



UNIVERSITY OF NAIROBI
COLLEGE OF ARCHITECTURE AND ENGINEERING
SCHOOL OF THE BUILT ENVIRONMENT
DEPARTMENT OF ARCHITECTURE AND BUILDINGSCIENCE

ADVANCING CULTURAL EXPRESSION ON FAÇADE DESIGN THROUGH PARAMETRIC MODELLING

GITHUNGO VICTOR KIARIE
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DEDICATION

TO GOD, FOR HE ALWAYS VINDICATES ME.
TO MY MOTHER.

DECLARATION

This thesis is my original work and to the best of my knowledge has not been presented for the award of a degree in any other institution.

Githungo Victor Kiarie (B02/0888/2013)

Signature.....Date.....

Supervisor: Arch. Caleb Mutali

Signature.....Date.....

Supervisor: Arch. Peninah Mutonga

Signature.....Date.....

Year Master: Arch. Norbert Musyoki

Signature.....Date.....

Chairman, Department of Architecture and Building Science: Arch Musau Kimeu

Signature.....Date.....

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ABSTRACT

The world has been changing at an unprecedented rate in the last century. With a move towards globalization, where the world is more connected than ever, there is a sense of placelessness. Optimized technology and highly standardized commercial regulations have limited the possibility of creating a rich urban form to some degree. In African cities, in this case, Nairobi, there has been little attempts at extracting the uniqueness from the regional culture, especially on highrise buildings. On the other hand, with advancements made in technologies, in this case, Parametric Design, optimized technology can be used to extract the uniqueness of any culture.

This research seeks to investigate whether Parametric Design can be used to advance what can be conceptualized, designed and built. The author chose to focus on facades particularly because they are the most visible and relatable aspect of a building from the outside, aside from form.

Based on the literature reviewed concerning the expression of culture on facades, and how parametric design can advance it. The author established that little attempts had been made at expressing culture in Nairobi. And even though Parametric modeling can be used to model culturally expressive buildings, some cased studies showed that it can be achieved using simpler means.

Therefore the overall conclusion was parametric modeling can actually help in this endeavor but the main problem was not a limitation of technology, rather it was a lack of willingness to challenge the boundaries that existing technologies have limited. Inspiration is everywhere in the African Continent, Architects and designers may need to step up.

Parametric Design through powerfull, is merely a tool. A tool is only as good as the person who wields it, how inspired they are. It is more about the architects needing inspiration.

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INTRODUCTION

CHAPTER 1





Figure 1 Decorated Mud Houses of Tiébélé, Burkina Faso. They are culturally rich, and decorating the walls of their buildings is an important part of their cultural legacy in this area of the country. (Patowary, 2012)

6.1. BACKGROUND STUDY

Whenever technology moves forward, architecture's nature changes with it. Technology alters the way of thinking and practicing architecture; and simultaneously, architecture demands from technology new solutions for conceptualization, functionality, and aesthetics. (Kalay, 2005)

In Abraham Maslow's *hierarchy of needs*, *belongingness* is part of one of his major needs that motivate human behavior. The hierarchy is usually portrayed as a pyramid, with more basic needs at the base and more complex needs near the peak. The need for love and belonging lie at the center of the pyramid as part of the social needs. (CHERRY, 2015)



Figure 2 Maslow's Hierarchy of needs establishes the need to belong as one of the basic needs towards self actualization. The Author argues that Africa as a continent cannot reach self actualization till they reach a sense of identity that is rooted in their history. (CHERRY, 2015)

In Architecture, more so on the African continent, Identity continues to be an elusive ideal that native architects have struggled to bring out in their buildings, with a small degree of success (Agbo, 2012)

Looking at traditional African architecture, Identity in the built environment was achieved through building form and even more strongly by ornamentation on the outer walls of the buildings as shown on Figure 1. A case of this is Burkina Faso, a poor country, even by West African standards, and possibly the poorest in the world. But they are culturally rich, and decorating the walls of their buildings is an important part of their cultural legacy in this area of the country. Wall decorating is always a community project done by the women and it's a very ancient practice that dates from the sixteenth century AD (Patowary, 2012) Figure 1



Figure 4 Rendering of the Ghana National Cathedral: Adjaye Associates Taking inspiration from Ghanaian Akan architecture and working side by side with local artists and artisans, Adjaye has designed what will stand as a globally recognized architectural landmark, proudly harking back its own, authentic history. (Latief, 2018)

At the national level, in the African context, countries are bound to their colonial pasts most visibly by their architectural makeup. A big part of a previously colonized country's identity is intertwined with its colonial history, and one could say the buildings still in existence are the memories of that painful past made visible. The history of colonialism in itself is traumatic, but it is part of what shapes us. (Latief, 2018)

The instance of Sir David Adjaye's National Cathedral of Ghana is a step in the direction both in its use of an African architect to fulfill the project (a privilege we've only been afforded in recent years), and in its unapologetic proclamation that the country is ready to embrace its own identity. (Latief, 2018)

Facades in building act as skins with multiple functions, ranging from, thermal control, aesthetics and an expression of culture, by borrowing from African ornamentation. The attempt so far has not been satisfactorily successful, largely due to limitations on technology. Now that the technology exists to bring what architects conceive to fruition, the issue of identity should be easily be tackled on facades.

This study will attempt to explore African Architectures' search for identity, and how parametric modeling can be used to advance the expression of African Culture on building facades.

6.2. PROBLEM STATEMENT



Figure 5 KICC featured on the kenyan ksh1000 note. An implication that KICC represents the kenyan Identity. Source: Author

In Kenneth Frampton's essay, "Towards a Critical Regionalism, Six Points for an Architecture of Resistance". In: *The Anti-Aesthetic, Essays on Postmodern Culture*, Kenneth Frampton argues against placelessness in the built environment. He suggests the main ideas about critical regionalism, the first one being "culture and civilization"

He posits that "Optimized technology and highly standardized commercial regulations have limited the possibility of creating a rich urban form to some degree. When the high rise and freeway become the symbol of metropolitan, drawbacks of modernism and postmodernism have started to be obvious" (Frampton, 1983)



Figure 6 Lorrho House in the Nairobi CBD that fails at representing a sensitivity to the region, picking a more international style



Figure 7 KICC extracts the uniqueness from the regional culture, and thus is a more successful in being critically regional

Kenneth further emphasizes the difference between critical regionalism and nostalgic historicism. He proposes that critical regionalism should extract the uniqueness from the regional culture with a systematic, economical and modern method. Hence, critical regionalism could seek a balance between regional culture and universal civilization. (Frampton, 1983)

In Nairobi, there has been little attempt at extracting the uniqueness from the local culture, especially in high rise buildings, with the rare exception of the Kenyatta International conference center (KICC) Figure 7 which strikes a chord with Kenyans as inspired by African culture. That is probably it was chosen to be on the highest denomination note as shown on Figure 5

Most high-rise buildings built after the 1980s tend to follow an international style that can ideally be built in any city in the world. With glass cladding and curtain wall façades, they do not represent any aspect of the regions as shown in Figure 8.

The problem of placelessness occasioned by globalization has recently affected Arab nations like Dubai, Where there has been rapid development due to the inflow of money from petroleum.

"Architecture should give the identity for the place itself. So when I look at a building, I should know this design is from Dubai, from the Emirates. If you go to Sheikh Zayed Road and see these towers, you don't know whether you're in New York, or London or Tokyo or wherever,"

The same should be said about Nairobi, that Architectural design in Nairobi should be specific to Nairobi.



Figure 9 Traditional Arabian Architecture in Dubai with the city skyline in the back ground

With the advancement of Digital technologies, parametric modeling in architecture can help African cities hold on to cultural identity through an exploration of how African patterns can be implemented on facades.

Ornamentation on Buildings is not new to African tribes as it has been carried out for millennia, Especially in Western African as shown in Figure 1 Decorated Mud Houses of Tiébélé, Burkina Faso They are culturally rich, and decorating the walls of their buildings is an important part of their cultural legacy in this area of the country. Figure 1. In the Kenyan context, there is a rich variety of native patterns that is unique to each community.

The Maasai and Turkana, for instance, are known for the rich ornamentation they adorn their bodies with. It can be argued therefore that Africa, is not short of inspiration for new façades that reflect richness found in African ornamentation.



Figure 11 Rapid Development of Dubai over the decades

In traditional African societies, the use of ornamentation in art and vernacular architecture is essential. It connects most local tribes to their earlier civilizations and tribal cosmologies. Without ornamentation, the history of most African tribes would be incomplete because, these symbols are not mere decorations or sources of decadent pleasure (although they remain pleasing to look at), they are deep and subtle repositories of history. (Mathias Agbo, 2019)

For most African tribes, ornamented traditional buildings, tell stories through pattern, color, and ornamentation, either with free-standing sculptures or as reliefs embedded into walls, door panels, and other architectural elements. In traditional Yoruba architecture, Figure 10 for example, the figurative house posts used to support the roof are like totem poles, with one sculptural element stacked atop another, representing a pantheon of deities or even a roll call of battles and tribal conquests (Mathias Agbo, 2019)

The hesitance to adapt facades to African art and ornamentation has been occasioned by the need for standardization of building parts, for both efficiencies in production and

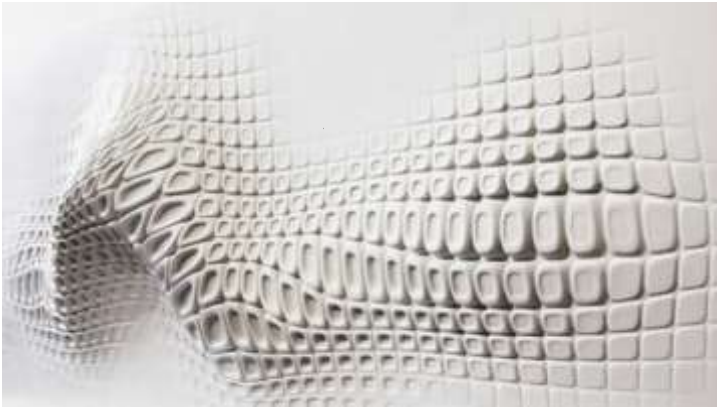


Figure 12 Parametric design opens up new possibilities for what can be designed, Model by Grasshopper, a plugin for Rhino 6



Figure 13 Soccer City Stadium, Johannesburg, South Africa. The form and design of the outer shell is achieved through Parametric design



Figure 14 proposal for new Camp Nou, the home stadium of FC Barcelona, The facade designed through digital modelling

installation. The author believes that a parametric design tool can help African art and ornamentation to be expressed on facades in their full glory.

Parametric design is a design method that uses computers and algorithms to create three-dimensional models. The advantage of parametric design is that it is very useful for optimization and form-finding because it is possible to get different versions of a model with changing the input parameters of the algorithm. It is possible to handle a lot of different spatial elements together, and with its mathematical and geometrical commands, it is possible to create shapes and forms which would be very hard to handle with traditional architectural tools. Its disadvantage is that the understanding of algorithms is necessary to be able to use it efficiently. If it is used in cases that cannot take its advantages, it is a more circumstantial and difficult solution.

6.3. AIMS AND OBJECTIVES

- To document attempts that have been made at Façade design buildings in Nairobi.
- To explore how Parametric Design has advanced design in the architectural world.



Figure 15 Assembly of the facade elements of the Heydar Cultural Centre in Baku. Each panel being unique for the particular part of the facade it belongs to. (Schielke, 2017)



Figure 16 North Nigeria, Yoruba house-post with carved wooden figures. The Yoruba expressed their religious in their Architecture. Source <https://www.pinterest.com/pin/39195459237338621/?lp=true>

- To Investigate how Parametric Design can advance the conception and implementation of façade

6.4. RESEARCH QUESTIONS

- What attempts at façade design have been made in Nairobi
- How Parametric Design has advanced design
- How can technology be used can be used to push the boundaries in the conception and implementation of African inspired façades

6.5. JUSTIFICATION OF STUDY

As earlier stated, the question of Identity is an existential one. As Africa develops it's important for it to maintain bits of its vernacular, and advance it to the modern age in its full splendor, otherwise African cities will continue to understate the beauty and variety of African ornamentation patterns.

If at all technology can be used to solve the old question of identity, it's definitely worth a look into.