HARNESSING DIGITAL ARCHITECTURE FOR DEVELOPMENT

The Potential Benefits of Information Technology for Contemporary Architectural Practice in Recovering Countries of Africa

by

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the Faculty of Graduate Studies and Research
in Partial Fulfillment of
the Requirements for the Degree of Masters of Architecture

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ABSTRACT

With recent developments in digital technology, information and access to information have been revolutionized. Mankind as a whole is on the brink of a single world civilization representing at once monumental progress and an overwhelming task of survival and adaptation within our cultural heritage. Everyone experiences the tension between the necessity for the free access to progress and, on the other hand, the exigency of safeguarding our heritage. We are under the strain of two different necessities, which are both pressing.

The potential of information technology in developing activities that improve the quality of life, efficiency of social and economic organization and its cohesion is evident. Development can be seen as an increase of knowledge and skills and creative potentials that can be applied to improve the quality of life. Research shows that low levels of knowledge and inadequate innovative skills at organizational levels have contributed to the continuous failures in African countries in political and economic spheres.

Harnessing the potential of the digital era for development in response to the technological divides that exist between developed and developing (or recovering) nations will be main theme of discussion in the thesis. Architecture defined as form and space experienced through movement in time proposes principles of structuring information. By architectural means we can propose a way by which navigation through the digital realm is as intuitive as through physical environments. Dynamic and

interactive multimedia environments can be applied to enhance our knowledge, experience and understanding of architecture.

Globalization has also contributed to an enormous backlog of unsatisfied needs in developing (or recovering) nations, fueled in part by an awareness of the developed model of material availability and consumption. The combination of unsatisfied demand and rapid rate of urban growth is explosive and difficult for governments to manage.

The speed by which information can be communicated in an immersive environment presents the opportunity to stretch lines of production from one physical location to numerous sites around the world.

The thesis will focus on new communication technologies that drive the changes discussed herein in terms of globalization in developing (or recovering) nations. What could these new technologies contribute to Nigerian and Zambian culture and, in particular, to their architecture?"

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CHAPTER ONE

GENERAL INTRODUCTION

1.1 Digital Architecture for World Development

Revolution is not anarchy; it is the seizure of government by the subjects. This stage of development is science, where the objective truth is that which stands over against thought and acting in conformity with scientific knowledge.

Fichte (The idea of History – R.G Collingwood))

Africa seems to be the last continent to have access to information technologies. The second largest continent is the least computerized. It may be argued that deficiencies in the use of information technology are the least of the problems of a continent plagued by a history of exploitation, post – colonial political difficulties, bloody civil conflicts, and extensive health, educational, demographic and economic problems. However, attention should be given to the fact that more than 500 million people have largely been left out of the “global information society.”

In May 28, 2001 leaders converged for the annual G-15 meeting in Jakarta, Indonesia. One of the main themes of discussion proposed a harnessing of the potential of the digital era for development in response to the digital divide that exist between developed and developing (or recovering) nations. While the medium of digital technologies is relatively new, the concern for international communication is not.

In the inspirational words of former Canadian Prime Minister Lester B. Pearson:

“There can be no peace, no security, nothing but ultimate disaster, when a few rich countries with a small minority of the world’s people alone have access to the brave, and frightening, new world of technology, science, and of high material living standard while the large majority live in deprivation and want, shut off from opportunities of full economic development; but with expectations and aspirations aroused beyond the hope of realizing them.”

Development is one of those plastic words that can suggest very many things. It really means research and application of strategies for social, economic, and environmental betterment. The world is rapidly moving towards knowledge based economic structure and information societies, which comprise networks of individuals, firms and countries that are linked electronically and in interdependent relationships. Information technology is one of the key determinants of competitiveness and growth of firms and countries.

Africa’s over-arching objective remains fundamentally one of accelerating economic growth and reducing widespread poverty. To effectively reduce poverty, the pattern of economic growth would need to be broad-based so as to bring about social development and improvements in the welfare of African peoples.

The Information revolution offers opportunities for African countries to build the required digital architecture and accelerate their convergence rate towards the standards set by the developed world. Also, this technology promises to create extra-ordinary opportunities to leapfrog development, which could empower the continent out of the vicious circle of poverty, low growth and the degradation of natural and human resources.

Since the world economy is becoming increasingly globalized, developing or recovering nations' quest for sustainable development should be based on the pursuit of the international goals of accelerating the pace of economic growth, while also spreading the benefits of digital architecture widely among the population so as to make significant strides in poverty reduction.

Information technology can be of great value in various economic sectors if used for decision-making, problem solving and innovations in science and technology. But computers are still largely used for routine data processing in Africa with very little computer-aided decision-making. There is still minimal recognition that information is one of the major determinants of economic and social development.

Africa's underdevelopment extends from poor or ineffective public sector management due to the lack of information or the inadequate use of data. Computers are often introduced to overcome some of these problems.

An increasingly affordable and broadly applicable technology is available to play an essential part in the process of development. Digital architecture and Computer aided - designs are a few examples of application, which should be encouraged. Development is all about people, their needs and their potential with the aid of sophisticated technologies.

Information technology facilitates the flow of knowledge in modern society. The failure to access information technology is becoming as negative as the refusal to attend school. It is a choice between being left out or accessing the enormous benefits of information technologies. Clusters of technologies are responsible for shaping the way modern information society is emerging.

Education and training are keys to building indigenous capacity that helps reduce dependence on the developed world, to cut under-utilization of existing equipment and to help to apply technology for solving local complex problems. Though the changes in technology render what was appropriate at one time inadequate at another, but brings about economic changes in terms of globalization in developing or recovering nations.

The research thesis will focus on the architecture of Nigeria (based on personal knowledge) as well as the housing needs of Zambia through recent research projects. This will be achieved by studying traditional vernacular architecture in the western half of Nigeria and peri-urban Housing in South Central Zambia. The dramatic impact which modernization has had on both countries and the way in which traditional architecture has influenced contemporary architecture in Nigeria and Zambia will be elaborated.

In the case of Nigeria, three ancient buildings as well as pre-modern architecture, modern architecture, building materials, forms and decoration, and the impact of “Habitat for Humanity” (NGO) in the area of housing provisions will be highlighted.

While in Zambia, undergraduate and graduate work at Carleton University’s school of architecture focused on housing and existing urban infrastructure will be considered.

1.2 Contemporary Architecture in Developing / Recovering Nations

Architecture is both a physical thing (through buildings) but also a cultural phenomenon, which speaks of identity, expression and representation. Architectural representation is of utmost importance for the architect in order to explore the aesthetics and functionality of the virtual object when designing and to communicate those ideas effectively to others.

Architects in Africa have an important role to play in the increasingly widespread use of dynamic information environments.

Contemporary African countries such as Nigeria and Zambia are comprised of many cultural groups stemming from ancient traditional tribes and, as such; do not have a common nor uniform national culture. Rather, the national identity is defined by its diversity and in the case of Zambia is seen as a gathering of all tribes. If out of this condition a cultural identity is to arise, it must be newly constituted based on diversity and, in both these counties, this may prove to be a formidable task.

African architecture, as representative of Nigerian and Zambian society, suffers in its task of providing clues to a clear cultural identity. Contemporary architecture in Africa tends to be diverse, heterogeneous, even contradictory, avoiding clear definition or easy categorization. It clearly falls under a triple heritage (Indigenous African, Islamic and European). These separate cultures have permeated African culture and it's built environment which influences the lives of Africans. These traditions nonetheless provide a strong foundation for studying a growing African contemporary architecture.

African architecture consists of more than huts with grass roofs. It reaches back to the monuments of ancient times, to cities of the middle ages, and includes construction activities of contemporary times. Practitioners are forced to reconcile diverse building traditions that date back thousands of years with construction techniques and styles newly imported from Europe and America.

There is nothing specifically “Nigerian or Zambian” expressed in contemporary buildings. Many exponents of the new architecture consider all forms of traditional architecture irrelevant or secondary to the modern scene. The early creators of this new style aimed at producing buildings based on the scientific adaptation of architecture to the new materials and techniques made available by the industrial age. There has been increasing criticism of many aspects of this new architecture.

Some modernists rejected all forms of traditional architecture as irrelevant to the new age. Le Corbusier, however, the most famous of the founding fathers of the new style, continued to mediate deeply on the classical and vernacular architecture of Europe and the Mediterranean area. His chapel at Ronchamp in France, designed in 1950 when he was sixty years old, is a modern evocation of Mediterranean architecture of which North African architecture is an integral part. It is also from this North African architecture that Hausa town architecture in Nigeria evolved.

At Ronchamp, the influence of this tradition is seen in the massive sloping walls pierced by small windows, the rough surface rendering, the projecting rain spout, the brilliant white finishes, and the avoidance of rigid right-angles in the ground plan.

In Nigeria, contemporary architects have made a number of attempts to adapt ideas from traditional architecture. In the early 1960's, several architects designed buildings, which incorporated aspects of the Hausa town style as demonstrated in the court of Justices in Kaduna, and several buildings in the new Federal Capital at Abuja. It is true that the beauty and distinctiveness of the thin-walled plastic forms of the Savanna building (of northern Nigeria) have not been entirely overlooked by the architects. However, it is not easy to adapt ideas from the Hausa town style into an architecture, which uses the more intractable materials of today.

Concrete, glass and steel cannot be treated like plastic mud. It is true that concrete could be poured into moulds to imitate traditional forms, but this would be an expensive and difficult exercise. Architecture has been severely affected (for better or worse) by the introduction of new materials and techniques and it is only in the more isolated area that the traditional ways of building survive with little or no change.

The beneficent effects of modernization can be severely critiqued, when beautiful traditions, which had survived for centuries, become extinct in a single lifetime. In all countries and in all ages, changes are introduced, as ancient traditions die, but attention must be drawn to the functional efficiency, variety and beauty of the traditional architectures and the inspiration they can provide for the future. Traditional building remains relevant to contemporary Nigerian and Zambian architecture.

Paul Ricoeur in *"History and Truth"* states that the only way of emerging from the narrowness of the human condition is through communication. Further, he defines truth according to which each person's continuous movement toward self-clarification and as an individual's unfolding perception of the world in communication with others. Truth would be attainable if this communication were total.

Communication as interaction affected by digital media can become an ever-changing palette of sensory interactions and real time information. As technology in our digital age grows at a furious pace, the boundaries between the initially distinct disciplines of hypermedia (the ability to dynamically organize and access vast networks of data, information and sensory experience) and architecture are blurring.

1.3 Impact of Modernization

As a tool for growth, information technology is as vital to Africa as it is to North America or Europe. A problem with writing about information technology in Africa is that Africa itself is a very diverse entity. The difference among countries in their economics, levels of education, languages, underlying cultures, and historic associations all have considerable effects on the likely success in the uptake of a new technology such as computing and these vary greatly between African countries.

Information technology should be considered to be going through “growing pains” in the development process in Africa. Information technology needs to be carefully analyzed and considered, but as a tool for growth it is vital to Africa’s future in a global structure. The immensely complex process of development having its roots in educational and infrastructural building cannot be by - passed.

Every society needs to be an information society to a greater or lesser degree. Africa needs information technology in the management of its operations, bearing in mind its rural nature and shortage of capital and foreign exchange. Computers can be used to transform inefficient systems into efficient ones.

This is in accordance with United Nation thinking which states that “the analysis and systematization that occurs when computerization takes place should be recognized in itself as a most significant contribution to improving management decision-making and resource allocation.”

Information technology reduces the constraints on expansion, which may not have resulted from lack of manpower alone, but absence of supervision and control, slowness and lack of firm policies. Information technology is worth introducing in its own right and may well overcome some of the constraints to accelerated development.

Today, information technology in Africa is being used, as it should, for the importation and production of vitally needed information. Information represents power in both the economic and political spheres.

If African economics are to improve, they need to have access to the same markets and the same information within the same time frame as more developed countries. Such access is only achievable through computerization.

Information technology is about access to international information, and its potential benefits, which includes medical information, strategies for food production and distribution or to foster basic education. Information is needed to allow Africa to find its own way forward based on international norms.

1.4 Makeup of Architectural Practices

Architecture as a profession relates to numerous interests in a variety of fields. The experience of architecture provides an emotional satisfaction, similar to other visual and performance arts.

In Africa, Architecture relates directly to the built environment, arts and sculpture, and is an extension of these traditions. The ever-advancing electronic technologies have greatly changed the western worlds built environment over the past fifty years and will continue to transform societies and cultures.

The makeup of architectural practices in developing or recovering nations of Africa is presently focused on the area of functionally based housing production. By contrast, in America or Europe, architects remain committed to creative attempts that bring together

abstraction and representation, function and form, nature and technology, tradition and innovation in the production of cultural and public buildings.

Potentially, African architecture can provide a comprehensive account of the evolution, transformation, and development of African culture. It has the opportunity to respond to historical, traditional, and contemporary African expression by looking at various cultural groups of Africa from ethnic, climatic, political, regional, economic, religious, and historical viewpoints.

Cultural exchange has been taking place between Africa and both western and eastern countries since ancient times and should continue in order to reduce a one-sided influence on civilization, pure culture or sacred architecture between nations. African architecture needs innovation, ideas and technology from the developed world as well as from within in order to promote a history of cycles.

The importance of historical precedents in African architecture, therefore, must be emphasized because these play an essential role in guiding the African architect through the past in order to navigate back to the unexpected avenues of the present and the future.

Architecture has its roots in both art and science and good architects are deeply concerned about society and culture.

Architects are critical thinkers with reflective sense of history and a visionary yet grounded attitude towards the future ¹. They contribute to the cultural direction of a society.

African architecture had not had the opportunity to grow, or flow through a synthesis of research study, evolutionary development, and refinement as its developed world counterpart. African architects continue to adhere to innovations in building design, introduced in the 60's by America and Europe.

As an architect working for the project development department of a government organization in Nigeria, I engaged in translating a client's ideas into an acceptable design and into contract documents. This led to the administration of building construction and the coordination of the activities of the building teams along with contract management and financial planning.

From this experience I have found that, current practicing African architects often lack information on the subject of information architecture, hence, they cannot fully understand interactive design concept and are unable to incorporate and interpret it in the changing skylines of African cities.

¹. Carleton University, School of architecture undergraduate bulletins 2002

1.5 Architecture and Housing

Research has clearly demonstrated that in most regions construction has the potential of becoming an engine of economic growth especially in the housing sector. While the economic benefits of housing have been widely recognized, housing is rarely used as an element of poverty alleviation strategies in Africa.

Habitat for Humanity's discussions on housing development states that poor urban tenants often use a large part of their incomes on rent, even for grossly inadequate housing. Research has shown that the proportion of income spent on housing is highest for the poorest. After paying the rent and buying daily food, the poor often have nothing left for savings. Thus, many low-income households find themselves in a vicious circle of poverty: lack of steady income forces them to rent accommodation, and high rents keep them poor.

The availability of cheap rental housing is a vital element in any poverty alleviation strategy. However, many developing or recovering nations lack a policy to support the low-cost rental-housing sector.

Housing is everything to a town and affordable housing is not just a third world problem. It addresses the density deficit that affects so many North America cities; help cities make better use of public infrastructure (roads, water and sewer mains, public transit and so forth). Allow working men and women to live closer to where they work and provide alternative accommodation for the elderly in neighborhoods where they have perhaps lived for many years.

The poor people who lived in densely populated area are been provided with low-cost quality housing by Habitat for Humanity and Food for the Poor. International NGOs have made significant progress in provision of quality housing for those urban poor. Canadian companies that are privately own have also provided programming and technical skills in housing provision.

In Order to meet the urgent needs of the urban poor in term of housing provision, Care Canada and Carleton University are working jointly in researching and developing practical skills and knowledge that would enhanced large scale donor-funded housing project in Zambia.

1.6 Architecture and Virtual Space

Architecture is more than several types of techniques to keep us shielded from the elements. It is a means of measure, a type of knowledge that organizes society, time and space. While space is the entity permeating the essence of architecture and its representations, time provides the structure, which organizes the different contents. ²

Generating representations of an architectural design is one of the basic skills required of an architect. Architectural representation is of utmost importance for the architect to explore the aesthetic quality and functionality of the virtual object (the eventual building) and should be able to communicate those ideas effectively to others.

The cyberspace / web technology is the best example of network effects used today for communication. Research shows that, the value of the web today is proportional to the square of the number of the worldwide users, now estimated at 320 million. The expectation is that the web will have over two billion users within seven years.

Lack of access to the web in developing or recovering nations has resulted in serious problems in Teenagers such as 13 to 19 years old. The web can help to bring future generations out of poverty by means of education and information.

2. Jordan Peter, Bettina Mehnert and Auto Harfmann: Representation and design, Acadia 97

Users can connect to networks without limitation of distance, time, age, political or racial orientation and institutions can access a wide variety of information on demand.

In the past the web was all about mass communication of data, graphics and automation. Now it is about relationships and “virtual” reality. The World Wide Web is eating an enormous hole in the world economy today, it allows homebuilders to choose the model they want, make changes to their design, add and subtract amenities, and view costs. No matter how little someone is paid in the third world; the Web can do it faster and cheaper.

The use of the Web is a boost to all forms of research in developing or recovering nations and connectivity helps to open the window to global knowledge. The willingness of nations, developers and individual users to co-operate, share expertise and knowledge, and the continued rapid changes of technology have made networking more affordable and achievable.

These technological changes have significant influence on architectural conception and construction. It also affects building technologies and techniques and, makes what is not visible (the building concept) to be visible (through “life-like” digital rendering).

Also, technology have changed the way we judge, visualized facts and measured things from the object to the image we see on the screen due to the sensibility of vectors and intelligibility of elements in digital technology.

CHAPTER TWO

TOWARDS A NEW VISION

Constructed spaces are more than simply the concrete and material substance of constructed structure, the permanence of elements and the architectonics of urbanistic details. It also exists as the sudden proliferation and the incessant multiplication of special effects, which along with the consciousness of time and of distances affect the perception of the environment.

Paul Virilio (The Lost Dimension, 1980)

2.1 Communication Revolution

In the 19th century, the society was emptied of its cultural and social substance because of city attraction. Furthermore towards the end of the twentieth century, the social structure of the urban space was upset as a result of technological advancement which led to loss of its geo political reality.

With the coming of transportation revolution and development of communications and telecommunications industry in the world, the average city no longer remains in localized and isolated state due to growth and density. These developments resulted into new building material invention such as steel skeleton construction, glass and plastic, which replace stone facades.

The invention of computers, television and teleconferencing makes communication more effective without any face to face encounter. Distance communication between places and people was reduced to zero without physical obstacles. The invention makes architectural element begins to float in an electronic environment with an instantaneous diffusion.

The new technologies change human practices, which affect the way we speak about technology and eventually creates changes in the world we construct. It also bring a changing awareness of human nature and human actions which in turn leads to new technological development. The structure of possibilities generated and represented contributed to architectural design development in developed World.

Computers, like all information technology, are vehicles for the transformation of tradition and the development of these technologies has constructed a permanent present, which destroys the societies. Computers are a means for creating, manipulating and transmitting symbolic objects.

Architectural expression cannot be separated from the world of communication because it is intrinsically involved in political acts and social communication. Architecture is affected by direct and indirect changes in the divergent means of communication from automobiles to audiovisual systems.

The way architecture is viewed has changed because of advanced technology since the beginning of the twentieth century. Due to the advanced technology, there is no more separation between video and graphic representations, nor between temporal

and spatial distances. The former methods of perspective design has given way to the televised instantaneity of digital representation. ³

2.2 Rise of the Virtual Workspace

The world economy is becoming increasingly globalized and the centrality of international and regional trade to the process of economic growth and poverty reduction cannot be overemphasized.

With the rise of the virtual workplace, physical proximity is becoming ever less essential. Interactive and immersive multimedia technology promotes economic growth and development in Africa through the wave of digital revolution originating from the developed world. This contributes or bridge the gap of digital divides between the developed world and developing or recovering countries including Nigeria and Zambia. The research is in two- way street that can benefit both Canada and the developing world.

2.3 How does Canada Benefit?

As a strategic mobilizer of disparate communities to find solutions to common problems, which really improve people's lives, the research will offer more opportunities for

3. See appendix F

Canada with a knowledge-based international outlook to contribute to, and benefit from international research.

As world leader, Canada needs to reinforce its role as a knowledge and research center for information and analysis on Africa's socio-economic issues in the era of dwindling resources. Development through knowledge assumes more importance in the global economy. Also, this information gathering becomes a major source of analysis and information data for policy-makers, businessmen, and economist interested in the African continent.

To enhance its role as a knowledge center, institutional capacity in Canada for research needs to be enhanced while at the same time pursuing greater networking with African development research centers to promote closer collaboration.

Knowledge center establishes a cooperative program to bring research institution into closer partnership by direct linkages between the research and development systems of developed and developing countries.

Permanent ties between Canadian and developing (or recovering) nations will also be established due to collaboration, and thorny research problems resolved which open doors of opportunity that would otherwise remain shut and improve rural economics through the development.

2.4 How does Africa Benefit?

In all countries and ages, changes must come to gear progress and development. The problems and challenges posed by rapid urbanization resulting in inadequate shelter, overcrowding, poor infrastructure facilities and services, development of urban center and inadequate database for planning and monitoring will be solved as a result of collaboration with developed nations.

It will also facilitate the attainment of the goals of sustainable human settlement in Africa. Encouraged private sector and community participation in urban renewal activities, housing, and infrastructures provision, and strengthen institutions with a view to make them more responsive and accountable in Africa.

The research will improve rural economics through the development of housing prototype to create job opportunities for rural dwellers, and thereby stem the tide of rural-

urban migration. It will also mount a sustained public awareness and education program for practicing architects in the area of information architecture to meet the challenges posed by today's digital revolution and improve the well being of the people.

Finally, information technology will bridge the gap of digital divides between developed and developing (or recovering) nations and revolutionized African architecture from its present stage of triple cultural heritage into a clearer definition or progressive national culture.

2.5 Medium of representation

With the coming of information technology as a medium of representation of designs in two-dimensional graphics and three-dimensional models in virtual space, the way architects use information and have access to information has been revolutionized with the development of computers.

Information technology provides the ability to integrate a variety of media using software programs such as *Macromedia Dreamweaver, Director, Fireworks, Flash, QuickTime*. These present new opportunities for displaying and communicating the ideas behind architectural concepts as well as physical works of architecture. Within multimedia environments, one can combine text, photographs, graphics, 3D models, animations, video, sound etc. into a multi-sensory experience.

This experimental mode of communication is far superior to the traditional ways in which architecture has been documented and represented, namely drawings, slides, written and verbal descriptions. Moreover, through computer simulation and the interactive integration of a variety of media, the architect may be better able to visualize his own ideas to work out ideas from the conceptual level to physical details in the design process.

Most arrangement of spaces in architecture can only be experienced as a linear sequence, as we can only go through one space at a time. But with information technology, the screen or hyperspace can include any number of windows or boxes where different projections are displayed simultaneously.

The appeal of architecture is in its ability to change perspectives giving a succession of views. Totality of views provides an accurate perception of an architectural space. Virtual reality provides the ultimate rendering tool for perception, evaluation and appreciation of designed architecture before its construction.

The development of information technology in the last thirty years has made it possible for computer-based drawings and models to be added in the architect's range of representation. All these representations will define a virtual world in which analogues of physical structures and spatial environments can be cognitively manipulated in a window of virtual reality in remote places including Africa.

2.6 Learning from Information Technology

Developing or recovering nations have witnessed significant improvements in education during the two decades after independence followed by serious problems from the 1980's to the present. Africa is also the only continent where the average gross enrollment ratios for primary education have remained lower than 100 per cent. ¹(The African development Bank group) In Zambia these numbers have around 55 to 60% of school-aged children.

Africa educational problems are related to inadequate funding and inefficient use of available resources. Information technology offers low-cost solutions. Distance education in Africa (defined to include print, broadcasting, Internet, and limited face-to-face education) could be extensively used to pursue entirely conventional educational ends. The main advantages of distance education include economy, flexibility, and suitability for widely scattered student bodies. ⁴

Information Technology has the potential to connect African educational institutions continent-wide, and link them with international universities, hence, facilitating research

4. Tallero, E and Gaudette, P: Harnessing information technology for development: A proposal for a world bank group vision and strategy, Washinton D.C, The World Bank , October 1995

and exchange of ideas simplifying access to data and educational materials. Zambia has made valuable educational use of the Internet especially at the University of Zambia (UNZA) medical library and the University teaching hospital (UTH).

Information Technology enterprise has the ultimate goal of improving the lives, health, and freedom of all peoples. Africa's scientific strength is at the heart of the future involvement in information technology that would encompass the national defense and economic boom of developing or recovering nations.

However, a preponderance of evidence indicates that the schools in developing or recovering nations aren't preparing students adequately for the knowledge based, technologically rich Africa of today and tomorrow. Without a strong supply of scientists and engineers, of technologically competent workers, and of scientifically literate consumers and voters, the future well being of Africa will be in jeopardy.

African student's performance in information technology especially in digital architecture is not on par with students in developed countries. Recent assessments of the progress of student performance in various subject area, including digital architecture, computer-aided design and technology education, have concluded that in some age

groups the grasp of web architecture in developing nations students are much less than that of their international peers.

It's also notable that over half of African graduate students in information technology and digital architecture are foreign-born. This highlights a situation with serious long-term implications for the developing/recovering nations. The apparent lack of education and training for careers in information technology will limit the innovation that propels the economic growth that creates prosperity.

In order to reverse the trend of a developing or recovering nation's economy, all citizens must be nurtured, so they may develop a solid educational foundation and be able to rely upon a talented and versatile workforce.

Over half of a developed nation's economic growth today can be attributed directly to research and development in information technology. In ensuring the conditions for economic prosperity, quality science, information architecture and technology education increasingly is becoming necessary for day-to-day life. The society in which we now live is based upon technology and information, and in this new century the most valuable commodity is knowledge.

As communications technologies rapidly change the way in which we interact with one another, the key to success is no longer acquiring information but rather analyzing and processing that information.

Education, information and communication are some of the sectors that need immediate attention for development in Africa. The future establishment of the African Virtual University (AVU) to educate and train world-class scientists, technician, engineers, business managers, health care providers and other professionals needed to support economic development will be a step forward in the application of information technology to education in developing or recovering nations and in the wake of the information society.

This technological revolution that is so touted indeed has the potential to do a great deal more than change the form of educational content from paper to electronic media. The technological revolution has the potential to provide the impetus, the tools, and the new structure to transform the practice, the art and the meaning of teaching.

CHAPTER THREE

EXISTING SITUATION

Architecture has been man's companions since primeval times and is an art among many art forms that have developed and has never been idle. The system we live now is that of rapid technological changes in which we can perceive things instantly.

Paul Virilio (The lost dimension)

3.1 Urban Migration

Urbanization is occurring rapidly in developing countries made evident by the continuing trend of rural to urban migration. It is anticipated that by 2020 over 75% of populations in developing countries worldwide (including Africa) will be living in urban centers.

(Compared with typical 25-60% urbanization levels today.) The high influx of populations into urban centers will place significant pressures on cities in terms of their capacity to provide adequate and affordable living spaces (housing), services, and employment opportunities.

Carleton University's School of Architecture (CCAAR) and CARE International, through CARE Canada, have commenced a joint Urban Research and Development Program with the objective of producing improved quality and lower cost "high density housing" for poorer families living in urban centers in and around Lusaka, Zambia. CARE Canada mainly supports research that alleviates poverty and promotes sustainable and equitable development in developing (or recovering) nations.

The program was implemented in 2001 as a teaching and research project under the School of Architecture's "Directed Studies Abroad" (DSA) course offering. The DSA course was closely affiliated with CARE Zambia's INSAKA (Initiative for the Sharing of Knowledge in Action) urban development program based at CARE Zambia in the capital city.

This research into digital architecture will borrow from the findings of Zambia Housing projects undertaken by the school of architecture, Carleton University and from "Habitat for Humanity" projects in Nigeria. Although there are precedents in the use of CAD technology in Africa, I am not aware of any previous use of immersive environments or digital technology using *HTML, Flash and QuickTime VR* for information /web architecture.

3.2 Need for adequate Housing

Housing forms an indispensable part of ensuring human dignity. Adequate housing encompasses more than just the four walls of a room and a roof over one's head. Housing is essential for normal healthy living. It fulfils deep-seated psychological needs for privacy and personal space; physical needs for security and protection from inclement weather; and social needs for basic gathering points where important relationships are

forged and nurtured. In many societies, a house also serves an important function as an economic center where essential commercial activities are performed by which a family can be economically empowered.

Despite global recognition of the importance of housing to human welfare and survival, it is estimated that over one billion people live in inadequate housing while over 100 million people are homeless. Governments claim lack of capacity and resources to implement programs and undertake reforms aimed at creating the conditions for expanding access to housing.

The right to housing should not be interpreted in a narrow or restrictive sense, but should be seen as the right to live somewhere in security, peace and dignity. It should be ensured to all persons irrespective of income or access to economic resources.

There is an acute housing problem in recovering nations (i.e: Nigeria, Zambia) where decent housing is scarce and relatively expensive. The urban poor, especially women and children, are forced to live in makeshift slums or shelters in appalling and degrading conditions presenting both physical and mental health hazards.

3.3 Interface in Africa

Since architecture is linked to social, economic and political conditions in the world, the application and adoption of information architecture in recovering nations will contribute to the digital advancement of Africa.

I wish to provide users with an intuitive sense of familiarity when traveling through virtual spaces, similar to what they experience in their physical environment. I propose to combine concepts from both disciplines in order to identify principles for creating truly meaningful and intuitive computer interface digital environments design and architecture for Africa. Furthermore, this proposed model would apply the appropriate architectural spatial concepts to fit the need of digital media in Africa.

The above mentioned project represent in general the work of a team based on extensive and also accurate references providing for what has been done in the Zambia Housing and “Habitat for Humanity” projects, and elaborating to what extent it has been implemented, while adding *information architecture* to its content.

The DSA Zambia group proposed housing prototype’s documentation through digital media production and accurate visualization of traditional architecture in developed world and recovering nations with quality computer representation using the latest technology will be considered in the thesis.

I will adopt In-depth analysis and application of digital multimedia using Html as the underlying *programming architecture* with its various derivations and finally designing the interface using other secondary application such as Photoshop, Premiere, Flash, sound edit, Dreamweaver, Quick Time that will eventually be imported into the Html format.

The final phase of the application will be tested and information technology delivered to representative of specific concerned Groups in Nigeria/Zambia (e.g.: CARE Canada).

Review and critique of the product will be solicited from these parties.

CHAPTER FOUR

URBANIZATION IN NIGERIA

The third world five years from now may not be where you think it is. There have been many theories of leapfrog development, none of which has yet survived the test of time. That's about to change.

Negroponte 1998

4.1 Urban Population

The rate of urbanization in Nigeria has witnessed tremendous increase in the last two decades. Census in the early Fifties showed that there were about 56 cities in the country and about 10.6% of the total population lived in these cities.

This rose dramatically to 19.1% in 1963 and 24.5% in 1985. Today, the national population is now estimated to be about 120 million with the urban population constituting about 30%. The rapid growth rate of urban population in Nigeria since the early seventies was mainly due to immigrating induced by the concentration of the gains from the oil sector in the urban areas.

Given the expected increases in urban population, the magnitude of the housing problem in the country is enormous. The phenomenal rise in population, the number and size of cities over the past few years have manifested in acute shortage of dwelling units which

resulted in overcrowding, high rents, poor urban living conditions, and low infrastructure services and indeed high crime rates.

On the micro-level, it has been observed that house ownership is one of the first priorities for most households and it represents the largest single investment for most families (between 50% and 70% of household income). This observation becomes very significant when it is realized that per capital income in Nigeria has been on the decline (currently N3,000.00 = US\$23.08) for average Nigerian. The rapid upswing in the prices of building materials in the last five years has further reduced the affordability of houses for most Nigerians.

4.2 Contemporary Civic Architecture - Overview

Nigeria is located in western part of Africa. The main peoples in the area are the Hausa to the north and the Yoruba to the south, both with populations well over twelve million. In between, there are over two hundred different peoples each speaking their own language. At its maximum extent, Nigeria measures about 750 miles from east to west, and somewhat less from north to south covering an area of some 924,000 square kilometer. Nigeria is the most populous state in Africa and estimated that as much as one-fifth of the

population of black Africa lives in Nigeria (one out of every six Africans is a Nigerian), and the tenth largest in the world.

The climate varies from generally wet and humid south to the much drier north where there may be as many as eight months in the year without rain. In the extreme north of the country, the savanna gradually fades away into the more arid areas of shorter grasses and thorn scrub where trees become increasingly rare.

4.3 Ancient/Vernacular architecture

The ancient architecture of Nigeria can be divided into two main types, that of the forest and that of the savanna. The forest buildings are rectangular construction and leaves were normally used for thatching. The savanna buildings are usually round construction and grass is used for thatching. The forest buildings tend to form rectangular groups around a rectangular courtyard, whereas the savanna buildings tend to group into roughly circular compounds.

The savanna style is not found anywhere in the forest, but the forest style overflows into parts of the southern savanna. In both savanna and forest, the warm climate allows the

people to spend much of their time in the open courtyards, which are as much part of the household as the buildings themselves.

4.3.1 Forest Buildings

In the forest, rectangular buildings can be constructed as single units, but it is more economical to join them end to end or at right angles under a continuous roof. This pattern can be developed until the units meet to form the four sides of an enclosed, rectangular courtyard. Additional courtyards can be linked together organically like the cells of a body, to form larger households.

The Yoruba people (of western Nigeria) in particular exploited this courtyard system. They built the walls of the rooms to a thickness of about nine to twelve inches. The floor of the house and inner verandah was often raised about one foot above the ground. The walls carried the outer section of the pitched roof, but the inner section passed over the walls and was carried by wooden beams supported by mud pillars or wooden posts. The rafters were made from branches of trees and covered by rectangular raffia-palm mats or broad leaves in the forest areas, and by grass in the savanna.

A fire-resistant ceiling made of earth carried on wooden beams covered some of the rooms, particularly sleeping rooms. Farm produce, carved masks, and other objects of value were stored within the ceilings.

The verandah might have a low wall separating it from the courtyard, and there were often broad mud platforms, built against the inner wall, on which the people could sit or sleep. During the day the verandah was used alternatively for resting, or for work, for cooking or weaving. At night people might sleep on the verandah, especially during the hot season.

Rainwater falling into the courtyard from the roof was collected at the Four Corners in large pots. Overflow ran out under the floor of the house through built-in channels. There was often an external verandah in front of the house. Special trees were planted nearby to provide shade for work or rest.

Beside the town or village houses, Yoruba families often had simpler, secondary houses in the distant farms, where they might stay for weeks or months at a time. A belt of untouched forest with dense undergrowth surrounded Yoruba towns and villages in the southern areas. This together with an earth wall formed a defense against attack.

The belt of forest also served as a source of firewood and as a barrier to prevent the sheep and goats of the village from fleeing to nearby farms.

From about 1945, the use of corrugated iron sheeting spread rapidly throughout southern Nigeria. This material was soon used to cover old style buildings, and was often nailed onto the traditional roofing poles. Newer buildings often had no internal verandah so that the wall carried the rafters on both sides.

4.3.2 Savanna Buildings

Building is done in the dry season when most of the farm work has been completed and the threat of rain has passed. Suitable earth is chosen and is mixed with water and kneaded underfoot. It is left to mature for at least one night. The builder marks out the base of a circular hut by using two sticks and a rope, or by sliding one foot forward in the dust and marking out a circle with surprising precision.

Rolls of clay are prepared as grass is crumbled into the clay, increasing the resistance of the clay to cracking and erosion. The first layer, about eight inches wide, is formed directly on the ground, but the wall narrows quickly to a thickness of between three to

four inches. The walls are built up in layers about four inches high; two layers may be made each day (one in the morning and one in the evening). Each new layer is smoothed over the previous one, filling up any cracks that may have formed.

The technique (of layered moulding) builds up a strong and smooth wall from which rain run off quickly. A well-maintained and well-made hut may last up to thirty years. Heavy rain may eat into the walls eroding sections, which are normally repaired in the dry season. A badly cracked hut is knocked down and a new one built.

Floor Plans of traditional Architecture in Nigeria

Plan 1 and 2 below illustrate two common types of household dwellings found in the savanna. The buildings are round, which is the predominant savanna form. The walls of the buildings are a little over three inches thick.

In household 1; the gaps between the outer buildings are closed by a mud or stonewall or fencing made from corn stalks etc. In household2; the buildings are enclosed in a freestanding wall fence. Below are detailed plans;

- a. An entrance hut through which all visitors must enter.
- b. A sleeping hut
- c. A cook house, showing a large pot for water storage

Figure 1: Sleeping Hut, Cooking House, Granary, Shrine and Fence

- d. A granary carried on stilts of stone, hardwood etc.
- e. A small hut, which could be used for storage, or as a pen for animals.
- f. A small shrine
- g. A fenced area for washing or latrine, in some households, a private corner may be used for washing and shrub land outside as a latrine.

In the coastal areas of Nigeria, where the soil may not be cohesive because of a high silt content, house walls are made from a lattice work of raffia poles or other timber and the interstices are packed with mud. Usually, timber piles are driven into the mud below the water, and on this foundation floors and roof frames are built usually with raffia poles, and the roof covered with raffia palm leaves.

Roof structures were usually made from a framework of branches, corn stalks, bamboo-canes, or the midribs of the raffia or oil palm frond. Grass or leaves covered the framework. In the savanna, grasses suitable for thatching were easily obtained. In the forest, however, suitable grasses were rare and the houses were covered with various kinds of tough, broad leaves, or with rectangular mats made from the long, narrow leaves of the raffia palm.

Fire is the major hazard for grass roofs. A sudden wind can carry sparks from a cooking fire on to a roof, setting it ablaze: the flames may then jump from roof to roof, and in a short time set a whole hamlet on fire. For this reason, the Yoruba people in the western half made strong, fire-resistant ceilings of wood and earth under the thatch, particularly in sleeping quarters.

4.3.3 Storage Huts

Storage huts are carried on short stilts of stone or hardwood, or by mud if no stronger materials are available. Ashes are thrown under the storage huts to discourage the attack of termites; they are also kept at bay by the hens, which scratch under the granaries and by the dogs, and goats that sleep there.

The outside of the granary may be polished with micaceous clay or locust bean gum and there may be ledges and projections to hinder mice climbing the walls. The most common type of household consists of a group of huts and granaries linked together (outer buildings) by short walls of stone or mud or by senses of cornstalks of a type more acceptable to the people.

4.3.4 The Fulani Hut

The Fulani people follow the rains each year in order to find grass for their cattle, going south at the beginning of the dry season and moving back north at the beginning of the wet season. In the migration people may travel several hundred miles in five or six weeks, making a new camp each day. Simple shelters are made by setting both ends of saplings in the ground to make a framework, which is covered with grass or leaves.

However, in the middle of the wet and dry seasons, they usually settle for several months and build more permanent homes.

The interiors are heated, and are furnished with strong beds made from raffia-palm poles, which are carried from place to place by cattle, some of which are specially trained to carry loads. Behind the hut a granite inselberg (Island Mountain) rises steeply out of the savanna, these dramatic outcrops of rock are a striking feature of the grasslands.

4.4 Pre-Modern Architecture

4.4.1 Forms and Decoration

Traditional builders tend to base the design of their buildings on what Le Corbusier, the famous modern architect called, “the great primary forms which light reveals to advantage’-namely the cube, the cylinder, the sphere, the cone, and also, the pyramid, the dome, the ovoid and the prism.

All these forms are found in Nigerian architecture, but they are freely adapted for technical or aesthetic reasons and are not bound by a rigid geometry. The walls of a

cylindrical or rectangular hut, for example, usually slope inwards to give greater resistance to the thrust of the roof.

Both Yoruba and Hausa town architecture use a variety of these basic forms. However, it is in the separate and distinct building units of the savanna architecture that we see the 'primary forms' used to the greatest advantage and variety.

Builders had practical aims in mind, yet they worked with the natural human instinct to create beauty. They also exploit the decorative possibilities of structural details such as doorways, windows, granary apertures and verandah supports. The carved verandah posts and doors of the Yoruba people are among the most notable art forms of Africa.

Colors were often added to the walls in the form of stripes, dots, geometrical designs or representational patterns. Added objects, such as animal or human skulls, animal horns, ceramic or enamel bowls, mirrors and silver paper, are still used in some areas.

4.4.2 Brazilian style

The Brazilian style of architecture owes its origin to craftsmen (Nigerian ancestors) who had been taken as slaves to South America, a majority to Brazil. Many of them began to return to Nigeria, and especially to Lagos, from about 1850 onward. In the New World

they had leaned to build and decorate houses in a style derived from the classical baroque architecture of Portugal.

Figure 2: Houses decorated with Classical Details

In Lagos they built houses of one or two storeys with walls of brick plastered with lime mortar, and with roofs of iron sheets. The houses were usually decorated with classical details, such as pillars and pilasters, true and false arches, decorative mouldings, and iron

grille-work in gates and balconies. Much of the decoration, carried out in lime plaster, consisted of colored moulded figures of animals, such as, elephants and lions often added as focal points to the building.

The Yoruba people, during this century, gradually departed from the traditional rectangular compound system, and began to build houses of one or two storeys with solid mud walls plastered with cement and roofed with sawn-timber and corrugated iron-sheets. Many of these houses were utterly plain, without porches, window-hoods or mouldings and were usually left unpainted. Others, however, were decorated often flamboyantly with motifs borrowed from Lagos-Brazilian architecture, though with little concern for classical purity.

Local builders also gradually developed a more restrained decorative style, which became common throughout Yorubaland. The Yoruba-Brazilian style seemed to be in full vigor until the mid-1950, when it was quite suddenly replaced by the modern style.

4.4.3 The Colonial Style

European administrators and traders introduced the colonial style in the 19th century.

Their residences and offices were usually two-storey buildings surrounded on four sides by deep verandas which were carried by pillars, often of imported cast-iron.

There are large windows to the rooms and the wide verandas could be completely closed by wooden shutters. The style was not adopted by Nigerians, but the masons and carpenters who worked on the buildings gained valuable technical experience, which they used to produce buildings of a type more acceptable to the people. The few public buildings put in the brief colonial period were undistinguished and have had little influence on Nigerian Architecture.

4.4.4 Religious Building

In the traditional religions, buildings were not essential to public worship. There were huts containing symbols of the spirits or of the ancestors, but no buildings in which large congregations could gather. Any major religious ceremony was held in the open, in the courtyard of a palace or household, in a forest grove, on a hilltop or beside a riverbank.

It is not yet two hundred years since the first Christian Churches were built in western Nigerian. The early Churches were essentially simple rectangular buildings with mud walls and thatched roofs but with larger doors and windows than those found in people houses.

Later iron-sheeted roofs and crafted wood doors and windows were introduced along with Romanesque or Gothic arches over the doors and windows. In more ambitious churches, the Brazilian style provided decorative details. Churches were built when possible with brick or stone set in mortar. It became the ambition of each community to build the most impressive and permanent church it could afford, even though the Church might take decades to finish.

The larger churches have a nave flanked by pillars carrying clerestories, side-aisles, and one or two square towers. For many years, European Gothic churches were accepted as the ultimate model for church building. The most ambitious buildings of this type were the Anglican and Catholic Cathedrals in Lagos; both built in the Gothic style, but with concrete instead of stone. The Anglican Church started work on its Cathedral in 1925, and the Catholic Church in 1932.

The modern style so readily accepted by the people for their domestic building from the 1950's was not so readily accepted for church building. However, an increasing number of Churches in the modern idiom are now being built.

4.5 Modern Architecture

The international modern style of architecture came forcibly to the notice of the Nigerian public in the early 1950's when the buildings of the new University at Ibadan (Maxwell Fry and Jane Drew Architects) were constructed. In the tradition of modernism, these architects aimed to make a strictly logical use of the available materials and techniques to produce buildings scientifically designed to suit their environment and function.

The structural framework of the new buildings at Ibadan and Lagos-foundations, pillars, beams, floors were constructed in heavily reinforced concrete. Plain walls contrasted with the openwork screens of the numerous verandahs. The buildings were finished with a coating of new, tough paints. Architects at the time did not favor the use of added ornament, but the natural instinct for decorative detail found a rich expression in the varied forms and pattern of the many concrete grilles, which became a noted feature of the new buildings.

Figure 3: First Bank Headquarters at Marina Lagos, Nigeria

There is nothing specifically “African or Nigerian” about the new buildings. Many exponents of the new architecture considered all forms of traditional architecture irrelevant to the modern scene.

After 1950, buildings in the modern style, including skyscrapers, commissioned by the government or by commercial firms, began to appear in the major towns and cities. The people also quickly adopted the new architecture; while the local builders misunderstood

many of the functional aspects of the new architecture. The clean geometric look was achieved- if not always with precision, and with insufficient or incorrect use of verandahs, grilles, and door and windows hoods, leaving the interior exposed to sun, rain and wind.

The new architecture has spread all over the world and has become a truly international style. For many years, however, serious questions have been asked about it: Is it as efficiently functional in regard to sun, glare, dust, humidity, rain and tornadoes, as it claimed: does it really satisfy the total human needs of the people who use the building. Is it not time to pay more attention to traditional solutions of the problems presented by physical condition and social structures, and to the deep human instinct that architecture should carry forward memories of the past?

4.5.1 Buildings Materials

The main traditional building materials used in Nigeria are mud, branches, corn stalks, leaves and grass. Mud suitable for building is found almost everywhere. It can be used in two quite different ways; it can be built up in massive layers as much as three feet thick, or its plasticity can be exploited to mould very thin walls little more than three inches thick.

Mud, however, has two serious disadvantages: it is easily eroded by rain and it is not resistant to termites. Mud walls can be protected from rain by verandahs or by overhangings roofs, by giving them a very smooth finish, by painting them with gums, or by a regular re-coating with mud plaster.

Termites can be kept at bay by continuous habitation; by the smoke of cooking fires, or by the smoldering logs keep in sleeping huts. In the long run, however, man often loses the battle against rain and termites.

Stone has not been a common building material in Nigeria in the traditional days. The available stone is mainly granite or other dense rock difficult to work into building blocks. In some mountain areas, broken stone is used to make rubble courses of stone set in mud.

Since the middle of the 18th century, broken stone set in lime or cement mortar has been used in non-traditional buildings. However, the cost of labor using this technique is high and it has not become common. Laterite stone is easily worked into rough blocks; in colonial times it was often used in smaller civic and religious buildings.

Pottery was made throughout Nigeria, but the craft of building with burnt brick did not develop except in Bornu where there are some records and remains of brick buildings. Brick was also introduced to the western part of Nigeria about the middle of the 18th century. The bricks were made from earth with low clay content and were fired in clamps at quite low temperature (500F). They are not fully rainproof and had to be plastered with cement mortar. However, they made quite good buildings although they suddenly went out of favor about thirty years ago, when cement blocks took their place.

In the recent years, an increasing number of modern factories for the production of extruded honey-comb bricks and other ceramic building materials have been established. Bricks are often been used as decorative facing rather than in the main structure. Bricks and ceramic roofing tiles have been used extensively in modern Nigeria.

In this century, mud has been used in combination with cement to make strong and permanent buildings. There are many two-storey buildings, with mud walls built on a concrete foundation and rendered with cement plaster, which are still in use after seventy years or more. The expansion and contraction rates of mud and plaster in heat and humidity are different, and there is no real cohesion between them. After some exposure

to weathering, particularly when rain enters through hairline cracks, large pieces of plaster may fall off.

Mud blocks cast in wooden moulds have become a very common building material. Efforts were made about thirty years ago to popularize the use of hand machines to make compressed blocks from earth, or earth mixed with cement, but these machines have not been widely used. Local builders have preferred a technique of building with mud block laid with thick cement joints. Excess cement from the joints is spread over part of the face of the blocks giving a better key for a rendering of cement plaster than plain mud would provide. The walls rest on solid concrete foundations.

Settlement and shrinkage cracks however can allow access to termites. This can be stopped by building the wall on a layer of tarred felt or aluminum, or by treating the foundations with termicide. Another disadvantage of mud building lies in the difficulty of making firm attachments for electric and other fittings, which can often be overcome by planning and ingenuity.

Galvanized iron sheeting has become a major roofing material in Nigeria; a sea of rust-red roofs covers most of the towns and villages in the south. But poor workmanship,

together with over-economizing in wood and nails, produce weak roofs, which are vulnerable to tornadoes. Until recently, iron sheets were relatively cheap, fireproof and long lasting and replaced thatch all over the country much more quickly than cement has replaced mud.

From the middle of the 19th century, the rapidly growing revenue from coca, cotton, groundnuts, and other export crops, and later from the oil boom led to a rapid increase in the use of imported cement, and then to the building of cement factories in Nigeria.

4.6 Habitat for Humanity Housing Provision

Statistics show that there are currently some 1.2 million people worldwide experiencing “income poverty,” meaning they live on the equivalent of less than one dollar per day.

The United Nations Center for Human Settlements (UNCHS) has estimated that 1.1 billion people are living in inadequate housing conditions in urban areas alone. ⁵

5. UNCHS (Habitat) 1999. Basic facts on urbanization, Nairobi, p.9 and table 9

UNCHS has estimated that some 21 million new housing units are required each year in developing countries to accommodate growth in the number of households during the period between 2000 and 2010. Some 14 million additional units would be required each year for the next 20 years if the current housing deficit is to be replaced by 2020. ⁶

In cities of the developing world, one out of every four households lives in poverty. Forty percent of African urban households are living below the locally defined poverty line; they need an average of 12.5 times their annual income to buy a house.

One may perhaps be tempted to ask why emphasis is being placed on housing. Firstly of all man's basic needs, housing arguably, constitutes and indeed poses the greatest challenge. Secondly, vigorous and buoyant housing sectors are an indication of a strong program of national investment and are indeed the foundation of and the first step to future economic growth and social development.

Economic activities are well known to encompass all aspects of human endeavor that are directed towards the creation of wealth. It is also known that one of the basic of human

6. UNCHS (The Nations Center for Human Settlements) State of the cities Report 2001 March.

needs is to seek to enhance one's self worth by improving one's living standards.

Economic growth is therefore a natural pursuit in any human set-up as such improvements are expected to lead to increased wealth and prosperity both for individuals and the whole nation.

Despite all interventions and huge investments in housing provisions since the colonial times and to date, Nigeria's housing problems still remain intractable. In fact, access to decent shelter has worsened for increasing segments of the urban population in Nigeria.

For instance, it was reported that out of 121,000 housing units slated to be built between 1994 and 1995, only 1,014 houses were completed (Central Bank of Nigeria CBN, 1994 and 1998; and vision 2010 main report). Also, it was estimated that about 85 per cent of urban population live in single rooms, and the number of occupants per room range from 8 to 12 with adverse effects on sanitation and health. The deteriorating housing situation in Nigeria, especially at the urban centers is too critical to leave for government to redress alone.

Nigeria is the 6th largest producer of crude oil in the elite league known as OPEC, whose members account for over two-third of the world's total supply of this commodity.

Also, the country's estimated reserves of natural gas runs into billions of metric tonnes and the first train of the liquefied Natural Gas (LNG) has recently been shipped out with the production all fully committed to purchases from abroad. In terms of revenue earning capacity and potential, it is worth mentioning that Nigeria to date has realized over US\$200 billion from crude oil sales.

For a country that could boast of such huge amount of resources, it is very saddening and disturbing to note that very little of the earnings have been put into use to boost the housing industry and infrastructure. The industry should have seen more activity and government support, in large-scale development schemes, and improvement and provision of infrastructure; and of large-scale housing and the creation and expansion of new towns.

A cursory look at the present state of the housing provision tells a glaring tale of a huge paradox - A paradox of achieving so little with so much endowment! An indictment of the government that ought to provide the lead, and so today the housing provision is in a state of comatose, neither dying nor living.

With recent development following completion of successful democratic elections in Nigeria, Habitat for Humanity began initiative development projects in housing provision in the middle belt of Nigeria.

Figure 4: Habitat for Humanity Housing in Nigeria

Habitat for Humanity Nigeria builds simple, decent and affordable houses using compressed earth bricks (CEB) system for buildings which makes its relatively cheap and affordable. The compressed earth brick system utilizes laterite (which is abundantly

available in Nigeria) mixed with little cement and then compressed with a brick molding machine. Bricks produced through this method are durable inexpensive and beautiful.

Many “Habitat for Humanity” houses in Africa countries are constructed with fired clay bricks, with tile roofs made of cement or fired clay. Around the world the houses reflects the local climate and culture of the people due to the usage.

CHAPTER FIVE URBANIZATION IN ZAMBIA

5.1 Annual Growth

Lusaka and Ndola which, are the main urban cities in Zambia, have grown rapidly economically and in population since the country's independence in 1964. The annual growth over a period of 22-years is 15.7% between 1968-1990 with a declining rate of 5.9% between 1991-1997 and 5.3% between 1998-2002 respectively.

The rise in population over 20-years led to the increase in “squatter compounds” all around the colonial residential areas. These areas are initially unstructured, densely

Quality of Life - Past 5 Years	Lusaka	Zambia
Improved	34.0%	27.0%
Remained the same	31.0%	27.0%
Deteriorated	33.0%	44.0%
Don't know	1.0%	1.0%
Not applicable	1.0%	1.0%
Total	100.0%	100.0%

populated and do not have basic amenities like toilets, water, drainage, electricity and garbage disposal.

The migration from rural areas into the city in Zambia, which was encouraged by the British during the colonial era, by “hut tax” imposed by the British to make people leave their rural homes to work in copper mines in order to obtain slave-wage labor. The growing urbanization trend is an inherited problem and could not be stopped by the Federal Government and the city council of these now densely populated cities.

The government of Zambia and city council being unable to stop the migration from rural to cities have together developed policies to protect the rights of new squatters and assist them to establish “squatter compounds” as permanent living areas.

Over time, squatter compounds have been made legal and have been set aside for upgrading into high-density housing and services under the municipal council. These areas which include George, Chawama, Garden and Chipata Compounds, are now legally recognized peri-urban areas. These areas have been zoned to be included in the Lusaka municipality with now 39 compounds housing over one million people. (CSO 1998; with assumed continuing growth at 5.3% per annum to the present).

5. Country Profile: Zambia

Below diagram represent Zambia country profiles showing different regions. 7

Figure 5

7. COUNTRY FACTS

- Population (2002): 10 million
- Urban population: 4.3 million plus, 43%
- Rural population: 5.7 million, 57%
- Capital: Lusaka
- Lusaka population: 1.5 million
- Lusaka population in squatter compounds: 1.16 million (77% of Lusaka's population)
- Number of squatter compounds in Lusaka City: 39
- Current Lusaka annual rate of population increase: 5.3%
- Lusaka population: under 20 years - 56.6%; under 30 years - 75.4%; Over 45 years - 8.6%; over 40 years: 12.6%
- HIV/AIDS infection rate nation-wide among adults: 25%
- Chances that a 15 year old will die of AIDS: 60%
- Reduced life expectancy due to AIDS: from 60 years to 45.7 years
- AIDS deaths in Zambia between 1996-1999: 650,000
- Prevalence of HIV infection among children (1994): 25% (urban areas), 13% (rural areas)
- Expected AIDS-related deaths within the next 10 years: 20% of the population
- Life expectancy at birth: 45.7 years (Lusaka 48.5 years)
- Adult literacy: 72.1% (Lusaka: 95.5%)
- School enrolment ratio: 61.8% (Lusaka 47%)
- Average annual per capita income: US \$350
- Real average annual per capita income (1996 dollars): US \$223 (Lusaka \$472)
- Human Development Index (HDI: on a scale of 0 to 1): Zambia: 0.369 (All Developing Countries: 0.576, World: 0.764, Sub-Saharan African Countries: 0.380)
- Population below the poverty line: 75% (using World Bank indicator of per capita income less than US \$1.00 per day)

5.3 Need for Urban Housing in Zambia

New arrivals in Lusaka from rural areas are usually very poor with very little money and few belongings. They compete with each other to acquire a piece of land and construct family shelter with whatever materials they find on site.

Housing Structures	Lusaka	Zambia
Traditional hut	8.0%	51.0%
Detached house	47.5%	35.0%
Flat, apartment, multi-unit	42.5%	12.0%
Other	2.0%	2.0%
Total	100.0%	100.0%

The typical way of building the family shelter is by use of mud brick and this is covered with plastic or asbestos sheeting roof. The mud bricks are made, by digging the mud on the land acquired, and the mud set in wooden brick moulds, then sun dried. The dried brick are layered with hands, with mortar made of sand and cement mixture. Roofing trusses are made of wood beams or poles. The roofs are made of asbestos sheets held down with stones. The sheets are usually cracked and lay in overlapping pieces.

A porch area is added as kitchen and outdoors sitting area. The area is made with porch roof and walls, which protect the inside from rain and wind. The main indoors is used mainly for sleeping, as windows are

Tenancy Status	Lusaka	Zambia
Owned	31.0%	68.5%
Rented from institution	14.0%	7.3%
Rented from private landlord	34.0%	10.3%
Free housing	21.0%	14.0%
Total	100.0%	100.0%

bricked up with little light for security reasons. Doors are made of worn wood slats. When the families' finances improve through local subsistence trading the building quality improves. Better roofing sheets are used, stronger wooden doors, louvered glass windows, iron security bars and mud brick shacks improved. The indoor floor could be cemented. Outdoors temporary "drop latrines" are enclosed with reed walls. However these temporary shelters made of mud brick by the poorest of the poor is gradually washed away by heavy rains and therefore has to be rebuilt after 2-3 years.

Lusaka land and outlying compounds are characterized by high groundwater, with a slippery thin clay soil surface over a karstic geological formation of porous and brittle limestone-dolomite, which easily fractures and fissures. This allows inflow of contaminated surface water into the groundwater due to improper filtration process. Contaminated groundwater is always health hazardous.

Existing “drop pit” latrines are nicknamed “cholera latrines”, because extensive flooding during the rains lifts everything floats, including the contents of the pits, spreading annual cholera outbreaks

Water Supply	Lusaka	Zambia
River or lake	1.0%	18.0%
Unprotected well	3.0%	30.0%
Protected well	1.0%	8.0%
Borehole	11.0%	9.0%
Public tap	41.0%	13.0%
Private tap	35.0%	17.0%
Other	8.0%	5.0%
Total	100.0%	100.0%

named surface that latrine especially

throughout the most recently established and least serviced “squatter compounds”.⁸

5.4 Effects of AIDS/HIV in Zambia

The rise in the spread of AIDS/HIV has increase with number of orphans surviving in Lusaka compounds. The public authorities now realizes that these children protection and social stability by inheritance laws will make it possible for these children to inherit and maintain ownership of family land and housing assets.

The impact of HIV/AIDs on orphans children are great all over southern Africa, particularly in urban centers were there is lack of social support compare to the close interaction that exists in the rural areas. Usually, the surviving children lose property assets. Only 36% of aids orphans go to school compared 98% of non-affected children.

8. Scoggan, John: Urban housing in Lusaka compounds Zambia, Care-Cardeton urban settlements program, Lusaka municipality, Zambia, 2002

The stability provided by property assets reduced the suffering of orphaned children and families in Zambia. It gives security to the family and help the older children to take care of younger ones. Also enable children of school age to continue schooling.

The legal framework for property transfer under the existing inheritance laws should be carefully utilized. Though, the issues are not easy to be resolve, the idea of giving refuge to suffering families and children through exploring inheritance laws has been sowed.

This is perhaps the first time in southern Africa, that alleviation of the suffering by surviving families of HIV/AIDs is being taken seriously. This enable the surviving families / children to inherit family property assets.

One of the compounds in which CARE has already worked (such as George Compound or Chipata Compound) was suggested by the Town Clerk and LCC official as the initial trial stage for housing development, such that the trust and reputation of CARE can be built upon in these regions.

There are new compounds with fewer community -based institutions. These compounds are more chaotic and would add difficulty to the proposed “design build phase” that is important for future project sustainability and expansion.

CHAPTER SIX

URBAN HOUSING IN LUSAKA COMPOUNDS – ZAMBIA

You can afford a lot more House if you invest in local technology, materials and services. Also, housing is a 'local' industry--it produces jobs where the people are if you use local tech, etc. The multiplier effect is much greater then! This model will only work if there is a capital system in place--a means to recycling money.

Dr Bruce M. Firestone, Ottawa

6.1 Low - Cost Urban Housing

Lusaka, Zambia's capital became urbanized rapidly after independence in the sixties (60s). In 1968 15% of Lusaka's population lived in settlements and unserviced compounds, and by 1974 it had risen to 42%. It became a problem that needed solution.

The increase in the number of people in settlement, led to multi-million dollar low-cost urban housing by the World Bank in 1974. The total amount spent was US\$42.1million upgrading over 1400 hectares of squatter compounds and housing about 145,000 people.

This is the "first Lusaka sites and services project" in Zambia.⁹

9. Project literature and lessons learned, ref.: Bish Sanyal, Nelson Valverde and Michael Bamberger, *Final Report on the Evaluation of the First Lusaka Upgrading and Sites and Services Project* (Washington, D.C., Urban and Regional Economics Division, Development Economics Department, The World Bank, 1981). Mpanjilwa P. Mulawanda, "The Socio-Economic Consequences of Squatter Clearance and Relocation in Zambia," *African Urban Quarterly* 4, nos. 3-4 (Aug-Nov 1989): 254-261. *Project Completion Report, Zambia - Lusaka Squatter Upgrading and Site and Services Project*, report no. 04611 (Washington, D.C., The World Bank, June 1983).

The aim of the project was the provision of low-cost urban housing with combined help construction, also upgrading, technical assistance, regularization of compounds and primary infrastructure. This project is unique because of its size and the community participation.

The ever growing needs of the poorest urban settler in southern African countries in being addressed by CARE Canada, CARE Zambia, CARE International Insaka and Carleton University School of Architecture (“CARE-Insaka-Carleton” shortened to “C-I-C”). These bodies are working together to develop large scale housing settlements at low-cost.

The C-I-C “architecture for urban development” housing settlements program project, started in March 2001. The first phase of the project in its first year was directed towards the housing needs of about 1.2 million people in peri-urban “squatter compounds” in Lusaka, Zambia. These people presently reside in sub-standard housing structures, which are crowded and unhealthy. Zambia is now the most urbanized country in southern Africa, and 43% of the population (10million) lives in urban or peri-urban areas.

6.2 Directed Studies Abroad (DSA) Program

CARE Canada and the Carleton University School of Architecture jointly sponsored a “Directed Studies Abroad” (DSA) program in summer of 2001. This program involved 12 students of Architecture under the leadership of Prof. Yvan Cazabon of Carleton University and Dr. John Scoggan from CARE Canada. A trip was made to Zambia by the group in fall 2001, to identify housing needs and find out opportunity for housing development.

The Directed Studies Abroad” (DSA) program is being carried out by CARE and Carleton in collaboration with CARE Zambia and CARE international Insaka in Zambia. CARE Zambia is a CARE country office managing development projects in Zambia. Whereas CARE International Insaka, based in Lusaka, Zambia, is CARE’s international coordinating office for urban development focus and knowledge sharing worldwide.¹⁰

The initial projects undertaken by CARE Zambia were through donor funded projects like PULSE and PROSPECT. The main focus was providing basic amenities to some of Lusaka’s most populated compound (e.g George, Chipata). Compound improvement

10. Scoggan, John: Urban housing in Lusaka compounds Zambia, Care-Carleton urban settlements program, Lusaka municipality, Zambia, 2002

projects were funded by the World Bank in Lusaka throughout the 1970's and into the mid-1980's which included water reticulation works, managing the community bore holes, deep well electric pumps, overhead gravity-feed water storage towers equipped with cement drainage skirts. (about one public tap to 100 houses).

Furthermore, urban based project activities which included clearing and maintenance of drainage ditches and road culverts to remove flood water were embarked on by CARE. It also include inspection of household latrines, construction of household soak-aways and general elimination of stagnant water to reduce mosquitoes flies population and therefore reduce malaria and diarrhea epidemic. CARE supported the communities in garbage disposal by burning in designated areas and landfill disposal site. These practices have been stopped as a result of lack of funds.

6.3 Overall Objectives of the Urban Housing/Settlements Program

The objectives of the C-I-C urban settlement is to develop housing settlement projects in the existing "squatter compounds" of Lusaka to provide Lower cost, durable, secure, high quality housing structures that are affordable to the poor. With interior living space beginning at 28m² with Choice of optional housing designs and design elements within an affordable pricing range of US \$500-800 per housing unit.

The settlement program will legally recognized transfer of inherited land titles and housing structures to surviving spouses and children with full ownership transfer of 340 m² serviced land plots in compound areas approved by the Lusaka City Council.

An initial “design-build” process in which community groups assist with the design and trial construction of a series of “model homes” will be implemented using on-site modular and pre-fabrication construction methods of locally available materials.

Rapid and easier construction methods that require fewer skilled labor inputs and associated costs with emphasis on skills training and job creation for urban housing work groups will also be considered.

It will involved design and construction methods that enable high participation by women and mortgage financing through commercial banks with monthly principle-interest-tax amortization payments equal to current rental charges being paid by poor families. In addition, guarantee underwriting of bank mortgages covering a portion of loan costs due to defaults.

Urban planning with community groups, with designation of public spaces for different purposes: roads, service corridors, markets, retail outlets, play grounds,

meeting spaces, urban gardens, security sight-lines, and other community defined needs will also be achieved.

6.4 Current NGO Involvement in Housing Projects in Zambia

Habitat for Humanity and Africa housing fund are the two NGO's in Zambia currently actively involved in urban or rural housing projects in Zambia. In rural areas Habitat for Humanity has on-going housing project with down payment received from prospective owners and actual labor done by voluntary skilled or semi-skilled labor for the actual construction.

The Africa housing fund has constructed 2555 low-cost houses, drilled 40 boreholes and given out agriculture and business loans to about 6649 families between 1996 to 2000. Africa housing fund is a pan-African NGO created under a statute of shelter Africa in 1990. Africa housing fund – Zambia was established in 1996 to collaborate with GOZ to assist the very poor in improving their shelter and living conditions.

Africa housing fund – Zambia received funding from NORAD (1996-1998) during which a grant of US\$1.690m was received and world bank funding through Zambia's ministry of housing. Africa housing fund – Zambia has 23 staff and most activities of this NGO

are in the rural areas. Current Africa housing fund – Zambia is constructing 50 houses in Linda compound, Lusaka. The city council refers to the activities of the NGO's as classical example.

A single model concrete block house with interior living room area of 30m² is being constructed by Africa housing fund. This model is in accordance with low-cost housing designated by United Nations Habitat for Humanity. Each of these model house is constructed with 1200 concrete blocks (at 1200 Kwacha or US\$0.40 cents per block), 26 asbestos roofing sheets, 8 bags of cement and other parts for doors, windows and roofing poles.

The priority housing needs of families is identified by Africa housing fund working in conjunction with Lusaka's resident development committees, and as such being in accordance with bottom-up approach to program delivery. The resident development committees supervise the day –to- day administration and implementation of the projects within their own block areas in Linda compound.

Table 1.

Africa Housing Fund Costs Per House, Linda Compound, Oct 2002

Materials	No.	Cost Per (Kwacha)	Total (Kwacha)	Total (\$US)
concrete blocks	1,200	1,200	1,440,000	400.00
roof sheets	26	35,000	910,000	252.78
Poles	300	1,200	360,000	100.00
Mortar & cement				
(bags)	8	24,000	192,000	53.33
Windows	-	-	-	-
Door	1	30,000	30,000	8.33
Labour			700,000	194.44
Total (\$US)				1,008.89

The total cost of the model house is about US\$1,000.00 compared with the total cost few years ago which was US\$500.00. According to Africa housing fund, the average time to construct each model house is 7 to 9 months. Delays are due to time taken to pour and dry molded concrete blocks and the period used to hire skilled bricklayers to lay the walls.

The design of the model Africa housing fund concrete house needs to be constructed by paid skilled labor example bricklayers, carpenters, electricians (ref. Box 1), and as such participation by families or unskilled volunteer work is minimized and these add to the

Box 1.
Current AHF House Construction Stages

- digging perimeter foundation trenches (family and community labor)
- building the perimeter wall foundation using cement block construction (combination of community labor and hired brick layers)
- leveling the soil floors (family and community labor)
- local manufacturing of air-cured cement blocks (separate work teams, bricks are then purchased by homeowners at full market price)
- cement block wall elevation (hired brick layers)
- setting pole roof trusses and fixing roof sheets (hired carpenters)
- finishing fixtures e.g. door (hired carpenters)

cost of the housing unit. Intending occupants (usually women) are only able to help with digging the perimeter foundation trenches and leveling of soil floors after foundation is laid before wall elevation. The restricted participation by families result in higher cost and ultimately reduced number of houses and lower benefits for fewer poor families.

The major time delay is due to construction method using 6x8x12 inch concrete blocks to build load-bearing walls. Concrete blocks can only be poured and air cured by using heavy-duty block-making machines or heavy manual labor.

A block making industry in Linda compounds which gives employment to about a dozen young men was established by AHF. These men work all day in the sun and are paid 400 kwacha per block and each worker makes up to 1000 block per day. AHF sells the block at the market rate of 1200 kwacha per block. The money from the sale of blocks is used to finance AHF operation and management costs and this help to sustain projects in Zambia.

These costs are added to the price of the home and then paid by the homebuyer. It is evident that the cost of concrete blocks alone (not including the brick-laying) account for about 1.44 million kwacha which is equivalent of US\$400 of the cost of a housing unit. Each housing unit is mortgaged over 7-years repayment period at the prevailing interest rate at the cost of US\$1,000 with the cost of labor done by owner deducted. The 7-years repayment period is long and could result in high default rate, also the environment is not predictable and there exist high risk, which would contribute to high default rate.

Consequently, the only reasonable option for C-I-C approach is reduction of housing costs so that shorter period of payment can be possible between 3-4 years, also the mortgage has to be close to what is paid in similar rented housing unit. The shorter

mortgage period and reduced monthly payment will reduce the rate of default. Also if eviction is used as a threats, it will also deter default of mortgage payment.

6.5 Design Strategies to Reduce Housing Costs

The main challenges of designing low cost housing is moving away from widely used and traditionally accepted concrete block wall construction, though there are many design possibilities for reducing the price of low cost housing.

The main disadvantage of concrete block construction that is overlooked is it's heaviness, and the fact that they are used as structural elements to support light tin or asbestos used for roofing. Heavy load bearing walls are not needed to support this kind of roofing therefore no need to spread the money and labor on block molding. Concrete block walls are widely thought to be safe, but they can't endure earthquake or other lateral stresses as they are rarely reinforced. These block walls can be put apart by removing the mortar, especially where are temporary openings in the wall.

The C-I-C team approach is pouring thin 2 1/2-inch thick 8x2 foot wall panels into rectangular molds, these rectangular mould are made with modular steel angles laid on flat ground, bars will be used for reinforcement. The mixing of concrete and pouring can be carried out without technical expertise, the homeowners including women and children could do it, thereby removing the cost of hiring labor.

The steel angle wall panel molds taken to different building sites, joined together with reinforcing rods in place, other needed materials like sand, aggregates and cement delivered on site and concrete mixing and pouring is done. When the blocks are cured, wall panels can be tilted into place in a short time hinged along the foundation's edge and locked into place. The wall panels can be raised by the use of leveraging pulleys hooked to the house's frame. The wall panels can be put in place quickly and without skilled labor.

The wall panel design could include window openings and security bars. Each house could be identified by using various textures as form-work inlays on the outer surfaces. Load bearing structure made of wood element can be made by securing wall panels to cement post. In the rural areas post and beam housing constructs are common, made from

tree trunk poles support thatched roof with smaller branches covered with mud walls tilting-in between main supports. These similar construction methods can be experiment and adapted in urban areas.

Time is saved and more houses built as the flipped up wall can be put in place in a few days. On the other hand, weeks or months are required for the completion of concrete blockhouses.

Box 2.

Proposed C-I-C House Construction Stages

- digging perimeter foundation trenches (family and community members)
- building the perimeter wall foundation (concrete block construction by trained work teams)
- leveling the soil floors (family and community members)
- setting post and beam structure and roof structure (trained work teams)
- on-site concrete mixing and assembly-fabrication of molded wall panels and/or other wall assemblies (family and community members)
- lifting and fixing assembly-fabricated wall panels and locking them in place (family and community members)
- affixing roof sheets (trained work teams)
- finishing fixtures, e.g. doors, windows, partitions, etc. (trained work teams)

The use of concrete wall panels will reduce cost of low-cost housing as less cement would be used, panels are made on site by homeowners and family without the use of skilled labor. Also panels can be raised into place without hiring skilled masons and many houses constructed at once, through wide distribution of steel angle panel molds, without waiting in cue for the manufacture and delivery of concrete blocks.

The above-described design would save costs on materials and labor. It also increases the participation of family members and consequently, reducing purchase price and mortgage financing costs of housing units.

This strategy and other design strategic will be examined and experimented in detail in September 2002 when the C-I-C team goes back to Zambia to work with the community participants. The other possibilities in other designs include: the use of new types of rapid construction welded metal roof trusses, simpler block construction of peripheral foundation (up to 2-feet below soil) surface and 8 feet above grade to deter erosion due to seasonal flooding). Textured walls using cement dipped burlap hung on tensile wires stretched between reinforced concrete block posts may also be used.

Open soil floors not cemented (which may be finished at a later time as families gain resources) with transient walls, and moveable partitions with hook and rod supports may be moved around to suit family needs (1-2-3 bedrooms as a matter of choice). Thatch and corrugated metal sandwich-roof panels to provide thermal and sound insulation (sun radiation and pounding noise of rain) can also be considered.

Provisions are made for safe indoors ventilated combustible heat sources indoor wood and fabric window screens and shutters in lieu of expensive louver verandah/porch areas and family gathering/semi-public space. Ventilation openings in upper part of walls with more wall openings for light along with light reflecting constructions, e.g. “light-shelves”, to alleviate the dark enclosed spaces within the current housing schemes (presently used only for sleeping and not as daytime living quarters). New types of roof finishing alternatives including burlap & concrete modular tiles, built-in storage and functional architectural elements (counters, seating, shelving, etc.) are possible options.

Figure 6: Montage Sequence: Cement dipped burlap hung on tensile wires stretched between reinforced concrete block posts

These possibilities are the proposed design changes, which will be tried out in fall 2002 on-site in one or two Lusaka compounds during a 3-month period. However, all these ideas may not work, some may be accepted. It is obvious that even small changes to the present housing structure, which increases quality, durability and reduces costs, will make a difference in Zambia, as it also will in most developing countries. The C-I-C architectural and urban development initiative even though is presently based on research hypotheses, if successfully will contribute immensely to developing countries.

The C-I-C design initiative is completely different from the already accepted way of constructing by simply rebuilding on old foundations. As a result of home ownership being beyond the poor in developing countries. The success of this plan would depend on the development of good and fast *on-site assembly-fabrication methods* ¹¹. As earlier mentioned, the procedure in which wall construction, using steel-angle molds taken to sites to make concrete wall panels which can then be hinged and locked into position on the site by people in the work team.

¹¹.The answers to mass production of housing in developing countries are usually either (i) importation of pre-fabricated materials for rapid construction (a high cost option with built-in profit margins), or (ii) local manufacture of materials purchased at prevailing market prices (also including labor/profit margins). Whereas the proposed intermediate option would be to enable families and communities to build lower cost on-site, assembly-fabricated housing elements, house-by-house, avoiding both import and local manufacturing costs by increasing local labor participation and the ease/speed/quality of construction methods.

These will take control over manufacturing designs and methods from the commercial or NGO builders and give the capacity for construction standards and controls to communities and individual household. The C-I-C will not be the typical “builder” but rather a facilitator of means of delivering low cost housing renovation / construction to the people all over Lusaka compounds

CHAPTER SEVEN

DEVELOPMENT OF A SYSTEM

Every architectural form, every building or group of buildings must express the basis for its stability, comfort, economy or symbolic meaning. The relationship between solid and void relationship, difference of light quality created by different hues, textures, opacity and transparencies of its materials make architectural space real.

7.1 Integrated Approach

Modern advances in technology have always precipitated new ways of operating in the world. During the second half of the 20th century, electronic media began to further erode traditional concepts of space and time and more recently, the Internet is now completely altering our daily lives to an extent that is unprecedented in history. All aspects of our lives are impacted by changes in technology as the prevailing world-view undergoes transformation and we make adjustments to that change.

All industries and sectors of the world economy are being restructured to maximize benefits afforded by technology. Technology serves as an aide and offers a variety of alternative solutions for consideration because of its fast information processing capability.

7.2 Architecture in the Digital Age

In order to eliminate design errors and to have a clear understanding of space, architects constantly seek better ways of representing and conceiving the architectural object.

Architects in the past used plan and section as their main design tools because of their two-dimensional abstract nature. They were involved in the creation of three-dimensional built form. Architects used physical and digital representations for proposed designs of the real world.

Perspective representation makes it possible for architecture to be referred to as an art. The origin of three-dimensional world in two-dimensional images when it began was called the state of the art digital architecture, and this brought about an identity relation between vision, nature and geometry.

Figure 7: Rendered Model Perspective

Perspective was described through geometric entities such as lines and points, establishing a mapping between the physical world and the geometric universe.

The reduction of images to points, then of points to numbers, which is mapping led us in the computer age to digital architecture.¹²

Perspective rendering is a projection of the object from a viewpoint on the plane of the representation through a paper or computer screen medium. It involves vision, the physical world and its representation. This is also the basic rule of visual reality representation. Perspectives act as visual framed as well as conceptual structure.¹³

In traditional representation of three-dimensional world, the designer can only detect errors after the actual construction of the object have taken place. These tools of representation (plans and perspective) along with scale models as means of simulating reality was not perfect because of its inability to realistic simulate objects and space of the three-dimensional object.

Architecture can be perceived through the world of electronic media in architecture (Computer aided design). Digital architecture would have a greater and wider effect on architectural representation than CAD, though digital architecture follows the path started by computer aided design. Architects are able to develop full size graphic descriptions of

¹² and ¹³: Bertol, Daniela. : Designing Digital Space, An Architects guide to virtual reality. John Wiley and sons, Inc, 1997

buildings (in two or three dimensions), share, reuse, and republish information in a variety of formats, views, scales, and levels of details with the use of computer aided design.

The database (set of numbers) that makes up digital architecture is stored in electromagnetic format. Visual simulations of architecture is created by these database which is similar to the physical structure and is metaphor in the creation of representation in cyberspace. Digital architecture does not create enclosure; the immersion is still only illusionary since the solidity of the enclosure is different from that perceived.

7.3 Perception of architecture

Cyberspace is a world where humans navigate in information-based space as defined by Benediket 1991. Cyberspace is a world of computers connected by telecommunication lines. The coming together of physical space and world of electronic media in architecture occurs in cyberspace. The traditional concepts of space and time has been completely changed by cyberspace such that a site can be experience by several people at the same time from different part of the world.

Naturally, eyes are greedy for beauty. Buildings are brought to life by ornaments, materials, light, shadows and sounds because they make things more beautiful, delightful and pleasing. It also covers disorder and contributes to the way architecture is viewed in different space.

The wide variety of materials in most visualization programs contributes to this by its color, shininess, transparency, textures, bumpiness and reflectance. Most massing and study models are best rendered using fairly simple matte finishes.

The world is understood and viewed by the means of light and shadow. Our perception of light and shadow enables us to defined and understand space; light and shadow intertwine with architectural form. As light, shadow and architectural form are mutually dependent on one another, they can be manipulated to create space.

Different lighting is able to produce different images with the same geometry. Several light sources can be simulated; the sources could be directional, spot or ambient. Clarity and depth is given to images by shadow, which could be *shadow map* or *cast shadow*.

A more realistic perception is given to a scene when the sound rendered complements the visual rendering. Three-dimensional space of the virtual world is mapped to different sound which have been assigned to different three-dimensional location. Zooming in and

out will also enhance the perception without changing the materiality and geometry of the building.

Digital architecture represents the ultimate development in the process of digitalization of design and architecture, which started with CAD and expanded into cyberspace.

Three-dimensional object as traditionally viewed has been brought into clearer focus by digital architecture. Digital architecture also reduces errors that occur due to abstract representation. This is possible because the three-dimensional nature and interaction being achieved in real time makes the designer able to experience his designed object quickly.

All these representations of digital architecture completely give new meaning and perception to architecture. The world of digital architecture being described is able to manipulate physical structure and spatial environment. It involves sight and other senses that are images, sounds and touch in a virtual environment.

People are also players in real time interaction not only passive viewers as in traditional architectural representations. It helps to shape things interactively using virtual tools long before they exist in the real world. The ability to experience three-dimensional object by walking round and feeling them can also be achieved.

7.4 QuickTime VR Technology

Virtual Reality VR conjures up science-fiction images of high-tech goggles, gloves, and body suite. Sensors are taped to all areas of our bodies and we imagine being fully immersed in our virtual environment. In virtual outer space we want to feel like we're floating and underwater we almost expect to feel wet! This is a highly romanticized notion of virtual reality.

Desktop virtual reality is different, usually able to be developed and experienced by normal powered desktop computers. It can be played back as interactive "VR movies" anywhere at anytime and also, much less expensive and easier than the custom programming and on-the-fly rendering done in fully immersive virtual reality (VR) software development.

Apple computers developed QuickTime VR as their entry into consumer-level desktop VR development, which is a subset of the larger QuickTime software architecture.

QuickTime is available for both Mac and Windows operating systems.

QuickTime VR system software allows the Macintosh and windows users to look around in three hundred and sixty degrees 360 panoramas or rotate object through their desktop

computer. Users navigate the space as if they were actually presents there, controlling their respective view by using the mouse, keyboard, or trackball. They can move left, right, up, down, and zoom in and out, and the files called “Movies”. It also enables textual information about place, object or person selected by clicking at the document cursor within a panorama.

QuickTime VR makes virtual scenes from actual still images and may also be modeled in 3-D software programs and rendered as still images to use instead of photographs in QTVR. Panoramas are often made from still photograph because they provide the most accurate images and can be digitally produced onto high-resolution photo CDs. Also can be made from captured video stills, though the resolution will only be as good as the video source (which is typically worse them photographs).

To create a QTVR scene, a photographer mounts a camera with a wide-angle lens on a tripod with a special rotational device that allows the rotation of the camera at pre-determined increments, so that each photo overlaps the previous one. The film is digitized and the images are digitized on a photo CD.

The images are processed with a software program that “Stitches” the individual still images together in such a way as to create one long panorama image – a continuous blend of all the photos. This panorama is mapped onto the inside of a cylinder, which creates a warping effect and keep up with the user’s movements “on the fly” showing the optically connected panoramic movie.

The QuickTime VR movies can stand alone, or be imbedded in various Multimedia authoring tools, such as Apple Media Tool, Macromedia Director or HyperCard and also, be served on the web.

The movement of QTVR to the web is a significant development for its spread and acceptance in the Multimedia field, web sites could include QTVR easily and files sizes are relatively small (usually between 100-200k) and download times fast. QTVR movie in WebPages browsers could create a new way to design, since the panoramic movie is a dynamic element within the WebPages, not isolated off the desktop.

7.5 Digital Media production of Housing Prototypes

Since QuickTime virtual reality (VR) is a multimedia technology that allows users to experience an object “in the round” with their own mouse movements. The world wide

web has accommodated ways to embed VR movies into WebPages combined with other electronic media elements, QuickTime VR can be coupled with intelligent information architecture and Interface design to create virtual experience delivered globally via the world wide web.

You must be in school of architecture, Carleton University or Zambia in order to experience the research project and construction. This is the problem! How can we spread the research based construction and material investigation, rich learning environment, and aesthetic of the research based project all over the world, especially to developing world? How can homebuyers, real estate developer and researchers experience the material investigations, construction and the house after completion? With the use of QuickTime VR delivered through the World Wide Web, these gaps can be bridged and, also enhanced digital architecture in Africa.

To test the implication of this technology, a walk through of the DSA Zambia housing project was created using animated computer models, photographers, maps, text and interactive QuickTime VR movies. VR can communicate a moving sense of place, something photos and text cannot do. VR is like a moving photo, where you are holding the camera and your movement define what you see and, not just dependent on the eye of the photographer.

The housing unit project can't come to life on a brochure, the spirit of moving and looking around the research project and construction is the real part of its fascination. The VR encourage a visitor / buyer / real estate / researchers to browse an area of the project, learn about the materials, methods, and navigate as randomly or as systematically as they wish, and show explorer their surroundings in a way that gives them the power over the findings and their environment.

I approached this project as an attempt to represent a dynamic learning environment for the web. This is an opportunity to combine what the web can offer well: graphical hypertext information environment, with a virtual reality element to fill the missing sense of place in the project.

Representing this place virtually would depend on looking at what makes the research different from others in the world in term of affordable housing provision, and what gives the project its enchanting aesthetic and cost value and trying to embody that in the web pages and QTVR.

To represent this project virtually, I had to use element I could assemble from DSA Zambia groups and lay them out in web pages. (See Appendix B and D for details)

Designing this virtual housing project was only part of my mission, however, it had to be used by prospective users of these project Care Canada, estate developers and researchers all over the world.

CHAPTER EIGHT CONCLUSION

8.1 Impetus for Change

Today, the way we perceive facts has been revolutionized due to the intelligibility of elements in digital architecture. These facts of perception have changed our senses on how we judge and measure things from the object to the image we see on the screen. In traditional architectural geometry, a person's judgment is based on what the eyes see and transmits to the brain. Regarding this, the computer and its software are indispensable tool. These technological changes have significant influence on conception and construction. It also affects building technologies and techniques. Technology makes the not so visible to be visible.

Representation has gone beyond the real. It extends beyond the perceptual appearance of the traditional conceptual frameworks, so that the difference of nature among objects and figure can no longer be distinguished. Virtual reality provides the ultimate rendering tool for perception, evaluation and appreciation of designed architecture before its construction.

8.2 Connectivity to the Global Infrastructure

If the developing world is to respond effectively to changing needs and production incentives, it will be imperative that they improve their technological capabilities.

Information Technology is rapidly changing economic and social activities in the world. It provides opportunities and challenges for making progress with accelerated growth and poverty reduction in developing world.

The emerging global infrastructure could make information technology increasingly possible for students to study and carry out research using the electronic networks to reach remote Universities and Libraries in the world. Information Technology presents opportunities for “Leapfrog” strategies that could accelerate the development of the continent.

To exploit these opportunities, African countries need, as a matter of priority, to upgrade their capabilities through the improvement of their information technology systems. Government should facilitate information transmission and connectivity to the global infrastructure.

8.3 Accelerating Economic Growth

Africa overarching objective remains one of accelerating economic growth and reducing poverty, the pattern of economic growth needed would be broad based to bring about social development and improvements in the welfare of Africa people. To this end, priority should be giving to housing as well as education.

Development through knowledge should assume more important role in Africa.

Knowledge and research center for information and analysis of Africa's socio-economic issues should be established to enhance development.

Networking between existing research centers in Africa can be achieved through the Internet by publications as well as information and data compiled from researchers over the years. Information resources center based on research, resources and technology should be created to compile, study, monitor and disseminate knowledge on developmental applications of information technology in Africa.

The information on development and research will enable developing nations to harness information technology and knowledge to meet the development challenges in the 21st century. The information that can be used, maintained and developed by the indigenous professionals is crucial for development.

African nations need information technology in the management of its operations to have access to the same market and information within the same time frame as developed world. These technologies will improve Africa rural nature and exchange of information.

8.4 Affordable Housing in Africa

“ Unlike a set of tools which accumulates, sediments and becomes deposited, a cultural tradition stays alive if it constantly creates itself a new. Here we have two ways for man-kind to pass through time: Civilization fosters a certain sense of time which is composed of accumulation and progress, whereas the way in which a nation develops its culture is based upon a law fidelity and creation; a culture dies as soon as it is no longer renewed and recreated”.

Paul Ricoeur in History and Truth. –p.280-281

The availability of cheap rental housing is vital element in any poverty alleviation strategy and forms an indispensable part of ensuring human dignity. Developing countries should encourage research towards providing low-cost affordable housing for urban poor who usually spend large part of their income on rent, even for grossly inadequate housing.

International NGOs and developed nations should intensify their support for projects which improved the well being of low-income households and communities, environmental and physical, research and knowledge based economic structures in Africa. The little achieved over the years can still be improved upon with the provision of information technology for development.

Information technology will provide a common or uniform national culture in Africa where interaction and dissemination of information will play an important role. As Ricoeur highlighted, it is through an “engaged creativity” that a culture survives as it continues to invest in its present. Harnessing digital architecture in recovering countries will create a cultural or national identity for development in Africa.

Bibliography

Anders, Peter. : Envisioning Cyberspace: Designing 3D electronic spaces. McGraw –Hill, 1999

Ajanlekoko, Joseph Segun; Sustainable Housing Development in Nigeria: International Conference on Spatial Information for Sustainable Development. Nairobi, Kenya, 2001

Ali, Dinar: Prospects for Information Technology in Africa: Ninth session of the conference of African Planners, Statisticians, Population and Information Specialists, Addis Ababa, Ethiopia, 1996

Benedikt, Michael ed. Cyberspace: first steps. MIT 1993

Bertol, Daniela. : Designing Digital Space, An Architects guide to virtual reality. John Wiley and sons, Inc, 1997

Barfield W. and T. Furness: Virtual environments and advance interface design. Oxford, England: Oxford University press, 1993

Bruce M. Firestone: Theoretical and Practical underpinnings of real estate development. School of Architecture, Carleton University, Ottawa, November 2001

Bogod, J: The role of computing in developing Countries. British computer society, London, 1979

Carroll, Kevin : Architecture of Nigeria. Lester crook Academic publishing 1992.

Cazabon, Yvan: Housing the Urban Poor – Lusaka, Zambia. Carleton centre for Applied Architectural Research (CCAAR), ARCC/EAAE conference Montreal, 2002

Coyne, Richard: Designing Information Technology in the post-modern age, from method to metaphor. 1995

Craig, Zimring and David, Latch Craig: Media and design process. Acadia 99

Ching, Francis,: Architecture: Form, Space & order. Litton educational publishing Inc. Van Nostrand Reinhold Co, 1979

Fadahnsi, Akin: The development process and technology, a case for a resources based development strategy in Nigeria: Uppsala, the Scandinavian Institute of Africa studies, 1986

- Goldberg Ron: Multimedia producer's bible. IDG books worldwide, 1996
- Hanna, Nagy K: The information technology revolution and economic development. World Bank discussion papers, No. 120, World Bank Washington DC, 1991
- Jordan Peter, Bettina Mehnert and Anto Harfmann: Representation and design. Acadia 97
- Karnak: Africa systems of Science, Technology and Art, The Nigeria experience. London, 1993
- Marshall, Mcluhan: Laws of media: The new science. uoft press, 1988
- Nwachuku, Micheal: Development of Information Technology in Nigeria,
- Negroponte, Nicholas: The third shall be first: wired. January 1998
- Nordberg, Rainer: Alleviating Poverty through Housing Development. UNCHS (Habitat),
- Nnamdi, Elleh: African Architecture, Evolution and transformation. McGraw-Hill books, 1996
- Negroponte, Nicholas: Being Digital: Published in New York and simultaneously in Toronto, 1995
- Leandro, Madrozo and John Marx: Digital Design studio, Acadia 98
- Odedra M,: Enforcement of Foreign Technology on Africa: Its effects on Society, Culture, and utilization of Information Technology, 1992, p.143-154
- Rasmussen, S.E: Experiencing Architecture. MIT Press, 1959
- Ricoeur, Paul; Universal Civilizations and National Cultures, History and Truth. Northwestern University Press, 1965
- Scoggan, John: Urban housing in Lusaka compounds Zambia. Care-Carleton urban settlements program, Lusaka municipality, Zambia, 2002
- Tallero, E and Gaudette, P: Harnessing information technology for development: A proposal for a world bank group vision and strategy, Washinton D.C, The World Bank , October 1995

Udo, Kultermann: New directions in African Architecture by George Braziller, Inc., 1996
United Nations: Committee on Economic, Social and Cultural Rights (CESCR), The right to adequate housing, 1998

Resources

Resources was based on reference material from International Development Research Center resources information, CIDA, CARE Canada, “CARE Zambia’s Urban INSAKA”, library and articles, magazines, materials from conference (Carleton’s conference on Housing) to update professional information especially related to the computer field where a very fast development is characterized. It was also based on the computer equipment of the school of architecture and through personal computer equipment at home.

Appendix A

Case Study (CD): DSA Zambia Prototype and Contemporary Architecture

Digital Architecture Design Page

Contemporary Architecture Page

The attached CD-ROM contains presentations done in DreamWeaver, Flash, QuickTimeVR to demonstrate the use of digital architecture for development in a jointly sponsored "Directed Studies Abroad" (DSA) program in summer of 2001 by CARE Canada and the Carleton University School of Architecture.

Appendix A

Case Study: DSA Zambia and Contemporary Architecture

1.0 This presentation demonstrated how digital architecture is used to harness development in recovering countries.

1.1 Digital architecture could be used extensively to facilitate collaboration and expedite project delivery to the public.

1.2 Digital architecture could be used effectively in the absence of traditional means of communication. The Internet was used as the vehicle to communicate ideas, images of distant projects.

1.3 African contemporary architecture aerial photos and plans were used to test and communicate the impact of several development concept and design alternative.

Appendix A

Case Study: DSA Zambia and Contemporary Architecture

1.4 Pre modern architecture photos were used to communicate information on existing conditions in recovering countries.

1.5 The modern architecture studies were based on existing digital data overlaid and re-scaled to reveal new information.

1.6 These series of design presentations are intended to demonstrate the use of new digital technologies in the research phase of the project.

1.7 Digital site plans were overlaid over digital Aerial photographs to defined space layout and circulation spaces.

Appendix A

Case Study: DSA Zambia and Contemporary Architecture

1.8 Preliminary design sketches were translated into 3D models to visualised volumetric massing, light and shade, colour, texture and flow through the interior space of the building.

2.0 3D models and photographs were used to create virtual interactive walk-through based on QuickTime virtual reality (QTVR). These walkthrough can be accessed by clicking on each image.

1.9 The construction designs aspect focused on research, observation, documentation, and especially process towards the implementation of the housing projects.

2.1 Various aspects of the project and partners are reached by clicking on the links to the site.

Appendix A

Case Study: DSA Zambia and Contemporary Architecture

2.2 Other presentation focuses on the thesis text and documentation.

Appendix B

Demo 1: Navigating through virtual space

DSA Project: School of Architecture, Carleton University Ottawa.

S.Orimoloye

DSA Project: School of Architecture, Carleton University Ottawa.

S.Orimoloye

DSA Project: Sequence of Montage

S.Orimoloye

QuickTime Virtual Interactive Walkthrough design based on 3D model of CARE Canada and the Carleton University School of Architecture jointly sponsored a “Directed Studies Abroad” (DSA) program in summer of 2001.

(Based on 3D model of the Directed Studies Abroad” (DSA) program by Chris Davis)

Demo 2: Navigating through virtual space

DSA Project: School of Architecture, Carleton University Ottawa.

S.Orimoloye

DSA Project: School of Architecture, Carleton University Ottawa.

S.Orimoloye

Exploded Perspective of design-build model.

S.Orimoloye

QuickTime Virtual Interactive Walkthrough design based on 3D model of CARE Canada and the Carleton University School of Architecture jointly sponsored a “Directed Studies Abroad” (DSA) program in summer of 2001.

(Based on 3D model of the Directed Studies Abroad” (DSA) program by Ryan McLennan)

Demo 3: Navigating through virtual space

Nigerian Contemporary Architecture

S.orimoloye

Nigerian Contemporary Architecture

S.Orimoloye

Nigerian Contemporary Architecture

S.Orimoloye

QuickTime Virtual Reality Interactive Walkthrough based on 360 degree panoramic photographs. Text, sound, Video of DSA Zambia embedded within design to triggered interactive.

Appendix C

Case Study: Nigerian Contemporary Architecture

1.0 The presentation covers Nigerian contemporary architecture: traditional, pre-modern and modern architecture.

1.1 Forest architecture design plans and elevations.

1.2 Savanna architectural design layout and concept.

1.3 Storage huts and granaries linked together (outer buildings) by short walls of stone or mud or by senses of cornstalks of a type more acceptable to the people.

Appendix C

Case Study:

Nigerian Contemporary Architecture

1.4 Fulani huts were made by setting both ends of saplings in the ground to make a framework, which is covered with grass or leaves.

1.5 Elias da Silva House: Close-up of top floor, balcony and roof arcade. Details of pillar and wall decoration

1.6 Water House Da Rocha house: Close-up of top section of pillar and details of windows.

1.7 Tape House: Close-up of top section of pillar and window details.

Appendix C

Case Study:

Nigerian Contemporary Architecture

1.8 Government press House: Overview, openings and details of the frontage

1.9 St George's Hall overview and upper floor

2.0 Efun House overview and upperfloor details.

2.1 Palace of the Oba of Lagos, new extension and ancient building showing details of window, door and pillar.

Appendix C

Case Study:

Nigerian Contemporary Architecture

2.2 Palace of the Ojara of Ijora, overvie,
details of window,pillars at inner chamber
and embellishment.

2.3 The first baptist Church, close-up of top
section of building.

2.4 Christ Church cathedral: Overview of
the building and close-up of windows, pillar
and cross.

2.5 Christ Church Cathedral: Overview of
the building and entrance door.

Appendix C

Case Study:

Nigerian Contemporary Architecture

2.6 Holy Trinity Church: Overview of the building

2.7 Holy Cross catholic cathedral: Overview and part of the roof arcade

2.8 Holy Cross Catholic Cathedral: Overview, doorway and part of the roof arcade

2.9 New Lagos Central Mosque: Aerial Overview and Shitta Mosque

Appendix C

Case Study:

Nigerian Contemporary Architecture

3.0 No. 83 bamgbose Street: Overview, close-up of top and details of windows.

3.1 salvation Army Building: Overview, close-up of top and details of windows.

3.2 Aderibigbe's Villa: Overview, close-up and windows details.

3.3 National Theatre Iganmu, Lagos: Overview, close-up, mother Africa statue and dancing masquerade sculpture including mural details.

Appendix C

Case Study:

Nigerian Contemporary Architecture

3.4 Institute for International Affairs, Lagos: Overview and close-up.

3.5 First bank Headquarter, Lagos: Overview, close-up and entrance

3.6 Independence Building, Lagos: Overview and close-up.

3.7 Mandilas House, Lagos: Overview and close-up.

Appendix C

Case Study:

Nigerian Contemporary Architecture

3.8 Tafawa Balewa Square, Lagos:
Overview, close-up and University of Lagos
entrance.

3.9 Lagos View from Apapa.

Appendix D

Tamara's Housei:

Research into a [hi]Story of African Dwelling

Prof. Yvan-pier Cazabon

ARCC/EAAE Conference Montreal, May 2002

Introduction

"The problem is this: mankind as a whole is on the brink of a single world civilization representing at once a gigantic progress for everyone and an overwhelming task of survival and adapting our cultural heritage to this new setting. To some extent, and in varying ways, everyone experiences the tension between the necessity for the free access to progress and, on the other hand, the exigency of safeguarding our heritage"¹¹

Along with the present pressures of globalization numerous developing /recovering African nations are struggling with the remnants of a recent release from colonial occupation.

In the case of Zambia in southern Africa

after a successful (and bloodless) revolution (1962), this struggle includes an attempt to secure political and economic self-determination along with reviving a fragmented cultural identity. The term's recovering nation's is perhaps more appropriate to Zambia's situation than the more commonly used term's developing nation's.

With the later comes the biased perception of incremental progress and gradual accumulation of techniques, tools, and knowledge whether applied to politics, economics or science and engineering.

Following Paul Ricoeur's assessment of the conflict between universal development pressures and the need to re-establish cultural identity, I would propose that Zambia as a recovering nation defines her identity from the deepest roots of cultural history. One example of this rooted stance is demonstrated by the co-existence of seventy-two tribal languages officially recognized by Zambia's constitution (English being one of them). This is not to say that Zambia, as she lays claim to her cultural origins, does not recognize the necessity of access to an international modern civilization. In fact, Zambia's future depends on her ability to engage in a complete dialogue and exchange with the international community.

"Whence the paradox: on the one hand, [a society] has to root itself in the soil of its past, forge a national spirit, and unfurl this spiritual and cultural re-vindication before the colonialist's personality. But in order to take part in modern civilization, it is necessary at the same time to take part in scientific, technical, and political rationality, something which very often requires the pure and simple abandon of a whole cultural past"

The House as Human Right

Architects throughout the Northern Hemisphere are beginning to respond to an urgent call - to build millions of houses for communities lacking in the most basic of human comforts. Architecture in the context of international aid and development is seen as a generous act of helping less privileged societies attain a basic standard of living.

From the point of view of international aid agencies this represents a significant part of the foundations of basic human rights which include health, education, freedom of speech, access to income, etc. Numerous architectural interventions however, while based on noble intentions, often present concepts and techniques foreign to the cultures within which they operate.

Inevitably, along with the architectural project comes the western (northern) bias of practise over theory driven by definitions of progress as cumulative betterment.

Practical questions of technique and "how-to" often override theoretical concerns of cultural perception, tradition and world-view. Herein a balance must be stricken.

Development history is "littered with shelter interventions based on the wrong assumptions, i.e. that materials and approaches are what are important - they almost never are." *iv*

More important issues revolve around land ownership and a sense of identity and stability. Also, it is all too often assumed that a shelter has the same function in different contexts. "John Turner (Ex Prime Minister of Canada) was right when he coined the phrase that "housing is a verb", i.e. it's what it does for you (brings an income, provides a stake in the city, becomes an asset, etc.) that counts'.

This is not to say that innovation in the *practise* of affordable housing has no merits. Architectural experiments going back to the 1960's and 70's raised

international awareness on issues of ecology, traditional methods, indigenous materials along with promises of affordability through mass production and economy generating labour participation.

The complexity of the problem lies in the adaptability of a given culture to a system which is applied from “without” as opposed to possible engagements with a host country where systems are allowed to evolve from *within*.

“... throughout the world an equally universal way of living unfolds. This way of living is manifested by the unavoidable standardization of housing and clothing. These phenomena derive from the fact that ways of living are themselves rationalized by techniques which concern not only production but also transportation, human relationships, comfort, leisure and news programming as well. ... There is a culture of consumption of world-wide dimensions, displaying a way of living which has a universal character” v .

International Non-Governmental Organizations (N.G.O.), such as *Habitat for Humanity*, *Builders Without Borders*, and *Food for the Poor*, are already making significant inroads in developing low-cost quality housing alternatives with improved design characteristics.

Private firms also have highly developed programming and technical skills in this area. From a critical experience however, projects like these operate at a distance from the community’s full potential.

Standardized plans and community layouts using “efficient’s materials and methods make it possible for numerous shelters to sprout-up instantly while personalization, family adaptation and specific programmatic needs are left wanting.

More importantly, the potential of community based management to ensure the gradual evolution of houses and neighbourhoods along with culturally defined expression are rarely components within the design process.

On the other hand, universal practises as defined by Ricoeur are “good” because they promote the availability of elementary possessions to the masses of humanity. In his words, “no kind of criticism of techniques will be able to counterbalance the absolutely positive benefit of the freedom from want and of the massive access to comfort.” vi

The House as Subject of Cultural Research

"... we should have to be prepared to conduct our research up to the stable images and the permanent dreams which make up a nation's cultural resources ... Images and symbols constitute what might be called the awakened dream of a historical group" vii .

In order to more thoroughly investigate the Africa housing crisis *CARE Canada* has initiated a working relationship with *Carleton University's School of Architecture* and the *CARE International* centre for urban development (*INSAKA* in Zambia). The primary objective of this collaboration is in researching and developing practical skills and knowledge that would contribute directly to the collective's competitive advantage in obtaining and implementing large-scale donor-funded urban housing projects.

More importantly however, in seeking out an academic centre for its housing research, *CARE* anticipated a "cultural exchange" that would reciprocally benefit both the host country and the research team.

CARE representatives understood that students of architecture, our future international architects, could afford a more profound research extending beyond the "real life" limitations of normal architectural practise.

"In-the-field" investigations culminating in architectural proposals would benefit from a prolonged contact with Zambian communities with the likelihood of personal experiences with deeper meaning.

Indeed, students were quick to observe the superficial evidence of internationalization. Strewn amongst the fabric of a "*culture not their own*" the young architects could discern the all-too-familiar discarded remnants of a universal consumer society as they walked past the smouldering garbage heaps of plastic *Coca-Cola* bottles and package wrappers.

"A threat [to the great civilisations of the past] is expressed, among other disturbing effects, by the spreading before our eyes of a mediocre civilisation which is the absurd counter-part of elementary culture. Everywhere throughout the world, one finds the same bad movie, the same plastic or aluminium atrocities, the same twisting of language by propaganda, etc. It seems as if mankind, by approaching en masse a basic consumer culture, were also stopped en masse at a sub-cultural level" viii .

More importantly however, in seeking out an academic centre for its housing research, CARE anticipated a "cultural exchange" that would reciprocally benefit both the host country and the research team.

After spending hours with individual families in their modest homes and conversing repeatedly with merchants and craftsmen in the local markets each and every student would return with unique fragments of a cultural puzzle.

"Yes I believe it is possible to understand those different from me by means of sympathy and imagination, just as I understand a character in a novel or at the theatre or a real friend who is different from me. Moreover, I understand without repeating, portray without reliving, make myself different while remaining myself. To be a man is to be capable of this projection into another centre of perspective". ix

The Structure of Exchange

Students participating in the *Directed Studies Abroad* (DSA) program were enrolled in three required courses including a materials application workshop, a full

design studio and a history/theory elective (culture).

Distinct lines were not drawn between these courses. Instead, the research based program aimed at unifying the various modes of investigation in an attempt to deliver a wider range of critical output. Students were able to align their observations with multiple input ranging from on-site interviews, presentations by local experts, drawing exercises, 1:1 material and methods experimentation, lectures in cultural studies and studio based design.

While each course would ultimately revolve around similar issues, the modfore the resulting assignments differed in scale, medium and focus.

Each course included a survey/research component which took place in Zambia over a one month period, and was followed-up by design based assignments upon the group's return to Canada.

For the first four weeks of the term (while in Zambia) participants in this course ventured into the field of community work as defined by numerous national and international programs. This first phase was one of gathering and documentation as well as a research which required dialogue and the exchange of ideas with members of host communities. Students sought to know about the aspirations and the frustrations; the desires and the concerns of people who they met in the underprivileged neighbourhoods – in short, students engaged in the exchange of stories.

Etymologically, the words story and history have evolved from the same root - *historia* (L.).

This is made evident in Latin based languages such as French and Italian wherein the same word, *histoire* and *historia*, are undifferentiated.

While much has been discussed with respect to the role of History in the understanding of architectural theory and practise, this research aimed at shifting the focus to the source of meaning imbedded in a people's stories. The act of narrative story telling is a creative endeavour that bears collection of the past as well as a creative projection into the *very-present* (*present as lived*).

Furthermore, in contrast to other modes of interpersonal exchange (such as music performance), storytelling oscillates between speaker and listener in a moment of observation/reflection/response.

It is with this reciprocity in mind that the course structure for the Directed Studies was established. In addition, it became clear from the outset that the student group would experience urban Zambia in a near-nomadic way.

With the exception of rudimentary sleeping accommodations, all participants made their homes within the fabric of Lusaka's urban settlements (compounds) and their inhabitants.

In lieu of a permanent studio space in Zambia, students were asked to create for themselves, a nomadic portable “studio” and to continually evaluate and transform it during their stay in Zambia. All aspects of the *Studio* and *Workshop* courses including “desk reviews”, public presentations and seminars were conducted in full mobility. Further to this, the theme of “storytelling as documentation” was set as the foundation to most course exercises. This concept stems from the *Tjuringa* from the novel: *The Songlines* - by Bruce Chatwin.

While Chatwin's book is based on observations made during travel in another continent (Australia's Out-back), his observations on the importance of storytelling and dreaming were deemed appropriate to our adventures into the ancient cultures of Africa.

The *Tjuringa*, an ancient Australian-Aboriginal object of recording, ensured the survival of cultural identity and ritual by engraving narrative content on a physical artefact. Similarly, the students' nomadic studio in effect became their personal *Tjuringa*. Its definition was to ensure that their experience in Zambia became a physical as well as a narrative record.

More importantly, the reconciliation of our presence in what is a “*culture-not-our-own*” could only be made by the communication of our personal stories alongside the stories of the culture that welcomed us. The *Tjuringas* were conceived to promote this reconciliation and to give it an abstract physical form.

“The Tjuringa is usually an oval-ended plaque carved from stone or wood and covered with patterns which represent the wanderings of its owner’s Dreamtime Ancestor” x

Workshop

The Workshop course was concerned primarily with the teaching of the architect’s fundamental tools: i.e. drawing (*drawing from*) and documenting the experience of a place. It was equally a drawing course and a course that focused on making.

Both modes of representation were important components able to formalize the abstract and represent (*re-present*) the lived experience of new and foreign places. The architect’s diary or sketchbook is often a juxtaposition of sketches, text and images which help to inform and recollect existing buildings, cities, landscapes and artefacts.

In addition to this, through this workshop (and the studio that ran in parallel), additional media investigations were encouraged: i.e. sound samplings, music, photography, video, material investigations and constructions, and eventually - upon our return to Canada -computer based media.

All of these were to support the ideas found in the *Tjuringa* - that layered traces of recording reflect the collage-narrative of the nomadic experience.

The Table/*Tjuringa*

The actual construction and development of the Table/*Tjuringa* was reviewed during the travel component of the workshop. In preparation for the table's design and construction, the Workshop projects explored issues of making, documenting and transportation. This was to include consideration for wear and tear, weight, weather, instructions for use, programmatic transformation, etc.

Every architect will express different preferences for tools, layout, materials, instruments, etc. It therefore became possible for each student to reflect carefully on the program for his/her portable workspace.

This course asked of each student to speculate on the inter-relationships between program and architectonics, use and construction, by developing a program outline in narrative form while critically challenging conventions within the tradition of representation in architecture. The three parts to this project addressed separate yet similar issues all geared to an overall questions, namely: How does the place, the objects and the intentions of

making (process) affect the product and work of an architect? Can drawing conventions be challenged by questioning, not their "style" but their "making"? Does a re-interpreted drawing board lead to a re-interpreted drawing?

The response to these questions (if not the answer) can most clearly be demonstrated by the personal and interpersonal qualities in each of the Table/*Tjuringas*. It is in the integrated "log-books" displaying sketches and text that personal intentions are best understood. Meanwhile the individual *Tjuringa* which incorporate all aspects of observation/reflection/response demonstrate the exchange between the students and the local trades who would help them resolve their personal constructions while giving insight into local traditions and contemporary craft. xi

“Unlike a set of tools which accumulates, sediments, and becomes deposited, a cultural tradition stays alive only if it constantly creates itself anew. Here we have two ways for man-kind to pass through time: civilization fosters a certain sense of time which is composed of accumulation and progress, whereas the way in which a nation develops its culture is based upon a law of fidelity and creation; a culture dies as soon as it is no longer renewed and recreated” .xii

After numerous iterations and critical “renovations” the individual logbooks, now merged with the *Tjuringa* can be read, can be touched, and can be interpreted. The logbook/Table/*Tjuringa* are at once a studio space, a personal diary, a “cabinet of curiosities”, and a graphic novel with physical attributes.

The “Drawing-From” Exercises

Both workshop assignments start from historical traditions and artefacts that have influenced architects and artists throughout the centuries. This was to enable students of architecture to “ground” themselves in a tradition which they have inherited in order to more completely understand the potency of precedents that they are so eager to observe. These exercises were constructed as vehicles for the analysis and comprehension of historical representations in order to spring from their origins into contemporary speculations. One exercise examined medieval triptychs as a model for the representation of a narrative (in space/ place and time).

The other, based on *Cubist* paintings, sought to complete the gathering of experience into its final form based on the song-lines of the *Tjuringa*; hence reinforcing the representation of space-time while reconciling the physical juxtaposition of numerous found conditions.

“Only a living culture, at once faithful to its origins and ready for creativity on the levels of art, literature, philosophy and spirituality, is capable of sustaining the encounter of other cultures - not merely capable of sustaining but also of giving meaning to that encounter... In order to confront a self other than one’s own self, one must first have a self”. xiii

All courses in the DSA Zambia line-up (Theories Elective, Workshop elective and Studio) were conceived as inter-related and complimentary - the product of one influencing the outcome of the others. For this reason students were asked to formulate relationships between them to satisfy their personal interpretations of the course objectives.

Design Studio

The studio course, in direct parallel with the workshop component, was structured around the articulation of discovery through *Recording, Sampling and Replay* leading to a proposal for an architectural speculation in the city of Lusaka. The building proposals,

as outlined in the Studio assignments were *urban* interventions. While these are interventions of opposite scales (one is modest - a market vendor's stall, while the other is of a public/urban scale - neighbourhood and house design) they speak of similar issues and concerns. How does architecture respond to complex urban issues which have more to do with cultural anthropology and tradition than with issues of form? With this we find ourselves in a situation where our actions, whatever they are, demand of us ethical contemplation and ethical action. Furthermore, the very idea of urban intervention is put to question when we as outsiders "intervene" upon a physical condition with hidden underlying orders.

"The phenomenon of universalisation, while being an advancement of mankind, at the same time constitutes a sort of subtle destruction, not only of traditional cultures, which might not be an irreparable wrong, but also of ... the creative nucleus of great civilizations and great cultures, that nucleus on the basis of which we interpret life, ... the ethical and mythical nucleus of mankind". xiv

History/Theory (Culture)

A significant portion of our involvement in Zambia revolved around the existing efforts of CARE Canada, CARE Zambia, Urban Insaka and other national and international groups. As part of our investigation into urban and peri-urban living conditions and our eventual proposals for housing we were introduced to relief efforts which are more structural (in a social sense) than physical. This is to admit at the outset that housing issues are not specifically architectural issues and rarely does architecture resolve the problematic of economic, political or social struggle.

We can nonetheless hope that the process of community building and the direct involvement of a community in the process of architectural delineation can lead to the successful implementation of community structure - including buildings.

Our success in communicating with/to our hosts in Zambia, especially the communities which could most benefit from our input can best be measured by the “documentation” of an *experience as lived* and the interpersonal communication of that experience. To witness from a distant stance can only lead to solipsism and a denial of the necessary reciprocity in the creative process of thoughtful-making.

As Ricoeur points out, it is through an “engaged creativity” that a culture survives as it continues to invest in its present. Our involvement in a reciprocal exchange was and continues to be crucial to a successful speculation.

In Canada

Upon our return to Ottawa, the Zambia group set up a studio bay devoted to the continued explorations of the Africa experience. In the Workshop component this meant a laboratory-like setting for materials and media exploration aiming at the “complete” documentation of each participant’s *story-line*.

These experiments, in turn, were to supplement/compliment the *Tjuringa* whereby exercises took on the “pure and applied” aspects of construction projects as well as the more illusive qualities of interpretative narrative.

From the experience in constructing the *Tjuringa* in Zambia completed with significant input from local crafts (wo) men, students had gained significant insight into the ever-evolving traditions of *making*. It is with this knowledge that the group set out to experiment with indigenous materials and traditional methods of construction. The specific location and program for the house proposals suggests that material application experiments and constructions were to consider the many facets of material inquiry including: Availability, structural integrity, workability, import vs. export potential, local construction means and conventions, technological adaptability – workmanship and appropriateness. In considering appropriateness, “design” issues in response to traditional and adapted ways of life figured prominently.

These were derived from an open dialogue with the community in question.

In the Design Studio component, students were to propose a public Architecture by responding to their gathered research. The contents of their *Tjuringa* which now included notes, sketches, sound-bites, video, photographs and artefacts would suggest a point of departure in defining an architectural program which would develop a speculative architecture focusing on urban living and large-scale housing projects for *Chepata Compound*, Lusaka.

In some instances and in response to individual research, community infrastructure (architectural) programs relating to health, culture and education (or hybrid versions of these) were encouraged.

The focus has been on developing demonstrated capacity to create affordable low-cost quality housing units and well-designed communities for the benefit of poorer urban families in countries faced with rapid urbanization needs.

While the central “topic” of such research can be signified by the term “housing”, greater issues of urban development, urban anthropology, urban economics, employment generation, social and cultural contexts, materials development, housing

and urban design, appropriate applications technology, community management, government relations, institutional and financial sustainability, cost structure, and potential donor interest also figure significantly.

Projects from the Design Studio were submitted using traditional and non-traditional representational techniques and depicted an elaborated architectural program (use) as well as a specification/speculation on eventual implementation (process). Each student was expected to propose an architectural program or a hybrid program of their own. While housing was the central focus of the studio, community infrastructure (architectural) programs relating to community, health, culture and education (or hybrid versions of these) were encouraged.

The course pedagogy focused on research, observation, documentation, and especially process.

The long-term expectations of the *CARE Canada/Carleton University* partnership aim at the implementation of housing projects. At *Carleton University Design/Build Studios* have, for a number of years been structured such that students are encouraged to find alternative methods of design based on the context of the problem and with the most limited of means. While good solutions rarely come down to materials and methods, we remain optimistic that architectural solutions can be found from within the communities in which they are set.

In this way architects and future architects can find their role as members of a community (universal or national) focused on the specific and inherent problems at hand.

"... [Cross-cultural] encounter has not yet taken place at the level of an authentic dialogue. That is why we are in a kind of lull in which we can no longer find truth and in which we are not yet capable of conquering the scepticism into which we have the twilight of dogmatism and the dawn of real dialogues". Xv

Endnotes:

i Tamara's House is the working title of a program for affordable housing in Zambia, Africa signifying: "Toward a Modest, Appropriate, & Responsive African House" and was inspired by a young Zambian mother interviewed by architecture student Andrea Macecek. This housing project is a collaborative effort between Carleton University School of Architecture and CARE Canada begun in 2001.

ii Paul Ricoeur: "*Universal Civilizations and National Cultures*" in *History and Truth*; - p. 271.

iii. Ibid., p. 277.

iv. David Sanderson, CARE U.K.

v. Paul Ricoeur "*Universal Civilisation and National Cultures*" in *History and Truth*. - p. 274.

vi. Ibid., p. 275.

vii. Ibid., p. 280.

viii Ibid., p. 276.

ix Ibid., p. 274

x. Bruce Chatwin, *The Songlines* - p. 43.

xi. By "local tradition" one will instantly make associations to the historical crafts of African wood and bone carvings, basket weaving, fabric printing, drum making, truly "honest" creativity in the way that craftspeople transform discarded materials such as wire, tin cans and plastics in the making of toys, functional objects and works of art.

xii. Paul Ricoeur "*Universal Civilization and National Cultures*" in *History and Truth*. - p. 280-81.

xiii Ibid., p. 283.

xiv Ibid., p. 276.

xv. Ibid., p. 283.

Appendix

Country Description

Zambia is a southeastern African nation with five distinct topographical regions: the central highlands; the western plains, swamps and semiarid deserts; the Rift Valley of the Zambezi Lowlands; the Muchinga

Uplands; and the swamps and lakes of the northeast. Despite progress in privatization and budget reform, Zambia's economy is struggling. With the drop in copper prices, Zambia's copper mining sector, which accounts for over 80 percent of the nation's foreign currency intake, is struggling. Meanwhile, inflation continues to be a serious concern. Adding to economic woes, many of Zambia's donors withdrew aid after political instability in the elections of 1996.

COUNTRY FACTS

Location: southern Africa

Climate: tropical

Population: 9,508,200

Economy: agriculture, brewing, cement, chemicals, mining (cobalt, copper, lead, zinc)

Government: republic

Religion: predominantly Christian with some Muslim/Hindu

Literacy: 72 percent

Language: English; 70 indigenous dialects

Community Description

The original capital city of Lusaka, in south central Zambia is home to approximately 300,000 people. Surrounding neighbourhoods termed "compounds" with colourful names such as Kamwala, Freedom, Chiesa,

Family Unit Description - Program

The implementation of the housing prototype was conceived with urban implementation and community development in mind. This "house-type", a construction of approximately 24 m², was designed based on the basic programmatic needs of an extended family living in the high-density peri-urban area.

In order to identify potential user families, students spent numerous hours in difficult conditions interviewing family members of the most diverse make-ups. A life of poverty and struggle is impacted by myriad social and economic factors. The search for work drives young Africans from their villages in search for work and a better life in the city creating a continuous influx into already crowded squatting neighbourhoods.

High unemployment limits dreams of success and gradually affects a family's earning potential and education access while squalid living conditions invite disease and health complications. A family member's good fortune, as rare as this may be, promotes additional influx of families coming to benefit from their relative's tenuous stability.

The impact of HIV/AIDS especially has transformed the African family unit. It is not uncommon to meet a grandmother caring for 5 or 6 grandchildren whose parents have recently been taken by the disease. We met a great number of young adults who were caring for the children of their siblings along with their own all the while struggling to make a better life for their extended family. These harsh realities have a profound effect on what would be considered a straightforward house program. Hence, built into the exercise of program definition was the requirement for direct contact and an exchange by storytelling.

With this direct contact, students could more readily focus their designs on a real clientele while pondering the necessary flexibility of architectural programming. The house therefore was to accommodate the most basic of a family's needs while responding to cultural traditions, changing lifestyle and eventual physical or financial growth/change within the family unit.

Participants in
Carleton University DSA Zambia:

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Ryan McLennan
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Appendix E

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Challenges for the next decade

"One of the things that we believe in very much is the use of the Internet and the World Wide Web," Bjornsson says. "It gives everyone common, easy access to anything."

Construction is a business that stands to benefit greatly from electronic commerce. More than two-thirds of the cost of a new building covers the expense of procured materials and services. Purchasing the right components at a reasonable price and arranging for them to be delivered at the proper time is a critical element in the construction process.

One project that connects the 3-D CAD model of a project with online vendor catalogs illustrates the potential of an automated equipment analysis and procurement process. When the engineer adds a pump of a certain type to a building model, the software automatically searches vendor catalogs on the Internet and identifies suitable vendors.

The inquiry then triggers the vendor's pump selection software that examines the building model and performs its own analysis to determine the proper pump model. "The prospect of using electronic commerce to automate the dynamic, two-way exchange of technical information is a very exciting one," Bjornsson says.

Another project demonstrates how use of the web may be able to cut down the time it takes to get a building permit approved. The program can check a 3-D CAD model of a building over the Internet and make sure that it conforms to local building codes.

The prototype checks a design for compliance with the disabled access code. Before it will work with other aspects of the building code, however, the code must be rewritten so

that it is performance-based rather than rule-based. This should not be a major obstacle because the move to performance-based building codes is taking place worldwide.

"When you think of all the parties involved in a construction project - all the suppliers, architect-designers, specialty engineers and contractors - everybody could easily have access to the information that they need through the World Wide Web," Bjornsson says. "But for this to work we need standards. What is beautiful about the World Wide Web is that it tolerates a number of standards. It is a liberal system. But we still need some structure." He says that CIFE intends to play a prominent role in the development of the protocols, business standards and processes that are needed to link the construction industry electronically.

In another mid-course correction the center will put more emphasis on "soft" managerial and organizational issues. "That is something our member companies have been asking for. Although they are really enthusiastic about what we do, they also realize that there is a big gap between what we do and what they do. They would like to do what we do, but they don't know how. So we need to study barriers, motivations, economic justifications, educational aspects," Bjornsson says.

To further this goal, the new director hopes to establish closer ties with experts in the industrial engineering and engineering management department and the business and law schools - something to which the center has not devoted much effort in the past.

CIFE also intends to increase its educational efforts by working more closely with the Stanford Center for Professional Development and Stanford Online. With new equipment donated by Intel, the center is reorganizing its laboratory. It is creating a workshop that will allow the center to push more information about its activities to members and other interested parties over the web.

"This is the first time that distance learning techniques have been developed that may actually work in the construction industry," Bjornsson says. "Contractors need education delivered to their workplace, to their desks, so that they can get access to what they need just when they need it. Stanford Online is tailored perfectly for this application."

Levitt doesn't think that research centers of this type should be permanent. "But there is plenty for CIFE to do for the next 10 years," he says.

ARCHITECTURE IN THE DIGITAL AGE

Information technologies and the construction industry are coming together in ways once unimaginable, and their union is changing what people do inside buildings, as well as how buildings are designed and built. "I don't like to use cliché words like revolution," says Hans C. Bjornsson, director of Stanford's Center for Integrated Facilities Engineering (CIFE), a world leader in the application of information technologies to the construction industry. "But it is a revolution."

For the last 200 years, the basic construction paradigm has been the factory, created for masses of people to work together to make complicated products.

"That paradigm has been applied not only to the workplace, but also to homes, schools and most other types of buildings," Bjornsson says. "Industrial society has created high-rise apartment buildings as human warehouses so that people can live near their workplace. Even the interior design of our homes has been influenced: subdivided, like factories, into a series of special purpose rooms - kitchen, dining room, living room, television room, sewing room, bedroom.

"Now that paradigm is changing," he says. With the rise of the virtual workplace, physical proximity is becoming ever less essential. "The big research question today," Bjornsson says, "is what kind of building will we be building in the next century?" Perhaps lots of meeting places, he suggests.

Engineering buildings for the future

The "built" environment - the office buildings where we work, the houses where we live, the factories that manufacture our goods, the malls where we shop - is on the threshold of dramatic change, driven by advances in digital computer and communication technologies.

"I don't like to use cliché words like revolution," says Hans C. Bjornsson, the new director of Stanford's Center for Integrated Facilities Engineering (CIFE), a world leader in the application of information technologies to the construction industry. "But, in a way, it really is a revolution."

Until very recently the construction industry has been relatively untouched by these new technologies. "There is still the environment that we had 50 years ago: drawings and

information on paper," Bjornsson says. Experts have been predicting for 20 years that digital technology will begin penetrating the building trades, but "only now has it reached the stage that we can actually do the things that people have been predicting. The industry has begun awakening to the tremendous potential of this new technology, [partly] because of things that have been done at CIFE," he says. According to Bjornsson, not only will the convergence of computer, telephone and television change the way that buildings are designed and constructed - potentially reducing costs by an estimated 10 to 30 percent - but it will also change what people do inside them.

For the last 200 years the basic construction paradigm has been the factory, which was created to allow large numbers of people to work together to make complicated products. "That paradigm has been applied not only to the workplace, but also to homes, schools and most other types of buildings," he says. Thus, our industrial society has created high-rise apartment buildings as human warehouses that allow large numbers of people to live near their workplace. Even the interior design of our homes has been influenced: Much like factories they have been subdivided into a series of special purpose rooms - kitchen, dining room, living room, television room, sewing room, bedroom.

"Now that paradigm is changing," Bjornsson says. With the rise of virtual organizations, physical proximity is becoming less and less essential. As a result, "the big research question today is, What kind of building will we be building in the next century?" He suggests that the new paradigm might be meeting places. "After all, the web is an electronic meeting place, but we will need physical meeting places as well."

Bjornsson took the reins of CIFE in January. He came from Sweden, where he was the dean of the School of Technology Management and Economics at Chalmers University of Technology and a professor of construction systems management.

Appendix F

Paul Virilio (The Lost Dimension, 1980)

Constructed space

Appearance has been replaced by transparency because accelerated disappearance has displaced progressive emergence of forms and figures in the constructions of architecture, painting, drawing, sculpture and their surface of inscription.

This transition is based on the sensibility of vectors of displacement and the intelligibility of elements in the communication and telecommunication. This development affect people and objects, image and their world of representation.

Information system based on numerics produce the precise digit of the image on the computer screen. But the dimension of its artificial image is that of the vector of execution or their emission and it no longer involves the physical dimension of geometry.

There is a great difference between the information of our senses and the information of the advanced technologies such that we transferred how we judge and measure things from the object to the image we see on the screen. The distance speed is now used to measure the space traveled instead of the time of passage.

Now that our knowledge of distance and dimension was been eliminated, communication does not displace users, but detaches them from their immediate environment.