>
<tr>
<td>Dedication</td>
<td>x</td>
</tr>
<tr>
<td><strong>CHAPTER ONE: INTRODUCTION</strong></td>
<td>1</td>
</tr>
<tr>
<td>1.1: Statement of Problem</td>
<td>1</td>
</tr>
<tr>
<td>1.2: Objective of Research</td>
<td>7</td>
</tr>
<tr>
<td>1.3: Background Information</td>
<td>7</td>
</tr>
<tr>
<td>1.3.1: The Effect of Colonization on Architecture in Nigeria</td>
<td>7</td>
</tr>
<tr>
<td>1.3.2: Traditional Nigerian Architecture – Post-Colonization</td>
<td>27</td>
</tr>
<tr>
<td>1.3.3: Information Technology and Architecture in Nigeria</td>
<td>30</td>
</tr>
<tr>
<td><strong>CHAPTER TWO: LITERATURE REVIEW</strong></td>
<td>34</td>
</tr>
<tr>
<td>2.1: Principles Underlying the Use of Digital Media in Architectural Education</td>
<td>34</td>
</tr>
<tr>
<td>2.1.1: Setting up a Computer Network</td>
<td>34</td>
</tr>
<tr>
<td>2.1.2: Structure of Computer Courses</td>
<td>37</td>
</tr>
<tr>
<td>2.1.3: Computerization Trends in Design Education</td>
<td>38</td>
</tr>
<tr>
<td>2.2: Use of Digital Media in Architectural Education in North America</td>
<td>44</td>
</tr>
<tr>
<td>2.2.1: The Early Stages</td>
<td>44</td>
</tr>
<tr>
<td>2.2.2: Current Practice (School of Architecture, University of British Columbia)</td>
<td>45</td>
</tr>
<tr>
<td>2.3: Post Colonialism in the Digital Age in Nigeria</td>
<td>50</td>
</tr>
<tr>
<td>2.3.1: Computers and Nigerian Design Education</td>
<td>50</td>
</tr>
<tr>
<td>2.3.2: Obstacles to Computing In Nigerian Design Education and Possible Solutions</td>
<td>51</td>
</tr>
<tr>
<td>2.3.3: Dangers of Computer-Mediated Learning and Remedies</td>
<td>51</td>
</tr>
<tr>
<td><strong>CHAPTER THREE: RESEARCH METHODOLOGY</strong></td>
<td>53</td>
</tr>
<tr>
<td>3.1: Procedure of Data Collection</td>
<td>53</td>
</tr>
<tr>
<td>3.2: Sample Selection</td>
<td>53</td>
</tr>
<tr>
<td>3.3: Places Visited and Participants</td>
<td>54</td>
</tr>
<tr>
<td>3.4: Questionnaire and Interview Design</td>
<td>56</td>
</tr>
<tr>
<td><strong>CHAPTER FOUR: RESEARCH FINDINGS</strong></td>
<td>58</td>
</tr>
<tr>
<td>4.1: Tradition in the Curriculum of Design Studio Courses</td>
<td>58</td>
</tr>
<tr>
<td>4.1.1: Level of Support</td>
<td>62</td>
</tr>
<tr>
<td>4.1.2: The Issue of Affordable Housing in Nigeria</td>
<td>62</td>
</tr>
<tr>
<td>4.1.3: Current Level of Incorporation of Traditional Nigerian Architecture in Curricula of Schools of Architecture in Nigeria</td>
<td>62</td>
</tr>
<tr>
<td>4.1.4: Other Associated Issues</td>
<td>63</td>
</tr>
<tr>
<td>4.1.5: The Role of Computers</td>
<td>63</td>
</tr>
<tr>
<td>4.2: Process of Adopting Computers in Schools of Architecture in Nigeria</td>
<td>66</td>
</tr>
<tr>
<td>4.2.1: Providing Adequate Space for Computing Facilities</td>
<td>67</td>
</tr>
<tr>
<td>4.2.2: Providing Computing Facilities</td>
<td>68</td>
</tr>
<tr>
<td>4.2.3: Training the Faculty Members</td>
<td>70</td>
</tr>
<tr>
<td>4.2.4: Developing a CAD Curriculum</td>
<td>71</td>
</tr>
<tr>
<td><strong>CONCLUSION</strong></td>
<td>72</td>
</tr>
</tbody>
</table>
LIST OF TABLES

Table 3-1: Sample of Case Studies: Universities ................................................................. 54
Table 3-1: Sample of Case Studies: Architectural Firms .................................................. 55
Table 3-2: Level of Computerization of Schools of Architecture Visited .......................... 57
Table 4-1: Anticipated Application Requirements ............................................................. 69
LIST OF FIGURES

| Figure 1-1: Map of Nigeria before 1900 | 2 |
| Figure 1-2: Map of Nigeria in 1900 | 2 |
| Figure 1-3: Map Showing Nigerian Vegetation | 9 |
| Figure 1-4: Benin Residence | 9 |
| Figure 1-5: Section through Benin Residence | 10 |
| Figure 1-6: Map of Nigeria Showing Ethnic Groups | 11 |
| Figure 1-7: Isometric Cut-Out Projection of Jaba Hut | 11 |
| Figure 1-8: Jaba Hut | 12 |
| Figure 1-9: Fulani Town House | 12 |
| Figure 1-10: Typical Colonial Design in the Southern Provinces | 18 |
| Figure 1-11: Typical Colonial Design in the Northern Provinces | 19 |
| Figure 1-12: Block Site Plan of University College, Ibadan | 22 |
| Figure 1-13: Map of Nigeria Showing Notable Schools of Architecture | 32 |
| Figure 2-1: Basic Computer Networking | 34 |
| Figure 2-2: The University of British Columbia (UBC) Computer Network | 35 |
| Figure 2-3: Connectivity and Participation Map of British Columbia’s Regional Research Network | 35 |
| Figure 2-4: Map of Canada’s National Research and Education Network (CANet 4) | 36 |
| Figure 2-5: Visualization of the World Wide Web | 36 |
| Figure 2-6: The Use of Shapes and Polygons in Site Planning | 38 |
| Figure 2-7: Digital Visualization | 39 |
| Figure 2-8: Design Generation with NURBS Modellers | 39 |
| Figure 2-9: Design Generation Using the Process of Animation | 40 |
| Figure 2-10: Collaborative Website Created for a Virtual Design Project | 40 |
| Figure 2-11: VDS Baghdad Publishing Page | 41 |
| Figure 2-12: VDS Baghdad Pinup Page | 41 |
| Figure 2-13: A Virtual Tour of the Swiss Federal Institute of Technology, Zurich (ETH Website) | 41 |
| Figure 2-14: A Vertical Design Studio Project | 45 |
| Figure 2-15: A Student’s Work done for a Digital Representation Summer Course | 46 |
| Figure 2-16: A Site Terrain Modelled for a Project Titled “Constructing the Ground Plane” | 46 |
| Figure 2-17: An Object Modelled for a Project Titled “Between Objet Types and Objet a Reaction Poétique” | 47 |
| Figure 2-18: Digital Record of Traditional Building Types in Nigeria. Directed Study | 48 |
| Figure 3-1: Map of Nigeria Showing Places Visited | 56 |
| Figure 4-1: Map of Nigeria Showing the Location of Kainji Dam | 59 |
| Figure 4-2: Map Showing the Location of Villages Before and After the Resettlement | 60 |
| Figure 4-3: The “Obi” (Family Open Space) in a Traditional Igbo Compound | 65 |
LIST OF PLATES

Plate 1.1: Office of District Officer, Badagry, Lagos, Nigeria (circa 1861) ........................................... 1
Plate 1.2: Members of the British Punitive Expedition with Objects Plundered from Oba of Benin’s Palace, Benin City, 1897 .............................................................. 4
Plate 1.3: Brass Queen Mother Tableau .................................................. 4
Plate 1.4: Brass Altar Head ................................................................. 4
Plate 1.5: Typical Adobe Hut, Umuhu Okabia, Imo State (Late 1950’s) .................................................... 8
Plate 1.6: Typical Wattle Hut .............................................................. 8
Plate 1.7: Typical Round Hut with Thatched Conical Roof ................................................................. 10
Plate 1.8: Fulani Building Showing Pendentives .................................................. 13
Plate 1.9: Fulani Building with Small Openings .................................................. 13
Plate 1.10: Merchants’ Stalls in Kano .................................................... 14
Plate 1.11: Granaries in Northern Nigeria .................................................. 14
Plate 1.12: Decorated House, Tudun Wada, Zaria .................................................. 15
Plate 1.13: Kano City Wall (Brandon Barnett) .................................................. 15
Plate 1.14: Katsina City Wall ............................................................... 16
Plate 1.15: Mbari House, Ukama, Owerri ................................................... 16
Plate 1.16: Vaughn’s House, Kakawa Street, Lagos Island .................................................. 17
Plate 1.17: Typical Colonial Design in the Southern Provinces .................................................. 18
Plate 1.18: Typical Colonial Design in the Northern Provinces .................................................. 19
Plate 1.19: Dormitory, St. Gregory’s College, Obalende, Lagos (1932) .................................................. 20
Plate 1.20: St. Gregory’s Catholic Church, Obalende, Lagos (1955) .................................................. 20
Plate 1.21: Cathedral Church of Christ, Marina, Lagos (1925-47) .................................................. 21
Plate 1.22: Government Secondary School, Calabar .................................................. 21
Plate 1.23: Ventilating Wall, University College Ibadan .................................................. 22
Plate 1.24: Verandah of One of the Buildings on the College .................................................. 23
Plate 1.25: Interior of Dining Hall of Queen Elizabeth’s College .................................................. 23
Plate 1.26: Trenchard Hall, University College Ibadan .................................................. 23
Plate 1.27: Faculty of Arts Block, University College Ibadan .................................................. 24
Plate 1.28: Courtyard of Arts Block, University College Ibadan .................................................. 24
Plate 1.29: Sultan Bello Hall, Men’s College Dining Hall .................................................. 24
Plate 1.30: Co-Operative Bank, Ibadan ...................................................... 25
Plate 1.31: National Theatre, Iganmu, Lagos ................................................... 25
Plate 1.32: Organization of African Unity Conference Centre, Abuja .................................................. 26
Plate 1.33: Ulum Family Residence, Ihitenansa, Orsu Local Government Area, Imo State ................. 26
Plate 1.34: Lagos in the Late 19th Century ................................................... 27
Plate 1.35: Ebute Eró Market, Lagos, about 1860 ................................................... 27
Plate 1.36: Lagos in the Late 20th Century ................................................... 28
Plate 1.37: Ancient City of Kano ............................................................. 28
Plate 1.38: Recent Picture of Kano ............................................................. 28
Plate 1.39: Village Restaurant, Umuhu Okabia, Orsu L.G.A. Imo State, Nigeria ...................................... 29
Plate 2.1: An Interactive Video Session during a Virtual Design Studio .................................................. 42
Plate 2.2: Computer Numerical Controlled Milling Machine .................................................. 43
Plate 2.3: A Digitizer Being Used to Create a 3D Computer Model of a Motorcycle .................................. 43
Plate 2.4: A Student Presenting His Work during a Design Studio Final Review Using an LCD Projector .................................................. 45
Plate 2.5: A Student Presenting Her Work during a Design Studio Final Review ...................................... 45
Plate 2.6: CNC Milled Model of the Site in Winter Sports Centre Design .................................................. 47
Plate 2.7: Lasserre Studio, School of Architecture, University of British Columbia .................................. 49
Plate 2.8: Lasserre Studio, School of Architecture, University of British Columbia .................................. 49
Plate 4.1: New Bussa ........................................................................ 59
Plate 4.2: The Original Village Type Houses Built of Mud with Thatched Roofs ...................................... 60
Plate 4.3: Typical New Village Houses ...................................................... 61
Plate 4.4: Adobe Hut, Oraukwu, Anambra State, Nigeria .................................................. 64
Plate 4.5: Kano City Wall, Kano, Nigeria ...................................................... 66
ACKNOWLEDGEMENT

I am indebted to my supervisor, Dr. Jerzy Wojtowicz, not only for his continuous support and guidance but also for his assistance in making equipment available to me for use in data collection during my field study. I also wish to express my sincere gratitude to Martin Lewis who, as a member of my thesis committee, generously offered his time and valuable criticism.

I pay homage and respect to Susan Denyer, Z.R.Dmochowski, J.C. Moughtin and Nnamdi Elleh whose works have inspired me and whetted my appetite for the documentation of Nigerian architecture.

My gratitude goes to my father Prof. Martin Okany, my sister Mrs. Nneka Obiegue and my brothers-in-law - Mr. Oluchi Dimoriku and Mr. Ben Mbanugo - who took out time from their busy schedules to take me round as I collected photographs for this project.

I am also indebted to the following people for the help they rendered during the course of my field study: Chizoba Ugodili, Bonny Anyadimaju, Chinedu Azubuike, Dr. Oluyomi MacGregor and Justina Azubuike.

I am grateful to the staff of the School of Architecture especially Dr. Sherry McKay for her guidance in the preliminary research I did for this thesis. A further debt is owed to the staff of the Fine Arts Library, especially Diana Cooper and Nicole Gjertsen who have always responded to my demands with kindness. I also wish to express my sincere appreciation to all the students whose works are displayed in this thesis.

My special gratitude goes to my friends - Dr. Chidi Oguamanam, Angela Uruski, Joy Okoro, Euphrates Gobina, Anne Lam and Irene Ho for their friendship, encouragement and support. I also wish to express my gratitude to Mathias Scolozzi and Hamir Smart, from the School of Architecture, for their assistance and support as I developed my research.

Last but not the least, I wish to thank God for His strength and guidance without which I could not have been able to conclude this research.
DEDICATION

This work is dedicated to my husband, Nick Dimoriaku, for his love, patience and moral support; and to my family in Nigeria who despite the distance were a continuous source of encouragement at all times and in all circumstances.
CHAPTER 1
INTRODUCTION

1.1: STATEMENT OF PROBLEM

Nigeria is one of the numerous countries affected by western colonization. It was colonized by Britain from 1900 till 1960 when it regained its independence. The British, in the bid to assert their presence, imported European architecture and life styles, though they tried to adapt it to the climate. Below is an example of a British architectural transplant (See Plate 1.1). It was constructed around 1861 and was originally the office of the District Officers who served in Badagry during the colonial era.

![Plate 1.1: Office of District Officer, Badagry, Lagos, Nigeria (circa 1861).](image)

Nigeria's first contact with Europeans was with the Portuguese in the late fifteenth century. During this period, Portuguese traders established a trading relationship with Benin. It was not long before other Europeans joined in the trade. By the sixteenth century, there arose a high demand for African slaves. This demand was a result of the discovery of America and the establishment of Spanish colonies in West Indies (America was discovered in 1492 and the Spanish colonies in West Indies were established in 1509). As a result of this, slave trading turned into a booming business. From late sixteenth century till early nineteenth century, there was unrestricted slave trade in the coastal areas of Nigeria among other West African countries. Portuguese, Frenchmen, Dutchmen and Danes, Brandenburgers and British, Swedes and

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2 Isichei, p.93.
3 Sir Alan Burns, p.66.
Spaniards were all at different times trading along the coast. The following Nigerian coastal towns areas participated in this trade: - Badagry, Benin, Warri, Bonny and Calabar. The first British contact with Nigeria was made in 1553. British influence on the West Coast of Africa became pronounced at the beginning of the eighteenth century. From this time, the British took a leading part in slave trafficking.

The decline of slave trade in Nigeria started with the prohibition of slave trade by the British in 1807. Subsequently, to ensure the implementation of this rule the British established the Royal Navy Patrol on the west coast of Africa. Their job was to track down Portuguese, American, French and Cuban slavers. In 1849, to ensure that slave trade is stamped out, the British set up a consulate for the Bights of Benin and Biafra (See Fig.1-1). Lagos was then under the jurisdiction of the Bight of Benin. Since Lagos was the centre of the slave trade in the Bight of Benin and since the British were particularly interested in stamping out slave trade, they felt it was necessary to establish a consulate there. This was done in November 1852 after an attack on Lagos by the Royal Navy in December 1851. After serving as a British consulate for about nine years, Lagos and neighbouring colonies were, in 1861, annexed to form a colony of Britain.

Lagos was the first part of Nigeria to be colonized. It was colonized in order to safeguard European trade from the instability resulting from the on-going Yoruba wars that began in the 1830s (trade in legitimate products like palm oil and palm kernels had been fostered soon after the abolishment of slave trade). At first, British control of Nigeria was limited to the coastal region and Lokoja; at the confluence of the Niger and Benue rivers (See Fig. 1-1). The other parts of Nigeria came under British rule between 1880 and 1905, with the southern part totally secured by 1897. In 1900, Britain declared a colonial government which would be administered as two protectorates: one in the south and one in the north (See Fig. 1-2).

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9 Sir Alan Burns. pp. 67, 73.
17 Ibid.
Though the British have done the laudable job of developing Nigeria by building schools, churches and administrative buildings, they have played a role in the present cultural decay in Nigeria. First of all, during the British Punitive Expedition to Benin Kingdom in 1897, which resulted in the Fall of the Benin Kingdom and its subsequent colonization, thousands of Benin artworks were carted away. (See Plates 1.2 to 1.4 overleaf). They are now scattered all over Europe in various museums. The British occupation of Benin destroyed its culture. The palace was the largest consumer of local art. Most of these art works were used for rituals conducted at the palace. Since the political structure of Benin was destroyed, the culture officially died.

Secondly, the treatment of the Nigerian culture by the British was also derogatory. The colonial curriculum gave the impression that there was nothing worth much in Nigerian society. Chinua Achebe’s words, in an essay written in 1973, testifies to this: “...colonial education was saying there was nothing worth much in my society, and I was beginning to question that, to see there were things that were beautiful even in the heathen”.

Again Dr. Ekpo Eyo, a Professor of History and Archaeology in University of Maryland, in his description of the influence of western education on Nigerian art stated that “...Since Western education came with Christianity, we were taught to look down on our arts which the Christian teachings regarded as idols. We were not given the opportunity to go near them. When we came across them, we ran away because we thought they represented evil spirits”. His career as an archaeologist started when he worked for Kenneth Murray as an Antiquities Assistant. Kenneth Murray is the Englishman who was responsible for starting the Antiquities Service in Nigeria. He literally had to force the government to build a museum to house the Ife bronzes which had started showing up in the late 1930’s. Professor Ekpo Eyo now specializes in African Art and Archaeology at the University of Maryland.

It is interesting to know that Maxwell Fry, a well known modernist, who during the colonial era, played an important role in the development of more durable architecture which responds to the Nigerian climate, was of the view that Nigerian historical architecture has nothing of value to offer to contemporary architectural practice. This can be inferred from various statements he has made. The first statement was made in an interview and is as follows:-

Q: Do you think that a modern Nigerian aesthetic is possible?
A: A Nigerian aesthetic? On what would it be based that is as solid as that on which Aalto’s Finnish tradition or Tange’s Japanese tradition was?

The second statement was made in an article he wrote about the introduction of modern building techniques to Middle Africa: “When we started our work, there was no building industry worth the name....nor was there any architecture, nor any art that was not drawn from the recesses of a tribal system and an animistic religion.....” To give him a benefit of the doubt, I may decide to defend his first statement from the standpoint of the modernist attitude which emphasizes function and providing for specific needs rather than imitating nature. However, his second statement obviously shows his lack of appreciation for African architecture.

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22 Ibid.
26 E. Maxwell Fry. p. 84.
Plate 1.2: Members of the British Punitve Expedition with objects plundered from Oba of Benin’s Palace, Benin City, 1897.29

Plate 1.3: Brass Queen Mother Tableau.28 Formerly collection of G. W. Neville, a member of the 1897 British Punitive Expedition.

Plate 1.4: Brass Altar Head.26 Thousands of carvings like this one arrived in Europe just months after the 1897 conquest of the Benin Kingdom.

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28 Ibid. p. 22.
29 Joseph Nevadomsky, p. 19.
The Independence of Nigeria was accompanied by a booming economy and rapid urbanization. During this period there was need for more building activity so as to provide infrastructure for the new nation.\(^{31}\) At this time, there were a few indigenous architects — most of them trained in Europe. Unfortunately, they did not know much about Nigerian architectural heritage. As a result of colonization, traditional Nigerian architecture had been neglected for almost a century. Moreover, their professional training in Europe did not put into consideration their historical and architectural backgrounds. Hence, when they returned to rebuild Nigeria, they were not only uneducated about Nigerian culture, they were also indoctrinated by the dominant Western culture. They were then left to seek out their own identities and apply them in their construction efforts. To achieve this aim, they had to resort to learning the basic vocabularies of traditional African art from unadulterated artists who had been trained by indigenous artists.\(^{32}\) Since there were not enough trained indigenous architects, architectural expertise was mostly provided by expatriates.\(^{33}\) These expatriate architects were equally ignorant of traditional Nigerian architecture and were more influenced by the international style which was becoming increasingly popular during that period. All these factors combined in making the international style dominant in Nigerian cities during the post independence period.\(^{34}\)

To compound this problem, there was a civil war in Nigeria (Biafran war). It lasted between 1967 and 1970. During the Biafran war, a lot of traditional buildings in Eastern Nigeria were destroyed (the battleground was Eastern Nigeria). Those buildings which were not gutted by fire disintegrated due to lack of maintenance. This is one of the reasons why there are more surviving examples of traditional Nigerian architecture in the northern part of Nigeria than in the South.\(^{35}\) Further, the oil boom of the 1970’s resulted in more intensified urbanization.\(^{36}\) More and more of the Nigerian populace were uprooted from the rural areas and migrated into the cities thereby aggravating the problem of cultural decay.

Recently, in Africa; the idea of an African Renaissance has become popular and fashionable.\(^{37}\) This concept is rooted in Pan-Africanism which was championed by Kwame Nkrumah, the first president of the independent state of Ghana starting from the late 1940’s and 50’s.\(^{38}\) The terminology “African Renaissance “ was used by Former President Nelson Mandela in 1994 at an Organization of African Unity (OAU) summit in Tunisia.\(^{39}\) The idea was gradually crystallized as a result of a series of conferences and OAU meetings starting with the African Renaissance Conference held in Johannesburg, South Africa, on September 28 1998 and OAU meetings held subsequently. All these efforts culminated in a project plan called “The New Partnership for Africa’s Development” (NEPAD). The objectives of this plan are: -

- to come to grips with the problems of Africa's underdevelopment.
- to correct the inequality between all of Africa and the nations of the Northern hemisphere, the so-called First World, through partnership and collaboration rather than dependency on aids and volunteerism.
- to close ties among African nations.


\(^{34}\) Nnamdi Elleh. pp. 71,72.

\(^{35}\) Onyeka Dozie. (Estate Surveyor, M.A. Bello & Partners), Personal Interview, 2 Oyekan Road, Yaba, Lagos, Nigeria, 16 July, 2003.

\(^{36}\) Nnamdi Elleh. p. 317.


The focus and logic of NEPAD is to assure confidence and hope in a gradual, if not swift recuperation from years of colonial servitude, dependence and dispossession. One of the cardinal resources of the continent from which strength of purpose and direction can be pulled is the cultural-artistic heritage. Moreover, it is part of the cultural policy of Nigeria to build up a national cultural identity and a parallel affirmation of cultural identities of different ethnic groups. This shows that the mood and attitude in Nigeria is ripe for change.

Nigeria has over two hundred and fifty ethnic groups, each with its own architectural narrative (See Fig. 1.6 on page 11). Most of the books that deal with Nigerian traditional architecture are written by foreigners and deal with the major ethnic groups - relegating the others to the background. Minority groups are protesting their absence from the schemes of architectural education. Traditional Nigerian architecture needs to be centred in the university curriculum, both as architectural history and studio-based architectural studies, thereby displacing the study of western architectural concepts and architectural history to the margins.

Creative architecture cannot be copied from foreign patterns. It must grow out of its own roots; be expressed in its own language. Only then will it grow healthy and beautiful. Only in this way can it reach the highest level of artistic achievement and become universally appreciated and universally accepted. If this is to be accomplished, the roots of the nation's building craft as well as the triumphs of Nigerian developed architecture should be made known and popularized. At present, it is a real tragedy that although many learned treatises have been produced about Nigerian art, Nigerian architecture has been treated as a marginal item, if at all.

The question now is "How can we popularize Nigerian architecture?" "How can we make the whole world aware of the wealth of our architectural culture?" Perhaps creating a digital database of information on Nigerian traditional architecture is the solution to this problem. In the present era, the information technology age, the computer is a valuable tool for storage of information and also for sharing information. The computer will definitely come in handy for this campaign. However, it is interesting to note that we are not yet fully aware of our architectural heritage. We need to become aware of and value our architectural culture. This is a very important step in the process of decolonizing our minds.

Furthermore, it is necessary for Nigerian scholars and researchers to have computer skills. This will make it possible for them to have access to online information and other scholarly journals on the web. Moreover, it will make them capable of digital collaboration on a global level. At present, unfortunately, most Nigerian universities are still untouched by the digital revolution that has swept through Western academia in the past decade. With this issue in mind, a Fellow of the Nigerian Institute of Architects (NIA), Architect Umaru Aliyu, in a seminar held by the NIA in April 2001 at Lagos, Nigeria, called on current architects to undertake proficiency in the use of computers in order to meet the global standards in the building industry. How can current

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47 Abimbola Akosile. "Architects Call for Bi-Sectoral Project Allocation" This Day Newspaper (Lagos, Nigeria) April 10, 2001, quoted on Internet and available from http://allafrica.com/stories/200104100188.html; Internet accessed 1
architects become proficient in the use of computers when digital media are not yet used in architectural education in Nigeria? It is therefore imperative that digital media be incorporated into architectural education in Nigeria.

1.2: OBJECTIVE OF RESEARCH

The objective of this research is to lay a foundation for Information Technology based studies in contemporary Nigerian traditional architecture. My first strategy for achieving this goal is to develop a scheme for incorporating computers into the design studios in schools of architecture in Nigeria. In this scheme, the issue of providing computing facilities for schools of architecture in Nigeria will be addressed. Other related issues like the funding, selection of computer hardware, software and maintenance of computing facilities will be discussed. The training of faculty members and the development of a suitable curriculum for this purpose will also be looked into.

My second strategy is to carry out case studies of some typical examples of traditional, colonial and contemporary architecture in Nigeria. This comparative study will form a background for further research work in various schools of architecture in Nigeria. The overall aim is to develop in various parts of Nigeria, architecture based on the use of local building materials and traditional methods of construction. The idea is to motivate incorporation of traditional Nigerian architecture into the architectural design studio course. The expected result is a revival of interest in traditional Nigerian architecture. More intensive research will be undertaken in this area.

The computer will assist in the research and the documentation of the research findings. Digital cameras will be used in taking pictures of the remaining traditional Nigerian architecture. These pictures can be converted into digital databases for reference purposes. The computer can also be used to store other information related to these architectural case studies (description of building materials, traditional building techniques etc). This will lead to further research into ways of improving traditional Nigerian architecture so as to fit it into the context of contemporary architectural requirements in Nigeria. Moreover, using three-dimensional computer software, simulations of extinct traditional building forms can be constructed.

1.3: BACKGROUND INFORMATION

1.3.1: The Effect of Colonization on Architecture in Nigeria

Prior to the colonial era, traditional buildings in Nigeria were constructed with materials available on site such as mud, palm fronds and grass. Due to the fact that many activities were conducted outdoors, the dwellings were used as a refuge and were built for temporary protection from rain, heat or cold. In Southern Nigeria, where the climate is hot and humid with a high annual rainfall of 4000mm and humidity hardly below 85%, and where the vegetation is tropical rain forest, the most other common materials available are timber, bamboo, mangrove poles, palm fronds, grass among other building materials. The characteristic house form in the tropical rain forest area is the rectangular house (See Plate 1.5 overleaf). In mangrove swamp areas like Port Harcourt, wattle huts on stilts are typical (See Plate 1.6 overleaf). Further inland, where sand and swamp give way to clay and laterite soils, wattle and daub walls become common.


Cities such as Benin and Ife which are in fresh water swamps and tropical rain forest areas respectively (See map on Fig. 1-3) were constructed entirely of mud with dwellings built around courtyards (See Figs. 1-4 & 1-5 overleaf). The roofs were thatched with large sections pivoting to direct the prevailing breezes down into the rooms. However, with the introduction of corrugated iron roofs many of the old techniques of construction and climate control seem to have been forgotten51.

Figure 1-3: Map Showing Nigerian Vegetation.

Figure 1-4: Benin Residence.  

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Further north, where the climate is hot and dry and where the vegetation becomes less as the desert is approached, clay and mud was the building material mostly used\textsuperscript{54}. The vegetation type in this area is known as savannah vegetation (See map on Fig. 1-3 on p.9). The characteristic architectural form in the savannah area was the round house with conical roofs made of grass (See Plate 1.7)\textsuperscript{55}.

\textit{Plate 1.7: Typical Round Hut with Thatched Conical Roof}\textsuperscript{56}.

\textsuperscript{53} Ibid. p. 30.
The Jaba (See map below) and their neighbours, the Kagoro, Kaje, Katab and Morwa, built a remarkable asymmetrical style, which was truly a sculpture for living (See Figs. 1-7 & 1-8 overleaf). However, the Fulanis (See map below) developed a different style of mud architecture in the nineteenth century.\footnote{Elizabeth Isichei. A History of Nigeria. (London: Longman, 1983) pp. 270,271.}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{map.png}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{cutout.png}
\end{figure}
It was rectangular and mud roofed (See Fig. 1-9). The walls were thick and the domed mud roof was supported on either ribs or pendentives (See Plate 1.8 overleaf) of split palm – a naturally termite-resistant and rot-proof material. Openings for windows and doors were small (See Plate 1.9 overleaf) and shuttered to exclude the intense solar radiation during the day and the dust blown off the desert during the harmattan season.

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50 Ibid. p. 44.
Plate 1.8: Fulani Building Showing Pendentives\textsuperscript{62}.

Plate 1.9: Fulani Building with Small Openings\textsuperscript{63}.

\textsuperscript{63} Ibid. p. 52.
Plate 1.10: Merchants' Stalls in Kano.

Tin drainage gutters project like guns from the flat roofs. The clay walls still bear the strokes of the plasterers' trowel.

The predominantly mud construction of the drier areas lends itself to moulded forms (See Plates 1.10 and 1.11) and surface decoration (See Plate 1.12 overleaf). Towns such as Zaria and Kano

Plate 1.11: Granaries in Northern Nigeria.

These houses suit the climate and way of life of Northern Nigeria. Places in Northern Nigeria are usually very hot and dusty during the day but cold at night. The houses keep out the sun and the cool night air. This house form is like the calabash gourds carried by local fishermen. The thatched umbrella protects the roof while the raised floors allow storm water to flow underneath the houses.

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64 "Nigeria: From the Bight of Benin to Africa's Desert Sands" National Geographic May 1944, vol. 85, Issue 5, p. 546 (Plate II).
in Northern Nigeria has typical examples of mud dwellings built in clusters around the Emir’s palaces, the whole complex being surrounded by a protective wall.\textsuperscript{67}

Many cities in Nigeria had impressive walls in the past, before the coming of the British (See Plates 1.13 and 1.14). However, with the coming of colonial rule, they began to fall into decay. This resulted from the fact that the supply of slave labour dried up due to the abolishment of slavery. Examples of towns that had such walls include Benin, Zaria, Owo, Birnin Yauri, and Kano (See Fig. 1-6 on p. 11). The Igbos had a different form of social organization. They lived in towns. The identity of these towns did not depend on city walls, but existed in the mind, in the belief of all its members that they are descended from one founding ancestor.\textsuperscript{68}

\textit{Plate 1.12: Decorated House, Tudun Wada, Zaria}\textsuperscript{66}.

\textit{Plate 1.13: Kano City Wall (Brandon Barnett)}\textsuperscript{69}.

\textsuperscript{66} J.C. Moughtin. Hausa Architecture p. 69.
\textsuperscript{67} John Godwin. pp. 247-249.
\textsuperscript{69} Brandon Avery Barnett. “The Nigeria Project: A Web Scrapbook by Brandon Avery Barnett” available from
The nineteenth century traders brought corrugated iron sheeting and it became popular in the coastal areas as a substitute for thatch on roofs and walls. This was the aftermath of colonization which resulted in the urbanization of many areas in Nigeria. This prompted rural-urban migration thereby bringing about a reduction in labour needed for maintenance of the traditional buildings. However, traditional forms of construction require constant maintenance to survive destructive insects and weather. As a consequence of urbanization, traditional roofing materials have given way to imported materials such as corrugated iron and asbestos cement sheets which require less maintenance (See Plate 1.15).
After the abolishment of slave trade in the late nineteenth century, the repatriated slaves from South America brought with them designs and constructions in the style of their former Portuguese masters. This style, which is now called the "Brazilian" style, may be seen in the coastal areas and particularly in Lagos (See Plate 1.16). The architecture is bold and well proportioned and includes all the features of classical architecture—wrought iron balconies, double hung sash windows, arches, acanthus leaves, and decorated doors, windows, and sills. Those Africans had no family ties and their loyalties were with their fellow "Brazilians", consequently, they broke with tradition and built individual family houses often in terraces with party walls along wide streets.

Plate 1.16: Vaughn's House, Kakawa Street, Lagos Island.

At the same time, the colonial administration was building their own brand of classical design and employed imported materials mainly brick, pitch pine and corrugated iron. Most of these buildings had their windows imported and built into position. Unlike the "Brazilian" houses that were designed without any consideration of the prevailing climatic conditions, the colonial buildings were constructed to suit the climate (See Figs. 1-10 & 1-11, Plates 1.17 & 1.18 overleaf). Building designs for the Northern region differed from building designs in the south in response to the respective climatic requirements. In the South, the buildings had large verandahs closed in by shutters or "jalousies". Usually the living quarters were raised on stilts and the occupants used the airy shaded verandah during the day and the interior rooms at night (See Fig. 1-10 and Plate 1.17). In the North, the traditional building style was replicated in the colonial buildings (See Fig. 1-11 and Plate 1.18).

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73 John Godwin, p. 249.
74 Dr. Oluwomsi MacGregor (Principal Partner, MacGregor & Ojutalayo Chartered Surveyors & Valuers), Personal Interview, 19B Military Street, Onikan, Lagos, Nigeria, 22 August, 2003.
75 John Godwin, p. 249.
76 John Godwin, pp. 249,250.
Figure 1-10: Typical Colonial Design in the Southern Provinces.

Plate 1.17: Typical Colonial Design in the Southern Provinces.

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Figure 1-11: Typical Colonial Design in the Northern Provinces\textsuperscript{78}.

Plate 1.18: Typical Colonial Design in the Northern Provinces\textsuperscript{79}.


The Roman Catholic and Anglican Missions built schools, churches and later cathedrals of considerable size (See Plates 1.19 to 1.21). Very little building was done during the period of the First World War\textsuperscript{80}.

\textbf{Plate 1.19: Dormitory, St. Gregory's College, Obalende, Lagos (1932).} St. Gregory's Secondary School was the first Roman Catholic Secondary School in Nigeria\textsuperscript{81}.

\textbf{Plate 1.20: St. Gregory's Catholic Church, Obalende, Lagos (1955).}

\textsuperscript{80} John Godwin, p. 250.

\textsuperscript{81} Oluwatoyin Ibikunle (Sectional Head, Senior School Section, St. Gregory's College). Personal Interview, 14 July 2003.
However, after the Second World War, there were many developments. Many schools were built during this period including primary and secondary schools and technical colleges. Below is the picture of one of the secondary schools which was constructed within this period (See Plate 1.22).
In the 1950's, modern architecture was introduced into Nigeria. The first example of modern architecture in educational buildings in Nigeria was the University College Ibadan (See Fig. 1-12). It was designed by Maxwell Fry and Jane Drew and was built between 1953 and 1959. The buildings were constructed to fit the warm and humid climate of Ibadan. Pierced block walls were used to exclude direct sunlight and admit air, deep verandahs and overhanging eaves protected the walls from the sun. (See Plates 1.23 to 1.29).

Figure 1-12: Block Site Plan of University College, Ibadan
Good Example of Early Modern Architecture in Nigeria.

Plate 1.23: Ventilating Wall, University College Ibadan.

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86 John Godwin. p. 251.
89 J. T. Saunders. p. 65.
Plate 1.24: Verandah of one of the Buildings on the College\textsuperscript{92}.
The Verandah serves as a sun shading device. The patterns of the pierced blocks together with the play of light and shade produce an attractive and harmonious design.

Plate 1.25: Interior of Dining Hall of Queen Elizabeth's College\textsuperscript{93}.
A Women's Residence College within University College, Ibadan. Pierced blocks are used for the wall construction.

Plate 1.26: Trenchard Hall, University College, Ibadan\textsuperscript{94}.

\textsuperscript{92} Ibid.
\textsuperscript{93} Ibid., "University College, Ibadan, Nigeria". \textit{Progressive Architecture} Vol. 43. December 1962. p. 89.
Plate 1.27: Faculty of Arts Block, University College, Ibadan\textsuperscript{95}.

Plate 1.28: Courtyard of Arts Block, University College, Ibadan\textsuperscript{96}.

Plate 1.29: Sultan Bello Hall, Men's College Dining Hall\textsuperscript{97}.

\textsuperscript{95} Ibid. p. 154.
The British left an indelible architectural mark in Nigeria, ranging from special housing for colonial administrators to churches and office buildings. Their church buildings adopted the Gothic style while their administrative buildings were built with the Italian Renaissance style, which they transformed into Elizabethan structures\textsuperscript{98}.

After Nigerian Independence in 1960, more buildings influenced by the modern movement were constructed. These concrete structures were produced by expatriate architects in collaboration with Nigeria's leading architects. This was in response to the new society's demand for "a monumental, nationalist architecture to reflect its transformed status". An example is the Co-operative Bank, Ibadan (See Plate 1.30). During the 1970's there was a financial boom in Nigeria which resulted from petroleum exportation. During this period, a multimillion dollar national theatre was built (See Plate 1.31)\textsuperscript{99}. This theatre, also a concrete structure, was built in 1975 by Technoexporteroy, a Bulgarian construction company\textsuperscript{100} and housed the Second World Black and African Festival of Arts and Culture (FESTAC) in 1977\textsuperscript{101}.

![Plate 1.30: Co-Operative Bank, Ibadan\textsuperscript{102}.](image1)

![Plate 1.31: National Theatre, Iganmu, Lagos](image2)

The idea behind the form of the building is the shape of a Nigerian army general's cap.

The oil boom resulted in a population explosion in Lagos and this led to the decision to move the Nigerian capital from Lagos to Abuja. Construction began in Abuja in 1981; in 1991, General Ibrahim Babangida declared it the national capital\textsuperscript{103}. Just before the declaration of Abuja as the capital of Nigeria, the government of Nigeria hosted the conference for the Organization of African Unity. For that purpose a conference centre was constructed (See Plate 1.32). This centre was designed by a foreign architectural firm and was constructed between 1990 and 1991.

The effect of colonization on Nigerian architecture was the adoption of imported building materials like cement, corrugated iron and asbestos roofing sheets just to mention a few. In most parts of

\textsuperscript{98} Nnamdi Elleh, pp.314, 316.
\textsuperscript{99} Nnamdi Elleh. p.
\textsuperscript{103} Nnamdi Elleh. pp. 317, 318, 327.
the country, adobe buildings are a thing of the past and building with cement blocks is fashionable.

Plate 1.32: Organization of African Unity Conference Centre, Abuja

Cement has to be milled from clinker, which is imported from Europe. Regardless of the cost and the fact that houses built of mud are more comfortable thermally, most people still adopt this new building technique (See Plate 1.33).

Plate 1.33: Ulum Family Residence, Ihitenansa, Orsu Local Government Area, Imo State.

Many of the traditional techniques of construction and climate control have died with the older generation as exotic designs and ideas have been embraced. It is therefore necessary to revive the study of Nigerian traditional architecture so as to help us recapture our architectural treasures from the past. We can then apply this knowledge in designing contemporary Nigerian architecture, which are more suitable for our culture.


\[105\] John Godwin. p. 248.
1.3.2: Traditional Nigerian Architecture – Post-Colonization

As seen in the previous section, colonialism has influenced Nigerian architecture. With modern building materials like cement blocks, corrugated iron, aluminium and asbestos roofing sheets, the appearance of traditional settlements have been transformed (See Plates 1.34 to 1.38). Our cities’ skylines have been westernized.

Plate 1.34: Lagos in the Late 19th Century\textsuperscript{106}.

Plate 1.35: Ebute Ero Market, Lagos, about 1860\textsuperscript{107}.


\textsuperscript{107} Ibid.
Plate 1.36: Lagos in the Late 20th Century. This picture seems to have been taken in 1956.

Plate 1.37: Ancient City of Kano. This picture was taken in 1999.

Plate 1.38: Recent Picture of Kano. This picture was taken in 1999.

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108 Noel Grove, p. 419.
This transformation is more pronounced in the south than in the north. The reason being that in the north, western education was only marginally allowed to penetrate. Hence, the culture of the north is preserved. In the south, the cultural transformation by the missionaries "...came too fast and tore the people away from their rural settings into the cities". Nigerian southerners have replaced their traditional values with foreign values. They have become disoriented – losing their past without fully understanding western values. For instance, "there are no more streets as can still be found in Zaria within the city wall". The extended compounds have disappeared. The village squares are also gone\textsuperscript{111}. The Yoruba, Bini, and Igbo traditional courtyards have become extinct. In the middle belt and northern parts of the country, though traditional house forms can at least be found in urban areas; economic, political and social changes have altered people's architectural requirements. Rectangular buildings are now replacing the round hut which was a feature associated with the middle belt and northern Nigeria. One of the reasons stated for this is that rectangular buildings are modern and conveniently allow for metal bedsteads unlike circular huts. However, the traditional method of building in mud is still adhered to in the northern part of Nigeria.

Even the Nigerian government has instituted building regulations through its Housing and Town Planning Ministries which make it impossible for traditional construction methods to be used in urban areas. With this development, traditional houses may become completely extinct in urban areas\textsuperscript{112}. However; the rural areas still use them with a few modifications (See Plate 1.39).

\textbf{Plate 1.39:} Village Restaurant, Umuhu Okabia, Orsu L.G.A., Imo State Nigeria. In this design traditional and modern building techniques are combined. Concrete blocks are used for the walling while thatch is used for the roofing.


1.3.3: Information Technology and Architecture in Nigeria

History of Computerization in Nigeria

The electronic digital computer made its first appearance in Nigeria in 1963, in connection with the analysis of the 1962/63 national census data. Information Technology development in Nigeria passed through three distinct phases, namely: the early phase from 1963 to about 1975, a period of rapid growth from 1977 to 1982, which was followed by a period of relative stagnation from 1982 to 1986. Currently, there is a new upsurge in the acquisition and use of computers. With the removal of import restrictions and foreign exchange controls, and given the pressure on the management of industrial and business concerns to adopt more efficient methods of production, the use of computers is expanding rapidly both quantitatively and qualitatively.

There is an urge for better information management in Nigeria. Currently, the Nigerian government is upgrading existing communications infrastructure and also, building new facilities across the country. The Nigerian government also is urging its ministries and agencies, including educational institutions, to computerize their operations and also to introduce computer appreciation and data management courses in their training curricula. Consequently, government establishments are computerizing their activities despite tight budgets and bureaucratic bottlenecks.

Well-informed industry watchers have put the total population of computers in Nigeria between 600,000 and 1 million at an annual growth rate that is projected to remain over 25 percent in the next five to ten years. The financial sector is the most computerized, with a high degree of network links, followed by the oil industry and various other commercial establishments. Hundreds of businesses are said to be in the market for e-mail facilities. Increasingly, more Nigerian homes and family businesses own personal computers, including laptops and notebooks including foreign trained professionals who also own personal computers, which they use for business transactions, personal communications, games and entertainment. Over the past two years, hundreds of computer vendors, computer training schools, some of which combined training and selling of computer hardware and peripherals, have been established, especially in Lagos and oil producing areas such as Port Harcourt and Warri Town, and in the capital city of Abuja. Noteworthy, major Nigerian commercial centers, particularly the commercial city of Lagos, serve as hubs for electronics distribution including computer hardware and peripherals for the West and Central African markets.

A market survey done in the late 1990's confirmed that several computer vendors and distributors have begun local assembly of computer systems using casings manufactured locally or imported mainly from Asia, and IBM compatible components such as mother boards, power units, key boards, VGA and disk drives cards, chips, and cables originating also from Asia. There are no official statistics to determine the volume and spread of local assembly across the country. Industry experts, however forecast that the future of Nigeria's computer market lies in distribution arrangements that recognize and use indigenous talent and initiatives. To support local initiatives and private-sector efforts toward local production of computer and electronic equipment, including accessories, the Nigerian government established the National Committee on Acquisition of Computer and Electronics Technology (NACACET). The committee consists of representatives from the Presidency, the Ministry of Defense, the Ministry of National Planning, the Manufacturers Association of Nigeria and the Computer Vendors Association of Nigeria (COVAN). Additionally, COVAN has begun training and certification programs for its members wishing to become industry specialists such as: Certified Novell Administrators (CNA) Certified Novell Engineers.

Computerization in Architectural Firms in Nigeria

The architectural profession and the building industry have become computerized. At present 75% of architectural firms in Nigeria are computerized. In fact, 90% of architectural firms in Lagos are computerized\(^{115}\). For instance, by the year 2000, A.T. Onajide Architects Ltd, Lagos, already had the following facilities:

- 10 CAD stations in its office.
- 8 other stations for administrative purposes (integrated into an intranet systems serviced with two servers running on Windows NT, Microsoft Exchange and Microsoft Proxy).
- An online Internet connection with its clients.
- HP1050C (AO) and HP650C (A1) plotters to produce drawings.
- HP Design jet and Laser Printer as part of their local area network.
- A wide variety of application software for their different operations including AutoCAD and ArchiCAD, 3D Studio Viz, 3D Studio Max, Microsoft Exchange, Microsoft Office, Corel Draw and Photo Paint\(^{116}\).

Further, all the architectural firms visited during this research produce architectural drawings by means of the computer. Currently, most if not all major firms are computerized. The few firms which do not yet make use of the computer are usually small or newly started practices\(^ {117}\).

Computerization in Schools of Architecture in Nigeria

Presently, in Nigeria, there are 10 accredited Schools of Architecture\(^ {118}\). Only three of these universities [University of Jos,\(^ {119}\) Obafemi Awolowo University, Ile-Ife\(^ {120}\) and Ahmadu Bello University, Zaria\(^ {121}\) (See Fig. 1-13 overleaf)] have direct Internet connectivity. Several of the universities use a telephone-based e-mail system sponsored by the National Universities Commission (NUC) that routes e-mail through the International Center for Applied Physics in Trieste, Italy. Others have a handful of e-mail accounts with Nigerian Internet service providers\(^ {122}\).


\(^{115}\) Arc. Nsabasi Ette (Practising Architect, James Cubitt Architects). Correspondence by e-mail, 29 March 2004.


\(^{117}\) Arc. Nsabasi Ette.


So far only two of the schools (University of Jos and the afore-mentioned university, Obafemi Awolowo University Ile-Ife) have set up a computer network.

However, it is encouraging to note that the National Universities Commission of Nigeria has undertaken a project to connect all the Nigerian Universities on a wide area network and to the Internet. With the support of World Bank and through various linkage programmes with the University of Iowa, United States of America, it is already providing dial up e-mail services to 27 universities and inter university centers in Nigeria as has already been mentioned. Also through its linkage with University of Iowa, computers are being donated to Nigerian universities by corporations, organizations and individual donors. In June this year, 300 computers were dispatched to University of Jos and University of Ibadan both in Nigeria.

In order to build a digital technical capacity in Nigeria, two technician training workshops for Information and Computer Technology (ICT) were organized. The first one was held in November 2001 at Abuja and the second was held in November 2002 at the University of Ibadan. In these workshops, the technicians were taught the basics in creating campus networks, computer assembly and how to create satellite links to the Internet. Participants were provided with a CD

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123 Adapted from map produced by Oxford University Press.
containing thousands of documents and tutorials on building and maintaining campus ICT, as well as computer-based training (CBT) software¹²⁷.

The Faculty of Environmental Design in Ahmadu Bello University has a cyber café with fifteen workstations¹²⁸. This is a very important development since the introduction of cyber cafés makes the computer easily available at affordable rates to students. This development motivates students to learn how to use the computer and the Internet, thereby popularizing the use of computers and paving the way for further training in the use of computers in architecture.

The University of Nigeria has produced a master plan for networking the Nsukka Campus of the university and is gradually networking the campus stage by stage. So far, cyber cafe housing up to fifty workstations has been set up. The campus already has a couple of Local Area Networks – one at The Management Information Systems Centre and one at the Library. By February 2002, they were in the process of linking the administrative centre with the Library’s Local Area Network. The plan is to add each of the buildings on the master plan to the network at a time, providing a cyber cafe within until the entire campus is networked. There is a plan to create a radio link with the Enugu Campus of the university where the Department of Architecture is located¹²⁹. At University of Nigeria, Enugu Campus, a cyber cafe housing five workstations has already been set up.

In response to the computerization of the architectural profession and the building industry in Nigeria, the Department of Architecture at the University of Jos has introduced a new unit (Computers in Architecture and Building Unit) into the department. The programmes of the Unit are geared towards promoting the use of computers in architecture and the building industry through the development of knowledge-based design systems and computational methods. The programme also seeks to develop relevant software for use in the training at undergraduate, graduate and practice levels. The unit organizes regular courses and workshops for mid career architects and engineers¹³⁰.

The Department of Architecture at the University of Nigeria, Enugu Campus, has acquired eight computers and has trained two of their staff in the computer applications in Architecture. This was done by means of an exchange programme conducted with a university in Switzerland¹³¹. Presently, a computer application course is offered at the Department of Architecture in the University of Nigeria but the curriculum of this course does not include practical training in the use of computers. In the Department of Architecture at the Enugu State University of Science and Technology, a practical computer application course has been recently included in the curriculum. This course is borrowed from the Department of Computer Engineering.

¹³¹ Arc. L.C.Chineme (Head, Department of Architecture, University of Nigeria, Enugu Campus) Personal Interview, Department of Architecture, University of Nigeria, Enugu Campus, Enugu, Nigeria, 6 June 2003.
CHAPTER TWO
LITERATURE REVIEW

2.1: PRINCIPLES UNDERLYING THE USE OF DIGITAL MEDIA IN ARCHITECTURAL EDUCATION

2.1.1: Setting Up a Computer Network

According to William J. Mitchell, the following have to be put into consideration before setting up a computer network:

Computer Hardware: The computer hardware is made up of input devices and output devices. Examples of input devices are the keyboard for characters, the scanner for images, or a microphone for spoken words. Examples of output devices are printers and plotters. The following should be put into consideration in the choice of the hardware:

- The speed of the central processing unit.
- The size of the internal memory.

Communication: Computer networking facilitates exchange of information between various computers via a telecommunication link. In a typical network there is at least one large powerful computer, with extensive storage capacity, that serves as a central repository of information. It is known as the file server. Usually there are many workstations in offices and design studios, laboratories and classrooms, and they may be configured for particular tasks, for example, word processing and graphics. The local area network (LAN) provides many users (using many smaller computers) with access to the file server (See Fig. 2-1). In selecting a Local Area Network

![Diagram](image)

Figure 2-1: Basic Computer Networking

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system, the following should be considered:

- the bandwidth (the greater the bandwidth, the better)
- the speed of transmission. (Networks require very fast data transmission times in order to maintain their response rates at a reasonable level.

The Wide Area Network allows computers to talk to each other over very long distances (See Figures 2-2 to 2-5). The best type of networking system for wide area networking is the integrated services digital networks (ISDN) that utilize fibre optic cables to transmit information at high speeds of up to 300 Mbps and will handle voice, visual, and computer data in digitally encoded form.136

Figure 2-2: The University of British Columbia (UBC) Computer Network137

Figure 2-3: Connectivity and Participation Map of British Columbia's Regional Research Network138

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137 Adapted from "IT Services Map", The University of British Columbia IT Services. Available from http://www.itservices.ubc.ca/contact/map.shtml; Internet accessed 7 November 2003.
Computer Software: There are various design software that are used for architectural design purposes. The principal categories are:

Two-Dimensional (2D) Design Software: Two-dimensional design software are used at the early stage in the design process. This is the space planning stage and drawings at that stage are mostly line drawings. This consists of maps, site plans, floor plans, elevations, sections and

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details. Examples of two-dimensional design software are AutoCAD, VectorWorks, and MicroStation.

**Three - Dimensional (3D) Modelling and Rendering Software:** Three-dimensional design software are used for developing floor plans, elevations and sections into life-like drawings. At this stage orthographic projections, axonometric projections, oblique projections, and perspective projections are the result. These models are made to look real by rendering them with lines, tones, colour, texture, shadows, transparency and reflections. Examples of three-dimensional design software are FormZ, 3D Studio Max, MicroStation and Maya.

**Image Processing Software:** Image processing software are used for capturing, storing, manipulating, displaying or printing images. Examples of such software are Adobe Photoshop, Adobe InDesign, Microsoft PowerPoint and Macromedia Freehand.

**Animation Software:** Models can even be made to look more life-like by animating them. This is done using animation software. Examples of software that perform such operations are Maya, Macromedia Flash and Macromedia Dreamweaver.

**Technical Support and Security:** The need for technical support in an educational set-up, which uses digital media, cannot be over-estimated. Such technicians are usually in charge of procuring, installing and maintaining computer hardware and the computer network. Moreover, computer equipments are very expensive. Hence, before installing them, an adequate safety plan should be made. Further, technical support is needed to ensure security of data.

### 2.1.2: Structure of Computer Courses

An architectural curriculum that makes use of digital media should have the following contents: -

**An Introduction to the Computing Environment**

This will enable students comprehend basic operating and logical principles. Hence they can become familiar with the computing system and the appropriate potential applications.

**Hands-On Experience in the Use of Two and Three-Dimensional Graphic Packages**

They should learn the basics of Computer Graphics (fundamentals, data organization and interactive systems), Space Planning (programming, utilization and design) and Project Management (scheduling, resource allocation and cost control). All this should be learnt through hands-on experience on the micro-computer. The construction of geometric models, their viewing transformations, light and material attributes, mapping, rendering and animation should be introduced. Key issues related to the adoption of computer graphics in architectural design should be explored and computer applications of selected topics in architectural practice should also be taught.

**Database Management**

This involves the organization and management of data files in so as to facilitate easy access when needed. Students should be taught how to use database management software to store, organize and manage the data generated from their design work.

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142 Ibid. pp.155-270.
143 Ibid. pp.73-97.
144 Ibid. pp.271-312.
145 School of Architecture, University of British Columbia. School of Architecture Prospectus, 1990/91 Session. p.36.
146 Ibid.
2.1.3: Computerization Trends in Design Education

The following are the current computerization trends in design education:

**Generative software** aid some aspects of design process. In site planning, polygons are used to represent buildings (See Figure 2-6). These can be selected and moved around as part of the process of exploring various design alternatives during the site planning process. This also applies in space planning for floor plans and for furniture arrangements within rooms.

![Figure 2-6: The Use of Shapes and Polygons in Site Planning. Site Plan for the Winter Sports Centre Design done for a Vertical Design Studio (Matthias Scolozzi, School of Architecture, UBC).](image)

**Digital Visualization.** It is easier to visualize a design with the aid of 3D programs. Computer models can be analysed by viewing from various directions (See Fig. 2-7 overleaf). This enables quick analysis of design models in various situations. There is no longer the need to build a physical model in order to enable you analyse your design – you can build your design ideas directly on the computer. Hence, the computer speeds up the design process.

**Virtual Reality** is a way of viewing a three-dimensional model in a computer. This can be done either with a computer panel on the computer screen, a head mounted display, such as a helmet or a theatre. It enables computerized simulation of architectural environments. Unlike standard computer animations virtual reality allows users to explore and discover environments at their own pace and according to their interest. A typical Virtual Reality rendering is done with three-dimensional geometric information produced by Computer Aided Design software. The user can then navigate through and view the finished surface from any direction. Real-time rendering allows a designer to adjust geometric forms, lighting and finish materials as he designs and even as he views them with his client. Furthermore, with this software one can extract two-dimensional working drawings from a three-dimensional imagery.

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149 Ifeyinwa Okany. *Computing in Architectural Education: School of Architecture, University of British Columbia* pp.8, 10.

Paperless Studio. With the advent of computers, traditional design studios have been eliminated. The present trend is to use paperless format via high-end rendering software such as FormZ, Maya among others. In the paperless studio, design generation is with NURBS modelers using differentiation and parametric variation (See Figure 2-8).
The design process is extended into the fourth dimension, i.e. by the use of animated images (See Figure 2-9). The designer has the opportunity to generate and test his design.

![Variations of Fragment](image)

**Figure 2-9: Design Generation Using the Process of Animation.**

**Information Architecture.** Designs are made not only for physical, analogue space but also for digital, virtual environments. There are now collaborative websites where people can access, create and edit design work (See Figures 2-10 to 2-12). You can even make a virtual tour of a place. (See Fig. 2-13 overleaf).

![Collaborative Website](image)

**Figure 2-10: Collaborative Website Created for a Virtual Design Project.**

(VDS Baghdad Home Page)

This is a dynamic website. Participants are continually modifying the content.

A student can add a new pinup project on this page.

All the students' works are displayed on this page of the website.

Figure 2-13: A Virtual Tour of the Swiss Federal Institute of Technology, Zurich (ETH website)\textsuperscript{154}


**Virtual Design Studio.** It is a kind of electronic design studio in which students and professors from universities in various locations all over the world can collaboratively and simultaneously work on a particular design project. It involves the use of the computer both for design and communication. This phenomenon was introduced by the School of Architecture, University of British Columbia in 1992. The first Virtual Design Studio was conducted in collaboration with Harvard University. Twelve Harvard University students at the Graduate School of Design in Cambridge and twelve students of School of Architecture, University of British Columbia worked together on the same design problem. Connected via Internet network, students were modifying and exchanging design ideas in the form of one, two and three-dimensional representations.

The Virtual Design Studio has been made possible by the following developments:

- the Internet which makes universal networking possible.
- the digital video.
- the integration of the video with computational processes.
- the development of handheld, wireless, digital telecommunications.

In this kind of studio set-up, all participating students and professors have access to a networked environment called the "digital pinup board". Participants download reference material from their server. Each student develops his/her own design and pastes on the digital pinup board. At the end of the project the participating studios are connected through a speaker phone and a review jury is conducted on the collaborative work (See Plate 2.1). The tutors in all the participating studios act as editors of the pasted design. This is made possible by means of video teleconferencing.

The introduction of virtual design studios has broadened design studio experience by making it possible for students to have external reviewers. Furthermore, this development has fostered a more collaborative environment among students, professors, and consultants. This new mode of collaboration increases the transmission of ideas.

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*Plate 2.1: An Interactive Video Session during a Virtual Design Studio*. Conducted by the University of British Columbia in Collaboration with Washington University and Massachusetts Institute of Technology.

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156 Dr. Jerzy Wojtowicz, (ed.) Virtual Design Studio (Hong Kong: Hong Kong University Press, 1995) pp. 52,53.

157 Ibid. pp. 11, 13, 57.


159 Dr. Jerzy Wojtowicz, (ed.) Virtual Design Studio (Hong Kong: Hong Kong University Press, 1995) p. 151.

42
Use of the Computer Numerical Controlled (CNC) Milling Machine and the Digitizer

A Computer Numerical Controlled (CNC) Milling Machine (See Plate 2.2) is used for making physical models of design projects. This machine makes physical models with data read from a computer file\(^{160}\). On the other hand, you can construct a three-dimensional computer model of a physical object using a digitizer. The digitizer is a device for converting analogue signals into digital signals. The conversion of the physical model to a computer model is effected by means of a stylus which is simply traced over the contours of the physical object to build the three dimensional computer model (See Plate 2.3).

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{plate22.png}
\caption{Computer Numerical Controlled Milling Machine\(^{161}\)}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{plate23.png}
\caption{A Digitizer Being Used to Create a 3D Computer Model of a Motorcycle\(^{162}\).}
\end{figure}

\(^{160}\) School of Architecture, University of British Columbia. *UBC School of Architecture Newsletter*, Fall 2002 Issue, p.3.
\(^{161}\) School of Architecture Workshops, University of British Columbia. *CNC Milling Manual*, p.6.
2.2: USE OF DIGITAL MEDIA IN ARCHITECTURAL EDUCATION IN NORTH AMERICA

2.2.1: The Early Stages

The following are ideas I received about the use of digital media during the early stages in architectural education in North America:

It is important to develop a strategic plan for computer support. One of the goals of such a plan should be to have all faculty and students use computers. This will create the necessary environment for the development of a computer culture in the university. A computer advisory committee will also be helpful.\textsuperscript{163}

There should be a foundation course in the general principles of computer technology and use. This course should be followed by an introduction to computer graphics and computer aided design concepts, then by the development of tool-using skills\textsuperscript{164}. If there are not enough computers to go round it might be necessary to teach a particular course in both semesters of the session. The classes may be divided into two parts; students should spend one session a week attending the lecture and the other in a computer lab. The enrollment to the course may also be limited according to computing facilities available\textsuperscript{165}.

It is a good idea to encourage the use of mixed media. Different trial approaches of introducing the computer to novice students could be tested so as to ascertain the most successful approach. However, it is necessary to mention that the approach of conducting an intensive workshop first three weeks of the studio has been found very effective. In some schools where this approach has been tried, it has been found that after the workshop, students usually had a basic foundation on the use of the media and were ready for longer and more complex design problems\textsuperscript{166}.

In order to prevent a situation where students have to physically relocate themselves every time they wished to shift a train of thought to a different tool or media, a design studio where computers are physically integrated into the studio should be constructed. Each workstation should be designed for use with traditional design tools and with the integration of a computer system. The studio design should be such that it can be used for non-studio classes like lecture and lab classes. A crit space should be included in the studio as well as an area for model building and large scale plotting\textsuperscript{167}.

For the security of the Design Studio, the following measures could be taken:

- Changing the combination of the studio lock every term.
- Encouraging students to keep the studio closed at night and when it is sparsely occupied.
- Cabling and locking major pieces of equipment to heavy furniture.
- Giving students a sense of responsibility for their equipment.
- Not allowing students to share equipment with friends\textsuperscript{168}.

Virtual Design Studio courses should be organized and offered on a yearly basis. This will enable collaborative design with students from other schools of architecture yearly basis\textsuperscript{169}.

\begin{itemize}
  \item \textsuperscript{167} Ibid. (Michigan: College of Architecture and Urban Planning, 1988) pp. 151-162.
  \item \textsuperscript{168} Dr. Jerzy Wojtowicz, Personal Interview, School of Architecture, UBC, October 24, 2002.
\end{itemize}
2.2.2: Current Practice (School of Architecture, University of British Columbia)

Electronic Design Studio Courses: Presently, in the School of Architecture, University of British Columbia, an electronic design studio course is offered each term as one of six design tutorials constituting the School's professional curriculum. In the final review of each of these design studio courses, each student presents his/her design to the guest critics and the class using an LCD projector (See Plates 2.4 and 2.5). See Fig. 2-14 for an example of a student's work from one of the design studio courses.

Plate 2.4: A Student Presenting His Work during a Design Studio Final Review Using an LCD Projector.

Plate 2.5: A Student Presenting Her Work during a Design Studio Final Review.

Figure 2-14: A Design Studio Project.
A FormZ Rendering of the Interior of an Ice Hockey Rink. Winter Sports Centre Design.
(Ricky Ting, School of Architecture, UBC).

The Introductory Design Studio Course: This is accompanied by workshops where students are taught how to use the design software like Form Z (See Figure 2-15) and Maya. There are other computer applications courses like Design Media II, Advanced Computer Applications and Directed Studies, which are electives.

Figure 2-15: A Student's Work done for a Digital Representation Summer Course
Geometric Model of Smith House by Richard Meier.
3D Modelling and Rendering was done with FormZ. This work was submitted by Larissa Luko for the Digital Representation Course, a Summer Course held at School of Architecture, UBC, in 2002.

Design Media II Course: In the Design Media II course students are introduced to the use of digital media. In this course, emphasis is laid on visual description of data, mapping and site analysis, digital modeling (See Figure 2-16) and the output of physical models using Computer Numerical Control devices (See Plate 2.6 overleaf).

Figure 2-16: A Site Terrain Modelled for a Project Titled "Constructing the Ground Plane"
(Anna Lisa Meyboom, School of Architecture, UBC).


46
Plate 2.6: CNC Milled Model of the Site in a Winter Sports Centre Design.
(Matthias Scolozzi, School of Architecture, UBC).

Advanced Computer Applications Course: In the Advanced Computer Applications course, 3D modeling skills acquired in the Design Media II course are perfected. Students continue to employ the interactive digital media in understanding and publishing of given architectural design (See Figure 2-17).

Figure 2-17: An Object Modelled for a Project Titled “Between Objet Types and Objet a Reaction Poethique”.
(Claudia Cozzitorto, School of Architecture, UBC).
Directed Studies: Beyond the format of the Advanced Computer Applications class, students have the opportunity to undertake a Directed Studies subject and apply computational tools in an individual project (See Figure 2-18).

**Figure 2-18:** Digital Record of Traditional Building Types in Nigeria. Directed Study, School of Architecture, UBC, 2002. Poster prepared by author.

Design Studio Setup: Coming to the set up of the design studio, each student is allotted a drawing board. In addition, the studio has been networked thereby enabling students to hook up to the school’s computer network with their private computers or laptops (See Plates 2.7 and 2.8). Moreover the School of Architecture is also connected to the university’s recently installed wireless network so students can check their e-mail, surf the Web and access the UBC network at high-speeds from almost anywhere on campus - without plugging in cables.\textsuperscript{173}

Plate 2.7: Lasserre Studio, School of Architecture, University of British Columbia
Student drawing at his workstation. His laptop is hooked up to the School’s Wireless Network.

Plate 2.8: Lasserre Studio, School of Architecture, University of British Columbia.
Faculty conducting a crit at a students’ workstation during a Design Studio session.

2.3: POST COLONIALISM IN THE DIGITAL AGE IN NIGERIA

The term "post colonialism" has many connotations. For the purpose of this thesis "post-colonialism" refers to the set of features (economic, political, social, etc) which characterize a country which is no longer colonized and the way in which it is negotiating its colonial heritage. "Digital" refers to any device or activity that makes use of, or is based on computer technology. For the purpose of this thesis, digital post colonialism is defined as the way in which a formerly colonized country seeks to negotiate its colonial heritage by means of computer technology. Hence, this thesis will discuss ways in which Nigeria can manage its colonial architectural heritage using computer technology.

2.3.1: Computers and Nigerian Design Education

The following are the positive effects which computers will have on Nigerian Design Education:

Collaborative Learning:

The computer will enable communication between professionals, scholars, educators, and researchers across the country. This will be done via Internet - e-mail, Internet chat rooms. Hence scholars will be able to gather information and explore issues without having to travel around. Papers and journals can even be published electronically. For instance, the AARCHES Journal (Association of Architectural Educators) and the NIA Journal (Nigerian Institute of Architects) will improve in quality if published electronically because with this new medium more architects will become involved in these publications and hence more ideas will be harnessed. This will create connections between the various universities in Nigeria. These new activities would have been very difficult to accomplish otherwise. Apart from the advantage of improving communication between scholars all over the country, the computer will serve as a means of pooling knowledge from the cream of academia and will create a healthy environment for collaborative research.

Visual Presentations

Much of the course work in the field of architecture involves imagery. In a situation where textbooks are not enough to go round, it would be very helpful if lecture notes are supplemented with visual information other than sketches made on the blackboard, which are not always effective. This information can be projected directly from a computer onto a screen e.g., in PowerPoint presentations. This is an effective way of imparting knowledge especially in courses like History of Architecture, Architectural Structures, Building Materials and Building Components & Methods.

For the Design Studio Courses, digital design presentations can be done not only for final presentations but also during the design development stages. This is especially beneficial in imparting design knowledge to a large number of students at the same time. This can be achieved by periodically conducting general crits in which each student presents his/her work to the whole class by means of an LCD projector. The advantage of such presentations is that each student sees and hears the correction given to others.

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2.3.2: Obstacles to Computing In Nigerian Design Education and Possible Solutions

One obstacle to computing in Nigerian design education is the problem of Internet connectivity. The telephone infrastructure in Nigeria is in poor condition. According to Cliff Missen, a Fulbright scholar from the University of Iowa, who was invited by the U.S. Embassy in Nigeria in 1999 to assess the state of Internet connectivity at Nigerian universities, the existing Internet connections at the time of his arrival in Nigeria were so slow that it was impossible to open a Web page without being timed out repeatedly.\(^{178}\)

The Internet connection of the Nigerian Telecommunications Limited (NITEL) is severely limited and overburdened. Moreover, those who use NITEL's Internet service report dramatic delays and frequent outages. Hence, satellite connectivity is the only current viable option for most Nigerian universities. At the time of Missen's initial tour of the country, only one university (Obafemi Awolowo University, Ile-Ife) had connected to the Internet via satellite. Four of the universities visited had intentions to install satellite ground stations, but only two had gone as far as collecting bids from vendors and preparing a plan.\(^{179}\) However, the good news is that a satellite was recently launched by the federal government of Nigeria (September 26, 2003)\(^{180}\). With this new development there is hope that the Internet connectivity needs of Nigeria's universities will soon be met.

Another problem is the lack of computer and network expertise in the country. A number of universities have tried to train a cadre of technologists only to lose them to private firms. In view of these problems, the National Universities Commission of Nigeria, motivated by Cliff Missen, has designed a plan, which is focused on both putting the necessary hardware into place while training the technologists to make the process sustainable.\(^{181}\) This plan is capital intensive, estimated to cost $1 million USD, and will definitely take some time to put into effect. As part of the project, two technician training workshops for staff members of federal universities have been held. In addition to that, three conferences on Information and Computer Technology in higher education have also been held.\(^ {182}\) It is also part of the plan that trainees should continue training at their home institutions.

For the problem of lack of computers, universities could source for computers from corporate firms. These firms could volunteer labour, administrative and technical support and work closely with partner universities while the universities raise fund for purchasing materials and also provide labour.\(^{184}\)

2.3.3: Dangers of Computer-Mediated Learning and Remedies

The idea of incorporating computers into design education in Nigeria is not without its inherent dangers. First of all, the computer initiates its users into the seductive consumer lifestyle of demanding continual technological innovations;\(^ {185}\) hence, introducing computers into education

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\(^{179}\) Ibid.


\(^{181}\) Ibid.


in Nigeria aggravates our technological and intellectual dependency on Western Europe and North America. Furthermore, computer programs are based on Western modes of thinking. The adoption of the computer will result in a subtle and imperceptible transformation of our culture. This is due to the fact that the computer reinforces the modern, Western pattern of individual-centered relations and forms of consciousness. Jean-Pierre Dupuy in his article "Myths of the Information Society" has observed that information technology, instead of fostering harmony among people, aggravates alienation.

Another aspect of computerization in education in Nigeria that has to be put into consideration is the fact that computer-mediated learning leads to the loss of important forms of knowledge and communal relationships. It is important to note that computers cannot reproduce forms of intergenerational communication and embodied experiences. As a result of this, knowledge associated with instructional software programs is usually decontextualized.

To alleviate these dangers, it is necessary while training faculty and students in the various applications of computers to help them understand how computers contribute to undermining the cultural diversity. This will help them recognize more clearly the appropriate and inappropriate uses of computers. Moreover, making faculty aware of the pedagogical and cultural aspects of educational computing will enable them to know when to supplement an instructional program with a historical perspective and when to ground it more with local custom. Faculty will then be left with the judgment of "knowing what should be communicated through print and what is more appropriately shared through the spoken word," In fact, the approach of sending Nigerian faculty to a Western country for advanced degrees in educational computing is not adequate, given the variation in cultural norms in thought and practice. Instead, an interdisciplinary institute for the study of education, technology, and culture should be developed so as to cater to the educational needs of faculty who will train future generations in the use of computers in education in Nigeria.

It is also necessary to mention some characteristics of the Internet which educators should take note of. One cannot always be sure of the accuracy and credibility of material gotten off the Internet. The Internet has no centralized control and regulation; hence it is susceptible to electronic sabotage and content alteration. The remedy for this problem is to encourage students to assess the value of the information they find on the Web. This can be done by requiring that students identify or explain who the Web-based sources they cite are. For example, students can be taught easy verification techniques such as noting if a Web site has a " .com" or " .org" domain name. Furthermore, students should be required to provide the credentials of the authors of the web sites which they have cited in their research paper.

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188 C. A. Bowers, Miguel Vasquez, and Mary Roaf. p. 185.
189 C.A. Bowers. The Cultural... p. 129.
190 C. A. Bowers, Miguel Vasquez, and Mary Roaf. p. 184.
191 Ibid. p. 189.
192 C.A. Bowers. The Cultural... p. 133.
193 C. A. Bowers, Miguel Vasquez, and Mary Roaf. p. 188.
194 C.A. Bowers. The Cultural... p. 134.
195 C.A. Bowers. The Cultural... p. 135.
CHAPTER THREE
RESEARCH METHODOLOGY

3.1: PROCEDURE OF DATA COLLECTION

The research included a series of case studies consisting of questionnaires and interviews. Questionnaires and interviews were used for obtaining information about the level of computerization in the schools of architecture visited. This procedure was also used to find out people's ideas regarding the issue of incorporating computers into architectural education in Nigeria and the means of effecting it.

For the purpose of obtaining typical examples of traditional, colonial and contemporary architecture in Nigeria, digital pictures of selected buildings were taken. Prints of original working drawings of some buildings were obtained and copies of historical documents related to colonial architecture in Nigeria were also obtained.

3.2: SAMPLE SELECTION

The case study was conducted on universities in Enugu and Lagos. Though there will likely be variations in other locations, due to social and economic factors, universities in Nigeria face similar issues in adopting computer technology.

Method of Selection

A total of three universities and five architectural firms were selected for interviews: -
- Two universities in Eastern Nigeria.
- One university in Western Nigeria.
- Three in Enugu, Eastern Nigeria.
- Two of the prominent architectural firms in Lagos. One belonging to an indigene and the other an expatriate firm.

A total number of one city, two towns and five villages were selected for the purpose of pictorial documentation:-
- A city which has many good examples of colonial and contemporary architecture.
- Towns which have good examples of colonial and contemporary architecture.
- Villages which have good examples of traditional architecture.

Two parastatals were selected for collection of historical documents:-
- One parastatal in Eastern Nigeria.
- One parastatal in Western Nigeria.

Criteria of Selection

The sample selection for universities was based on the following criterion:-
- Universities which offer architectural degrees.
- Prominence of the university.

The sample selection for the architectural firms was based on the following criteria:-
- Firms belonging to indigenes.
- Firms belonging to expatriates

The sample selection for the parastatals was based on the following criterion:-
• Parastatals situated in one of the regional capitals (i.e. the regions created during the colonial period).

3.3: PLACES VISITED AND PARTICIPANTS

Universities

Three universities were visited - University of Nigeria, Enugu Campus; Enugu State University of Science and Technology, Enugu and University of Lagos. A total of two Heads of Departments, twenty one faculty members and thirty four students filled the questionnaires.

At the University of Nigeria, Enugu Campus, the Head of Department and eight faculty members of the department filled the questionnaires. All of them are members of the Association of Architectural Educators in Nigeria while seven are members of the Nigerian Institute of Architects. In fact one of them is a foundation member of the Association of Architectural Educators in Nigeria while another is a member of the Education Board of the Nigerian Institute of Architects. Twelve students from the department filled the questionnaires. Out of these twelve students, three were first year students, eight were second year students and one was in the second year of his M.Sc programme.

At the Enugu State University of Science and Technology, Enugu, the Head of Department and ten faculty members of the department filled the questionnaires. Ten of them are members of the Association of Architectural Educators in Nigeria; one is a fellow, six are full members while two are associate members of the Nigerian Institute of Architects. Eleven students from the department filled the questionnaires. Out of these eleven students, one was a fourth year student while ten were second year students.

At the University of Lagos, the Head of Department was not available for an interview. However, three faculty members of the department were interviewed. Two of them are members of the Association of Architectural Educators in Nigeria while two are members of the Nigerian Institute of Architects. Eleven students from the department filled the questionnaires. Out of these eleven students, five were second year students while six were fourth year students.

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<tr>
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KEY
UNECE – University of Nigeria, Enugu Campus.
ESUT – Enugu State University of Science and Technology
UNILAG – University of Lagos.

Table 3-1: Sample of Case Studies: Universities.
Architectural firms

Five architectural firms were visited and a total of fifteen architects filled out the questionnaires. Out of the five architectural firms visited, three were located in Enugu and two were located in Lagos. The three architectural firms visited in Enugu were Frank Mbanefo and Associates, Design Modules and Chic Designs. At Frank Mbanefo and Associates, the Principal Partner, Arc. Frank Mbanefo, who is one of the founding members of the Nigerian Institute of Architects, was interviewed. He has once served as the President of the Institute (1989-91) and as the Vice President of the Commonwealth Association of Architects for Africa (Zone 5). He is also a fellow of the Institute. At Design Modules, the Principal Partner, Arc. Kanu Okoronkwo and one of the other architects in his firm were interviewed. At Chic Designs, only the Principal Partner, Arc. Chuba Uboma was interviewed.

The two architectural firms visited in Lagos were A.T.Onajide Architects (a firm belonging to an indigene) and James Cubitt Architects (an expatriate firm). At A.T.Onajide Architects, the Principal Partner, Arc. Ayoola Onajide and four of the other architects in his firm were interviewed. At James Cubitt Architects, six of the architects in the firm were interviewed.

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<tr>
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</tbody>
</table>

**KEY**

CD – Chic Designs  
DM – Design Modules.  
ATO – A.T. Onajide & Associates  
JC – James Cubitt Architects.

*Table 3-2: Sample of Case Studies: Architectural Firms.*

Others

The Ministry of Works and Housing, Enugu was visited and prints of the original working drawings of a number of colonial buildings, which they had in their archives, were obtained. The Ministry of Works, Lands and Surveying, Lagos was visited and prints of survey plans of Lagos were obtained.

The following towns were visited and pictures of selected buildings in these towns were taken:-

- Owerri, capital of Imo State (See Figure 3-1).
- Ihitenansa, Orsu Local Government Area, Imo State.
- Umuhu Okabia, Orsu Local Government Area, Imo State.
- Ihiteoworri, Orlu Local Government Area, Imo State.
- Mgbee, Orlu Local Government Area, Imo State.
- Umuchima, Ideato South Local Government Area, Imo State.
- Enugu, capital of Enugu State (See Figure 3-1).
- Lagos (See Figure 3-1).
Figure 3-1: Map of Nigeria Showing Places Visited\textsuperscript{197}.

St. Gregory's College, Obalende, Lagos, (the first Roman Catholic College in Nigeria) was visited and the sectional head of the senior school section of the college was interviewed. A firm of chartered surveyors and valuers was also visited. The principal partner who is an old student of St. Gregory’s College and who is also a descendant of one of the returnee slaves of Nigeria was interviewed. He had a lot of valuable information related to St. Gregory’s College, and Brazilian Architecture in Nigeria.

The first storey building built by European immigrants in Nigeria and the first administrative block built in Nigeria, both located at Badagry were visited. The District Officer’s residence which also lies within the same axis was visited.

3.4: QUESTIONNAIRE AND INTERVIEW DESIGN

Four different sets of questionnaires were used for the interviews. There was a different format for each of the following categories: - Heads of schools of architecture, faculty members, practicing

\textsuperscript{197} Adapted from map produced by Oxford University Press.
architects and students (See Appendix A). The questionnaires were filled by the interviewees. However, in some cases where a particular interviewee had additional information to offer, I filled in the information during the interview.

The questionnaires were designed in such a way as to help ascertain the following:
- the level of involvement of the selected heads of departments, faculty and architects in professional bodies.
- the extent of knowledge of the computer by the selected faculty members and students (See Table 1).
- the available computing facilities in the selected schools (See Table 3-1).

Further, it examined the general interest in the use of computers in architectural education, plans for computerization if any and effort already made towards computerization. Suggestions were solicited for means of providing computer facilities in schools of architecture in Nigeria. Finally, it sought to find out views about incorporating Nigerian traditional architecture into the architectural design studio course.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>UNIVERSITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UNEC</td>
</tr>
<tr>
<td>Number of students</td>
<td>250</td>
</tr>
<tr>
<td>Number of faculty members</td>
<td>19</td>
</tr>
<tr>
<td>Number of faculty members who know how to use the computer</td>
<td>8</td>
</tr>
<tr>
<td>Number of lecturers who know how to use AutoCAD</td>
<td>1</td>
</tr>
<tr>
<td>Computing facilities</td>
<td>8 PCs &amp; 1HP LaserJet printer</td>
</tr>
</tbody>
</table>

**KEY**

*UNEC* – University of Nigeria, Enugu Campus.
*ESUT* – Enugu State University of Science and Technology

*Table 3-3: Level of Computerization of Schools of Architecture Visited.*
CHAPTER FOUR
RESEARCH FINDINGS

4.1: TRADITION IN THE CURRICULUM OF DESIGN STUDIO COURSES

4.1.1: Level of Support

Based on my survey, there is majority support for the idea of incorporating traditional architecture into the design studio curriculum. Nigerian architecture has not dealt sufficiently with traditional aspects due to influence of colonial education. Even in our national architectural projects the importance of cultural use of spaces is not emphasized. I have a story which buttresses this point.

The creation of Kainji Dam (See Figure 4-1 overleaf) on the Niger River caused the displacement and resettlement of about 44,000 people between 1967 and 1968. Kainji Lake had been created for the generation of hydro-electric power on the River Niger. As a result of this new development, New Bussa Township (See Plate 4.1 overleaf) was planned for the resettled population of old Bussa and about hundred villages were moved from areas to be flooded and relocated along the lake front (See Figure 4-2 on p.60). Many indigenous groups were affected by the resettlement exercise and among them were the Kamberis. Unfortunately, they lived for only “six months before deserting their new modern houses and building themselves traditional houses with the inner/outer spaces they had lived in all their lives”.

David Aradeon, in his study of the Kamberis and the effect of the resettlement on them, observed that the new modern houses had many problems. Although, the architect, Robin Atkinson, had tried to duplicate the traditional house forms of the Kamberis, upgraded the building materials and methods of construction and provided basic amenities, the spaces were out of scale. The functional interrelationships of the Kamberis in the new villages became disoriented and confusing. What in their traditional spatial organization was a single family structure became a compound for several families. The compounds in the new villages were built to accommodate ten to twelve people while a typical compound in their traditional setting contained as many as forty people. Domestic animals got mixed up, people could overhear other people’s conversations, and physical privacy for these people, who do a great deal of their living outdoors within the compound, was no longer possible.

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202 David Aradeon.
204 David Aradeon.
Figure 4-1: Map of Nigeria Showing the Location of Kainji Dam\textsuperscript{267}.

Plate 4.1: New Bussa\textsuperscript{268}.

\textsuperscript{267} Adapted from map produced by Oxford University Press.
"In addition, the secretive Kambaris had to endure an echo problem, a totally new and unpleasant phenomenon. Moreover, because of their need for warmth at night and smoke to keep out mosquitoes, the Kambaris in the resettlement villages woke up in the morning covered by a film of black smoke – where the grass roof of a traditional house had allowed the smoke to escape (See Plate 4.2), an asbestos roof could not handle this problem (See Plate 4.3 overleaf). In

Plate 4.2: The Original Village Type Houses Built Of Mud With Thatched Roofs.\(^{210}\)

\(^{208}\) I.A. Adalemo. p. 278.
\(^{209}\) Ralph Mills-Tettey. "New Bussa: The Township and Resettlement Housing". p. 34.
\(^{210}\) I.A. Adalemo. p. 298.
addition, the Kamberis, who had been living in a subsistence farm economy, were suddenly confronted with houses and their attendant problems, such as repairing/Replacing cracked asbestos roofing sheets, compelling them to seek professional expertise from outside their cultural milieu²¹².

The above narrative shows that there is need for an in-depth study of Nigerian traditional architecture by students of architecture so as to prevent similar experiences to the one mentioned above in the future. The present generation is ignorant in this area. In the present age of postmodernism, students should be conversant with their cultural heritage. The current state of ignorance in matters pertaining to traditional Nigerian architecture is surprising in the light of the fact that the Nigerian Universities Commission has in its minimum standard for Nigerian universities emphasized cultural component of architectural education.

Traditional concept in design studios should be revived by encouraging students to carry out research on traditional Nigerian Architecture. The improved curriculum should include the study of cultural use of spaces, traditional building materials and building styles which reflect our own tradition. Students should be encouraged to study what existed and what is current. There should then be a cross matching in order to project the future. The students should also learn traditional construction methods, practice them with local artisans and develop their research findings in their designs. In the course of their research they should also find out the extent to which the lack of technological knowledge has influenced rural building construction. Such in-depth study of Nigerian traditional architecture will make it easier for them to incorporate useful and positive traditional elements into their modern designs.

Incorporating traditional architecture into Nigerian design education will assist us in preserving our cultural heritage. When this is done neo-colonialism will be moderated and our culture, which has been replaced by western culture, will be revived and promoted. A link will be created between architectural students and their roots thereby providing cultural orientation. This kind of research will help students to find out about the development of Nigerian architecture in various

²¹¹ I.A. Adlemo. p. 276.
²¹² David Aradeom.
communities and during various periods. They will then be able to appreciate the socio-architectural problems of Nigeria which will lead to more appropriate use of spaces in their designs. Moreover, a lot of contemporary Nigerian architecture has no character. Incorporating traditional Nigerian architecture into contemporary designs would inject some character and order into it. Further, these cultural studies will serve as a background for students of architecture to compare and contrast their own architecture with architecture in other parts of the world.

It is not enough to educate students in this area, professionals should also be educated about adopting traditional architectural elements in their designs. They in turn have the responsibility to educate their clients on this need to revive our traditional architecture. This subject should be discussed in professional architectural journals. Exhibitions should be organized in traditional Nigerian architecture. Books should be written on the subject. This is very important and indeed is an urgent task because Nigerians do not know much about their culture and hence do not value it.

4.1.2: The Issue of Affordable Housing in Nigeria

Research into traditional Nigerian architecture may lead to a reduction in building cost. Presently, the popular building material is cement but it is very expensive. Cement has become so expensive that it is now out of reach of the poor masses in Nigeria. The use of local building materials is the solution to the high cost of building. There is presently a dire need for affordable housing in Nigeria. Consequently, many concerned authorities have called for more simple humane and moderate scale structures which reflect the socio-cultural needs, physical and economic circumstances of Nigerians.

The Nigerian Institute of Architects (NIA) in its communiqué at the end of its November 1985 Silver Jubilee Celebration, recommended that more attention be paid to the usage of traditional building materials. The communiqué also stressed that there should be increased funding for research into the availability and quality of local materials, resources and motifs. Effort has also been made to resuscitate interest in the use of clay bricks in building construction. It is interesting to know that clay bricks were also introduced during the colonial era, even before sandcrete blocks, and at a time was very popular, but the present reality is that sandcrete blocks have taken over as the most popular building material. The Nigerian Federal Government in its bid to reduce housing cost has set up brick work plants in different parts of the country. However, prospective house owners still prefer using sandcrete block, despite the fact that it costs more than brick. Hence, more effort has to be made in the area of educating the masses about the advantage of using traditional building materials. Introducing traditional Nigerian architecture into the design studio curriculum is a step towards this goal of educating the masses since the students are part of the masses. They can extend this knowledge to their family and friends who will in turn spread the information.

4.1.3: Current Level of Incorporation of Traditional Nigerian Architecture in Curricula of Schools of Architecture in Nigeria

Some of the universities visited have already included tradition in their design studio course. At the University of Lagos, tradition is fully incorporated into the design studio curriculum. At the University of Nigeria, Enugu Campus, tradition has been integrated into the educational philosophy of the Department of Architecture and has been expressed in many students' works, however, they are working towards incorporating the design component of that course. At Enugu State University of Science and Technology, the concept is already in practice but more

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213 Innocent Akubue. "Mitigating Nigeria's Housing Shortage With Brick-Based Housing". Housing Science Vol. 14, No. 3, pp. 220, 221
emphasis needs to be made by designing a specific course that treats the subject matter. However, several postgraduate students at the university, who had dissertation topics like cultural centres, and masquerade centres, have come up with interesting Nigerian traditional architectural statements which are quite encouraging. In Northern Nigeria where separation of private and public domain is critical to the success of any scheme (Islam is the predominant religion in Northern Nigeria) cultural use of space is already taught in schools of architecture.

4.1.4: Other Associated Issues

Standards of Nigerian traditional architecture should be defined and agreed upon by members of the Nigerian Institute of Architects whereby modifications and various concepts would be mere offsets from these standards. This would help us create an identity for Nigerian architecture, hence, giving us cultural relevance. However, it is necessary to note that traditional Nigerian design elements cannot be integrated into every design project. There are many project types for which a traditional precedent does not exist. For instance, for a design topic like a hospital, in the Nigerian traditional context, the sick were treated in their homes, so one cannot emphasize the cultural use of spaces in a hospital design. Hence, this idea should only be encouraged in domestic and cultural buildings where relationship between traditional architecture and the design project can be emphasized.

4.1.5: The Role of Computers

Information Technology has transformed every aspect of social life all over the world and can make a positive impact on Nigerian Design Education. The following are the ways in which it can assist us in reviving our traditional architecture:

**Documentation**

Students of schools of architecture should be made to go back to the village; document life styles; record forms and discover the use and meaning of their cultural space. For the purpose of this research they should be given guidelines (See Appendix B for a sample guideline for documenting Nigerian traditional Architecture). The information obtained from such research should be converted into digital databases.

Below is an example of a building documented by me (See Plate 4.4 overleaf). It was built in the 1940's to serve as the "obi" (family open space) of the Ogbunofo family in my town Oraukwu, Anambra State, Nigeria. This picture was originally taken by the Ogbunofo family in 1975 just before the building was pulled down. You can see from the picture that there are cement blocks assembled around the building waiting to be used for the construction of the new "obi".

I had to retake this picture from the original in 1992 when as a student of architecture; I was given an assignment to conduct research into laterite construction in my village. I was not able to find a single existing building constructed of laterite at that time — hence, the need to retake this picture as a case study. This shows how urgent it is to document all these now before it is too late.

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215 Mrs. F. I. Obembe, Personal Interview, Department of Architecture, University of Lagos, Nigeria, July 22, 2003.
Plate 4.4: Adobe Hut, Oraukwu, Anambra State, Nigeria.

During my field study in Nigeria, I was able to compile many more examples of traditional, colonial and contemporary architecture in Nigeria. These can be seen in the CD-ROM which is attached to this thesis.

Simulation

As a result of colonial influence, in most parts of the country, traditional architecture is a thing of the past and, as I have already mentioned, there are many areas in Nigeria where there is no living example to document. In such cases, sketches should be made from descriptions obtained from interviews. Three-dimensional models should then be constructed to simulate what used to exist.

Below are images from my simulation of a traditional Igbo compound (See Figure 4-3). I was able to construct this model from the information I gathered from interviews. Other images of the simulated Igbo compound can be found in the CD-ROM attached to this thesis.
The “Obi” is the room for receiving visitors. It is usually placed in a strategic position so that the man can oversee the entrance.

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**Figure 4-3: The “Obi” (Family Open Space) in a Traditional Igbo Compound.**
*Computer model by author.*

**Sharing of Information**

It is not enough to gather and store this information. The research findings should be shared by making them available on the Internet. This means that every school of architecture in Nigeria should have a website where this valuable information can be stored. If each of these departments has a website and makes available information on traditional Nigerian architecture on their website, we will become more aware of the wealth of our architectural heritage and hence come to value what we have. Moreover our traditional architecture will be made known to the whole world and consequently popularized.

Some effort has been made in the use of computers for documenting traditional African architecture. For instance, there is a non-governmental organization known as “Legacy” founded by a group of Nigerians and non-Nigerians whose aim is preserving and conserving historic buildings and monuments. They have a website with pictures of historic buildings and monuments216. One of the examples on this website is the Kano City Wall (See Plate 4.5) which has existed for about ten centuries.

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Research

The computer will also facilitate research into the traditional methods of construction and will help us find ways in which they can be adapted to our contemporary needs. My idea is that research should be undertaken to harness the positive aspects of our traditional architecture in order to apply them to contemporary architectural designs in Africa. We need architecture, which is sustainable and suitable for our climate and culture. Presently, there is an architect in Ghana, Alero Olympio, who is exploring natural building materials in the bid to develop the skills to use them. Her aim is to develop a contemporary African architecture that is sustainable. She builds houses with laterite brick which is much cheaper than the use of cement. I got to know about her through the Internet. Hence the computer, through the Internet, can create links between researchers all over Africa who are interested in this area of research.

4.2: PROCESS OF ADOPTING COMPUTERS IN SCHOOLS OF ARCHITECTURE IN NIGERIA

Similar to the case of the idea of incorporating traditional architecture into the design studio curriculum, there is unanimous support for the concept of adopting computers in architectural education in schools of architecture in Nigeria. The computer has many advantages:

- It facilitates the processing of ideas within seconds.
- It makes design work easier and interesting.
- It makes storage and location of information and design drawings easier.
- It reduces the menace of drawing preservation and bulk storage.
- It increases efficiency of students.
- It improves the work of students in the area of generation of ideas, precision and detailing.

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• It makes transfer of knowledge faster.
• Computers aid research.
• Knowledge gathered in the course of research work from a particular region in terms of housing systems can be stored and retrieved for use when required.
• Students will have a broader knowledge of the profession by visiting websites of architectural firms and other schools of architecture and exchanging design ideas online.
• It will enhance productivity on the part of students and lecturers.
• It will improve standards and exposure in the architectural industry.

Though the computer has many advantages, traditional methods of teaching design should be retained while incorporating computer-aided design. As part of the process of adopting computers the following steps should be taken:
• Provide adequate space for computing facilities
• Provide computing facilities
• Train faculty members
• Develop a curriculum that includes courses in computer-aided design.

4.2.1: Providing Adequate Space for Computing Facilities

Space is a very important consideration in this enterprise. Each school should have a computer room or laboratory with enough computers to serve both students and faculty members. Moreover, these computers should have various architectural design software. Before acquiring the computer facilities a suitable work space should be designed and prepared. The university should provide the required space. The allocated space should then be designed to suit the needs of the computer laboratory. This design should provide space for the following:

• Equipment: computer, disk drive, monitor, keyboard, printer, scanner, digitizer
• Additional accessories: wires, cables, uninterruptible power supply (UPS)
• Paper
• Disk storage
• Software storage
• Current and previous hard copies
• Backups
• Manuals and references
• Visual attraction to relax eyes from constant looking at computer monitor219.

The main considerations should be:
• Availability of required space physical space
• Position of user to the input devices and display
• Lighting (lighting design should minimize glare)
• Noise
• Furniture
• Flexibility to accommodate future changes220

4.2.2: Providing Computing Facilities

At the stage of computer acquisition the following issues need to be addressed:-

(i) Funding

This aspect of the scheme is the most tasking aspect. This is because most Nigerian universities do not have the financial capability for this. There are many means through which fund can be raised for this project and they are as follows:-

- Grants from National Universities Commission, Nigeria.
- Donations from Alumni.
- Donations from individuals.
- Donations from organisations.
- Grants and donations from architectural firms.
- Grants and donations from Nigerian Institute of Architects.
- Sourcing for computers from foreign universities.
- Students to provide for themselves.
- Students to be levied.
- Acquisition cost of laptops should be subsidized for students.
- Loans or grants from Non Governmental Organisations.
- Loans or grants from Multi Nationals.
- Sponsorship from computing firms.
- Sponsorship from building material manufacturers.
- Assistance from government through the Education Tax Fund.
- Donations from corporate bodies like banks and oil companies.
- Donations from foreign high commissions like British Council, French Council and German Council.
- Donations from Manufacturer’s Association of Nigeria.

In order to ensure stability, each university should fund the computerisation of its school of architecture while other sources supplement. However, the computer laboratory should be self-sustaining.

Some of the above suggestions have been implemented successfully by some universities in Nigeria. For instance, National Universities Commission, Nigeria distributed about fifteen computers to each federal university in 1998. University of Lagos got a couple dozen computers from a local bank for educational purposes. The University of Nigeria Nsukka received a grant of N25 million from the Central Bank of Nigeria (CBN) to assist them in establishing direct Internet connectivity.

(ii) Selection of Software and Hardware

Before selecting the software and hardware to be acquired there should be proper planning. Proper consideration should be made of the anticipated use of these hardware and software. This will help to determine what should be acquired. The number of people going to use these

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221 Arc. C. O. Oji (Senior Lecturer, Department of Architecture, University of Nigeria, Enugu Campus). Personal Interview, June 6, 2003.
computing facilities should also be tabled in. A guideline for system selection can be found in Appendix B. Below is a sample table designed to assist in this stage of planning:-

<table>
<thead>
<tr>
<th>ANTICIPATED TASKS</th>
<th>APPLICATION SOFTWARE NEEDED</th>
<th>ANTICIPATED USERS</th>
<th>NUMBER OF ANTICIPATED USERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word Processing</td>
<td>Microsoft Word</td>
<td>Faculty Members, Students and Administrative Staff</td>
<td>273</td>
</tr>
<tr>
<td>Spreadsheet</td>
<td>Microsoft Excel</td>
<td>Faculty Members and Administrative Staff</td>
<td>23</td>
</tr>
<tr>
<td>Database</td>
<td>Microsoft Access and Excel</td>
<td>Faculty Members and Administrative Staff</td>
<td>23</td>
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<td>Office Management</td>
<td>Microsoft Excel</td>
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<td>23</td>
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<tr>
<td>Financial Management</td>
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<tr>
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<td>Faculty Members and Students</td>
<td>270</td>
</tr>
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<td>Computer Aided Design</td>
<td>AutoCAD</td>
<td>Faculty Members and Students</td>
<td>270</td>
</tr>
<tr>
<td>3D Draughting</td>
<td>FormZ</td>
<td>Faculty Members and Students</td>
<td>270</td>
</tr>
<tr>
<td>3D Animation</td>
<td>Maya</td>
<td>Faculty Members and Students</td>
<td>270</td>
</tr>
</tbody>
</table>

Table 4.1: Anticipated Application Requirements.

Putting into consideration the fact that power supply in Nigeria is not dependable and that uninterruptible power supply is a critical requirement in the operation of computing facilities; it is a good idea to adopt solar backup systems for the computing facilities. This system is currently in use at the University of Jos. The computer networks at the Bursary, Accounts Section, Computer Centre, Library, and the Central Administration of the University of Jos have recently been backed up with solar systems.224

(iii) Maintenance of Computing Facilities

It is not enough to provide computing facilities, they need to be maintained. For this purpose, an individual should be put in charge of system management. All computer issues should be communicated to the system manager and related to the appropriate sources through him/her. The system manager should co-ordinate the following225:

- Acquisition, installation and maintenance of computer hardware, software and the computer network.
- Problem solving procedures.
- The security of information.
- The ongoing educational and training programmes.
- The efficient use of the system (schedule, capabilities).
- The development and use of the evaluation methods (quality, efficiency, effectiveness and economy).

225 Mitra Kamaneshi. p. 156.
• Scheduling the system use.
• Evaluating the growth requirements and time.226

4.2.3: Training the Faculty Members

Before incorporating computers into the architectural curriculum, it is very important that all the faculty members should have basic knowledge not only of the use of computers but also of the use of relevant architectural design software. This is very important so that they will be able to guide the students effectively.

From the data collected as part of this research, in University of Nigeria, Enugu Campus, eight out of nineteen faculty members know how to use the computer but only one knows how to use AutoCAD. At the Enugu State University of Science and Technology, ten out of twenty faculty members know how to use the computer while five know how to use AutoCAD. This shows that there is still a lot of work to be done in the area of training. There are many ways in which this training can be achieved and they are as follows:

Exchange programmes

Exchange programmes can be organized between schools of architecture in Nigeria and foreign schools of architecture. Under such an arrangement, faculty members and students from schools of architecture in Nigeria can be sent to foreign universities to gain some exposure in the area of computer applications in architecture. This step has already been taken by the Department of Architecture at the University of Nigeria, Enugu Campus. Two of the faculty members were sent to a university in Switzerland for computer training. Unfortunately, one of them died soon after returning from the training227; hence only one is left to train the other faculty members.

Workshops

Workshops can be organized by schools of architecture for training their faculty members. Architects who are experienced in the use of computers can be invited to share their knowledge. Moreover, faculty members should be assisted with funding to attend workshops anywhere they can acquire some relevant training. Training should not be restricted only to architectural software but should also extend to the basics of computer networking and setting up of Internet links.

Currently, there is a nonprofit project at the University of Iowa (The WiderNet Project) which is working on improving digital communication in developing countries. Their current focus is on Africa and their closest ties and connections at the moment are with Nigerian universities228. They have been organizing workshops and conferences in Nigerian universities since November 2001. In these conferences participants have received technical training in computer networking, wireless networking and web design. At least a hundred staff members from about fourteen of the federal universities in Nigeria have participated in these workshops229.

Personal Effort

Faculty members can also make personal effort to acquire or update, as the case may be, knowledge of computer applications in architecture. However, it will be encouraging if the university were to provide computers for them. This will facilitate the process. Practice makes perfect but practice cannot be possible where there is no computer to practice on.

Finally it is necessary to mention that in the recruitment of new faculty members for schools of architecture, one of the criteria for employment should be experience in the use of computers. This will help reduce the time and fund spent on computer training for faculty members. If all the necessary effort is made the faculty members will attain the proficiency level necessary for training the students.

4.2.4: Developing a CAD Curriculum.

It goes without saying that the present architectural curriculum needs to be modified to accommodate computer application courses. Various suggestions were made by respondents to the questionnaires. They are as follows:-

- Courses in Computer Aided Design and Draughting should be introduced.
- Courses in Applications of Information Technology (e.g. internet browsing e.t.c.) should be introduced.
- Two or more courses of 2 or 3 credit units each on “Introduction to Computer” and “Computer Aided Design” should be established. These courses should be compulsory.
- Computer applications in architecture should be taught as an aspect of the usual graphic design course.
- Students should be taught the application of computers to design after the general introductory lectures on computer science.
- Computer Aided Design should be permitted in design studio projects.
- Students should be made to produce their drawings using computers.
- There should be other electives in other computer applications such as ARCHVIEW, GIS.

Suggestions were also made concerning the modality of adopting these courses. They are as follows:-

- The computer application courses should be a combination of lectures and practicals.
- The computer application courses should be more of practical activity.
- Application of computer courses should be taught for four hours a week.
- Students should be taught AutoCAD in years 1 and 2.
- There should be compulsory computer training for students of architecture (whether at universities or at polytechnics) after the first two years of study.
- Basic draughting skills should be upheld in the first degree while computer design should be introduced at Masters’ Level.
CONCLUSION

We have lost touch with the roots of our built heritage. Foreign architecture has been imported into our environment. Some of the foreign examples are good, however many are unsuitable for our climate and economy. There is a need to revive the use of traditional building materials. We need to rediscover the beauty of our traditional building materials and methods of construction. I found out to my dismay during the course of my research that the old woman who owns one of the huts I documented no longer appreciates her hut but is more interested in having a corrugated aluminium roof. On the other hand, it is interesting to know that there are companies now producing thatch roofed bamboo huts in the United Kingdom and exporting to Africa\(^ {236} \). We need to re-educate ourselves in our traditional architecture by teaching these theoretically and practically. I am advocating for the introduction of computers in Nigerian design education to facilitate research in this area.

To this end I have, during my field study, explored the level of incorporation of tradition in the curriculum of schools of architecture in Nigeria. I have also studied the level of computerization of schools of architecture in Nigeria and the problems associated with adopting computers. Three schools of architecture provided in-depth information about the level of computerization of their schools and the level of incorporation of tradition in their curriculum. Five architectural firms provided ideas for the process of adopting computers in schools. However, the information could be improved by interviews instead of the use of questionnaires so that the respondents understand the context of certain questions which are posed by the researcher.

From my findings I have seen that our schools of architecture are ripe for the incorporation of the computer. Research has been going on in various aspects of traditional Nigerian architecture in our schools; however, they have not been sufficiently publicized.

1. RESEARCH IMPLICATIONS

Curriculum Development

The architectural curriculum should be developed to include tradition in the design studio courses and courses in computer aided design. My own view of a modified architectural curriculum which integrates the computer is as follows:-

- There should be a course which introduces students to the use of computers in the first year. Basics like the operation of the computer, word processing and internet browsing should be taught at that stage. The course should be more of a practical course.
- An introductory level component on the application of computers in architecture should be added to the curriculum of the traditional Architectural Graphics course which is usually taught in the first year. At this stage students should be familiarized with image processing software.
- A more advanced computer application course should be taught in the second year. This will go hand in hand with the first design studio course. At this stage the basics of two-dimensional computer draughting should be taught.
- An even more advanced computer application course should be taught in the third year. At this stage 3D computer packages should be introduced. The use of computers in

producing rendered geometric models like orthographic projections, axonometric projections, oblique projections, and perspective projections should be emphasized.

- At the Master's level, the use of the CNC milling machine and the digitizer should be introduced.

At all these stages, the students should learn by hands on experience. Classes should be scenarios where students work in a multi user environment and get exposed to different means of communication and information sharing, file protection, design processing software. If there are not enough computers to go round there should be a time sharing system where each student can be allocated a certain number of hours to practice on the computer per week. However, as has been mentioned before, the computer should not take the place of traditional methods.

**Policy Development**

Computing facilities should be included among the facilities required for the accreditation of schools of architecture. This step will motivate schools to acquire computing facilities. Serious effort should be made by schools towards acquiring computing facilities. As for the provision of computing facilities, they should be provided the way drawing boards and papers have been provided in the past. It is not a matter for debate. This should be a shared responsibility between the school authority, students, architectural firms, Nigerian Institute of Architects and philanthropists. Before acquiring the hardware and software, there should be proper planning to avoid unnecessary waste of fund. When the computing facilities have been acquired the faculty members and students should be levied as a means of providing fund for maintaining the facilities.

The next stage in the process would be the training of faculty members and finally the training of the students after the faculty members must have reached a stage of proficiency. For the training of the students a curriculum should be developed which will gradually take them through the various levels of computer applications in architecture. Students can also empower themselves by teaching themselves. The good thing about computing software is that it is easy to teach oneself subsequently after learning a couple of software.

Computers should be incorporated into the Nigerian university system, not only for reviving traditional Nigerian architecture but also to enable students to become computer literate. These days it is not unusual to see graduates that are computer illiterates. After graduating, Nigerian students often have to take up remedial professional courses from Information Technology schools to catch up on computer skills, which is really not the way it should be. Yet many architectural firms in Nigeria are now computerized. Some private secondary schools are already encouraging school pupils to learn AutoCAD for technical drawing/design. A proper foundation needs to be laid by encouraging AutoCAD instruction in the public school sector.

Each school should have a website where these research findings are published. Many research papers in traditional Nigerian architecture have already been written by students in various universities in Nigeria; however, the information is not publicized. It is my view that information from these research findings should be made available to the public by displaying them on these websites.

Good examples of traditional Nigerian buildings should be preserved and proper records of those that are demolished should be kept. Furthermore, it should be made obligatory to submit a survey and photos of existing buildings before new plans are passed by local authorities.

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231 Chris L. Emejuru. Correspondence by e-mail, 29 November 2003.
2. GUIDELINES

Proper planning is very important not only for a thorough research into traditional Nigerian architecture but also to ensure that computer facilities acquired respond adequately to the educational and administrative requirements at schools of architecture in Nigeria. Following this research, two guidelines were developed, one for the documentation of traditional Nigerian architecture and the other for system selection (See Appendix B). These guidelines will be of valuable assistance in documenting Nigerian traditional architecture and in selection of computing facilities for schools of architecture in Nigeria. The sample design assignment will be a guide for schools which have not yet incorporated traditional Nigerian architecture into their design studios.

3. FURTHER STUDIES

The introduction of traditional Nigerian architecture into the design studio course in Nigerian schools of architecture will promote studies in traditional Nigerian architecture. Computers will not only facilitate these studies but will also make the information acquired there from available to a large number of people, not only in Nigeria but all over the world. Further studies should include:

- Cultural use of spaces in the numerous ethnic groups in Nigeria.
- Documentation of surviving examples of traditional Nigerian architecture in all parts of the country.
- Simulation of extinct traditional house forms.

It is necessary to revive the study of traditional Nigerian architecture so as to help us recapture our architectural treasures from the past. We need to value our architecture and popularize it. I hope that my research will motivate appreciation of our architectural heritage. I also hope that it will result in a revival in the use of local building materials so that in the near future many more buildings will reflect traditional Nigerian architectural elements. Then, houses will become affordable for the masses. If there is a revival of traditional Nigerian architecture, future Nigerian architectural designs will acquire a character and identity. This may lead to the development of a standard for traditional Nigerian architecture so that traditional Nigerian architecture will then become culturally relevant.
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Map of Nigeria. Adapted from map produced by Oxford University Press.
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WEBSITES


APPENDIX A
QUESTIONNAIRES

QUESTIONNAIRE FOR HEADS OF DEPARTMENTS

Name:______________________________________________________________

University:________________________________________________________

Date:______________________________________________________________

1. Are you a member of the Association of Architectural Educators?

2. Are you a member of the Nigerian Institute of Architects?

3. How many students do you have in your department?

4. Do you use computers in teaching your students?

5. Do you intend to start using computers in design education?

6. Do you know how to use the computer?

7. What is the extent of your knowledge of the computer?

8. How many of your lecturers know how to use the computer and to what extent?

9. What computing facilities do you have?

10. What are your plans for incorporating computers into architectural education in your department?

11. What are the obstacles you envisage to your plans of incorporating computers into architectural education in your department?

12. Do you have a course on traditional Nigerian architecture in your curriculum?

13. What do you think of the idea of incorporating Nigerian traditional architecture into the architectural design studio course by laying emphasis on the study of cultural use of spaces in every design project given to students?
QUESTIONNAIRE FOR FACULTY MEMBERS

Name: ____________________________________________________________

University: ______________________________________________________

Date: ___________________________________________________________  

1. Are you a member of the Association of Architectural Educators?

2. Are you a member of the Nigerian Institute of Architects?

3. Do you think that incorporating computers into architectural education is a positive step?

4. How do you think that this can be effected in your department?

5. What are your suggestions regarding the issue of providing computing facilities for your department?

6. What are your views about incorporating Nigerian traditional architecture into the architectural design studio course by laying emphasis on the study of cultural use of spaces in every design project given to students?
QUESTIONNAIRE FOR ARCHITECTS

Name:__________________________________________________________

Address:_______________________________________________________

Date:__________________________________________________________

1. Are you a member of the Nigerian Institute of Architects?

2. Do you think that incorporating computers into architectural education is a positive step?

3. How do you think that this can be effected in Schools of Architecture in Nigeria?

4. What are your suggestions regarding the issue of providing computing facilities in Schools of Architecture in Nigeria?

5. What are your views about incorporating Nigerian traditional architecture into the architectural design studio course by laying emphasis on the study of cultural use of spaces in every design project given to students?
QUESTIONNAIRE FOR STUDENTS

Name: 

University: 

Year of Study: 

Date: 

1. Do you know how to use the computer?

2. What is the extent of your knowledge of the computer?

3. Do you think that incorporating computers into architectural education is a positive step?

4. How do you think that this can be effected in your department?

5. What are your suggestions regarding the issue of providing computing facilities for your department?

6. What are your views about incorporating Nigerian traditional architecture into the architectural design studio course by laying emphasis on the study of cultural use of spaces in every design project given to students?
GUIDELINE FOR DOCUMENTING TRADITIONAL NIGERIAN ARCHITECTURE

Good examples of traditional buildings should be documented and for each building selected, photographs should be taken and the following information should be provided:

BACKGROUND INFORMATION
- Name of owner
- Location
- When built
- Use of building
- How the building was constructed (i.e. by whom? whether it is by a builder or by local/family help)
- Performance in use.

DESCRIPTION OF LOCALITY
- There should be a general description using a map of the area (ordinance survey maps may be obtainable from the Ministry of Lands & Survey).
- Highlight the social and cultural traditions that may have influenced the architecture of the place.

DESCRIPTION OF GEOGRAPHY OF THE PLACE
- Show the influence of the following on the traditional architecture of the town.
  - Climate
  - Vegetation
  - Topography
  - Soil
- Photographs and maps should be used to highlight essential points.

DESCRIPTION OF BUILDING MATERIALS, TRADITIONAL SKILLS AND BUILDING TECHNIQUES
- Photographs and sketches should be used to illustrate the following materials particularly the mode of preparation and stages of construction
  - Flooring Material (including surface finishes)
  - Walling Material (including surface finishes)
  - Fenestration.
  - Roofing Material
  - Construction technology
  - Construction skills

N.B: This guideline was adapted from a guideline drafted by Arc. N.M. Obinegbo and given to students of the Department of Architecture, University of Nigeria, Enugu Campus, for writing a term paper on "Mud Architecture in Nigeria". This term paper was written for the course "History of Traditional Architecture in Nigeria" in 1993.
GUIDELINE FOR SYSTEM SELECTION

System selection includes the selection of application software and hardware. It is necessary to identify the application software which respond to your present requirements and accommodate your future tasks; then select corresponding hardware.

SELECTION OF APPLICATION SOFTWARE

Software consist of two types: system and application. System software manages the hardware, for instance, such operations like reading data from a disk, and provides services to the application software. IBM PCs generally use a system called DOS. DELL PCs use Microsoft, Novell and Red Hat. Application software deals directly with the user's interest.

When selecting your application software, you should:

- have a clear idea of what you want
- understand what different programs are intended to do, and learn what they can be extended to.

1. Know what you want.

Based on your requirements you should develop some realistic specifications for software application, indicating the capabilities they must have, and those you would like it to have.

Examples of criteria for your Application Software

i. What capabilities must your software have?

2D Drafting
Technical report writing
Manage supporting documentation
Data compatibility
Auto-dimensioning of drawings
Number of associated drawings
Programmability
Parametric design
Mirroring
Construction lines and removal
Symbols library
Ease of use
Local training and support
Sketching
Specification tracking
Bills of materials
Support various input methods
Graphic user interface or command line

ii. What capabilities do you like it to have? For example:

3D Drafting
Wireframe
Hidden line removal
Surfaces
Multiple light sources
Rendering ability for presentations
Interface for survey/site data for civil engineering
digital terrain mapping
site planning
road/street design
land development
Facility management
space planning
design and layout
Structural engineering
design and analysis
Heating, Ventilation and Air Conditioning design
duct work and piping
energy analysis
Landscaping
Custom build user interfaces for your applications
Colour Postscript support
Spreadsheet and database compatibility
Heads-up drafting or menu oriented

iii. Make a wish list. For example:
- Visualization and walk-through capabilities
- Ultra-realistic 3D rendering
- Interactive walk-through
- NTSC and PAL video production facilities
- Freehand drawing and illustration
- Audio integration
- Automated raster to vector translation
- Virtual reality design environment

2. Understand what different programs are intended to do.

Software Function Recommendations:
- Word processing
  - Contract administration
  - Specifications
  - Simplified working drawings
  - Marketing
  - Secretarial
- Spreadsheet
  - Engineering calculations
  - Contract administration
  - Simplified working drawings
  - Design programming
  - Schematics
  - Design development
  - Project management
  - Executive management
  - Estimating
  - Bookkeeping/Accounting
  - Office management
  - Financial management
  - Marketing
- Database
  - Office management
• System drafting material
• Product information files
• Marketing and client/contact information files
• Business Accounting
  • Bookkeeping/Accounting
  • Office management
  • Financial management
• Specialty programs
  • Engineering calculations
  • Document checking
  • Specifications
  • Estimating
  • Design programming
  • Schematics
  • Design development
• Graphics
  • Simplified working drawings
• Computer-Aided Design & Drafting
  • Design drawings
  • Simplified working drawings
  • Working drawings

3. Locate suitable software.

In selecting suitable software you should:
• Consider the suitability of the software for your applications
• Limit your search to architectural packages for your architectural application
  N.B: Mechanical and Electrical CAD software are not suitable.
• Evaluate the availability of local support.

HARDWARE SELECTION

To select and purchase your hardware you need:
• To have an understanding of computer technology.
• To explore hardware choices.
• To determine your computer and work station requirement.
• To select your supplier.

1. Have an understanding of computer technology.

It is important to learn a few words and be conversant with sales representatives, when comparing computing equipment. The basic parts of a computer system are:

INPUT: Card, Keyboard, digitizer, Light pencil, Mouse, Voice, Scanner and Track ball

MEMORY AND PROCESSING: Chips, Central Processing Unit (CPU), Circuit Boards, RAM, ROM, Cache and Math Co-processor.
OUTPUT: Printer (Terminal, Laser, Dot Matrix), Plotter (Pen, Ink-jet, Electrostatic), Video, Display, Sound.

STORAGE: Tape, Hard disks, Diskettes, CD ROM and RAM.

Some other terms are:

APPLICATION SOFTWARE: Programs for specific tasks such as word processing.

BIT: The smallest measurement of data. i.e. the amount of data that can be processed simultaneously (8 bits, 16 bits, 32 bits).

BYTE: One character, letter or number, representing eight bits of information.

CAAD: Computer Aided Architectural Design.

CAD: Computer Aided Drafting or Computer Aided Design.

CADD: Computer Aided Design and Drafting.

CPU: Central Processing Unit. The brains of the machine.

FILE TRANSFER: (i) through an electronic hookup (ii) by saving and transferring data disks.

HARDWARE: Input, storage, processing and output equipment.

KB/MB: Memory capacity – usually stated in kilobytes (thousands of bytes), and also often stated in megabytes (millions of bytes). N.B: Kilobyte means 1024 bytes but is sometimes rounded to a thousand in general usage.

MFLOPS: Millions of floating point operations per second; a measure of the CPU's performance.

MICROPROCESSOR: “Chip” of Central Processing Unit. Identified by manufacturer's numbers: 280, 6502, 8088, 68000.

MIPS: Millions of instructions per second; a crude speed bench mark.

NETWORKING: To access computer data:
(i) cable connecting two or more computers, allowing one computer to access the files on another.
(ii) several computers cabled to a central computer that delivers files to any user.

OPERATING SYSTEM: Internal instructions that operate the equipment. CPM, MSDOS, UNIX. Operating systems determine the compatibility of software.

PORTS: A pin connector to hook up peripheral equipment. (RS-232-C and SCSI are industry standards for port connectors).

PROGRAMMING LANGUAGES: C, COBOL, ML, Opal, and Mercury.

RAM: Random Access Memory.

ROM: Read Only Memory. Built in memory; non-programmable.
2. Explore Hardware choices.

Choice of hardware for a school of architecture is limited to workstations and personal computers (PCs). However, the purchase of portable (laptop) computers for some applications outside the office especially for faculty members can also be considered.

**Workstations:** Hewlett Packard, Intergraph, IBM, DEC, SGI, Sun Microsystems and NeXT.
- high performance computers which use UNIX operating system.
- multi-user/multi-tasking
- high-speed math/graphic
- network ready

**Personal Computers (PC):**
- Apple, Dell, IBM, IBM Compatible.
  - one user at a time
  - stand alone
  - networkable.

**Portable:** Apple, Compaq, Hewlett Packard, IBM, Toshiba.
- battery operated
- less powerful than desktops
- not a primary work machine.

In evaluating hardware, you should:
- make sure that it will actually run the software you need.
- include maintenance in your considerations.
  - Is a service centre available?
  - What are the costs?
  - What if your machine goes down at a critical point? Can you get a repair or replacement within twenty four hours? Or should you have a back up machine?
- examine what you get for the quote price and compare systems with similar capabilities.
- make sure the system responds to your future requirements.
- examine graphic capabilities which are critical to CAD and CADD applications.
- networking capabilities which provide the possibility of high speed communication between computers for file sharing, back ups and shared printing plotter.

3. Determine your computer and work station requirement.

The number of required stations will be affected by:
- Number of faculty members in your school.
- Number of administrative staff in your school.
- Number of students in your school.

4. Select your supplier.

In choosing your supplier you should examine:
- Their business record.
- Their reputation (check with other schools).
- Their financing terms.
- The support and maintenance they offer.
- The possibility of working with them in the long term.
Most importantly, compare and negotiate the rates and terms of different vendors. Computer business is very competitive and there is room to negotiate discount, terms of contract, additional support and/or accessories on your deal, and maintenance contracts such as repair, replacement, and unusual conditions of use (e.g. night, weekends).

N.B: This guideline was adapted from a guideline prepared for architectural firms which are in the process of adopting computers in their practice to assist them in system selection. It was prepared by Mitra Kiamanesh in her MASA Thesis of January 1992 entitled "Adopting Computers in Architectural Firms". The thesis was submitted to the School of Architecture, University of British Columbia.
APPENDIX C
A SAMPLE ARCHITECTURAL DESIGN STUDIO ASSIGNMENT

MY ARCHITECTURAL LANGUAGE

Theme: My Architectural Language.
Project: House for Mr. A.B.C. Wazobia.

This scheme aims at demonstrating the architectural language you have developed over the years. It should bring out your creative approach to design. It is for you to demonstrate your architectural language fully and clearly and to show a good understanding of the cultural tradition of the locality in which the building will be erected.

THE CLIENT

1. The client is an educated man, about 50 years, married, and has four children (two boys and two girls).
2. He is a religionist and believes in the generally accepted standards for the home and the upbringing of children. He also considers that there are roles which are special for men, women and for children.
3. He is a traditionalist and therefore seeks to emphasize the roles of women and men. He would want a domestic building that reflects such roles. He socializes a lot, according to local customs, and would want a house that makes it possible to host meetings of his extended family. He would want a design that brings out clearly his role as the head of the family (in terms of governance, security, etc). He loves traditional aesthetic elements, including symbols, signifying rank in society, occupation, etc. He also wants his house to reflect the cultural tradition of his people in all aspects (as much as possible) in a modern idiom of expression.
4. He is modern in outlook and behaviour. He likes the modern gadgets, equipments and electrical appliances that improve the quality of life. He would like the design to make provision for a refrigerator, gas/electric cooker, a television set and video equipment, etc. He also likes to have clothes washed carefully and ironed at home. He intends to install a stand-by electric power generator. He would consider a solar kit as an alternative.

However, he insists on natural lighting and natural ventilation as a rule, and considers the use of artificial lighting during the day and the use of mechanical ventilation as emergency measures.

He loves sitting in the garden lawn with the family.

In spite of his desire for good living, he insists on economy of design and would prefer cheaper materials that can perform efficiently. Also he would not be happy with costly methods of construction if cheaper methods could do the job.

DESIGN REQUIREMENTS

You are required to produce the following:-

1. DESIGN BRIEF

The Design Brief should state the following:-
(a) Name of owner, income level and social standing.
(b) Occupations of the man and his wife, ages of the children and whether attending school or not (if attending school, is any part of the year spent in a boarding house? If so, are there any design implications?)
(c) Spaces required (note that the house may be a bungalow or one-storeyed)
(d) Any other requirements, features, peculiarities, etc. hobbies (any special provision?)
(e) The site: Its location (name the town or village, stating the natural features and any man-made environmental conditions). A standard plot size (or double plot) may be used.
(f) A list of the cultural values we can derive from the study of traditional architecture in Nigeria. Comment on each of these values. Show which values are relevant to your present design.

2. DESIGN DRAWINGS

The Design Drawings should include the following:

(a) Site plans.
   The first site plan should show the site in its original condition and environmental features (e.g. existing houses, farmlands, etc.)
   The second site plan should show the new development.
(b) Floor plans, Sections and Elevations.
(c) Perspectives or model (a model is preferable).

PLEASE NOTE: No tracing paper should be used for the presentation drawings. Art (or drawing) paper should be used so that colour and texture can be properly shown.

Mural decorations, where they form part of the design, should be properly shown.

3. MODEL

If you prefer a model to a perspective drawing, then the model should be properly made to enhance your design.

4. REDUCED DRAWINGS

You are required to submit a set of reduced drawings to the department (in addition to presentation drawings for the jury). The reduced drawings should be on A3 sheets. The drawings should be:

(a) Site plan (of new development)
(b) Floor plans, sections and elevations.

5. SKETCH PAD

A sketch pad in which you recorded your thoughts in sketches as the design developed (from the beginning to the end – when the final design comes out).

N.B: This assignment was given by Arc. N.M. Obinegbo to second year postgraduate students in the M.Sc. degree programme at the Department of Architecture, University of Nigeria, Enugu Campus during the 1998/99 session.