UNIVERSITY OF NAIROBI

College of Architecture and Engineering

School of The Arts and Design

BDS 413: PROJECT PAPER

(Interior Design Specialization)

INCORPORATING BIOMIMICRY TO INTERIOR AND EXTERIOR SPACES OF MISANGA FARMHOUSE TO EASE SPINAL DISK PROBLEMS

Farmhouse Misanga, Bungoma North

By: B05/1113/2017

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Project paper submitted in partial fulfilment of the requirement for the Bachelor of Art in Design Degree submitted to the school of the Arts and Design, University of Nairobi.

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DECLARATION

I Donde Ericsson Mudembei hereby declare that this is my original piece of work and it has not been presented for the award of Degree in any other university. Where ideas of other scholars have been used, I have clearly indicated in a standard way.

To the best of my knowledge I have not committed any plagiarism or deliberate omission in the acknowledgement of original works by others.

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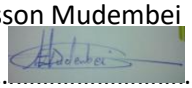
Donde Ericsson Mudembei

Signature……  ……..Date ……14/04/2020.....

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DEDICATION

I dedicate this paper to God Almighty for seeing me through my education and life and for faithfully bringing me this far.

I also dedicate this paper to Mr. & Mrs. Donde, Mrs Lusiji Alison, Juddy, Lilian, James and Annette for being my support system, ensuring that I receive education, bringing me up to believe that I could do anything that I set my mind to do and always praying for me. They taught me to be religious, strong, follow my dreams, pursue my passion and develop my talents. I could not make it this far without your support all the way and even for tolerating me through my years of learning.

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ABSTRACT

For centuries now humans have had to battle with spinal disk problems, the term ‘disc’ is short for ‘intervertebral disc’. These are the spongy cushions that separate the bones of the spine (vertebrae). Discs provide shock absorption, keep the spine stable and give the vertebrae ‘pivot points’ to allow movement. The symptoms of spinal disk include: back pain, increased back pain when repetitively bending or with prolonged sitting, increased back pain with coughing, sneezing, laughing or straining also pain, numbness or pins-and-needles radiating into an arm or leg if a disc has caused irritation of a nearby nerve. A designer therefore needs to appreciate the severity of this problem and through the design process strive to find a workable solution.

The research paper will be sectioned into five chapters. Chapter one will describe the introduction and background leading to this study, problem statement, objectives resulting into research questions, significance of this study to the design industry and the scope of the research, as well as the limitations and finally the justification of the study. Chapter two entails a critical analysis of theoretical literature on biomimicry, sustainability, sustainable materials and African adinkra symbols from the Ashanti of Ghana and how biomimicry has contributed to design. Chapter three will outline the research design adopted by the researcher, the Methodology used by the researcher to collect, analyse and present data of this study. Chapter four will contain a qualitative analysis of Misanga Farm house – the case study to this research, the presentation and interpretation of findings then lastly, chapter five will be a summary of the findings, and the researcher’s recommendations on the four thematic areas of interior design for the farm house.

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CHAPTER ONE

1 INTRODUCTION OF THE STUDY

1.1 INTRODUCTION

Anybody who has experienced a damaged spinal disk understands how painful it is. Every movement seems to make it worse. This pain is a warning signal that you should heed. If you take appropriate action, the discomfort usually stops, and the problem can be corrected. Spinal disks are rubbery pads between the vertebrae, the specialized bones that make up the spinal column. Doctors call them intervertebral disks. Each disk is a flat, circular capsule about an inch in diameter and one-quarter inch thick. They have a tough, fibrous, outer membrane (the annulus fibrosus), and an elastic core (the nucleus pulpous). For every 10 people working in offices in Nairobi, eight are likely to have back problems, a new research shows. The commonest disorder is nerve tension along the upper back, ranging from mild to very severe, the survey by Chiropractic and Physiotherapy Health Centre shows. The group of clinicians, specialised in musculoskeletal and the nervous system, carried out the research during a campaign to educate the public about back and neck disorders. (Mwangi, 2016) . A glimpse of the house shows that considerations towards back problems were not taken and as such a solution is much needed.

Biomimicry is an approach to innovation that seeks sustainable solutions to human challenges by emulating nature's time-tested patterns and strategies. (Benyus, Biomimicry institute, n.d.) The goal is to create products, processes, and policies, new ways of living that are well-adapted to life on earth over the long haul. The practice of looking to nature has historically been standard practice, from Corinthian columns on Greek temples to Santiago Calatrava's iconic biomorphic structures. But the practice of biomimicry looks beyond form and teases out life's inherent sustainability strategies, creating structures that fit form to function and are material efficient as well as well-adapted to their environment.

Designers are innately curious, and biomimicry provides the opportunity to learn about life's water, energy, and material use strategies, and broadens the design solution space to bring new solutions to the design table. The practice of looking to nature has historically been standard practice, from Corinthian columns on Greek temples to Santiago Calatrava's iconic biomorphic structures. But the practice of biomimicry looks beyond form and teases out life's inherent sustainability strategies,

creating structures that fit form to function and are material efficient as well as well-adapted to their environment.

It also helps to accomplish multiple needs with one simple gesture. In nature, there are no single-purpose tools. For example, trees provide shade with their leaves, which also generate energy, and bark, which also helps to protect and cool the moving water beneath the surface. Imagine building surfaces and systems that could accomplish multiple functions with one simple, multi-functional design! In this design the researcher will expound on how biomimicry can and will be used in solving problems with regard to a farm house in Misanga, Kitale, Kenya.

1.2 STATEMENT OF THE PROBLEM

There is a design challenge in the farm house from the interior and exterior layout, to furniture choice and positioning and also in terms of exhibition as the challenge of spinal disk problem has not been addressed. This despite the fact that the owner who is the permanent residence suffers from this condition

1.3 OBJECTIVES

1.3.1 Main objective

To recreate the interior and exterior of the farm house considering the issue of spinal disk problems with regards to the owner.

1.3.2 Specific objectives

To use biomimicry to provide for the needs of a person with a spinal disk problem

To demonstrate how the application of Gye Nyame can be used to achieve aesthetically appealing and functional interior spaces

To apply the use of repurposed materials in the interior and exterior spaces of the farm house

1.4 RESEARCH QUESTIONS

What are the needs for a person with spinal disk problems?

What gaps are there with regard to the interior of the house and how can biomimicry provide for them?

How can these gaps be filled through the use of chosen adinkra symbols?

How can repurposed materials be used in the interior and exterior spaces of the farm house?

1.5 SIGNIFICANCE OF THE STUDY

Back pain is one of the most common reasons people go to the doctor or miss work, and it is a leading cause of disability worldwide. Back pain is common; it can range from a minor nuisance that resolves on its own, to a chronic problem that limits mobility and diminishes quality of life. In most cases, back pain does not require urgent care. But, when the pain persists and does not improve after a few days, medical attention may be needed. (Nairobi spine and orthopaedic centre, 2019) As a result designers and innovators are seeking solutions to challenge the issue in terms of its genesis, treatment and cure.

Biomimicry has often been a reference point when it comes to solving complex human problems such as; Creating mechanical structures with extreme strength and minor material usage also Developing light, effective, and sustainable body armour. This proposal therefore will look to greatly understand the aspect of biomimicry and thereafter apply it in providing for the need of those with back problems and with specific regard to Mr Frederick Asamba the owner and full residence of the farm house.

1.6 LIMITATION

1.6.1 Time

The time allocated towards the completion of the research is limited

1.7 SCOPE OF THE STUDY

1.7.1 Geographical

The farm house is located in Misanga, Kenya along the Kitale-Eldoret highway. The researcher will be dealing with the farm house belonging and the adjacent structures around the farm house. Also inclusive of the landscape.

1.7.2 Conceptual

The researcher will focus on the above mentioned farm house, with regard to interior design aspects and landscaping under the philosophy of biomimicry.

1.8 CONCLUSION

In the initial stages of this paper it is important for the researcher to understand the fundamental elements of the site to understand fully what is required to bring out better output considering the philosophies under discussion.

CHAPTER TWO

2 LITERATURE REVIEW

2.1 INTRODUCTION

This chapter will survey the current knowledge and literature on the idea of Biomimicry and Sustainability in a sense also featuring exemplars and models behind the theories and their works. It will narrow down the idea to its environmental components, for example, Repurposing with regard to design laying out a portion of the materials. This chapter will likewise layout the job of plan in sustainability, and biomimicry with regards to the residential industry. The last bit of chapter two, the researcher broke down the auxiliary logic and relation of the chosen African symbols.

A portion of the famous designer will be referenced with Eduardo Campos: The butterfly chair being featured as the most reasonable champion the extent that biomimicry is concerned. The researcher will close by featuring a portion of the remarkable works of the Chris Lee and Aldrin C in accordance with the interior design process.

2.2 BIOMIMICRY

Science alone won't solve global challenges it needs help; there is a need to accustom human behaviour with the wider world. (Hutchins, 2013). Biomimicry itself is an advance towards innovation that searches for sustainable solutions to human challenges by looking into nature’s time-tested patterns and strategies. The aim is to create products, processes, and policies together with new ways of living that are well-adapted to life on earth over the long haul. The importance of biomimicry manufacturing materials that imitate life's natural processes has been known for years, and designers have often looked to nature for formal solutions. In the popular imagination, the best-known example is the microscopic "hook" on burrs that inspired the development of Velcro, but there are many more applications, from kingfisher beaks inspiring the shape of bullet trains to shark skin being used as a model for advanced swimsuits. (Kapsali 2016) Biomimics inquire into nature’s best ideas: photosynthesis, brain power, and shells and adapt them for human use. (J. M. Benyus 2009)

2.2.1 Kingfisher-Inspired Bullet Train

Figure 2.1 kingfisher and bullet train (Source; momtastic.com)

The fastest train in the world that's travels at speeds of up to 200 miles per hour, Japan's Shinkansen Bullet Train was a marvel of modern technology. But there was one major problem after its initial debut: noise. Each time the train emerged from the tunnel; it caused a change in air pressure that caused thunder-like sounds that were a nuisance from a quarter of a mile away. The train's head engineer, a bird-watcher, had an idea: borrowing inspiration from the shape of a bird's beak to make it more aerodynamic. The consequent design was based on the narrow profile of a kingfisher's beak, resulting in a quieter train that also consumes 15% less electricity and goes 10% faster than before. (Steph, n.d.)

By copying nature's forms, scientists have been manufacturing and designing new devices to help keep us healthier. Here are some ways the unmatched efficiency of nature has been copied to advance medicine. (page, 2013)

2.2.2 Tentacle-Inspired Prosthetic Arm

Figure 2.2 Tentacle Inspired Prosthetic Arm (Source; Momtastic.com)

Why would a prosthetic arm for humans need to take its shape from the appendage of another living organism? For Kaylene Kau, designer of this fascinating concept, it comes down to study of how the prosthetics are actually used. Says Kau, “Through extensive research I found that the prosthetic functioned as an assistant to the dominant functioning hand. The prosthetic needed to be both flexible and adjustable in order to accommodate a variety of different grips.” Tentacles provided an ideal design, gripping objects with a simple curling motion. An understanding that biomimicry has been influential in the health field. (Steph, n.d.)

2.2.3 Biomimcry in Landscape

Figure 2.3 carbon Fiber Pavilion (Source; Dezeen.com)

Researchers and students from the University of Stuttgart have used robots and drones to weave this carbon-fibre pavilion, which is based on the silk hammocks spun by moth larvae. The 12-metre-long cantilevering structure known as the ICD/ITKE Research Pavilion 2016/7 is made from over 180 kilometres of woven resin-impregnated glass -and carbon-fibre.

It is latest in an annual pavilion series built by students and researchers at the University of Stuttgart, which investigates the capabilities of carbon fibre as a building material by mimicking structures found in the natural world. This design approach shows that biomimicry has worked with regards to landscape design. (Gibson, 2017)

2.2.4 Biomimicry in interior design(lighting)

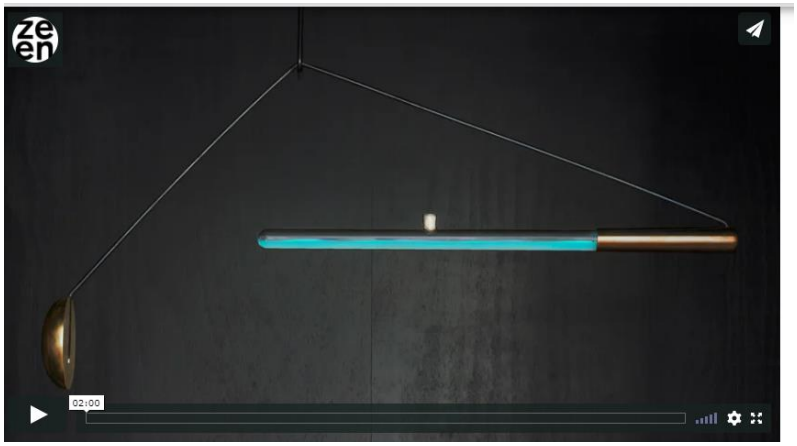

Figure 2.4 Ambio lamp (Source; Dezeen.com)

Van Dongen's Ambio lamp, which was her graduation project at Design Academy Eindhoven, is made up of a glass tube filled with bioluminescent bacteria inside a saltwater solution. "Ambio is a lamp that works with bioluminescent bacteria that are usually found on the skin of an octopus," says van Dongen in the movie, which was filmed at the Sense Nonsense exhibition at the Van Abbemuseum during Dutch Design Week. "We isolate the bacteria, grow it and place it in an artificial seawater medium with the right nutrients and food." The lamp is suspended with the glass tube at one end and a counterbalancing weight at the other. When it is gently rocked the liquid in the tube is mixed with oxygen, causing the bacteria to glow This design shows biomimicrys use and application with regards to lighting. (Hobson, 2015)

2.2.5 Biomimicry in furniture

Figure 2.5 Lilian van Daal Chair (Source: Dezeen.com)

Design graduate Lilian van Daal has design a conceptual chair inspired by plant cells that would be 3D-printed from a single material Van Daal's Biomimicry: 3D-printed soft seat is designed as an alternative to conventional upholstered furniture, which requires several different materials and processes to

create the frame, padding and covers. A large pool of materials is used in normal furniture production, including several types of foam, and it's very difficult to recycle because everything is glued together. The designer for the above furniture began to look at ways of printing structures that behave differently depending on how material is distributed, enabling some sections to be soft and others to be

In particular, Van Daal looked to nature for inspiration and examined the properties of plant cells, which are able to perform several different tasks. The act of the designer looking towards nature is a demonstration of biomimicry in the field of furniture . (Griffiths, 2014)

2.3 EXEMPLARS

2.3.1 CHRIS LEE AND KAPIL GUPTA FROM SERIE ARCHITECTS

Figure 2.6 The Tote (Source; Formakers.com)

2.3.1.1 *Project: The Tote*

Chris Lee and Kapil Gupta from Serie Architects have converted a disused building from Mumbai's colonial past into a banquet hall, restaurant and bar called 'The Tote'. The site was covered with mature rain trees whose wide spread leaves shaded most of the spaces throughout the year, permitting almost the entire new program to occur outdoors. Inspired by these rain trees, a new structural system creates a stunning aesthetic that runs throughout the space designed as a steel truss, the challenge lay in working through the construction system compatible with local skills. Rather than looking at steel fabricators within the building construction sector, the architects sourced boiler fabricators for high precision work. This elaborate structural system becomes a spatial organizer as it defines each separate dining program (wine bar, restaurant, pre-function and banquet facilities) within a different spatial volume. The interior of the lounge bar on the upper level is an intricate

arrangement of 3-dimensional, faceted wooden panelling, that is an abstracted textured take on the trees' intersecting branches.

2.3.1.1.1 Application

Nature derived inspirations can be taken from two approaches, one is the direct mimicry whereby like in the project above the designer took the tree shape as it is from how the branches break off from the tree itself to how its canopy is formed. The designer uses this understanding to create both a stunning aesthetic and a structural support system. The second approach with regard to nature derived inspirations is abstraction, whereby instead of taking the form as a whole, certain aspects are individually chosen and used as the base, for example in the Tote the upper level is an intricate arrangement of 3-dimensional, faceted wooden panelling, that is an abstracted textured take on the trees' intersecting branches.

2.3.2 EDUARDO GARCIA CAMPOS

Figure 2.7 Butterfly Inspired Chair (Source; Pinterest.com)

Inspiration; This piece is inspired in nature, particularly in Mexican "Monarca" butterfly. This insect, in addition to its distinctive beauty and despite of the rather fragile appearance of its wings, is known for its strength and longevity. While other butterfly species have a life cycle of about twenty-four days, this one can live up to nine months, that is twelve times more. The Monarca butterfly is capable of traveling more than 4000 kilometres just to put into perspective the extent of its strength . (Scott 2013)

2.3.2.1 *Understanding the work*

As from the face value the chair when completed in doubles facing each other resemblances the wings of a flying butterfly. The structural system from the arm rest and the legs of the chair are in from the study of the patterns on the butterfly's wing. The designer also had to keep in mind that a chair must

be functional and as such he knew the its durability is key so he drew his inspiration from a butterfly whose lifespan is twelve times more in comparison to the usual butterfly.

2.3.2.1.1 Application

Having reviewed the above exemplars and their works the researcher has foundational knowledge on biomimicry in terms of its use in solving problems and creating aesthetics. By comparing the two works and in an attempt to merge them the researcher is also able to appreciate that nature offer more than one solution by provision of even on tool, the butterfly chair is an example, where Eduardo Garcia used the wings as the structural from another designer could abstract how the butterfly opens and closes its wings as the principle mechanism for creating opening and closing mechanism for storage units.

From the point of view of the tree, Chris lee and Kapil Gupta abstracted the tree form and branch positioning in order to create interior and structural elements. The researcher sees another point of view whereby the restaurant and bar would be founded on the trees themselves, or maybe the texture of the tree barks could be abstracted to form texture on furniture finishes. So, one single aspect of nature can for sure inspire various outputs in the field of interior design

2.4 SUSTAINABILTY

First introduced by the Brundtland Report for the World Commission on Environment and Development in the year 1987, the overall concept of sustainability covers the integration of the economy, environment and social aspects in decision making processes (Emas, 2015). Sustainable design is the governing basis of a growing movement of individuals and organizations that seeks to define how buildings are designed, built and operated to be more sensitive to the environment and responsive to people (McLennan 2004). Sustainable design is the intention to reduce or completely be rid of negative environmental impacts through the implementation thoughtful designs. This concept can be applied across all fields of design such as designing buildings or products.

Decorilla interior designer, Tabitha M. shares: Sustainable design is a necessary part of our future. Bringing awareness to what is considered disposable is key. “We need to think about how things are made and whether they are easily recyclable.”. (M, 2018)

2.4.1 The problem

Longevity

‘Since the 1930s, manufacturers have been designing their products to be

replaced frequently just as fashion designers keep us buying by making last year’s fashions

look outdated" (White). People acknowledge that contemporary products don't last as they used to. Some of them try to keep their objects in a working order by replacing essential parts.' Darinka Aguirre BSc Industrial Design, University of Monterrey, Mexico 2006

Thus, it is understood that since products do not last long as they used as they used to then the need to either dispose of or rely on more, new materials are on the rise. This not only puts a significant amount stress on our landfills due to waste accumulation but also on non-renewable virgin materials.

2.4.2 The Solution

Committing ourselves straight up from the individual level to take charge even in the small things, gearing them towards mechanisms that are favourable towards environmental sustainability, this way can be through repurposing, rethinking, reusing and recycling to name a couple. The move towards sustainability is already a reality.

For example, 'according to Datamonitor, companies have so far launched 458 products that claim to be ''sustainable,'' ''environmentally friendly,'' or ''eco-friendly,'' and this number is likely to touch 1570 new green products launched this year (Greenbiz, 2009). For example, Ford has developed soy-based seat cushion foam, while SC Johnson uses a green list process to weed out restricted ingredients, and Lipton Tea recently announced an expansion of their sustainability program, pledging to source 100% of their tea from estates certified as sustainable.' Journal of Business Ethics (2010) 95:471–486

2.5 DESIGN AND SUSTAINABILITY

As designers, we have to understand our critical role in the sustainable world. One of the designer's roles is to solve problems and provide innovative solutions through products or services. Considering the critical problems that face our planet due to the irresponsible consumption of natural resources, designers play an important role in providing solutions to this problem and replacing obsolete products with innovative and sustainable ones that can ensure lower consumption of resources and less waste. (elmansy, 2014)

2.5.1 Principles of sustainable design

2.5.1.1 *Form*

The form represents the visual shape of the product and is usually perceived to be the main element of the design. Before designing a product's layout, however, the designer should ask questions like how will the shape affect energy consumption; and how will the size affect the packaging,

transportation costs, and fuel emissions? IKEA's flat packing strategy, for example, helped it reduce transport costs, fuel usage, and emissions.

2.5.1.2 *Function and Usability*

The function and usability of the product contributes to its sustainability in an indirect way, as it helps consumers use the product more easily in less time and with less energy consumption. People do not want to keep hard-to-use products, so usable products can ensure less waste and throwaways.

2.5.1.3 *Cost-Effective Solutions*

For many of today's sustainable products, cost is one of the key barriers that prevents many customers from making the switch from their dependence on non-sustainable products. Therefore, the designer and decision-makers are responsible for reducing the cost of current sustainable products.

2.5.1.4 *Renewable Energy*

Designers should stop depending on carbon energy and think in terms of building products that depend on renewable energy, such as solar panels and wind farms.

2.5.1.5 *Materials and Recycling*

Similar to energy, materials play an essential role in sustainable design, as every designer should search for materials that can be easily recycled or for which the planet can recreate in a short amount of time. For example, IKEA depends on mixed woods and innovative materials to replace traditional varieties of wood that can take a long time to grow in forests. The mixed and recycled materials can also help reduce product cost.

2.5.2 Durable Design Solutions

In order to reach zero waste, products have to either be durable enough to last for a long time or be fully recycled and transformed completely into new products. Depending on both methods can help recycle products more than one time and decrease the dependence on Earth's resources. Constant Improvement and Sharing of Knowledge Evaluation and improvement are important parts of any design process, but they take on even more importance in order to evaluate sustainable initiatives and improve them enough that they attain the same or better quality than existing products.

The principles above are general considerations that designers can depend on in order to build a sustainable design or service. Overall, the above design principles take into consideration the environment, people, economy, and culture. Every product or service design should consider these four factors. For example, the materials embedded in products should reflect concern for consumer safety and fit the cultural context in which they will be used. (elmansy, 2014)

2.5.3 R'S of Sustainability

Figure 2.8 7r's of sustainability (Source; Aeromatico.com)

2.6 REPURPOSING

Introduction to repurposing.

2.6.1 Introduction

Repurposing as a factor of environmental sustainability aims towards meeting the need of the present without compromising the ability of future generations to meet their own. Tanya Mclean says “unless someone like you cares a whole awful lot, nothing is going to get better, it is not” Repurposing is a subset of re-using and it involves transforming say a particular design object or approach from its original onto a new function. (Mclean, n.d.)

2.6.2 Ways in which repurposing can be achieved

2.6.2.1 *Addition/Assembling*

In this approach already existing design products are assembled together with other whether of the same core material or of a different in order to achieve the next desired function. A practical example is in countries like Cameroon where old plastic bottles of sodas, water is first collected then cleaned before being piled onto each other to make boats. These boats are then used for small scale commercial purposes. Also present in a fashion house in Rio where old crates have been fashioned into benches.

Figure 2.9 Plastic bottle boat (Source; Aljazeera)

2.6.2.2 *Subtraction*

For the subtraction method a significant or minor piece of a larger existing design piece is subtracted in order to allow the design piece achieve its new function. A good example regarding the point of repurposing by subtraction is the use of old cars parts in making of chicken coupes.

Figure 2.10 Old Vehicles turned into chicken coops (Source; The owner builder network)

2.6.3 Advantages of repurposing

Saving energy, it takes fewer resources and processes to complete the actualization of the intended product as part of the product is already existing thus also reducing the need and stress on virgin materials

This can be a cost-effective strategy, since items that can be used instead of discarded prevent a business from having to purchase new, possibly expensive items

Reduces waste on landfills as it reclaims items that would otherwise have been waste and breathes life purpose into them

Therefore, it is evident that we can play a big role in conserving our environment using the repurposing route, because it is true that in almost all household there are those items that are considered of no value or of a lesser value then they were at one point in time that can now be put into use in a different

way once some thought is put into it, more so given that the process of repurposing does not necessarily involve high profile processes.

2.7 SUSTAINABILITY IN INTERIOR DESIGN AND SUSTAINABLE MATERIALS

The following are some of the repurposed materials.

2.7.1 BAMBOO

This is a very beautiful sustainable natural material. This can be used in many ways like the window treatments, flooring, decorations and many more. Using bamboo blinds is a good way to block the sun in your space. Merely adding anything with bamboo can bring an Asian influence in your space. Bamboo is greatly known for its being durable and gorgeous. When it comes to sourcing for bamboo particularly in Kenya, bamboo growing has begun to be quite popular in Kitale, Trans-Nzoia county.

Figure 2.11 Bamboo in Bathroom (Source; Homedesignlover.com)

2.7.2 BRICKS AND STONES

Who wouldn't recognize the beauty of bricks in the house? Using bricks can make a lovely wall accent. You can also see this as a common material for a fireplace too. Meanwhile, stones can be added to some areas of the house especially if you have an indoor garden. But they can be used as decors too.

Figure 2.12 Brick wall (Source; Homedesignlove.com)

2.7.3 WOOD

The very first thing that would come to our minds when we talk about natural materials is wood. It could either be cherry, pine, maple, oak or whatever tree it came from. Wood is sturdy and could come in different colours and finishes. It is easiest to find something made from wood and to add wood to your home interior. Wood, a tried and true construction mainstay, retains many advantages over concrete, steel, and other industrial building materials. Trees absorb CO2 as they grow and don't need to undergo energy-intensive procedures to be converted into a construction product. This is however a very challenging material to come across in Kenya especially due to the ban on logging.

Figure 2.13 Wood finishes (Source; Homedesignlover.com)

2.7.3.1 *DESIGN EXEMPLARS*

2.7.3.1.1 **Aldrin C.**

2.7.3.1.1.1 Bathroom by reclaimed wood

Figure 2.14 Bathroom by reclaimed wood (Source; Pinterest)

2.7.3.1.1.2 Sources of wood

Shipping and crating materials. Shipping crates are often made from exotic and tropical blends of Asian and European hardwood species. These woods are chosen because of their durability and ability to take a beating. Deconstructed buildings. Old houses, barns, warehouses, and water tanks often contain old-growth wood that's still beautiful (and in many cases harder than new wood). Old gym bleachers. Wine casks. Made from old-growth redwood, wine casks feature rosy stains that perfectly accent any space.

2.7.3.1.1.3 Process

The highest-quality timber that's salvaged is dried in a kiln to stabilize it. Once it's dried, the lumber gets milled to remove its old, rugged exterior. This is when the lumber's true beauty starts to appear, as you can start to see the different hues and characteristics of the original wood. The reclaimed wood is then packaged and shipped to those who seek beautiful new table tops, panelling, flooring, decks, countertops, and more. Reclaimed timber varies a great deal both in terms of quality and longevity, with some working well even in the harshest of conditions while others fade away quickly. Yet it is a sense of uniqueness, weathered charisma and inviting warmth that is turning them into one of the hottest trends in home design. This piece sees the use of reclaimed wood lining the interior walls of the bathroom.

2.7.3.1.1.4 Application

Due to the ban on logging in Kenya wood is no longer an easy come by commodity as it may have been before so it becomes easy for one to think that it is not a feasible repurposing material, but it can still be used say for example if the researcher is called upon to redesign the interior of a house. During the process of tearing down old storage compartments instead of using blunt force approach the designer can have the compartments properly removed so as to ensure they are not damaged to a point they cannot be recovered. The same approach can be made on other materials and not just wood allowing the materials to be transformed for another use.

2.8 AFRICAN DESIGN

Adinkra symbols were chosen as the African design symbols

2.8.1 Adinkra Symbols

From masks to the symbolic script of the Ashanti of Ghana, symbols play an important role in all aspects of African life. These sacred items come in a breath-taking array of styles. Other fascinating symbols include sculptures, cave paintings, status symbols, and art for everyday use (Owusu 2007).

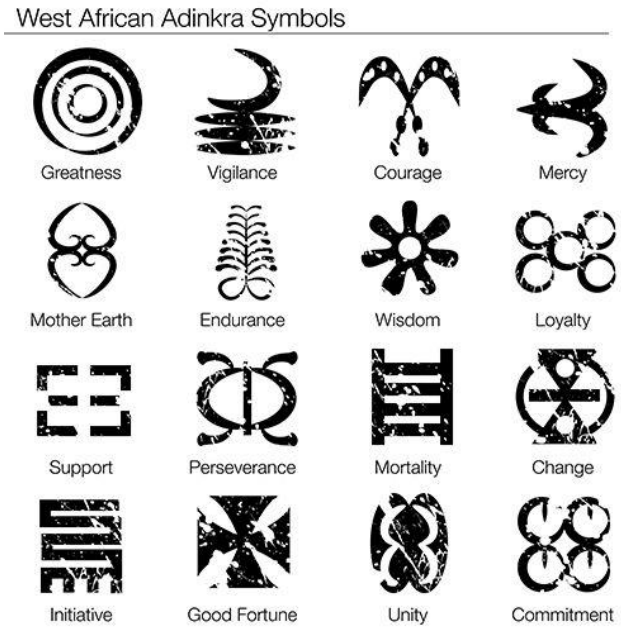

Figure 2.15 Adinkra Symbols (Source; Google.com)

Adinkra are symbols that represent concepts or aphorisms. Adinkra are used extensively in fabrics and pottery among the Ashanti's of Ashanti Kingdom and the baoules who historically migrated from Ghana. GYE NYAME is included in the African Symbols collection. It was designed to celebrate the power and magic of West African tribal art, which has origins in the Ashanti (Asante) of Ghana, and the Gyaman of Cote d'Ivoire in West Africa. Gye Nyame is a visual religious symbol of the supremacy

of God. Gye Nyame translates to except God. (Books, 2019). This unique and beautiful symbol is ubiquitous in Ghana. It is by far the most popular for use in decoration, a reflection on the deeply religious character of the Ghanaian people.

Figure 2.16 Gye Nyame Symbol (Source; Adinkrabrand.com)

Mate masie > what I hear, I keep. The implied meaning of the phrase “mate masie” is “I understand”. Understanding means wisdom and knowledge, but it also represents the prudence of taking into consideration what another person has said.

Figure 2.17 Adinkra Symbol (Source; Adinkra.com)

African culture is to be understood before it can be used as a design inspiration, with regard specially to symbols because whereas an onlooker may see them as purely aesthetic, they contain deep cultural and religious meanings which must be adhered to while they are being put to use. The same is also with the fabric because of the traditional political systems some fabric prints were reserved for the different hierarchies at the time. So, all in all it is not just about using the symbols but also understanding them as that would play a hug role especially in terms of placement. A concept that will be Inco-operated into this project.

2.8.2 Ghana Kente Cloth

Kente is a brightly coloured, banded material and is the most widely known cloth produced in Africa. Although Kente cloth is now identified with the Akan people in West Africa, and particularly the Asante Kingdom, the term originates from the neighbouring Fante. Kente cloth is closely related to Adinkra cloth, which has symbols stencilled into cloth and is associated with mourning. Kente cloth is made from thin strips about four cm thick woven together on narrow looms - typically by men. The strips are interlaced to form a fabric which is usually worn wrapped around the shoulders and waist like a toga - the garment is also known as Kente. Women wear two shorter lengths to form a skirt and bodice.

Figure 2.18 Kente Cloth (Source; kitengestore.com)

ADINKRA SYMBOLS IN INTERIOR DESIGN

Figure 2.19 Partition wall (Source; houzz.com)

Casa Massona Homes, Cantonments, Rustic Hal. In this design the adinkra symbols, multiple of them for that matter have been used to decorate the partitioning's through use of negative and positive spaces

Figure 2.20 Ceramic tiles (Source; houzz.com)

Adinkra Kitchen Eclectic, Los Angeles. The design above also depicts the use of adinkra symbols in decoration whereby in this case some of the tiles on the wall have been decorated using adinkra symbols.

2.8.3 EXEMPLARS

2.8.3.1 *VICTORIA AGYEPOMAA (USE OF GYE NAME)*

Gye Nyame translated from the Twi language to English means Except God. Gye translates to Except, and Nyame translates to God. The symbol symbolizes God's omnipotence and the deep knowledge that people should not fear anything except for God. (Adinkrahene 2018)

Figure 2.21 Stool (Source; Pinterest)

This decorative stool brings a touch of African culture to any home it features in, crafted by hand of sese wood and accented with brass triangle motifs. Victoria Agyepomaa gets her inspiration from the traditional Adinkra motifs of the Ashanti tribe, depicting a sankofa bird with multi-coloured beads of recycled glass, its form originating from the shape of a stylized heart. This symbol motivates us to learn from the past. The bottom part of the stool features an Akan symbol that reads Gye Nyame, symbolizing the supremacy of God. It weighs in at 1.9 pounds, dimensions are 6 inches' height by 9 inches wide by 5 inches' height, materials used Sese wood, recycled glass beads, brass method of production is hand crafting. (Novica n.d.)

2.8.3.1.1 Application

When it comes to furniture and exhibition form and function are one, in that respect therefore while considering aesthetics of a particular piece of furniture or exhibition unit it is therefore important to consider what function that aesthetic addition would add. Adinkra symbols are largely organic and therefore for an individual who is yet to come into contact with them can consider them quite abstract.

This gives the interior designer allowance to play around with them in terms of either support whereby either the arms of a chair, or the support on the table or chair is abstracted from one of the symbols. Looking at it from another point of view these symbols can also be used add ornamentation on interior products through engraving them onto say the sides of a table. The one thing to remember when dealing with adinkra symbols is that this symbols each have a meaning, therefore this meaning may therefore set out to already define what role each can serve. For example, if one is to mean bad omen then it cannot be used as the furnish on a door.

Given the unique nature of these symbols and their origin with the Asante in Ghana their use gives the African feel into the room in terms of appreciation of culture and for those who may yet have

come into contact with them can therefore have a chance to interact with some history from the people of Ghana

2.8.3.2 *JEFF FIORITO (Fiorito 2015)*

Figure 2.22 Kente fabric on furniture (Source; fioritinteriordesign.blogpost.com)

Here he uses the Kente Fabric as a seat cover on the two chairs by the fireplace.

2.8.3.2.1 Application

Kente cloth form Ghana has often been used largely as a fashion design inspiration, but in terms of interior design it has been very instrumental in terms of furniture whereby cushions on seats are seen to be lined with Kente fabric. This means that there mainly serves a decorative purpose where the fabric is either sourced for that specific purpose or reclaimed from old clothing and given a different use in interior furnishing

There is however another way in which this Kente fabric can be used in terms of an inspiration in two ways, the patterns for one can offer a unique inspiration in terms of say the making of spice racks or utensil storage partitions which can be made to resemble the look of Kente fabric and still serve their storage purpose instead of having a drawer just open and have a plain open space

Another avenue in which this fabric can be used is in terms of colour combinations, Kente fabrics tend to exhibit a unique interplay of colour whose understanding can be very useful in terms of interior colour choices from walls to furniture to exhibition units. The colours in this fabric are never in chaos and always portray a sense of balance so there is security in understanding that their application would also bring out aesthetic balance

African culture is to be understood before it can be used as a design inspiration, with regard specially to symbols because whereas an onlooker may see them as purely aesthetic, they contain deep cultural and religious meanings which must be adhered to while they are being put to use. The same is also with the fabric because of the traditional political systems some fabric prints were reserved for the different hierarchies at the time. So, all in all it is not just about using the symbols but also understanding them as that would play a hug role especially in terms of placement.

2.9 INTERIOR DESIGN PROCESS

The design process chosen by the researcher is from a combination of interior design website, the interior design student this process was chosen due to their totality and clarity in terms of requirements and processes at each stage.

2.9.1 Programming

The initial Problem Statement defines the project in very general terms. It identifies the nature of the project the location of the project; the purpose of the space and the extent of the design work as a whole

The research process begins with identification of each of the users. In a residential design, a profile may be developed for each of the principal residents, including such information as their age and sex, hobbies, habits, need for privacy, style and colour preferences, and an inventory of possessions and furnishings that need to be accommodated in the redesigned space. This stage involves interviews with the client and other end-users, surveys, inventories and wider research. It is important to ascertain the objectives, requirements, feasibility, extent and constraints (regulatory or financial) associated with the project. Space adjacencies, circulation patterns ('traffic flow') and spatial and activity relationships may be sketched in the form of 'bubble diagrams'.

The programme data is analysed and the results are compiled in a Programme Document that articulates the design problem and outlines a solution. The programme document is reviewed and approved by the client . (The interior design student, n.d.).

The researcher at this stage will put together information from an interview with the owner and other occupants of the farms and information from gathered from other chosen data collection methods in order to ascertain the objectives, requirements, feasibility, extent and constraints (regulatory or financial) associated with the project. The researcher will then draft a programme that will outline the problem and proposed solution which will be presented to the client for approval.

2.9.2 Concept Development

Once the Design Programme Document is approved, the concept development phase begins. The first stage involves brainstorming design solutions before filtering out unworkable ideas and refining the workable ones until one or more main design concepts emerge (The interior design student, n.d.) At this stage the researcher will do case study research on existing design solutions that will serve as inspirations, thereafter moving on to sketching and report writing dependant on the findings.

2.9.3 Presentation

One or more design concepts is presented to the client in the form of a proposal, for review, feedback and approval. The researcher will present concept sketches to the client for approval and discussion explaining the inspiration and thought process behind each.

2.9.4 Final Design Development and Documentation

Final Working Drawings are produced. These may include perspective drawings, site plans, floor plans, reflected ceiling plans (showing lighting and ceiling fixtures), sections, elevations and detailed drawing of architectural elements (along with all drawing notes necessary for the construction and installation of the design (The interior design student, n.d.) After the design has been chosen by the client, the researcher will thereafter produce detailed drawing together with a design report on all of them.

2.9.5 Execution

Once the final design is approved, the execution or implementation phase marks the realisation of the design. The researcher will then embark on the realisation of the design.

2.10 CONCLUSION

The previous sections of the chapter looked at biomimicry sustainable materials. Biomimicry Sustainable materials as key factors to consider when designing spaces that are meant to be environmentally conscious as well as to provide for in the design challenge. They provide the necessary guidelines and methods to follow as well as exemplars who have applied them effectively in order to achieve the much desired ideal. Consequently, Adinkra symbols from Ghana with their history and background, have been identified and their applications discussed. Finally, the design process was outlined, whereby the stages were explained and how they were implemented in the research project.

CHAPTER THREE

3 RESEARCH AND METHODOLOGY

3.1 INTRODUCTION

This chapter outlines the methods, tools and sources of research data, targeted time series data from which primary and secondary data was collected in order to attain the objectives of the study. The researcher intends to use the quantitative methods of data collection to obtain information from the recipients or target audience that will allow addressing the four mandatory Units-Interior Architecture, Landscaping, Furniture design and exhibition and display.

3.2 RESEARCH DESIGN

A research design according to Robert K. Yin (Yin R. K.) Is the logical sequence that connects the empirical data to a study's initial research questions and its conclusions. It is the action plan that the researcher uses to undertake the research study, from data collection and analysis to data presentation and finally, drawing conclusions from the information initially collected. This study took a descriptive research design approach. Descriptive research studies are those studies which are concerned with describing the characteristics of a particular individual or of a group. Diagnostic research studies determine the frequency with which something occurs or its association with something else. The studies concerning whether certain variables are associated are examples of diagnostic research studies. As against this, studies concerned with specific predictions, with narration of facts and characteristics concerning individual, group or situation are all examples of descriptive research studies.

Most of the social research comes under this category. The research obtained data in the form of words, based on Observations and interviews, rather than numbers which is the basis for quantitative research (Jacqueline Fawcett, 2009). The researcher carried out a normative research. Normative research was the most appropriate because it not only gathers facts about the problem but also to point out in which ways the problems can be improved.

3.3 POPULATION AND SAMPLE

3.3.1 Target population

Target population refers to the entire group of individuals or objects to which researchers are interested in generalizing the conclusions. The target population usually has varying characteristics and it is also known as the theoretical population. With regards to the site, the target population is a total of twenty-two people.

3.3.1.1 *Sampling*

Qualitative sampling is the process of selecting a small number of individuals for a study in such a way that the individuals chosen will be good key informants (i.e. collaborators, co-researchers) who will contribute to the researchers understanding of a given phenomenon. The characteristics of a good informant include the ability to be reflective and thoughtful, to communicate (orally, in writing or both) effectively with the researcher and to be comfortable with the researcher's presence at the research site. (Research 2015)

3.3.1.1.1 Sampling techniques

3.3.1.1.1.1 Stratified sampling

In this method, the population is first divided into subgroups (or strata) who all share a similar characteristic. It is used when we might reasonably expect the measurement of interest to vary between the different subgroups, and we want to ensure representation from all the subgroups. For example, in a study of stroke outcomes, we may stratify the population by sex, to ensure equal representation of men and women. Stratified sampling is used in certain types of surveys because it combines the conceptual simplicity of simple random sampling with potentially significant gains in reliability. (Paul S. Levy 2013). With regard to the site the researcher intends to use this method as to divide the population into: permanent residents, visitors, workers and occasional residents

3.3.1.1.1.2 Convenience sampling

Convenience sampling is perhaps the easiest method of sampling, because participants are selected based on availability and willingness to take part. Useful results can be obtained, but the results are prone to significant bias, because those who volunteer to take part may be different from those who choose not to (volunteer bias), and the sample may not be representative of other characteristics, such as age or sex. Note: volunteer bias is a risk of all non-probability sampling methods. (Barratt 2009) The researcher will use this method of sampling while collecting data from the workers.

Table 1 Sampling

Sample unit	Number
Owner	2
Workers	8
Residents(permanent)	4
Visitors	8

3.4 DATA COLLECTION

Data collection methods

3.4.1 Observations

Observation, as the name implies, is a way of collecting data through observing. Observation data collection method is classified as a participatory study, because the researcher has to be immersed in the setting where the respondents are, while taking notes and/or recording. Making direct observations is a simple and unobtrusive way of collecting data. (Research Methodology n.d.) Gathering first-hand information in the field gives the observer a holistic perspective that helps them to understand the context in which the item being studied operates or exists. (Puckett 2018)Advantages of observation data collection method include direct access to research phenomena, high levels of flexibility in terms of application and generating a permanent record of phenomena to be referred to later. At the same time, observation method is disadvantaged with longer time requirements, high levels of observer bias, and impact of observer on primary data, in a way that presence of observer may influence the behaviour of sample group elements.

The researcher intends to apply two methods of observation. Complete observer, this is a detached observer where the researcher is neither seen nor noticed by participants. It's one way of minimizing the Hawthorne Effect as participants are more likely to act natural when they don't know they're being observed. Participant as an observer, here the researcher is fully engaged with the participants. The researcher is more of a friend or colleague than a neutral third party. While there is full interaction with participants, they still known that this is a researcher. (Sauro 2015) Participant enables researchers to learn about the activities of the people under study in the natural setting through observing and participating in those activities.

3.4.2 Photography

Photography offers a visual representation of the actual situation as it is, it gives both irrefutable evidence and also timelessness as it can be reviewed from time to time accurately without corruption due to memory loss for example. The researcher intends to take well placed and thought out photographs of areas of interest with regard to both the site to be improved as well as others sites that will serve as additional knowledge.

3.4.3 Interviews

Interviews can be conducted in person or by phone, and can be structured (using survey forms) or unstructured. The downsides are that interviews require time and money to plan and execute including interviewer training and they require more cooperation on the part of the interviewee, who may be uncomfortable sharing personal information. But there are also many benefits to interviews:

They don't require the literacy on the part of the respondents, for one thing. For another, they allow the interviewer (especially a well-trained one) to uncover deep insight by clarifying and deep-diving into the respondent's answers, as well as by collecting nonverbal data. The researcher intends to interview at least two members from each stratum.

3.4.3.1 Key informants

Within the context of survey research, key informant refers to the person with whom an interview about a particular organization, social program, problem, or interest group is conducted. In a sense, the key informant is a proxy for her or his associates at the organization or group. Key informant interviews are in-depth interviews of a select (non-random) group of experts who are most knowledgeable of the organization or issue. They often are used as part of program evaluations and needs assessments, though they can also be used to supplement survey findings, particularly for the interpretation of survey results. Key informants are chosen not because they are in any way representative of the general population that may be affected by whatever issue is being studied, but they have immense knowledge on the study. The researcher in this study used the owner of the farm as a key informant.

3.5 DATA ANALYSIS

Data analysis methods chosen

3.5.1 Content analysis

Content analysis is distinguished from other kinds of social science research in that it does not require the collection of data from people. (university 2019) Like documentary research, content analysis is the study of recorded information, or information which has been recorded in texts, media, or physical items. Content analysis is a research tool used to determine the presence of certain words, themes, or concepts within some given qualitative data (i.e. text). Using content analysis, the researcher will quantify and analyse the presence, meanings and relationships of such certain words, themes, or concepts from the collected data.

3.5.2 Visual analysis

There are many ways to begin an analysis of a work of art, a photograph or an advertisement, but most critics agree that interpretation begins with description. Basic descriptive work requires articulation of form, subject matter, genre, medium, colour, light, line, and size – the building blocks of images. Some art historical knowledge is helpful for identifying form and genre and making art historical comparisons. When working with photographs, for example, relevant descriptive variables include production qualities, the photographer's vantage point, focus and depth of field; each constitutes aesthetic, ideological and strategic choices (Barrett, 2005). The relationship between

description and interpretation is intricate but, ideally, interpretations emerge from descriptive details. The researcher will use this method especially in the analysis of photographed data.

3.6 DATA PRESENTATION

This refers to the organization of data into tables, graphs or charts, so that logical and statistical conclusions can be derived from the collected measurements. Data may be presented using a variety of techniques and given the abundance of data available, it is not surprising that they have been presented in some useful and not-so-useful ways (Wainer 2005-2009). Pick up any newspaper or magazine, online images and you will find various forms of data presentation. (Hoffmann 2017)

3.6.1 Photographs

The primary data collected by the researcher through the use of photographs will be presented photographically and complimented by descriptions underneath each and every photo to give a clear, comprehensive and detailed pictorial nature and state of the site and their relevance to the research.

3.6.2 Narratives

The secondary data reviewed from the existing literature: books, articles, journals, thesis and magazines on the area of study will be analysed and presented in narrative form. Field notes from face-to-face interviews will also be narratively presented, clustered and transcribed under various specific thematic subheadings based on the researcher's objectives and research questions.

Table on Summarized Data Collection, Analysis & Presentation

Table 2 Data presentation

Data Collection	Data Analysis	Data Presentation
Observation	Content analysis	Photos Description
Photography	Visual analysis Content analysis	Photos Description
Interviews	Content analysis	Description and writing
Key informants	Content analysis	Description and writing

3.7 CONCLUSION

The research methodology section utilized qualitative research. Data was collected using interviews, key informants, photographs and observation. Analysis of the data took a qualitative approach of content analysis and visual analysis. Photographs and recorded audio interviews were transcribed respectively. The main methods of data presentation were from interviews and photographs being described to the audience verbally and in written form.

CHAPTER FOUR

4 SITE ANALYSIS AND INTERPRETATION OF FINDINGS

4.1 INTRODUCTION

This chapter comprises of the analysis, presentation and interpretation of the collected data. It starts with the Historical background of the site, Geographical analysis of the site and then the climatic conditions of the site including topography and drainage. The researcher used graphical methods to represent the climate and temperature of the site. Existing conditions of the spaces at the site will also be discussed in detail using the four main areas of interior design as guidelines, namely Interior Architecture, Landscaping Design, Furniture Design and Exhibition and Display. This will be done through the use of photographs taken of the site and short narratives. Analysis and presentation of the responses from the interviews and observation will also be discussed by employing narration and pie charts.

4.2 QUALITATIVE ANALYSIS

This section focuses on information regarding the site profile such as the history, location and social and geographical factors affecting the site. In addition, a detailed description of the interior and exterior spaces, furniture, exhibition and the landscape at the site in that order will be provided.

4.2.1 Background

The farmhouse targeted belongs to Mr David Frederick Asamba and is located a few hundred metres to the right from the market centre approaching from Eldoret. It seats on a six-acre piece of land that was purchased in 2010. It was opened in May 2011 after construction was completed. The first holiday event held at the house was the Christmas party in 2011

4.2.2 Geographical location

Figure 4.1 Map of Bungoma county showing location of Misanga market (Source; Google Maps)

The farm house is located in Misanga. Misanga is a market place in Bungoma north county Kenya, the main trading items are farm produce from large- and small-scale farmers in the area. The farmhouse targeted belongs to Mr David Frederick Asamba and is located a few hundred metres to the right from the market centre approaching from Eldoret.

4.2.3 Climatic conditions

Climate in Bungoma is tropical with significant amounts of rainfall especially in the early months of the year. Bungoma experiences average annual temperatures estimated at 22.5 °C and an approximate average annual Rainfall of 150 mm

4.2.4 Rainfall

To show variation within the months and not just the monthly totals, we show the rainfall accumulated over a sliding 31-day period centred around each day of the year. Bungoma experiences extreme seasonal variation in monthly rainfall. Rain falls throughout the year in Bungoma. The most rain falls during the 31 days centred around April 29, with an average total accumulation of 8.9 inches. The least rain falls around January 28, with an average total accumulation of 1.2 inches. (Weather spark, n.d.)

4.2.5 Temperature

The hot season lasts for 2.2 months, from January 15 to March 21, with an average daily high temperature above 84°F. The hottest day of the year is March 1, with an average high of 86°F and low of 60°F. The cool season lasts for 4.1 months, from May 6 to September 9, with an average daily high temperature below 79°F. The coldest day of the year is September 6, with an average low of 58°F and high of 79°F. (Weather spark, n.d.)

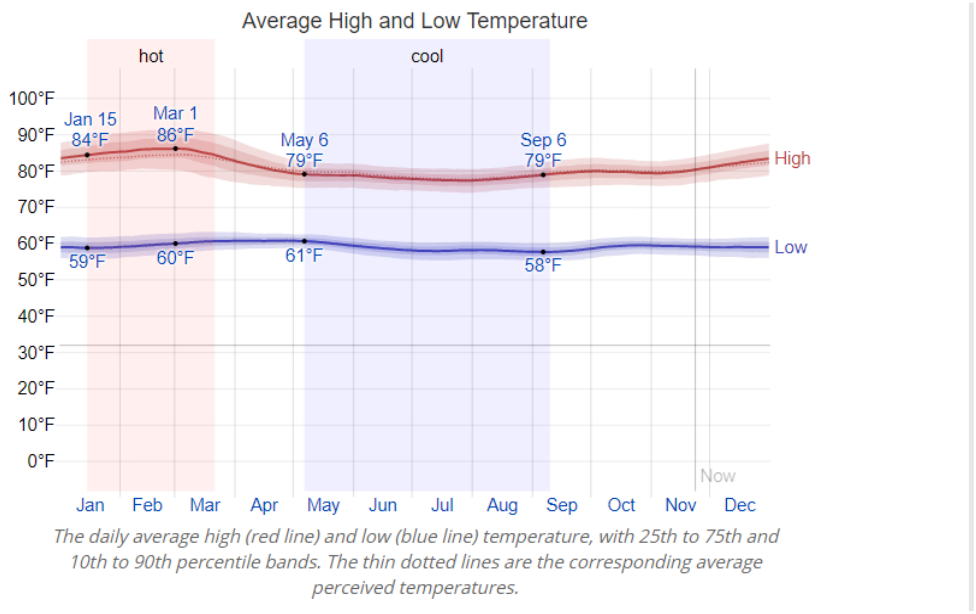

Figure 4.2 Line graph showing temperature patterns in Bungoma county (Source; weatherspark.com)

4.2.6 Topography

The farm house is a slopping site lying 1385 metres above sea level. For the purposes of this report, the geographical coordinates of Bungoma are 0.583 degrees' latitude, 34.583 degrees' longitude, and 4,751 ft. elevation. The topography within 2 miles of Bungoma contains only modest variations in elevation, with a maximum elevation change of 361 feet and an average elevation above sea level of 4,736 feet. Within 10 miles contains only modest variations in elevation (1,329 feet). Within 50 miles contains very significant variations in elevation (10,679 feet). The area within 2 miles of Bungoma is covered by cropland (57%) and grassland (38%), within 10 miles by cropland (58%) and trees (26%), and within 50 miles by cropland (48%) and trees (29%) (Weather spark, n.d.)

4.2.7 Access and Circulation

Access to the premises is through one main gate. This entrance is situated at the front of the building. There is one entry / exit gate. This is done for direct approach and also to control who leaves and enters the farm house for regulation of visitors and workers coming in as only one walkway and pathway leads from the gate.

Figure 4.3 Gate and walkway (Source; Camera author)

4.2.8 Parking

There is a challenge of adequate parking facilities in the site at the front as the farm house with a current allocation of two vehicles. This on a regular basis does not pose any problem but with regards to the frequency of visitors the allocation becomes insufficient

Figure 4.4 Parking Space (Source; Camera author)

4.3 INTERIOR ANALYSIS

4.3.1 Plan analysis

The farm house is shaped in a regular shape based on the rectangle. The house is made out of stone blocks that are painted in selected areas according to the owner's preference. The farm house is a four bedroomed house with three of the four bedrooms located on the ground floor and the fourth at the first floor allowing access to the balcony. The top floor is however a semi-permanent structure as it is made of wooden floor. It features two complete bathrooms, two storage rooms, one living room and a kitchen that has a window access to the dining room area. The walk-in ceiling is big enough to feature an additional room.

4.3.2 Color scheme and flooring

The color scheme of the farm house is from a very broad color pallet, with colors such as blue, red, purple, peach, green and even black. The color scheme can be easily noticed because the exterior and interior walls at large have been painted with these colors. The flooring of the corridors is of concrete slab painted over in grey while that of the stairs and the upper room are made of wood red and brown in color respectively.

Figure 4.5 Dinning Area (Source; Camera author)

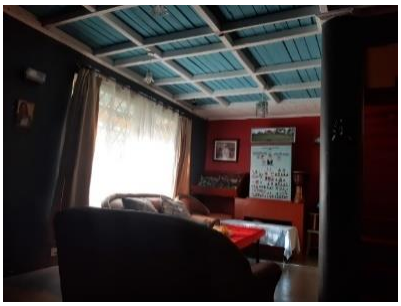

Figure 4.6 Sitting room Area (Source; Camera ya author)

Figure 4.7 Corridor (Source; Camera author)

Figure 4.8 Bedroom (Source; Camera author)

4.3.3 Lighting, aeration and ceiling

There is a plain wooden ceiling painted white in most of the rooms except in the master bedroom that has an inset ceiling which has the inner section painted blue as well as the living room that has a blue ceiling with white wooden beams. There is enough natural lighting and aeration in the interiors of the house because of the presence of French door windows which allow ease of air flow. The lighting in rooms are out of suspended energy saver bulbs houses in lamp shades from the coast of Kenya and also in plastic lamp holders. This is except the kitchen that uses a fluorescent tube as its light source. The master bedroom has a combination of energy saver bulbs houses in lamp shades together with multiple bed side lamps

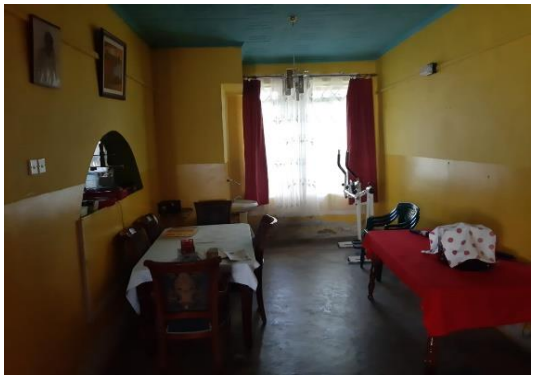

Figure 4.9 Dining area (Source; Camera author)

Figure 4.10 living room (Source; Camera author)

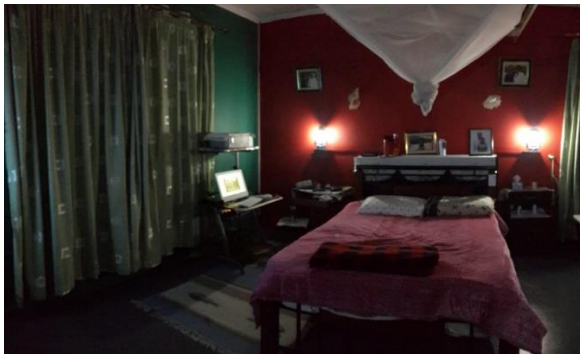

Figure 4.11 Bedroom (Source; Camera author)

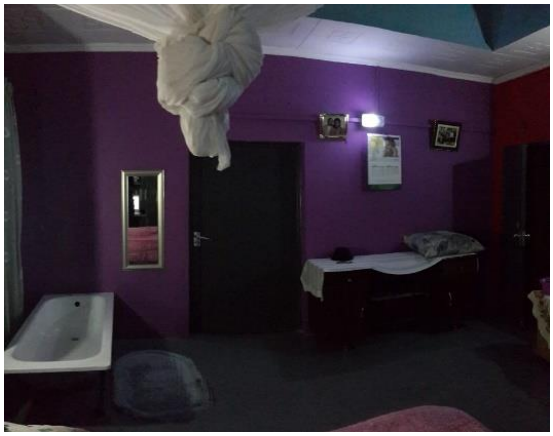

Figure 4.12 Bedroom (Source; Camera author)

4.3.4 Circulation space

In the farm house there is enough circulation with wide enough corridors the feature enough space to see to people walk through side by side, this together with and open dining and living room plan. The challenge comes in with specific attention to the staircase that is very narrow and with quite high steps creating quite the challenge.

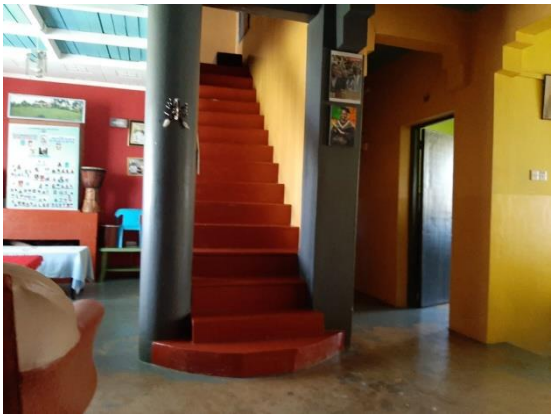

Figure 4.13 Stairs (Source; Camera author)

Figure 4.14 Dining room area (Source; Camera author)

4.3.5 Bathroom

The bathroom suite features one toilet, european type made of white ceramic and which has a double flash system. One stand in bathroom with a seating area, surface covered with ceramic tiles and partitioned from the toilet using with a curtain rail system. The bathroom is also fitted with a single basin sink area also made of ceramic and lastly the bathroom has wall mounted storage unit made of wood, oak situated at the top left side of the sink.

Figure 4.15 Toilet (Source; Camera author)

Figure 4.16 Sink area (Source; Camera author)

Figure 4.17 Bathroom (Source; Camera author)

4.3.6 FURNITURE

4.3.6.1 *Kitchen furniture*

The kitchen features to storage cabinets used to store frequently used kitchen utensils and cutlery, there is also a wall mounted shelf near the fridge where cooking ingredients are placed. There is also a small table onto which a table gas cooker is placed. The last piece of furniture in the kitchen is a plastic chair with a pillow on it that the owner sits on while using the small gas while cooking ugali.

Figure 4.18 Kitchen (Source; Camera author)

Figure 4.19 Kitchen (Source; Camera author)

4.3.6.2 ***Dinning furniture***

The dining room is fitted with a single with a single dining table set made of pine wood. It's a six-seater set with cushioned chairs.

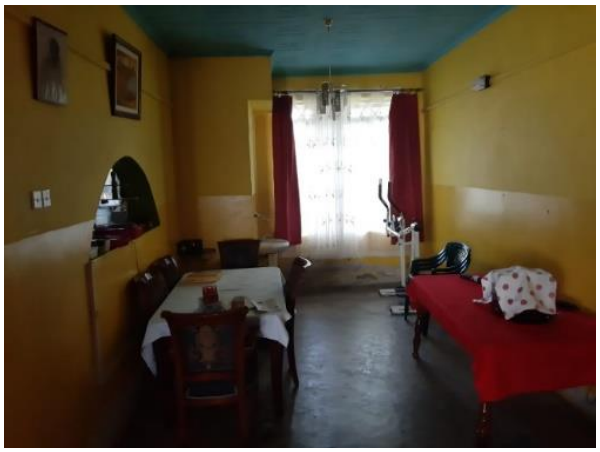

Figure 4.20 Dining room (Source; Camera author)

Figure 4.21 Dining chair (Source; Camera author)

4.3.6.3 ***Bedroom furniture***

Both the master bedroom and the upper room have six by six beds whereas it's only the master bed that has storage compartments and bedside cabinets together with storage units on the bed itself both of them made of mahogany. In the master bedroom there is a computer stand and a small table that the owner places his remotes and record books the material for both pieces of furniture is oak. There is also another storage unit by the window made of mahogany

Figure 4.22 Bedroom upstairs (Source; Camera author)

Figure 4.23 Bedroom (Source; Camera author)

4.3.6.4 ***Living Room furniture***

Figure 4.24 Living chair (Source; Camera author)

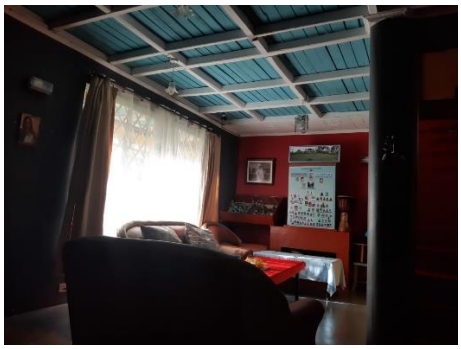

Figure 4.25 Living room chairs (Source; Camera author)

Figure 4.26 Living room (Source; Camera author)

In the living room there is a complete sofa set with two single chairs, one double and one triple chair. All of which have cushion lining. There is another set of two chairs cushioned also but supported with a metal frame. There are two tables both made from mahogany that are used for a variety of activities from eating to writing and more

4.4 EXHIBITION AND DISPLAY

4.4.1 Living room

The house has wall unit, which houses a small old antique TV, several books, a turn table and old albums. The unit is made of wooden frames, with lockable cupboards at the bottom the material used is particleboard. There is also a suspended landscape project enclosed in a wooden box made of particleboard with a glass frame on top

Figure 4.27 TV unit living room (Source; Camera author)

Figure 4.28 Landscape model Jay (Source; Camera author)

4.4.2 Bedroom

In the bedroom there are two shelves on either side of the fire place. The one by the door is made of particleboard it has two columns and five rows. The shelf is home to an array of many items from DVDs to books and some electrical appliances. The shelf that is on the far side of the door is used primarily as a television stand and placement of electrical appliances used in line with the television which include DVD player and Decoder. This shelf is also made of particleboard.

Figure 4.29 Bedroom TV unit (Source; Camera author)

4.5 LANDSCAPING

Whereas the farm house has utilized the space that they have in terms of landscaping there is opportunity for improvement. Landscape is divided into two: hard and soft landscape. Hard landscape materials include rocks, glass, metal etc. while the soft landscape include the vegetative materials such as flowers, grass, shrubs and trees.

4.5.1 Vegetation

The landscape has a total of twenty for trees from the bottlebrush, the mango tree, African olive, acacia, avocado, cypress and orange. There is also a yellow hedge grown around the landscape, from a shrub called Forsythia suspense. The grass that covers the lawn is Kikuyu Grass. In addition to this there are two boulevards of flowers that consists of cosmos, nasturtium, California blanket, coreopsis, zinnia. More flowers and potted plants form the circumference of the house.

Figure 4.30 Flower boulevard (Source; Camera author)

Figure 4.31 Front lawn and trees (Source; Camera author)

Figure 4.32 Flower boulevard (Source; Camera author)

Figure 4.33 Front view of house (Source; Camera author)

Figure 4.34 Flower pots (Source; Camera author)

4.5.2 Structures

There are several structures on the landscape that are noticeable. One of the structures is a black Ken tank used to harvest rainwater and supply the house. The other tank is an underground reservoir also to supply the house with water made of concrete and metal reinforcement and are rectangular in shape. There are two of these tanks one by the side of the house and the other is towards the back of the house. There is also an outdoor seating area square based, made of wooden beams as support and iron sheets as the cover. In addition to these structures is a two-car parking lot with wire mesh that forms its top as well as the base for a growing bougainvillea. A sculptor is placed right next to the tank with a light fixture beneath it. Behind the house is a black bench as well as a hanging area for washed utensils.

Figure 4.35 Outside reserve tanks (Source; Camera author)

Figure 4.36 Outside reserve tank and sculpture (Source; Camera author)

Figure 4.37 Outside underground reserve tank (Source; Camera author)

Figure 4.38 Manhole (Source; Camera author)

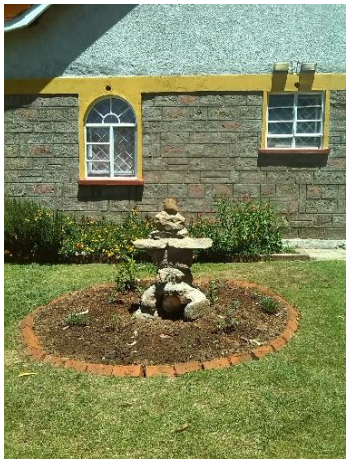

Figure 4.39 Sculpture (Source; Camera author)

Figure 4.40 Outside dish hanger (Source; Camera author)

Figure 4.41 Patio (Source; Camera author)

Figure 4.42 Patio (Source; Camera author)

4.5.3 Repurposed materials

When it comes to the site, the most abundant sustainable material that can be easily found and applies when it comes to the overall design in order to achieve repurposing is wood. This is due to harvesting of wood from fell trees that were grown for the very purposed and also the demolition of old structures that are now no longer in use. This wood is stored primarily for use as firewood and takes the strain off the gas and electric cooker saving on both electricity and gas.

Figure 4.43 Wood on pickup (Source; Camera author

4.6 SPINAL DISK PROBLEMS

Persons experiencing spinal disk problems face a lot of associated issues in their day-to-day activities. Whereas some of these problems are universal, the owner cites certain complications that are specific to him and his environment. These issues include:

- Standing up from a seating position; he has to either hold on to inanimate object or have someone assist him get up in order to ease the strain on his spine.
- Standing for a long period of time.
- Seating on normal chairs, these are angled chairs such as recliners that do not have a right angle back rest or generally seating for long anywhere
- Visiting the lavatory where you cannot sit, Asian style toilets are a no-go zone because of the strain it puts on his spine as he crouches and then subsequently has to get up from that position.
- Bending while brushing teeth, the height of the sink if to low will force him to bend and as a result putting strain on his spine causing pain.
- Sleeping position. Given that the spine is a main support frame of the body while attempting to sleep the client has to toss and turn continuously in order to find a position where there is no strain and therefore no pain. Sometimes forced to place pillows bellow the back to aid in support.
- Lifting or carrying objects even small ones
- Walking especially on uneven grounds including staircases
- Bending for whatever reason

The owner goes further to state that whereas this problem makes more so part of his day to day life he says that these are the most severe; sleeping position, walking on uneven grounds, seating, standing for too long and standing from seating positions.

4.7 Conclusion

This chapter first described the historical background of the site, Geographical analysis of the site and then the climatic conditions of the site. The researcher used graphical methods to represent the climate and temperature of the site. The existing conditions of the site was described in detail, particularly the landscape, interiors, exhibition areas and furniture. Afterwards, data collected by the researcher through photography, observation and face to face semi- structured interviews with key informants was analyzed. The results were examined to find out the views and preferences of the respondents regarding the challenge of spinal disk problems at the site together with sustainable materials available.

CHAPTER FIVE

5 SUMMARY FINDINGS CONCLUSIONS AND RECCOMENDATIONS.

5.1 Introduction

The chapter will aim to discuss and make a summary the findings presented in the previous chapter. Thereafter, in relation to the research questions, the researcher summarized the findings so as to develop an appropriate conclusion and recommendations, the researcher will seek to make conclusions and suggest appropriate recommendations pertaining to biomimicry, sustainable materials and chosen adinkra symbols discussed in the literature review section. All data is based on the fact finding done by the researcher through observation and participatory semi-structured interviews to the sample population at Misanga farm house. The recommendations will touch on the interiors of the living room, master bedroom, bathroom, dinning and the landscaping of the whole as well as the furniture and exhibition and display techniques suited for the Misanga farm house. All the recommendations are based on the facts established by the researcher from data methodology in chapter three of the research. Chapter five being the last chapter of the research it gives a conclusive summary of the research followed by the researcher's suggestions for the further study and research for the use of biomimicry to ease spinal disk problems.

5.2 Summary of Findings

The case study site, Misanga farm house is a middle-class establishment home to a retired civil servant. From the researcher's participant observation and qualitative analysis of the site's existing spaces and surrounding conditions, it can be concluded that little regard has been put into addressing the issue of spinal disk problems, something that the owner himself suffers from. There is no evidence of the incorporation biomimicry and African culture in the interior and exterior spaces of the site. This is clearly observed from the house's physical environment, interior spaces, color scheme, furniture designs and the entire landscape. From the interview guide whereby, the researcher had asked for the user's suggestions on the specific areas of the house that are supposed to be renovated, all the four areas of the home's physical environment; landscape, interior architecture, exhibition spaces and the furniture were suggested for renovations.

The landscaping at the site has quite a lot of vegetation but more could be done in terms of systematic alignment of vegetation types, well-defined flower beds, outdoor seating and lighting and a well-

defined entrance and driveway inclusive of a more private gate. Exhibition and display were mainly confined interpretive types of exhibitions with minimal exhibitions displayed both indoors and outdoors. Furniture in the site has taken quite a beating especially due to wear and tear and at that needs to be refurbished but in line with recommendations suited to easing spinal disk problems.

5.3 Recommendations

The following solutions were therefore recommended by the researcher for implementation with regards to rectification of some of the issues revealed in the exterior and interior design of spaces at Misanga farm house, majorly pertaining to spinal disk problems.

5.3.1 Interior Architecture Recommendations

Interior architecture encompasses wall, floor, lighting and ceiling treatments as well as doors and windows and any other opening found within an indoor space. These four areas under interior architecture shall be discussed while giving various sustainable and appropriate recommendations in line with the objectives. This will comprise of the bedroom and dining room.

5.3.1.1 *Walls*

The interior and part of the exterior walls on site are painted over with petroleum-based paints that range from a broad color palette.

5.3.1.2 *Cork*

Cork may be best known for its history with wine and the office pin board, but in reality, it is an incredibly green and versatile product when applied to interiors this is evident with its recent frequent use in walls. Cork's innate renewability is considered its finest feature as it can be harvested from the outer bark of the cork oak tree (Quercus Suber) without particularly harming the tree and leaving the tree to regenerate. Cork has been known to last up to fifty years when used in interiors thanks to its resilience to pressure, which makes it very suitable for high traffic areas such as flooring in hallways or on kitchen counter tops. (Muratto natural surface design, 2107).

Figure 5.1 Cork on wall (Source; Pinterest.com)

Figure 5.2 Cork on wall (Source; Pinterest.com)

5.3.1.3 ***Brick***

Brick is one of the most common and popular walls building materials this is because they are very durable and require quite low maintenance. Walls made of brick are not damaged by moisture and chemicals easily and have the ability to survive the very extremes of climatic conditions. Bricks are made of clay which is eco-friendly and doesn't catch fire easily. Brick walls are heavy and need a strong foundation to support it. The major setback when it comes to bricks is the price. Price of constructing walls from bricks is high. Another drawback of brick as a building material is that it doesn't offer much flexibility in design. (Projectlink, 2019)

Figure 5.3 Brick wall (Source; Pintrest.com)

Figure 5.4 Brick on wall (Source; Pintrest.com)

5.3.1.4 ***Flooring***

5.3.1.4.1 Vinyl

Vinyl is a resilient flooring and flexible material that feels a much softer underfoot than rigid wood or tile. It's made from a layer of PVC (short for polyvinyl chloride) plastic over a layer of felt. Vinyl flooring can be found in a variety of different types. Sheet vinyl which is a large sheet of flooring that you unroll, adjust to size, and fix onto to your subfloor. You can also buy click-style vinyl planks that is correspondent to engineered wood or vinyl tiles, that you glue in place one at a time. Some vinyl tiles come with a peel-and-stick backing, so you don't have to add any adhesive before laying them down. (Moneycrashers, 2020).Vinyl is very advantageous in that it can stand up to both moisture and heavy traffic. It very comfortable to walk on and unlike tile is very warm on bare feet and is inexpensive and thus economically sustainable.

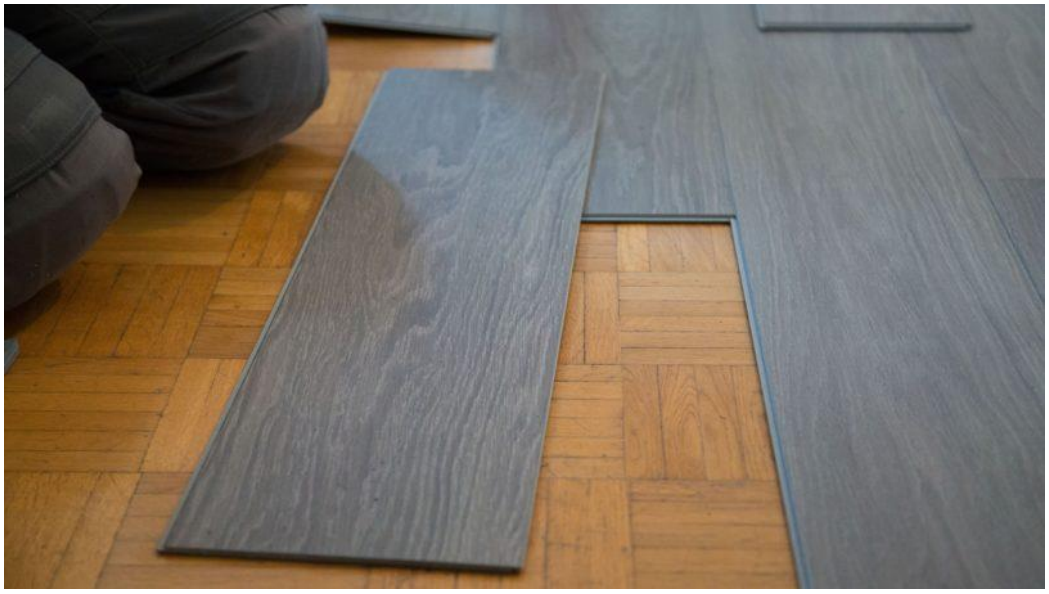

Figure 5.5 Vinyl Floor (Source; moneycrashers.com)

5.3.1.5 *Ceiling*

5.3.1.5.1 Gypsum

Gypsum is a sulphate of calcium available as an evaporate mineral. It is a popular material for false ceilings this is because of its thermal and sound insulation, lightweight and fire resistance properties making it quite popular as a ceiling and partition material. Gypsum ceiling boards come in various patterns. They are light weight and straightforward to install without revealing the seams. They are recommended for interior purposes such as in the living room or bedroom, but since they are made from compressed gypsum powder covered with paper, they are not resistant to water or moisture, which makes them unsuitable for exterior purposes, or they will easily become soft leading to a fail in their structure. Thus a very well suited material for ceilings especially drop down and recessed ceilings . (Shera, 2020)

Figure 5.6 Gypsum ceiling (Source; Pintrest.com)

5.3.1.6 *Lighting*

5.3.1.6.1 Energy Efficient Light Bulbs

The sustainable building industry is primarily focused on energy efficient lighting solutions. Standard light bulbs, known as incandescent bulbs, are known to be highly inefficient. Electricity is passed through a metal (tungsten) filament that heats to over 2000º Celsius and glows to give off light. Only 10% of the electrical energy is converted to light; 90% is wasted as heat. Halogen bulbs are similar but instead have a small pocket of halogen gas that reacts with tungsten to produce light. They burn brighter, use less electricity and last twice as long as a standard bulb, but are still inefficient compared with other forms of bulbs.

Energy efficient light bulbs use significantly less energy than incandescent bulbs, and also last longer. There are two main kinds: Compact Fluorescent Lights and Light Emitting Diodes.

5.3.1.6.2 Light Emitting Diodes (LED)

LEDs are small, solid light bulbs that are lit by the movement of electrons in a solid semi-conductor material as electricity is passed through it. This is also called 'solid state lighting', because it uses a solid material, as opposed to gas (CFL) or filament (incandescent). LEDs are extremely energy efficient, lasting over 100 times longer than incandescent bulbs, and up to 10 times longer than CFLs. They have low heat generation, low power requirements, and are highly durable because there is no filament or tube to break.

LED is a relatively new technology, and currently the bulbs are most suitable for track and recessed lighting, where a pointed light is required rather than radiated light. They are more expensive than CFLs, but energy savings over their lifetime means their cost is soon recouped. Because their power inputs are minimal, LEDs are readily combined with solar panels to provide reliable, energy efficient lighting day and night. In Kenya LED strip snake lights range from a price of Kshs 185 to Kshs 25000, they are easy to install, waterproof and are available in single and multi-colors.

5.3.2 Furniture Recommendations

5.3.2.1 *Furniture layout*

The way furniture is laid out in a room or an exterior space is a crucial element. The layout affects one, circulation, how people will navigate through a space is highly dependent on how the furniture in that room is arranged. With that understood it is important to note that furniture layout itself is affected by a number of factors such as architectural elements consisting of windows and doors. The layout is also affected by the function of the room. Below is the chosen recommendation of the furniture at the Misanga farm house.

5.3.2.1.1 u-shape style

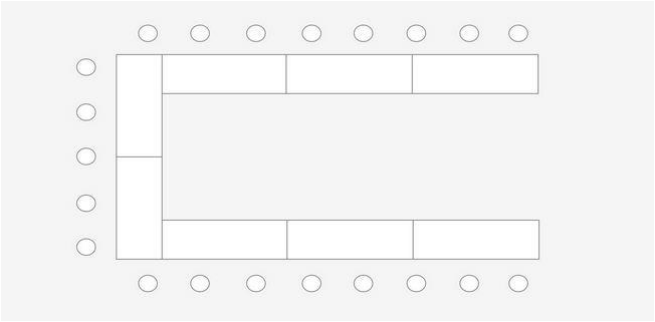

Figure 5.7 billetto.co.uk (Source; conference room style)

This model supports interaction between people at the house, it also allows for ease of movements to either chair with regards to the living room. The same layout format will also be applied in the bedroom with regards to the bed, cabinet and special chair.

5.3.2.1.2 Boardroom style

The setup for a boardroom style conference room is very simple. It’s the classic meeting room style you’ve seen in countless movies and sitcoms, where top executives gather around a central table to discuss important matters

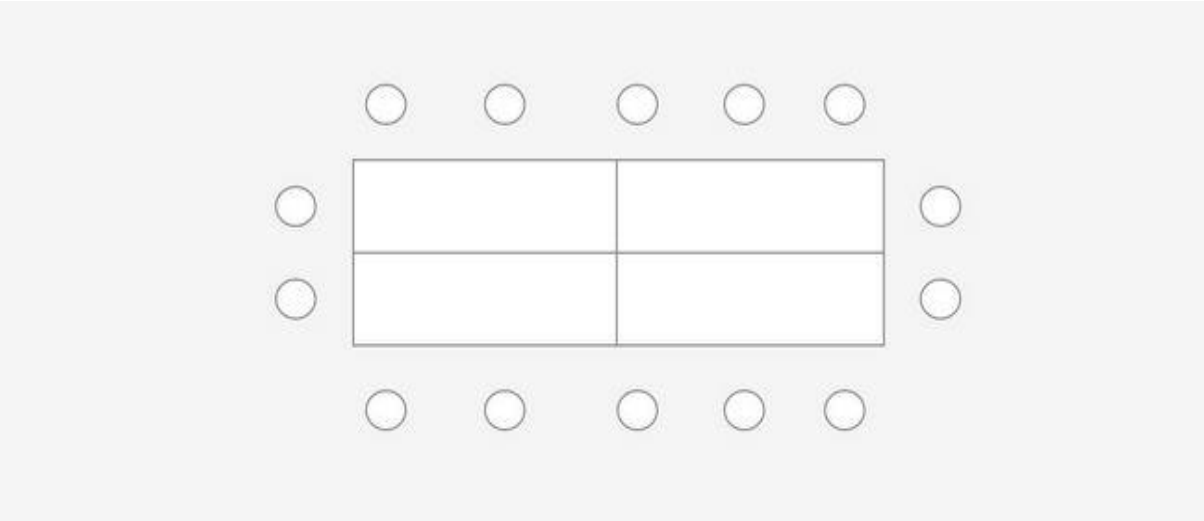

Figure 5.8 Conference room style (Source; biletto.co.uk)

This layout style will be employed in the dining room with specific regards to the chairs and the dining table itself.

5.3.2.2 ***Furniture materials***

5.3.2.2.1.1 Cork

Cork is a unique material characterized by its porous texture, softness, and lightweight quality. (GOLENDA, 2018) The use of cork will be predominant across all the interior furniture along with metal such as brass and steel. The cork in some instances will be used in its natural appearance state whilst in other cases it will be given a different colour finish or pattern overlay.

Figure 5.9 Cork Furniture Product (Source; archpaper.com)

5.3.2.2.1.2 Rattan

Rattan is a type of material that is used in wicker weaves. Rattan is a naturally growing vine like species that is native to tropical regions of Australia, Asia, and Africa. For production use, the skin is peeled away and utilized for weaving purposes. Often times, the core is not wasted and finds use for different types of furniture.

With over 600 different species, rattan can be distinguished as a strong fibrous plant that is similar to bamboo. Rattan has been used for furniture because it is lightweight, durable, flexible, and attractive. While the popularity of these strands has created high demand, sustainability of these plants has been put into question. When rattan stalks are cut prematurely, they are not able to regrow. For this reason, many synthetic materials have been created to combat exploitation of rattan in favour of more environmentally viable materials. (Administrator, 2013). This material will be predominant for outdoor furniture.

Figure 5.10 Rattan Furniture (Source; alibaba.com)

5.3.2.3 ***Furniture heights and angles***

With regards to spinal disk problems any slight bending causes pain, as this is the case, it is recommended to look at getting an upright chair or sofa to relive back pain, as these will support the lower back. Something like the Stress less Windsor sofa will work well, as it provides a lot of lumbar support, especially to the lower spine. As the Tess is lower towards the back of the sofa, it will also ensure that your legs are at the optimum 110-degree angle, to prevent any pressure on the back of the legs. When it comes to height of the furniture the closer to ground level the furniture piece is then ultimately the more stress it is on the lower back while getting up. Therefore, the height should allow for sitting upright position rather

than slouching and also stand up position while reaching out to access shelves without forcing the user to bend.

5.3.3 Landscaping Recommendations

The following are landscape recommendations.

5.3.3.1 *Soft landscape*

The vast majority of the landscape is covered by grass with some shrub and hedge at some locations. It is agreeable that vegetation plays a significant role in the overall aesthetics of a landscape of exterior spaces.

Below are the recommended flowers, shrubs and ground covers

5.3.3.1.1 Flowers

5.3.3.1.1.1 **Lavender**

Lavender is a flowering plant in the mint family that's easily identified by its sweet floral scent. It's believed to be native to the Mediterranean, the Middle East, and India, with a history dating as far back as 2,500 years. Lavender is chosen for its scent.

Figure 5.11 Lavender flower (Google Images)

5.3.3.1.1.2 Dahlia flower

Dahlia is a genus of tuberous plants that are members of the Asteraceae family; related species include the sunflower, daisy, chrysanthemum, and zinnia. They grow from small tubers planted in the spring. Chosen mainly due to aesthetics.

Figure 5.12 Dahlia (Source; google.com)

5.3.3.1.1.3 Wedelia

The Wedelia is referred to as the rabbit's paws, the trailing daisy or the yellow dots. Yet in other quarters it is known as the creeping ox-eye. Its dense ground-hugging foliage at times chokes out weeds as its yellow daisies, which it bears all year round, remain a sight to behold. Chosen for its aesthetic appeal.

Figure 5.13 Wedelia (Source; Pinterest.com)

5.3.3.1.1.4 Angel's trumpet

Angel's trumpet is a vase-shaped shrub or small tree. Its leaves are 6 to 8 inches long, arranged alternately on the stems. Known for its spectacular drooping flowers, they grow up to 20 inches long. The flowers, which are especially fragrant in the evening, may be produced year-round in warmer climates

Figure 5.14 Angel's Trumpet (Source; Google Images)

Bougainvillea: Bougainvillea are thorny ornamental bushes /creepers with flower-like spring leaves near its flower's blooms year around. Bougainvillea are thorny ornamental bushes /creepers with flower-like spring leaves near its flower's blooms year around.

Figure 5.15 Bougainvillea (Source; Google Images)

5.3.3.1.2 Plants and shrubs

5.3.3.1.2.1 Boxwood

Boxwood is the most versatile shrub; it grows almost everywhere in all the continents. The most adaptable and easy to grow shrub, boxwood is landscapers' favorite and without a doubt one of the best shrubs for the containers.

Figure 5.16 Boxwood (Source; Pinterest.com)

5.3.3.1.2.2 Rosemary

Mild temperate climate. Rosemary is a highly aromatic perennial shrub, a useful culinary herb. Its beautiful blue colored flowers and silvery green foliage also makes it an ornamental plant.

Figure 5.17 Rosemary plant (Source; Google images)

5.3.3.1.2.3 Bougainvillea

Bougainvillea are thorny ornamental bushes /creepers with flower-like spring leaves near its flowers blooms year around. Bougainvillea are thorny ornamental bushes /creepers with flower-like spring leaves near its flowers blooms year around.

5.3.3.2 ***Hard Landscape***

5.3.3.2.1 Patio

Is an outdoor space generally used for dining or recreation that adjoins a residence and is typically paved.

Figure 5.18 Patio (Source; Google Images)

5.3.3.2.2 Lighting

Landscape lighting or garden lighting refers to the use of outdoor illumination of private gardens and public landscapes; for the enhancement and purposes of safety, nighttime aesthetics, accessibility, security, recreation and sports, and social and event uses.

Figure 5.19 Ground lighting (Source; Google Images)

Ground lighting is particular used along walkways for aesthetic enhancement as the lights are not particularly very bright and also for demarcation as they are placed at the edge of the walkway.

Figure 5.20 Overhead lighting (Google Images)

Overhead lighting serves a variety of purposes including security and general lighting.

5.3.3.2.3 Pavement

Limestone: Reflecting heat is one of the good characteristics of limestone. We recommend using limestone for those areas with hot climates. It's white to off-white color is perfect for warm climate conditions, as it can reflect heat instead. It's best to use limestone for shaded areas in your patio; it can lighten up the area with its natural color. The limestone will be flat with gradual easy slopes during ascent.

Figure 5.21 Limestone on furniture (Source; gardenfurnitureland.com)

5.4 Exhibition and display

It involves the dining and bathroom at the Misanga farm house.

5.4.1 Lighting:

LEDs are small, solid light bulbs that are lit by the movement of electrons in a solid semi-conductor material as electricity is passed through it. This is also called 'solid state lighting', because it uses a sold material. They come in single and or multiple colors

Figure 5.22 Pineapple Light (Source; Pinterest.com)

Figure 5.23 Thor's hammer light source (Source; Pinterest.com)

5.4.2 Shelves:

Wall mounted shelves as well as shelves abstracted from animal forms, the shelves will feature the same material properties as those of the furniture, cork and rattan but with more aesthetic color and pattern finishes. The shelves will be a meter from the ground so that the user need not bend.

Figure 5.24 Wall mounted animal Inspired shelf (Source; Pinterest.com)

Figure 5.25 Wall Mounted animal inspired shelf (Source; Pinterest.com)

5.4.3 Ceiling

Both the dinning and bathroom will feature recessed ceiling designing with mounted, the dining room ceiling will be from gypsum board whereas the bathroom will be a combination of wood and gypsum board.

Figure 5.26 Ceiling with wood beams (Source; Pinterest.com)

Figure 5.27 recessed Gypsum ceiling (Source; Pinterest.com)

5.4.4 Walls

A wall finish as the word suggests is a finish given to the wall to enhance the interior or exterior look of the structure. New contemporary trends have brought about a great deal of increase in the usage of various types of wall finishes for the aesthetic purpose in their interior and exterior space.

Figure 5.28 Wood wall finish (Source; Google Images)

Figure 5.29 Decorative patterns on walls (Source; Google Images)

Flooring

Rubber flooring made from recycled tires is usually found at the local gym or on the neighborhood playground. It is slowly finding its way into our kitchens, sunrooms and bathrooms as a versatile, beautiful and lasting option. It is great to walk on and water resistant which a very good for class rooms. It also comes in many color and pattern options.

Figure 5.30 Rubber flooring (Source; freshome.com)

5.5 Suggestion for Further Study

Biomimicry is very wide and associated with a rich history as a result of various cultural influences and transformations over the years. Biomimicry is thus diverse and the extent covered in this research report are not exhaustive enough as there is much still to be understood from the world around with regard to why animals do what they do. Therefore, the researcher recommends further research to be done by interested individuals and groups concerning biomimicry and the designs associated with it.

5.6 Conclusion

This chapter looked at the summary of the researcher's findings from which the researcher gave various recommendations and proposed design ideas that could be used to ease spinal disk problems with regards to spaces at the study site while still incorporating aspects of Sustainable materials and biomimicry. The researcher concluded that by applying the recommended solutions with regards to transforming the site will in people suffering from spinal disk problems.

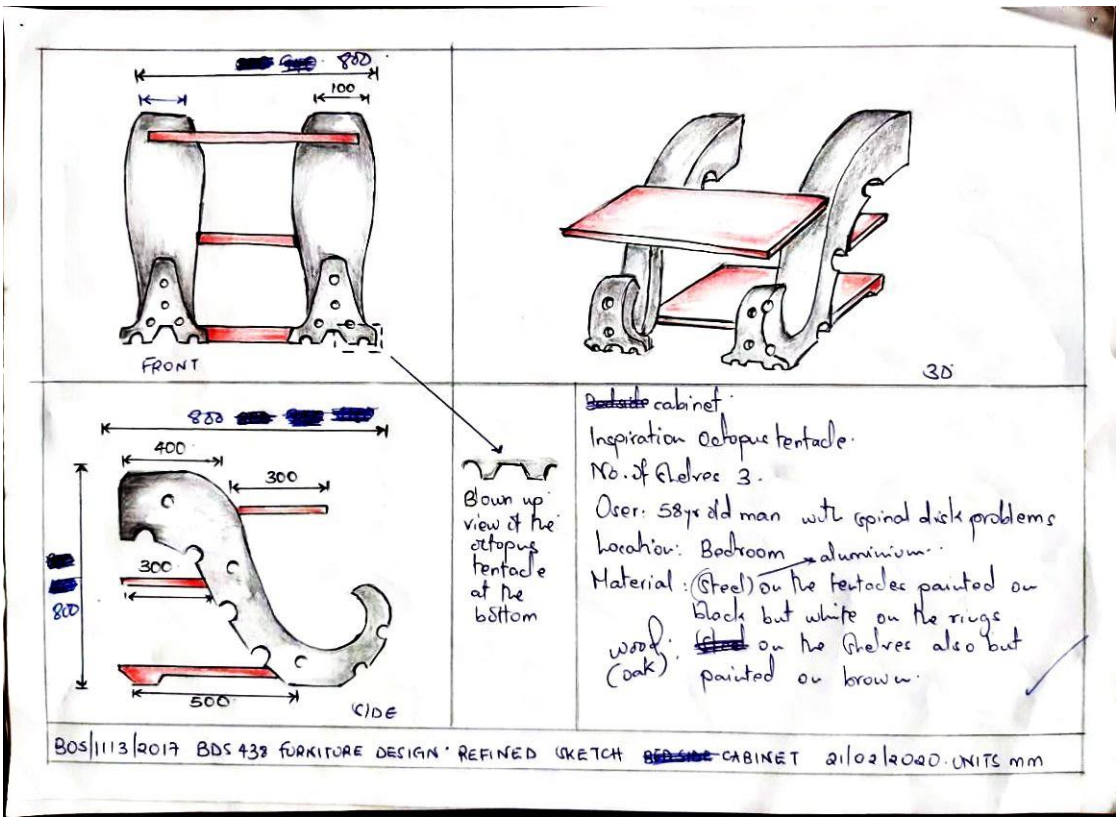

Figure 5.31Furniture Design Refined sketch (Source; Author)

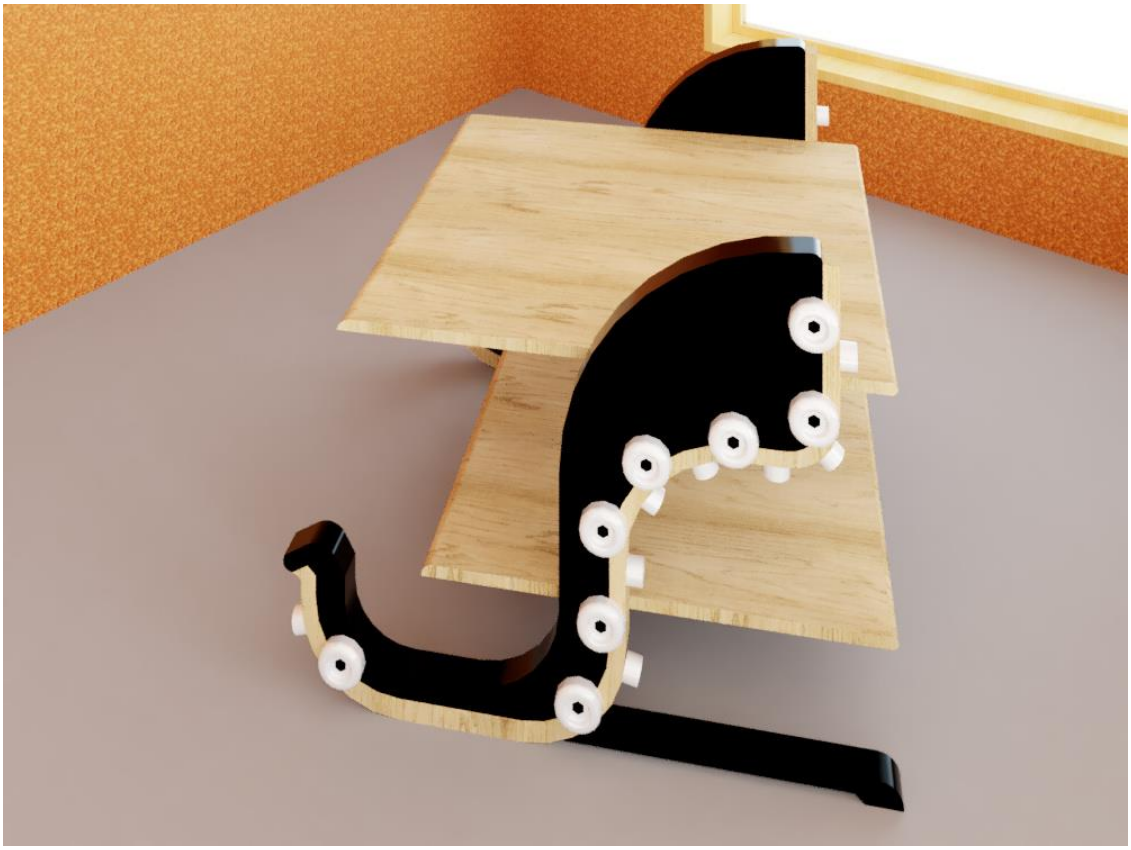

Figure 5.32 Furniture Render (Source; Author)

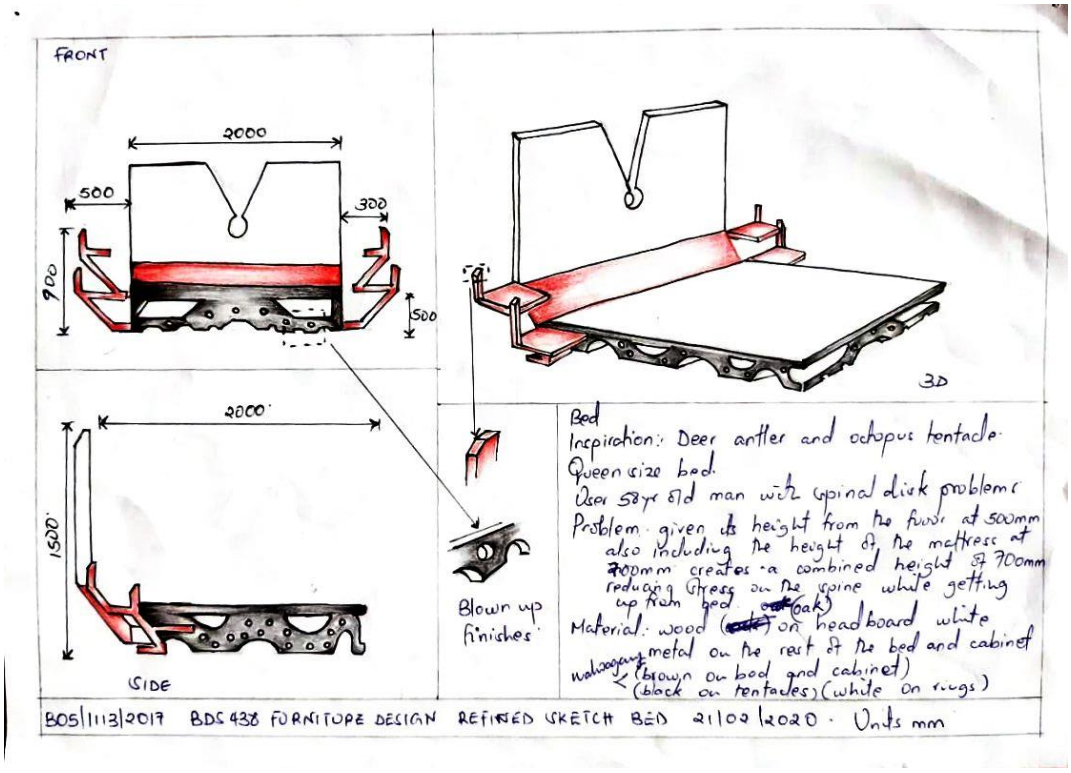

Figure 5.33 Furniture design Refined sketch of the bed (Source; Author)

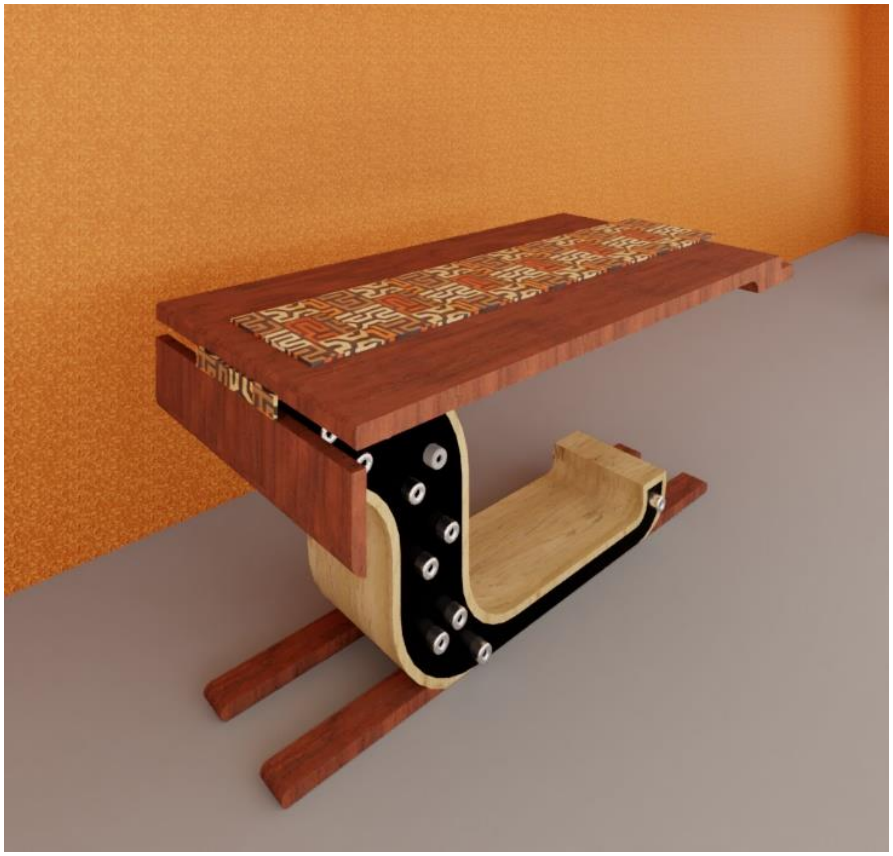

Figure 5.34 Furniture render of a table octopus inspired table (Source; Author)

Figure 5.35 Furniture Render of a bed (Source; Author)

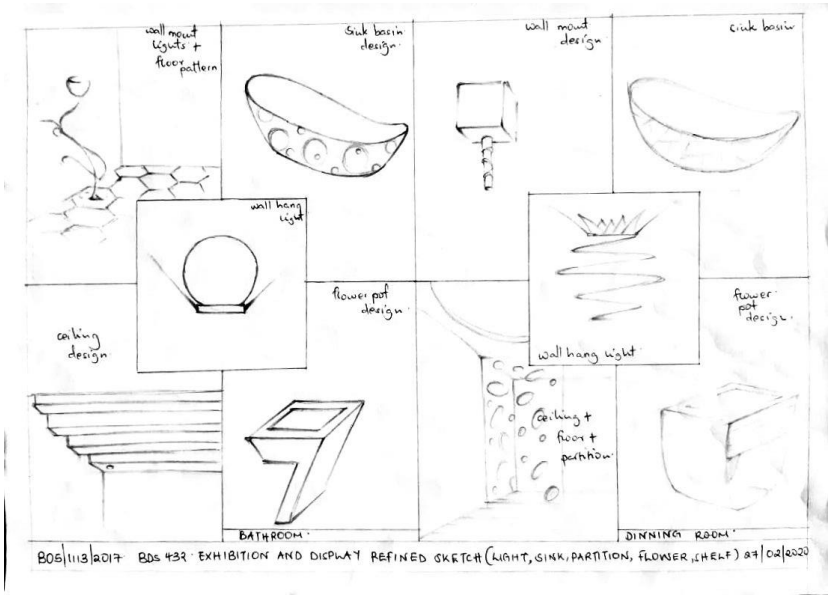

Figure 5.36 Exhibition and Display refined sketches (Source; Author)

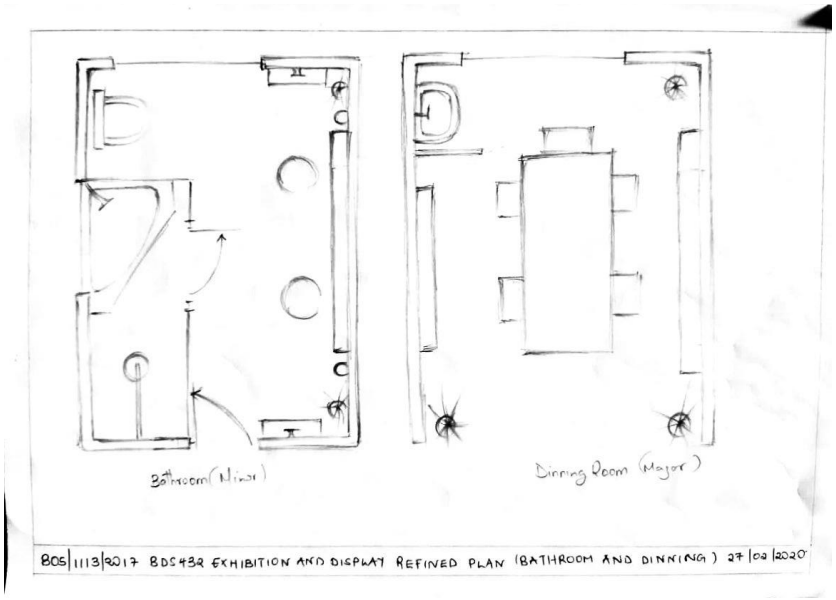

Figure 5.37 Exhibition and Display refined plan of bathroom and dining (Source; Author)

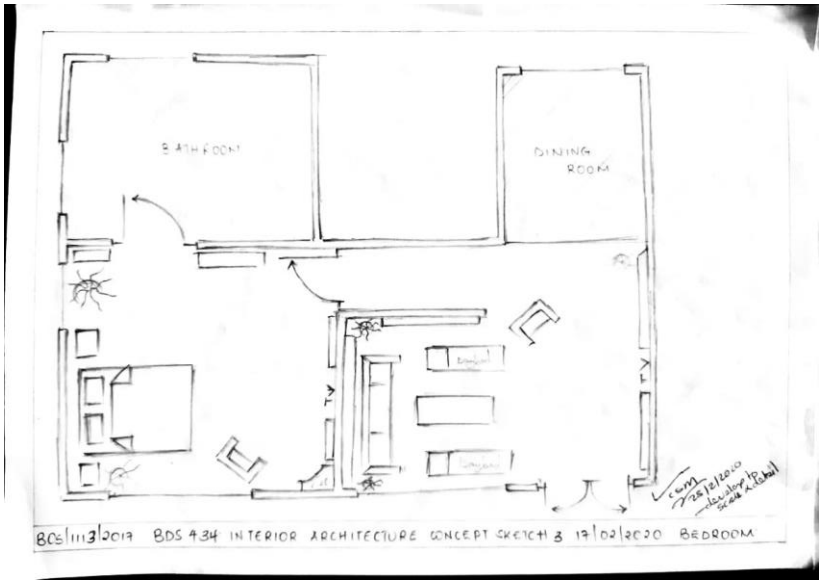

Figure 5.38 Interior Architecture concept sketch (Source; Author)

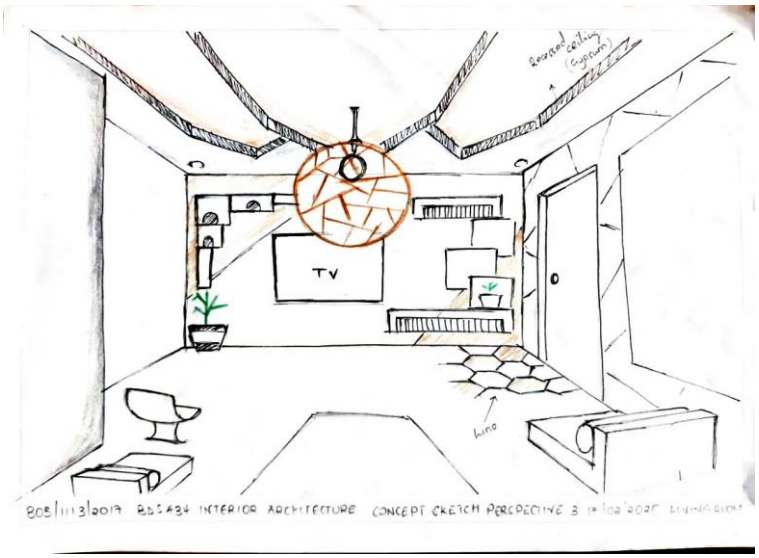

Figure 5.39 Interior Architecture concept sketch perspective 3 (Source; Author)

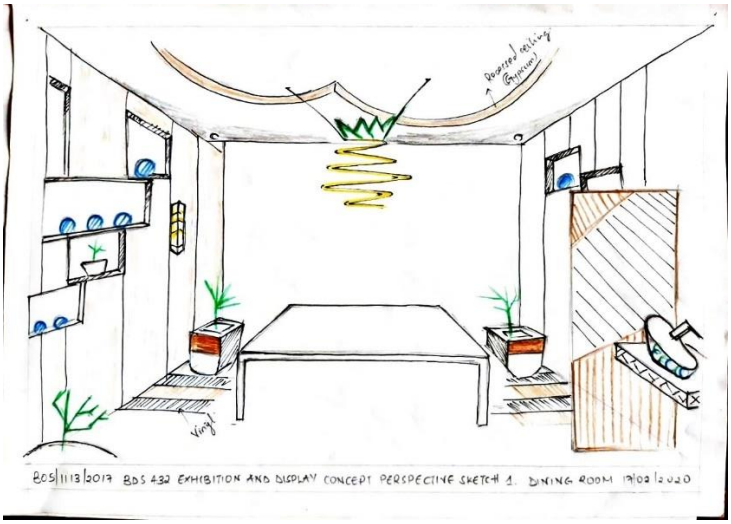

Figure 5.40 Exhibition and Display Concept perspective sketch 1 (Source; Author)

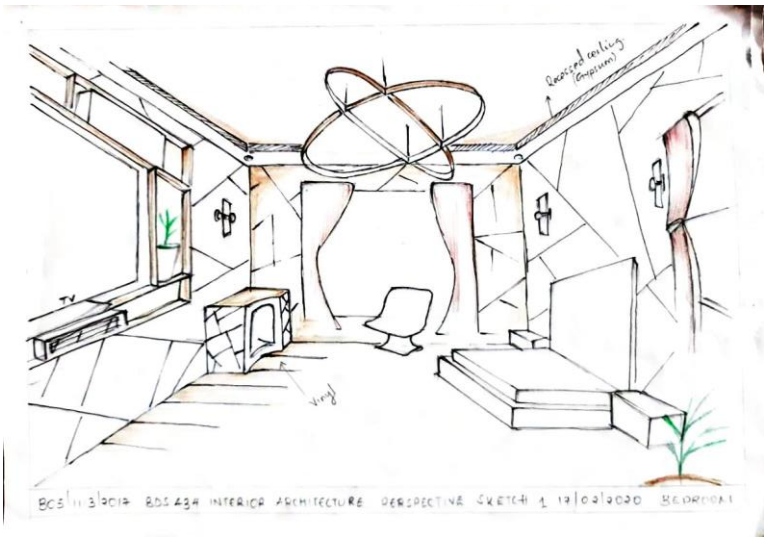

Figure 5.41 Interior Architecture perspective sketch 1 (Source; Author)

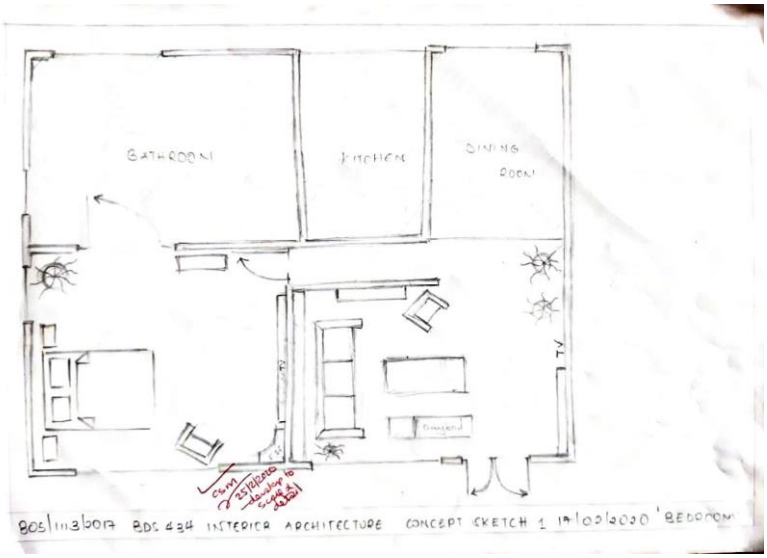

Figure 5.42 Interior architecture concept sketch 1 (Source; Author)

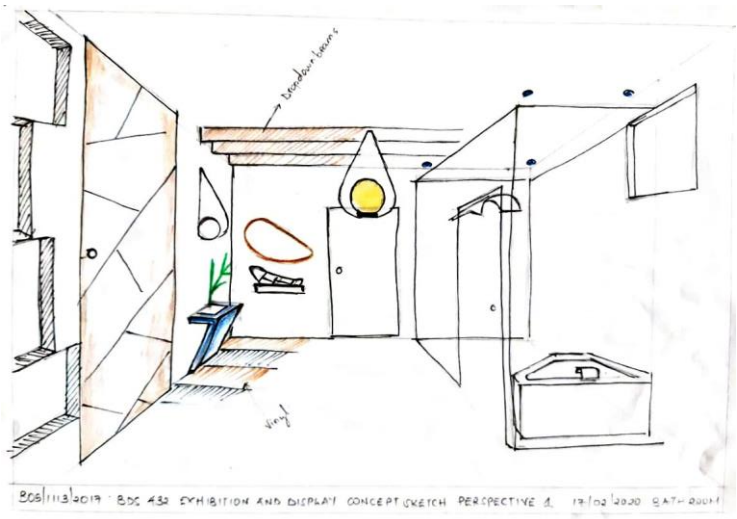

Figure 5.43 Exhibition and display concept sketch perspective 1 (Source; Author)

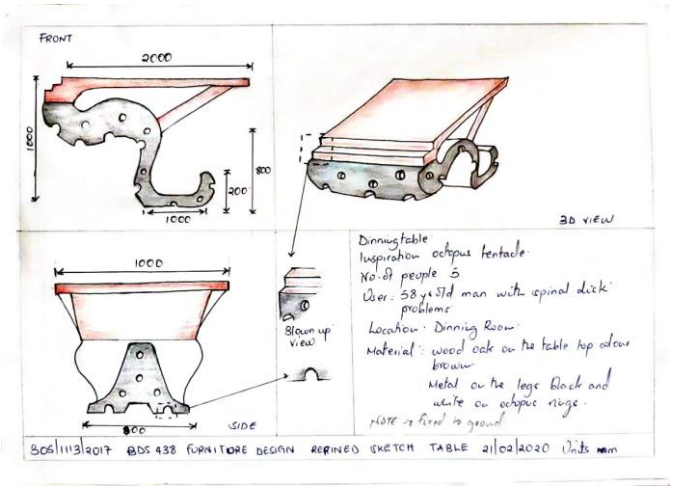

Figure 5.44 Exhibition and Display Refined sketch of a table (Source; Author)

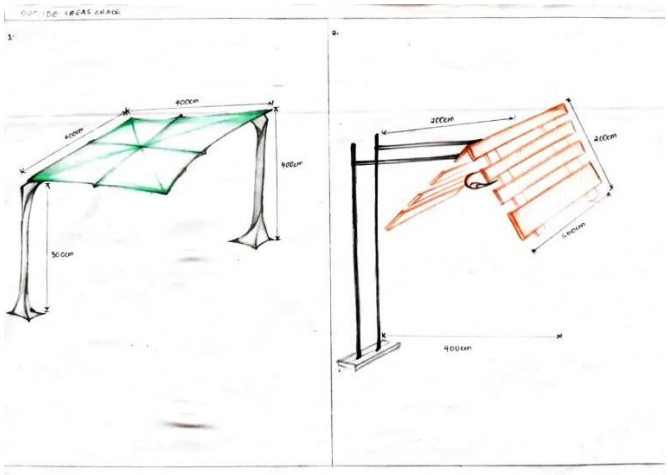

Figure 5.45 Outside furniture sketches (Source; Author)

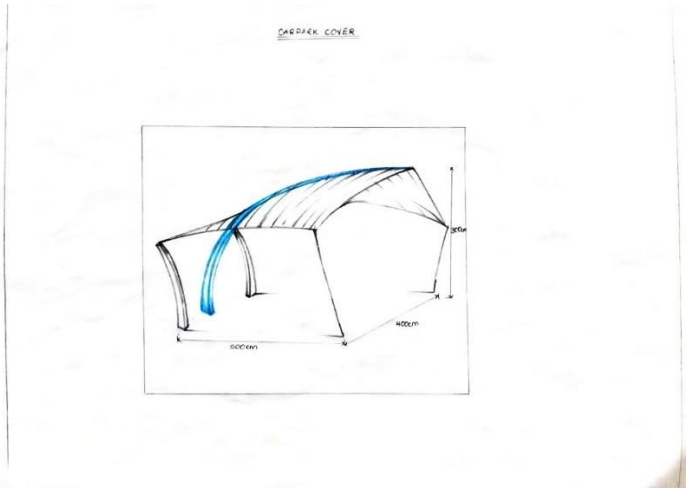

Figure 5.46 Carpark cover sketch (Source; Author)

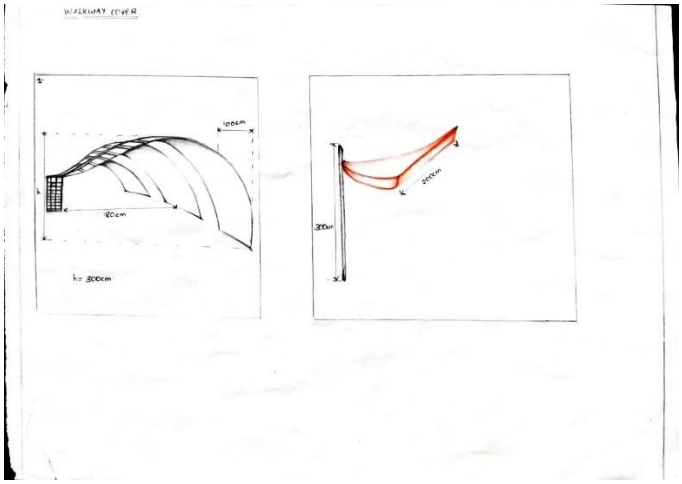

Figure 5.47 Walkway cover sketch (Source; Author)

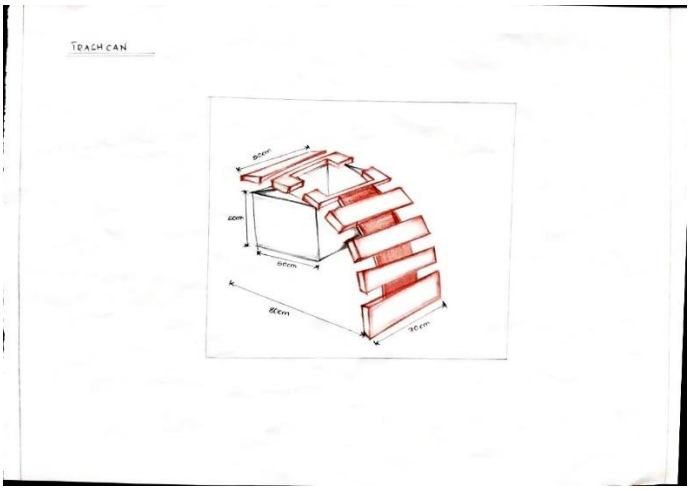

Figure 5.48 Trashcan sketch (Source; Author)

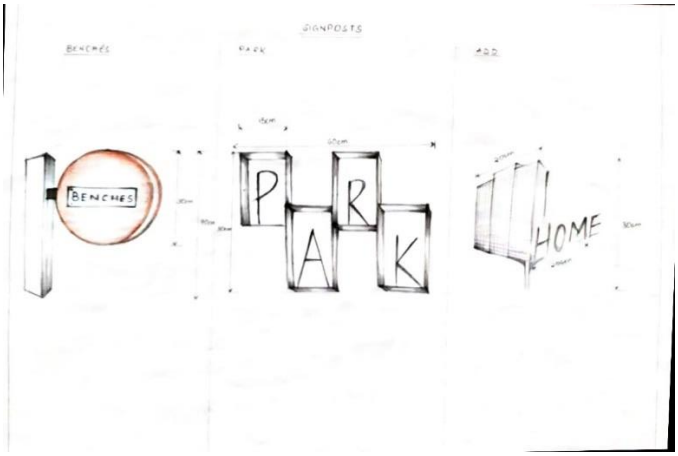

Figure 5.49 Signpost sketches (Source; Author)

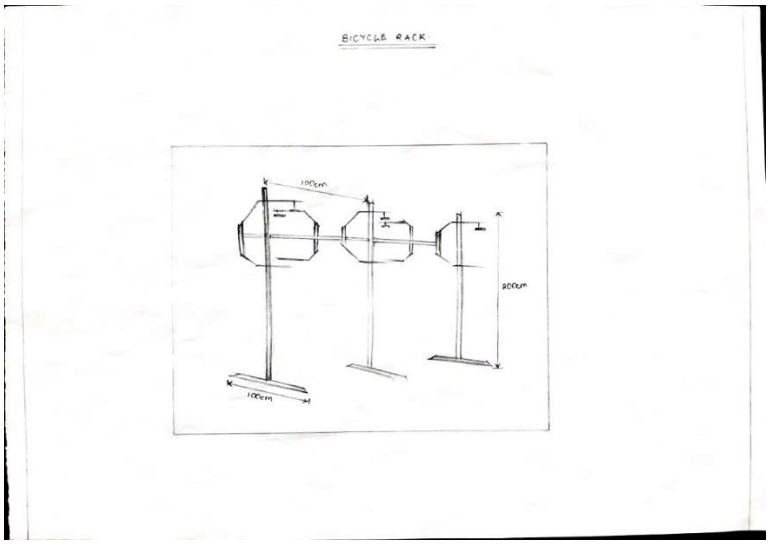

Figure 5.50 Bicycle rack sketch (Source; Author)

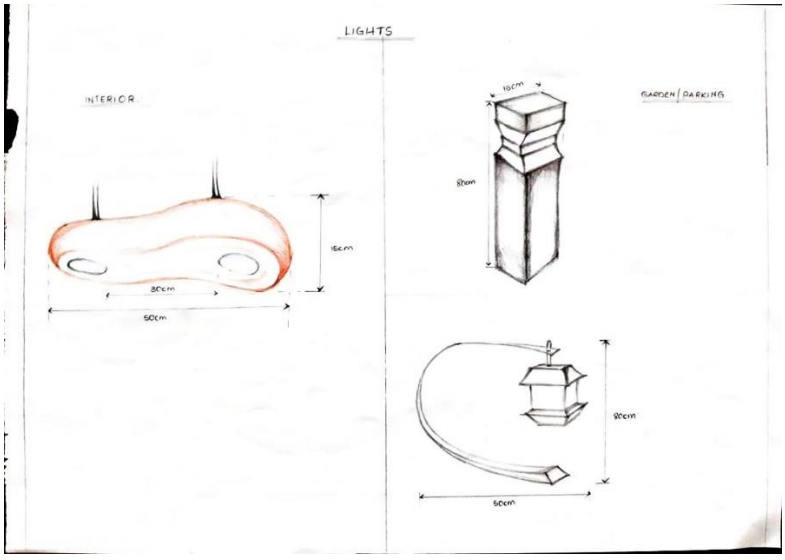

Figure 5.51 Lights sketches (Source; Author)

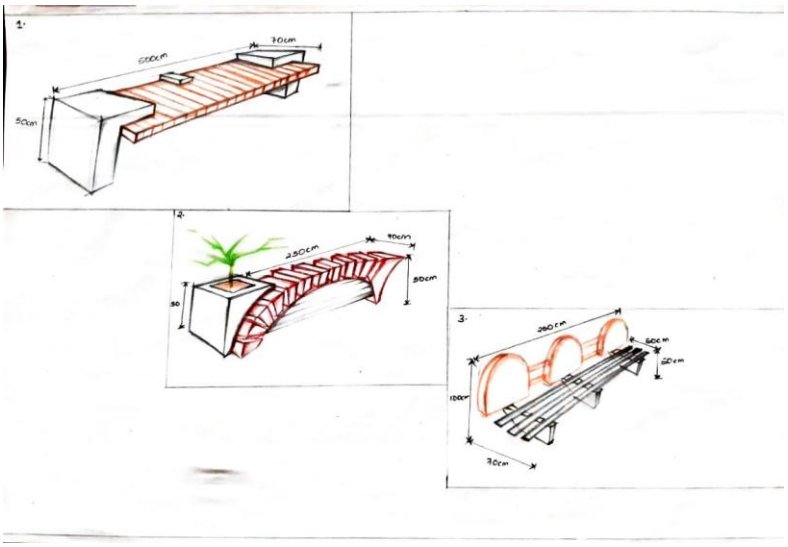

Figure 5.52 Benches sketches (Source; Author)

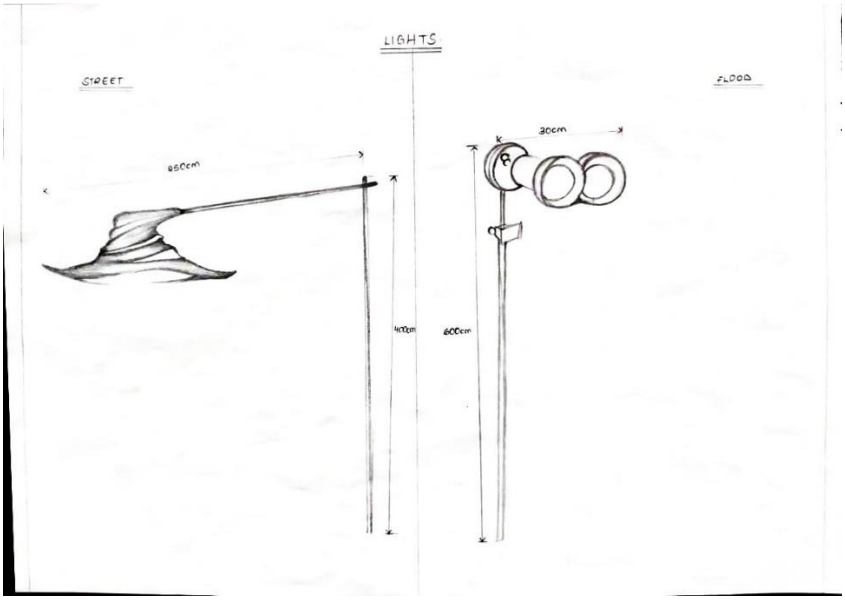

Figure 5.53 Lights sketches (Source; Author)

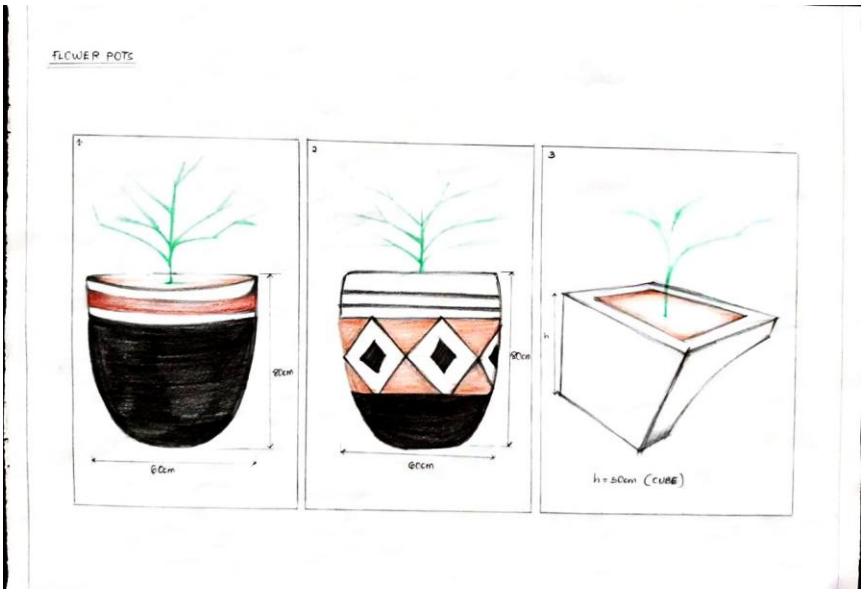

Figure 5.54 Flower pot sketches (Source; Author)

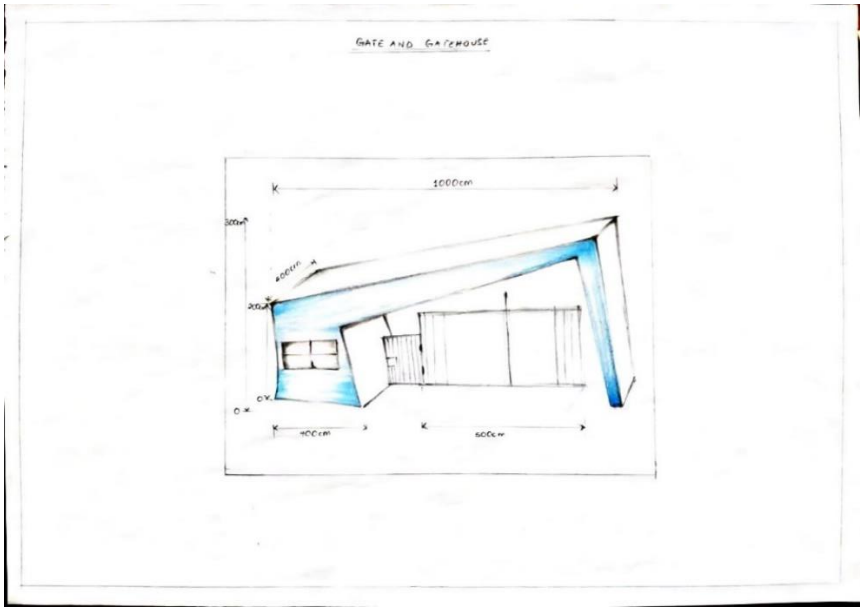

Figure 5.55 Gate and Gatehouse sketch (Source; Author)

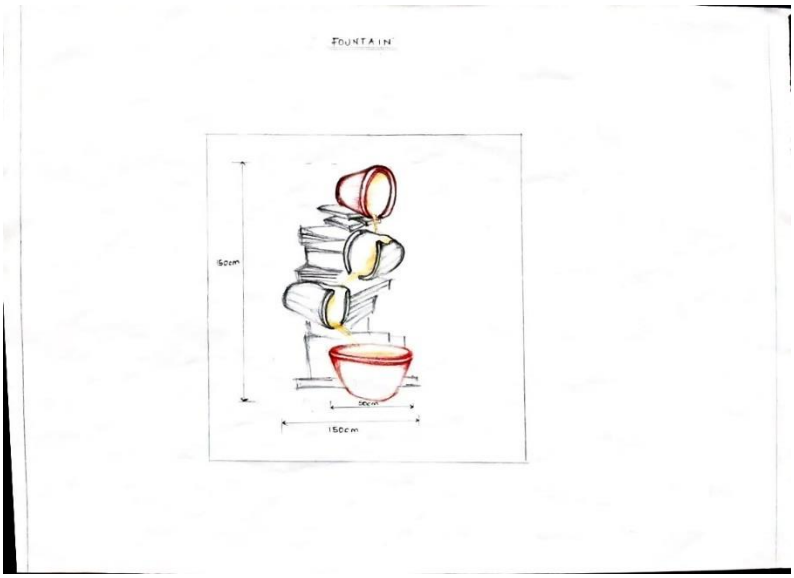

Figure 5.56 Fountain sketch (Source; Author)

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7 APPENDICES

7.1 Interview Guide

UNIVERSITY OF NAIROBI

College of Architecture and Engineering

School of The Arts and Design

7.2 Section A: Owner Key informants

1. What was the considered inspiration for design of Misanga farm house?

2. What is your opinion on Biomimicry and Sustainable design and has it been used in design of Misanga farm house?

3. What are some of the daily challenges you face with regards to spinal disk problems and to that point which are the most severe?

4. Would you reconsider redesigning of Misanga farm house by use of biomimicry and sustainable materials? If Yes which areas would you recommend to be redesigned first?

7.3 Section B: Workers

1. What is your take on the current state and design of the farm house?

2. After a brief description of sustainable design through use of sustainable materials and biomimicry, would you recommend the school to be redesigned based on that?

3. What areas of the farm house would you recommend to be redesigned first?

4. What are your opinions on ensuring sustainable design through use of sustainable materials?