
Project 3

“Reimagining traditional techniques and forms with natural materials to design a range of contemporary products”

Sulagna Mukherjee | 196130015

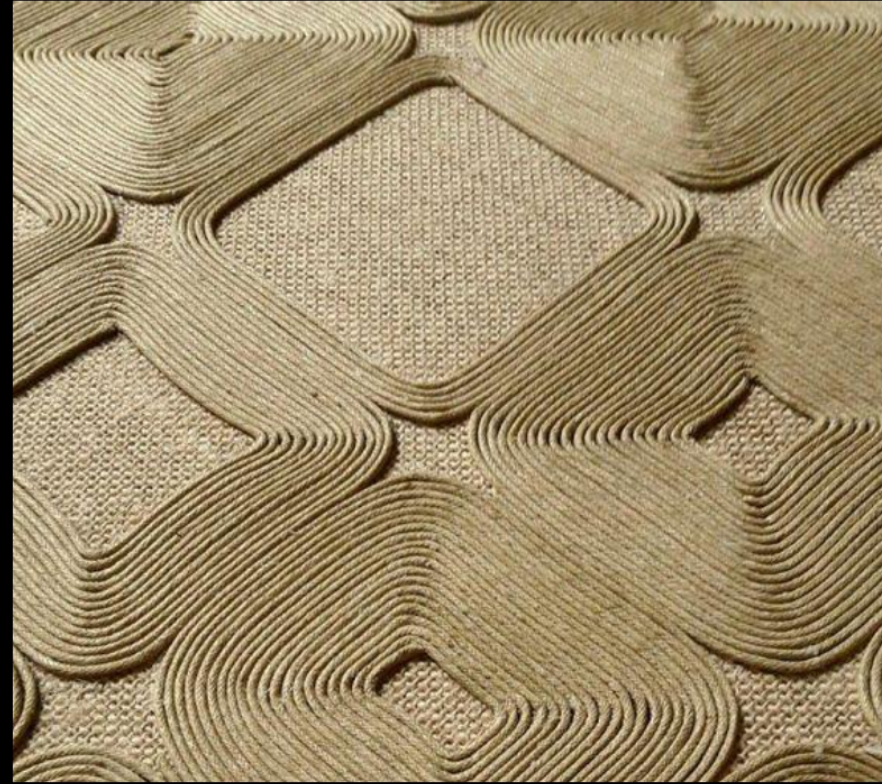
Under the supervision of Prof. Sandesh R.

Final Report

IDC School of Design

Indian Institute of Technology, Bombay

2019-2021



Contents

I. Approval form	3	12. Design Directions and Ideations	70
II. Declaration form	4	1) Mind mapping	71
III. Acknowledgement	5	2) Design Direction	72
IV. Abstract	6	3) Design Direction and Initial Ideations	73
V. List of figures	9	4) Comparing the Directions	79
 		13. Ideations	81
1. Project Timeline	12	1) Ideations (Direction 1)	82
2. Methodology	13	2) Ideations (Direction 2)	88
3. Introduction	14	3) Evaluation	91
1) Context	15	14. Detailing	92
4. Literature Study	18	1) Details (Direction 1)	93
1) Fibre extraction	19	2) Details (Direction 2)	96
2) Machinery used	21	15. Conceptualization	98
3) Tools, moulds and fixtures	25	1) Concepts (Direction 1)	99
4) Product making processes	26	2) Evaluation	109
5) Product making skill, techniques and training	31	3) Dimensional Analysis	110
5. Market Study	33	4) Mock-ups	111
1) Market study	34	5) Existing partitions and screen walls	113
2) E-commerce websites	46	6) Renders	114
3) Eco-friendly home and lifestyle accessories	47	7) Visualization in Interior spaces	119
6. Initial Design Brief	48	8) Design Feature – Compactness	122
7. Initial Ideations	50	9) Concepts (Direction 2)	123
8. Secondary research	55	10) Evaluation	127
1) Plastic pollution	56	11) Renders	128
9. Analysis	61	16. Final Concept	130
1) Inference	62	1) Final concept	131
2) Techniques of using Natural fibres	63	2) Renders	134
10. User Group Study	66	3) Details	135
1) User Personas	67	4) Renders	138
11. Design Brief (Revised)	68	5) Details	140

Contents

6) Renders	142
7) Transportation and Storage	143
8) Hinge detailing	144
9) Contemporary hinges	145
10) Traditional hinges	146
11) Barrel hinge (for bamboo and wood)	147
12) Ideation	148
13) Hinge (for bamboo)	149
14) Hinge (for wood)	150
15) Design of Jute work	151
16) Mural	152
17) Jute mural	153
17. Final Design	155
1) Scaled mock up	156
2) Prototyping	157
3) Final Design	160
4) Dimensions	161
5) Details	162
6) Different components	164
7) Packaging	165
8) Cost analysis	167
18. System Design	168
19. Conclusion	170
1) Unique Selling Point	171
2) Conclusion	172
20. References	173

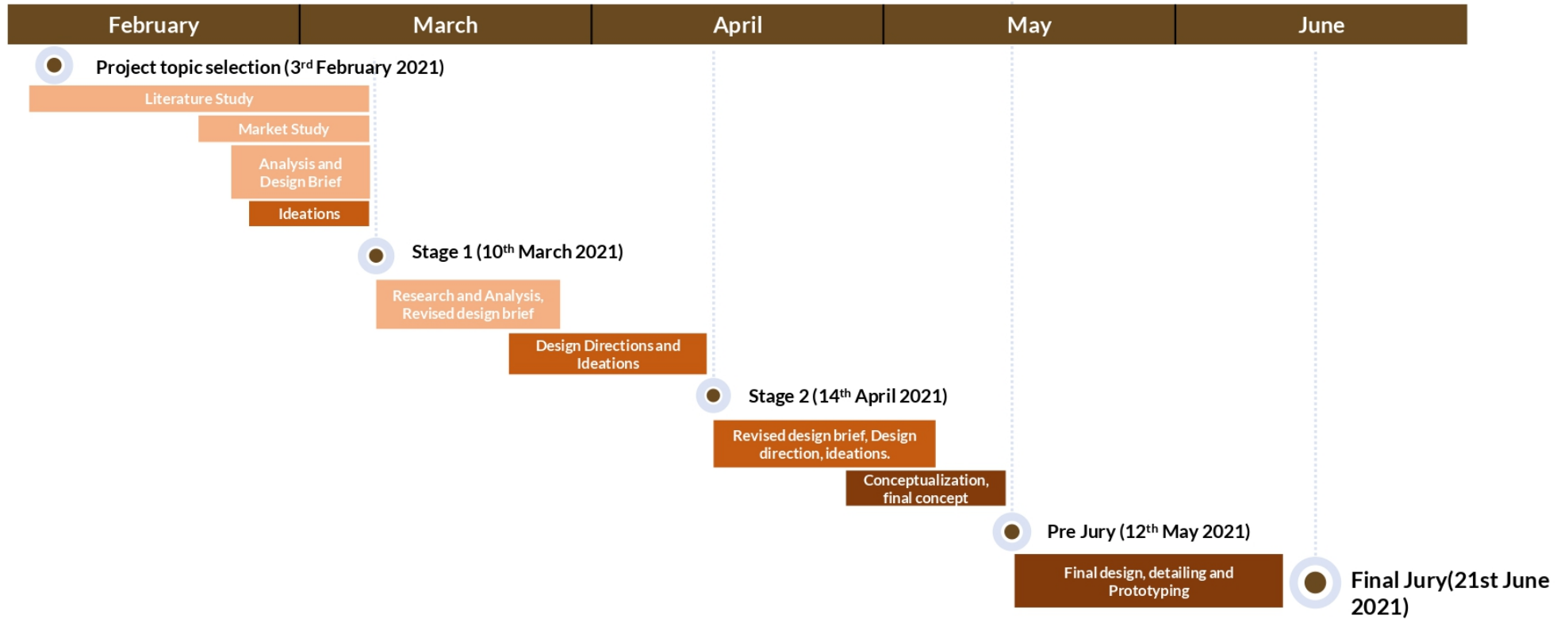
List of Figures

Fig 1: Different natural fibres	15	Fig 33: Ideation 1.....	51
Fig 2: Fibre extraction process	19	Fig 34: Ideation 2.....	52
Fig 3: Coir extraction process	20	Fig 35: Ideation 3.....	53
Fig 4: Manual ribboner	21	Fig 36: Ideation 4.....	54
Fig 5: Jute spindle braiding machine	21	Fig 37: Plastic waste generation map	56
Fig 6: Jute decorticator	21	Fig 38: Plastic waste generation data	56
Fig 7: Jute weaving loom	22	Fig 39: Plastic waste generation map (Asia)	57
Fig 8: Jute spinning mill	22	Fig 40: Plastic waste generation data (Asia)	57
Fig 9: Raspador machine	22	Fig 41: Plastic waste generation by different sectors	58
Fig 10: Coir extractor	23	Fig 42: Mismanaged plastic waste	59
Fig 11: Coir extractor	23	Fig 43: Mismanaged plastic waste data (Asia)	59
Fig 12: Coconut dehusking machine	23	Fig 44: Projected Mismanaged plastic waste	60
Fig 13: Coir rope spinning machine	24	Fig 45: Projected Mismanaged plastic waste data (Asia)	60
Fig 14: Coir rope spinning machine	24	Fig 46: Techniques using natural fibres	63
Fig 15: Mould in which coconut husks are hot pressed to produce fibre boards.	25	Fig 47: Techniques using natural fibres	64
Fig 16: Tool for weaving jute bags	25	Fig 48: Techniques using natural fibres	65
Fig 17: Cocomform	28	Fig 49: Mind mapping	71
Fig 18: Cocomform	29	Fig 50: Design direction	72
Fig 19: KIDS (Kottapuram Integrated Development Society)	31	Fig 51: Design direction 1	73
Fig 20: Fig 20: WDO Training program	32	Fig 52: Design direction 1	74
Fig 21: Fashion accessories	35	Fig 53: Design direction 2	75
Fig 22: Fashion accessories	36	Fig 54: Design direction 3	76
Fig 23: Interior furniture and accessories	37	Fig 55: Design direction 3	77
Fig 24: Interior furniture and accessories	38	Fig 56: Design direction 4	78
Fig 25: Interior furniture and accessories	39	Fig 57: Idea 1 (Direction 1)	82
Fig 26: Crafts and artwork	40	Fig 58: Idea 2 (Direction 1)	83
Fig 27: Other miscellaneous products	41	Fig 59: Idea 3 (Direction 1)	84
Fig 28: Other miscellaneous products	42	Fig 60: Idea 3 (Direction 1)	85
Fig 29: Traditional method of making carpet	43	Fig 61: Idea 3 (Direction 1)	86
Fig 29: Macrame (knotting technique)	44	Fig 62: Idea 4 (Direction 1)	87
Fig 30: Contemporary products	45	Fig 63: Ideating (Direction 2)	88
Fig 31: E-commerce websites	46	Fig 64: Idea 1 (Direction 2)	89
Fig 32: Homestyle products with natural fibres	47	Fig 65: Idea 2 (Direction 2)	90
		Fig 66: Detailing (Direction 1)	93

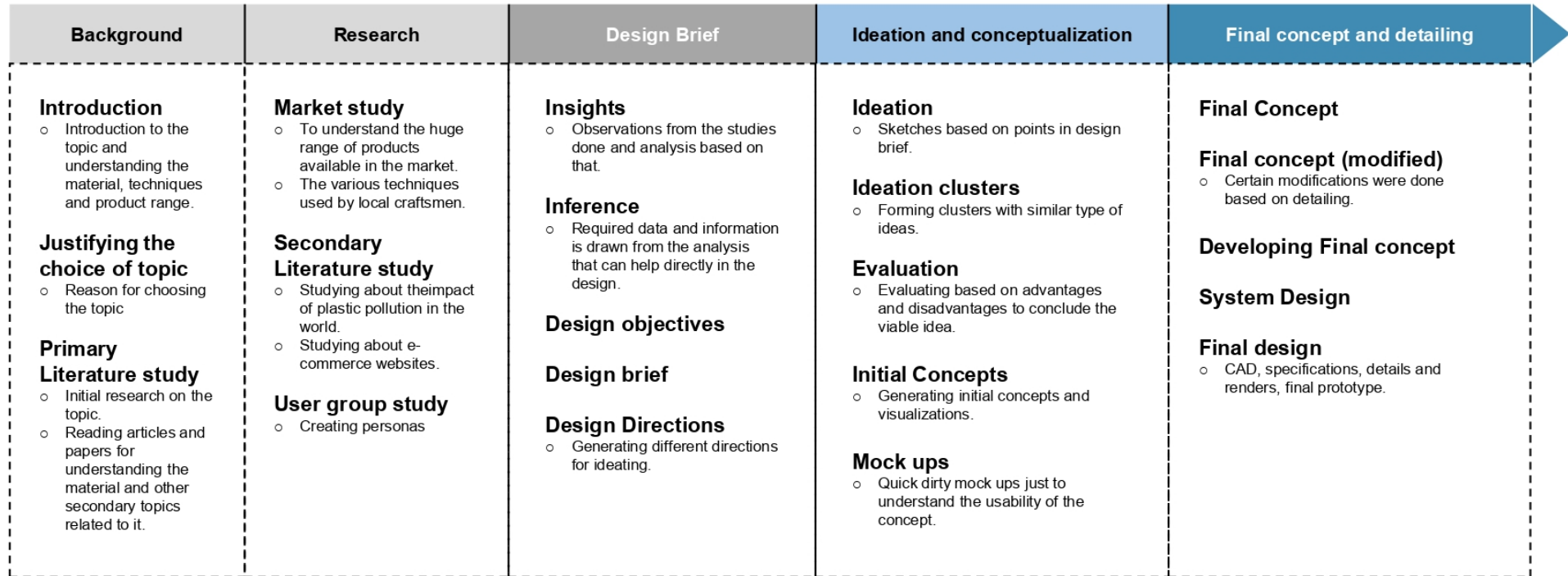
List of Figures

Fig 67: Detailing (Direction 1)	94	Fig 101: Final Concept	132
Fig 68: Detailing (Direction 1).....	95	Fig 102: Final Concept	133
Fig 69: Detailing (Direction 2).....	96	Fig 103: Render	134
Fig 70: Detailing (Direction 2)	97	Fig 104: Details	135
Fig 71: Concept 1 (Direction 1)	99	Fig 105: Details	136
Fig 72: Concept 1 (Direction 1)	100	Fig 106: Lamp details	137
Fig 73: Concept 2 (Direction 1)	101	Fig 107: Render	138
Fig 74: Concept 2 (Direction 1)	102	Fig 108: Render	139
Fig 75: Concept 3 (Direction 1)	103	Fig 109: Details	140
Fig 76: Concept 3 (Direction 1)	104	Fig 110: Details	141
Fig 77: Concept 4 (Direction 1)	105	Fig 111: Render	142
Fig 78: Concept 4 (Direction 1)	106	Fig 112: Foldability and storage	143
Fig 79: Concept 5 (Direction 1)	107	Fig 113: Contemporary hinges	145
Fig 80: Concept 5 (Direction 1)	108	Fig 114: Traditional hinges	146
Fig 81: Dimensional Analysis	109	Fig 115: Barrel hinge	147
Fig 82: Mock ups	111	Fig 116: Ideations	148
Fig 83: Mock ups	112	Fig 117: Hinge detail (for bamboo)	149
Fig 84: Existing partitions and screen walls	113	Fig 118: Hinge detail (for wood)	150
Fig 85: Renders (Direction 1)	114	Fig 119: Murals	152
Fig 86: Renders (Direction 1)	115	Fig 120: Jute murals	153
Fig 87: Renders (Direction 1)	116	Fig 121: Jute murals	154
Fig 88: Renders (Direction 1)	117	Fig 122: Scaled Mockup	156
Fig 89: Renders (Direction 1)	118	Fig 123: Prototyping	157
Fig 90: Visualization in interior spaces (Direction 1)	119	Fig 124: Prototype	158
Fig 91: Visualization in interior spaces (Direction 1)	120	Fig 125: Prototype	159
Fig 92: Visualization in interior spaces (Direction 1)	121	Fig 126: Final Render	160
Fig 93: Design feature – foldability and compactness	122	Fig 127: Dimensions	161
Fig 94: Concept 1 (Direction 2)	123	Fig 128: Details	162
Fig 95: Concept 1 (Direction 2)	124	Fig 128: Lamp details	163
Fig 96: Concept 2 (Direction 2)	125	Fig 129: Components	164
Fig 97: Concept 3 (Direction 2)	126	Fig 130: Packaging	165
Fig 98: Render (Direction 2)	128	Fig 131: Branding	166
Fig 99: Render (Direction 2)	129	Fig 132: System design	169
Fig 100: Final Concept	131		

Project Timeline



Methodology





01.

Introduction

Context

History

Natural fibers have traditionally been used in all cultures of the world to meet basic requirements of clothing, storage, building material, and for items of daily use such as ropes and fishing nets. People in early times used various kinds of natural fibers depending on their local availability.

Different types of fibers:

Fibers can be extracted from the –
bark (**banana, jute, hemp, and ramie**)
stem (**banana, palm, and bamboo**)
leaf (**palm, screw pine, sisal, and agave**)
husk (**coir**)
seeds (**cotton**)
grass (**sikki, madhurkati, benakati, munj**).



Fig 1: Different natural fibres
Source: [IR1]



Context

Location

Natural fibres are obtained all over India.

- Sisal –Maharashtra
- Screw pine, coir – Kerala
- Palm leaf –Tamil Nadu and Kerala
- Banana – Southern Indian states
- Korai grass –Tamil Nadu and Kerala
- Pineapple leaf fibre–Meghalaya
- Shitalpati–Assam, Meghalaya
- Bamboo – largely North-Eastern India
- Sikki and Munj grass – Bihar
- West Bengal is another region abundant in natural fibres. A variety of grasses like madhurkati, khudi, taal beti, and benakati are used for making products. Palm leaf, khajurleaf, cane, and bamboo are other natural fibres used.



Context

Market

The market for natural fiber products has seen an upward trend in recent times. While jute and silk have for a long time held a major share of the market in natural fibers, products made out of banana fiber, sisal, palm leaf, coir, screw pine, grass, etc. are also gaining popularity in the contemporary market.

Design

Design development has been noticeable in natural fiber crafts. A variety of products are being made to suit contemporary spaces. Range of innovative natural fiber products includes cushions made of screw pine and banana fiber, furniture in innovative designs, lamps, storage products, and table ware and personal accessories.

Technology

A variety of natural fibers is available in abundance in several parts of the country, and thus the scope of crafts based on these is huge. Technological up gradation in some processes has led to greater efficiency.

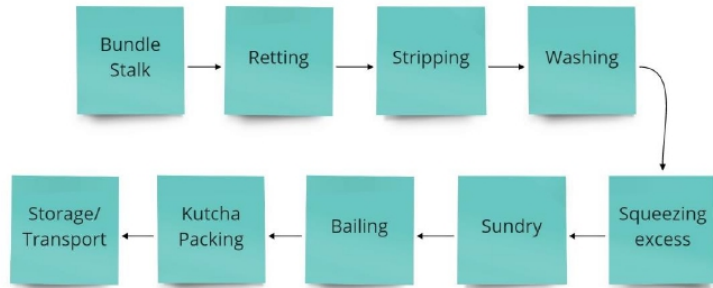




02.

Literature Study

Fibre extraction



- **Retting** – The stalks are bundled and submerged in water bodies like lakes and ponds.
- **Stripping** - The process of removing fibres from the stalk after completion of retting is called stripping.
- **Washing** – After stripping, the extracted fibres are washed.
- **Sun drying** – Fibres are kept in the sun for drying.
- **Bailing** – the fibres are bundled for storage/ transportation.



Fig 2: Fibre extraction process
Source: [IR1]



Fibre extraction

Coir extraction

- Coconut husk is kept submerged in water for 6 months and then beaten to loosen coir.
- Spinning into yarn is not possible for coir due to its coarse texture, hence it is twisted into ropes.
- However, the process of alkali boil in soda makes the fibres soft and hence they can be blended with jute to manufacture a yarn.

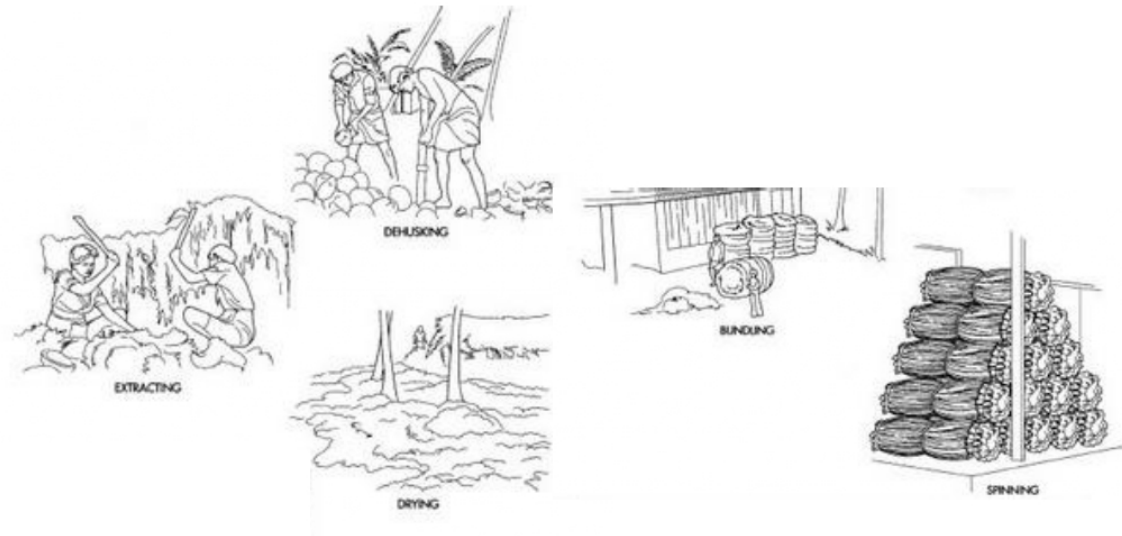


Fig 3: Coir extraction process
Source: [IR2]



Machinery used



Fig 4: Manual ribboner
Source: [IR3]



Fig 5: Jute spindle braiding machine
Source: [IR3]

Price: Rs. 9000 - 10000



Fig 6: Jute decorticator
Source: [IR3]

Price: Rs. 35,000 – 1.35 lakhs



Machinery used



Fig 7: Jute weaving loom
Source: [IR3]
Price: Rs. 6 lakhs – 8 lakhs



Fig 8: Jute spinning mill
Source: [IR3]
Price: Rs. 15 lakhs – 30 lakhs



Fig 9: Raspador machine
Source: [IR3]
Price: Rs. 40,000



Machinery used



Fig 10: Coir extractor
Source: [IR3]

Price: Rs. 75,000 - 2 lakhs



Fig 11: Coir extractor
Source: [IR3]



Fig 12: Coconut dehusking machine
Source: [IR3]

Price: Rs. 1.25 lakhs – 2 lakhs



Machinery used



Fig 13: Coir rope spinning machine
Source: [IR3]



Fig 14: Coir rope spinning machine
Source: [IR3]
Price: Rs. 72,000 – 2.70 lakhs



Tools, moulds and fixtures



Fig 15: Mould in which coconut husks are hot pressed to produce fibre boards.
Source: [IR3]



Fig 16: Tool for weaving jute bags
Source: [IR3]
Price: Rs. 49,000



Product making processes

Jute spinning process

The main function of jute spinning units is to convert jute fibre into yarn for various end uses.

- **Jute selection:** After drying, the raw jute is packed in jellies in the form of 150 kg or 180 kg bells for easy movement.
- **Batching section:** Batching is the process of mixing oil and water in jute.
- **Batching emulsion recipe:** Jute batching emulsion usually consists of three products such as mineral oil, water, and an emulsifier.
- **Softener process:** The softener machine is used for batching of sucking yarns, its raw materials are low grade.
- **Carding process:** Dividing the jute root in longitudinal and breaking it transversely.
- **Drafting process:** Drafting finisher card slivers to make the spinning frame suitable for feeding.
- **Jute spinning:** The main objectives of the spinning process are to draft, twist, and rotate

Weaving process

The process of separating two series of thread warp and waffle yarn to produce a fabric of the desired quality is called weaving. The weaving department has separate looms for hessian and dismissal. Hessian loom, the shuttle whose materials (weft yarn) have been changed manually. The sacking looms are equipped with an eco-loader to automatically load polish into the shuttle.

Damping

The process is damp, where the rolled woven fabric is uncontrolled and water is constantly sprinkled on it to provide the desired moisture. Each roll is typically 104 yards or 95.976 meters. This is done manually.

Calendaring

The process is similar to dressing calendaring fabric. Damp fabric renders the thread into the fabric through heavy roller pairs to expand and improve quality and appearance.



Product making processes

Traditional moulding of coir

- Over the last years interesting and economic new ways of moulding coir products have been developed.
- The freshly rubberized coir fibres are pressed in moulds and then vulcanized.
- The moulds are manufactured in-house according to the customer's specification.
- Applications: Widely used applications are seat cushions and armrests for furniture and car seats.



Product making processes

Cocoform

One of the latest innovations is CocoForm; a natural, sustainable, alternative to mainstream packaging. CocoForm is very strong, highly protective, totally natural and easily compostable.

CocoForm can be formed in almost any shape imaginable.

The latex that is sprayed on the coir sheet is a fully renewable material. Neither the latex tree, nor the palm tree from which we get our raw material is sprayed with pesticides.

One of the main manufacturers is Enkev.



Fig 17: Cocoform
Source: [IR4]



Product making processes

Cocoform

Next to this traditional moulding, a different press and moulding machine to make packaging shape, Cocoform, was recently developed.

- Cocoform is pressed very firmly and has a more smooth, tight and fixed character and is very suitable for a premium product packaging.
- Unvulcanized rubberized sheets can be shaped in many different forms.
- After moulding the material into the right shape, it is heated to vulcanize the natural latex. The result is a very open structure that is strong, resilient and comfortable.
- The properties do not differ a great deal from those of industrial foams. At the same time it's a product made of fully sustainable raw materials.

COCOFORM
natural packaging



Fig 18: Cocoform
Source: [IR4]



Product making processes

Making fibre reinforced composites

- In case of producing, fibre reinforced composites, the natural fibres undergo surface treatment.
- The treatments include use of various chemical substances like alkali, silane, peroxides, sodium chlorides, etc.
- However, an eco-friendly biological treatment with fungi is also used for surface treatment of fibres.



Product making skill, techniques and training

The aim of the Natural Fibre Craft Department is the promotion of the craft so as to serve hundreds of artisans with a sustainable income. Over the years KIDS has been focusing on the integrated development of the traditional artisans in the areas through value addition to Screw pine and Water Hyacinth.

- Skill Up Gradation Trainings.
- Design Development Workshops
- Identity cards of Ministry of Textiles, Govt. Of India to the Screw pine artisans.
- Health Cards to artisans.
- Scholarship to the high schoolchildren artisans.
- Participation in prominent exhibitions in prime locations.
- Muzris Sales Emporium,
- Natural Resource Centre
- Common Working Facility Centre with Dyeing & Drying Units and effluent Treatment Plant.
- Screw pine Cluster supported by NABARD



Fig 19: KIDS (Kottapuram Integrated Development Society)
Source: [IR5]



Product making skill, techniques and training

Women's Development Organization

Following are the key features of the workshop:

1. 48 days subject to a minimum of 288 hours for design training.
2. No of participants per workshop is up to 20 artisans per batch.
3. All payments of stipend/wages are paid through Account Payee Cheque/Demand Draft/Accounts transfer to artisans' accounts. No cash payment is allowed in any circumstances.

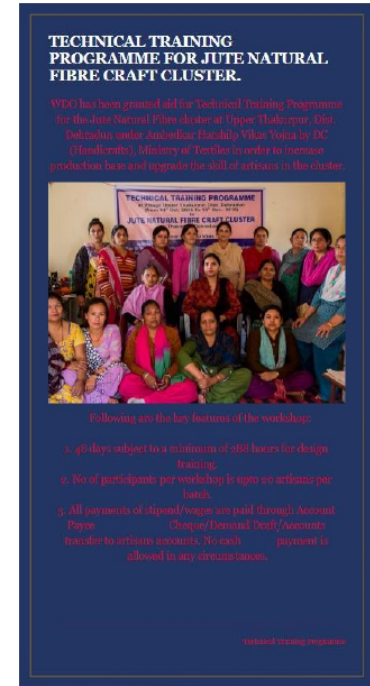


Fig 20: WDO Training program
Source: [IR6]





03.

Market Study

Market Study

Different types of products have been designed using natural fibres till date. Based on the purpose they serve, I have classified them into the following categories:

Types of products:

- Fashion accessories
- Interior products
- Crafts and decorations.
- Packaging and other miscellaneous products.



Market Study

Fashion Accessories

These are the most common products that are made from natural fibres since the natural way of using the fibres is to weave and convert them into planar surfaces. The various products include **tote bags, contemporary bags, pottlis, purses, jewellery, sandals, etc.**

In certain cases, the natural fibre is combined with materials like leather to give it a contemporary look.



Fig 21: Fashion accessories
Source: [IR7]



Market Study

Fashion Accessories

A new fashion trend is being introduced through accessories and jewellery made from natural fibres.

This product category of bags have been explored to a great extent using natural fibres. The demand for such bags is gradually increasing in the market and leading to innovative and inspiring designs.



Fig 22: Fashion accessories
Source: [IR7]



Market Study

Interior furniture and accessories

This category of products display the design scope of using natural fibres to provide volume in a space. These include various **furniture, carpets, lamps and other accessories.**

In some cases, we see a combination of natural soft material with hard materials like wood, bamboo and metals in this category of products.



Fig 23: Interior furniture and accessories
Source: [IR7]



Market Study

Interior furniture and accessories



Fig 24: Interior furniture and accessories
Source: [IR7]



Market Study

Interior furniture and accessories

Contemporary style lamps can be created through a combination of hard and soft natural materials. The light and shadow play of these lights create a heavenly aura in the interior space.

A lot of traditional as well as contemporary designs have been introduced in making carpets and rugs.

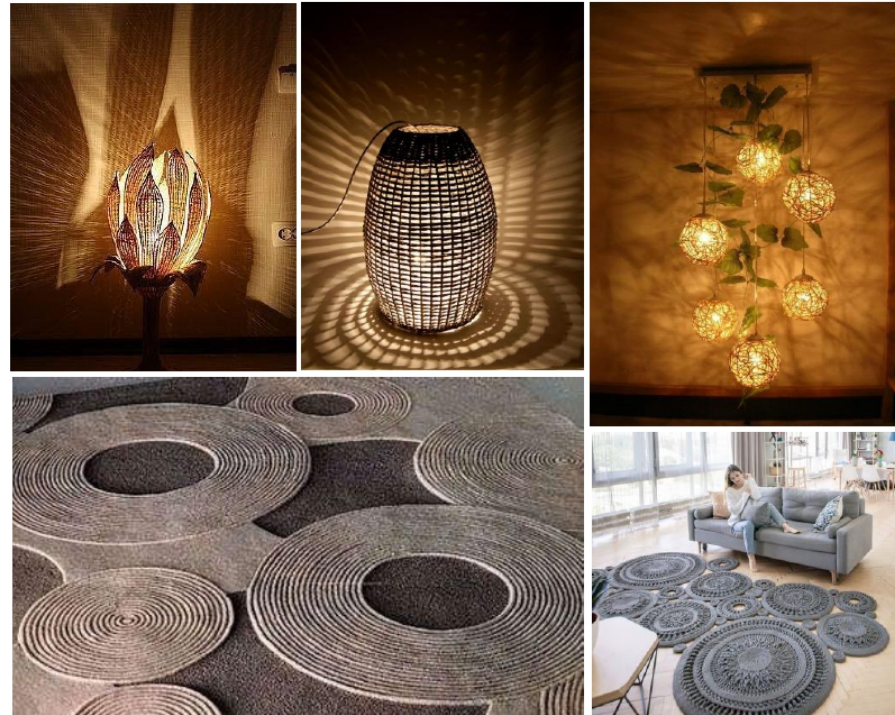


Fig 25: Interior furniture and accessories
Source: [IR7]



Market Study

Crafts and artwork

This category of products amplifies the aesthetic value of natural fibres. They add value to the space in which they are kept.



Fig 26: Crafts and artwork
Source: [IR7]



Market Study

Other miscellaneous products

This category consists of different types of products that have been made by innovative use of natural fibres. These are not traditional types of products made from fibres, and some of them are mass produced.



Fig 27: Other miscellaneous products
Source: [IR7]



Market Study

Other miscellaneous products

In recent times, packaging of some exclusive luxury products like wine bottles, etc. are being done using natural materials.

Lots of different types of organisers are made using natural fibres or a combination of soft and hard natural materials.



Fig 28: Other miscellaneous products
Source: [IR7]



Techniques

Traditional Approach



Fig 29: Traditional method of making carpet
Source: [IR8]



Techniques

Macrame



Fig 29: Macrame (knotting technique)
Source: [IR7]



Techniques

Contemporary Approach



Fig 30: Contemporary products
Source: [IR7]



E-commerce websites

It's interesting how there are a lot of portals today showcasing art forms and handicrafts from remote corners of India. These collectives take it upon themselves to source directly from the artisans and also educate consumers about the various art forms in the country. These websites are bridging the gap between the maker and the consumer. Some of them are:

- Dastkar Andhra
- Chanderiyaan
- Gaatha
- The India Craft House
- Okhai
- Coppre
- KashmirBox
- eMithilaHaat
- Lal10
- Hands of India



Fig 31: E-commerce websites
Source: [IR10]



Eco-friendly home and lifestyle accessories



Fig 32: Homestyle products with natural fibres
Source: [IR10]



04. **Initial Design Brief**

Design Brief

Design Objective

“Using traditional techniques and forms with jute and other natural materials to design a range of contemporary products”

Design Brief

- Explore the different possibilities of using traditional methods and forms.
- Translate the traditional techniques and forms to contemporary products.
- Explore the combination of hard and soft natural materials.
- Design tools to increase efficiency of traditional method of using natural fibres.



Traditional form and technique

Area of Intervention

Reimagining traditional forms and methods to make contemporary products



Contemporary products



05. **Initial Ideations**

Initial Ideations

- The methods used for making carpets and rugs can be adopted to make panels, screen walls, temporary partitions, etc.
- The play of solid and void of the patterns can be utilised well in partition walls.
- There is scope for combining natural hard materials with natural fibres.

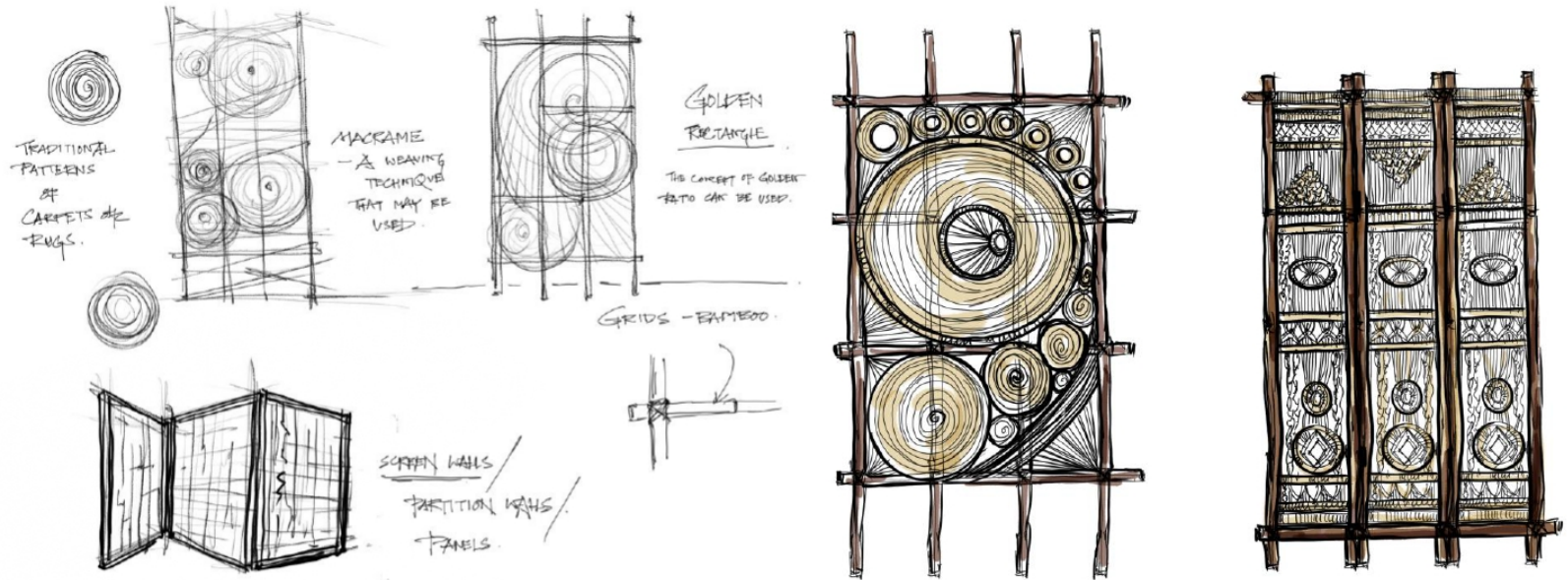


Fig 33: Ideation 1
Source: Author



Initial Ideations

- The light and shadow play of these lights can be explored a great deal by creating patterns with natural fibres.
- A lot of traditional as well as contemporary designs have been introduced in making carpets and rugs.

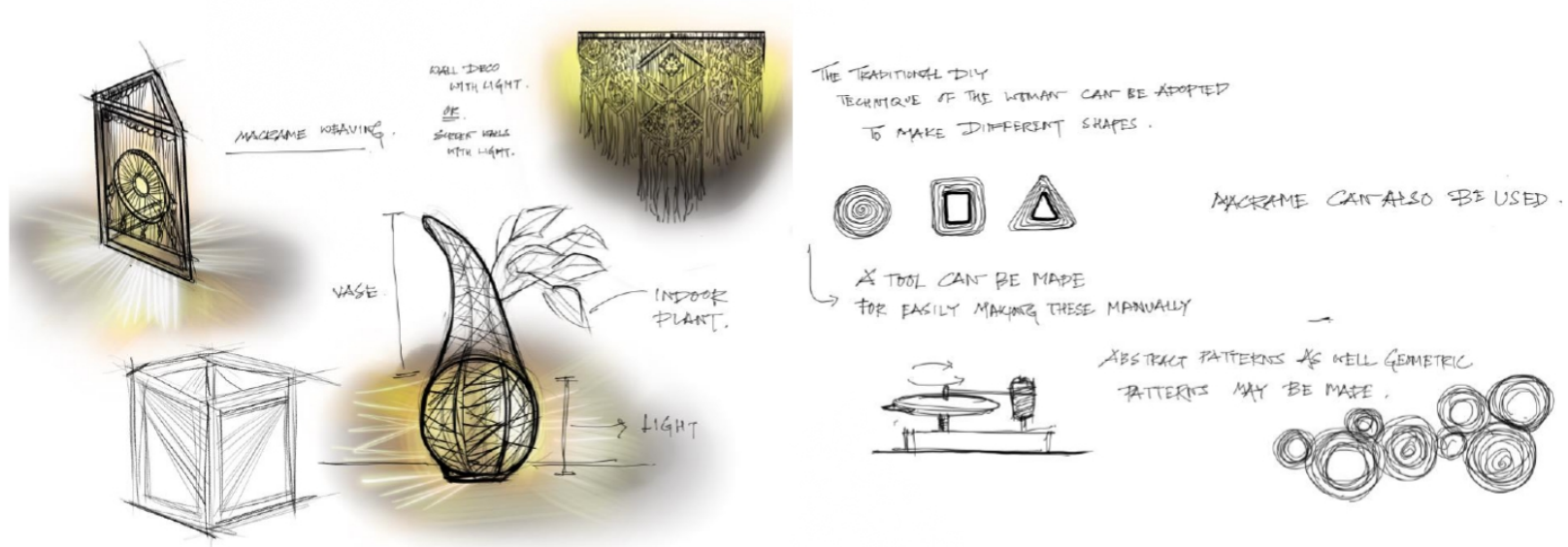


Fig 34: Ideation 2
Source: Author



Initial Ideations

- The demand for innovative use of natural fibres is leading to its use in jewellery and other fashion accessories.
- Bags are however one of the most common products that are made from natural materials. But the design has grown over the years.

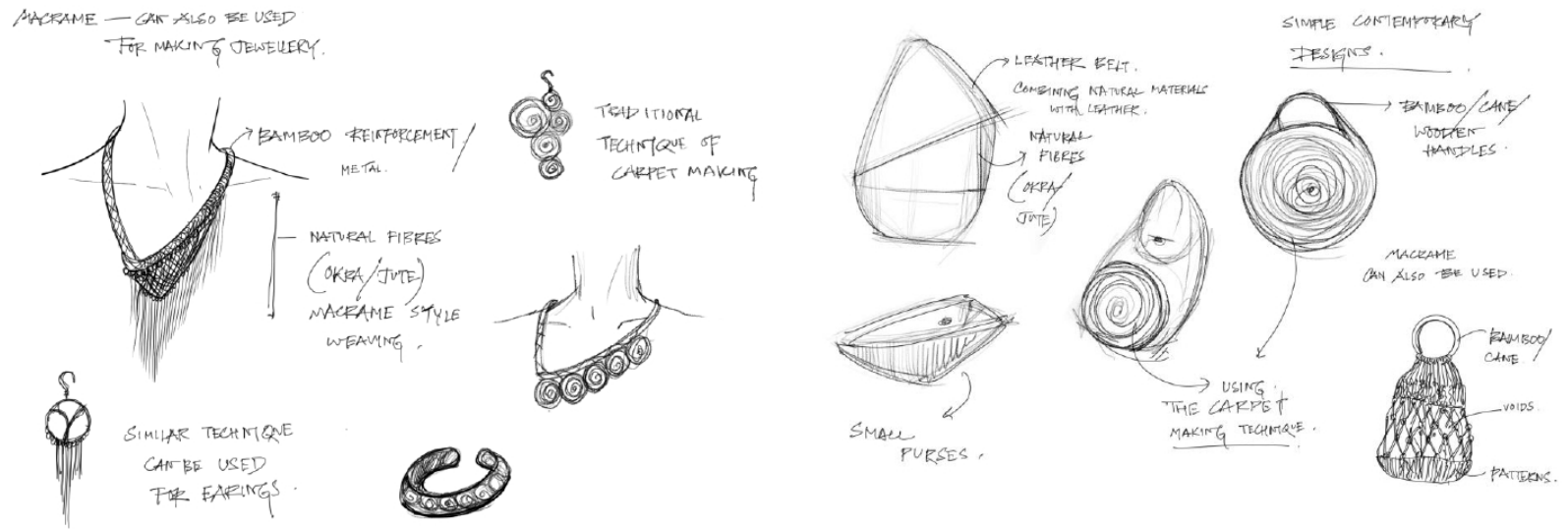


Fig 35: Ideation 3
Source: Author



Initial Ideations


- In order to attract the urban consumers, natural fibres are being used to make premium packaging for luxury items and gift items.
- Lots of different types of organisers are also made using natural fibres or a combination of soft and hard natural materials.


PREMIUM PACKAGING CAN BE MADE
 ↳ FOCUSING ON URBAN MARKET.
 ↓
 LUXURY PRODUCTS.

PRODUCTS

- COSMETICS
- BODY CARE PRODUCTS.
- WINE PACKAGING.
- SOUVENIR PACKAGING.

Various hygiene based products using jute bags for storage.
 ↓
 Due to its breathable fabric.

 → POTTIS (Jute/okra)
 ○ Packaging of souvenirs/
 ○ Special gift packaging of chocolates/sweets/ any small item.

 → Baskets.

ORGANIZERS
 MODULARITY - ONE OF THE MAIN FEATURES TO LOOK AT IN THIS CATEGORY.



BASKETS OR ORGANISERS LIKE THIS CAN BE MADE USING NATURAL FIBRE FIBRES

THESE CAN ALSO BE STACKED. - MODULAR.



SPINNING AND USING ADHESIVE FOR HOLDING THE STRUCTURE.

NATURAL FIBRES CAN ALSO BE COMBINED WITH BAMBOO, WOOD OR METALS.

Fig 36: Ideation 4
 Source: Author





06.

Secondary Research

Plastic pollution

- Plastic pollution is having a negative impact on our oceans and wildlife health.
- High-income countries generate more plastic waste per person
- In the chart we see the total plastic waste generation by country, measured in tonnes per year. This therefore takes account of per capita waste generation and population size.

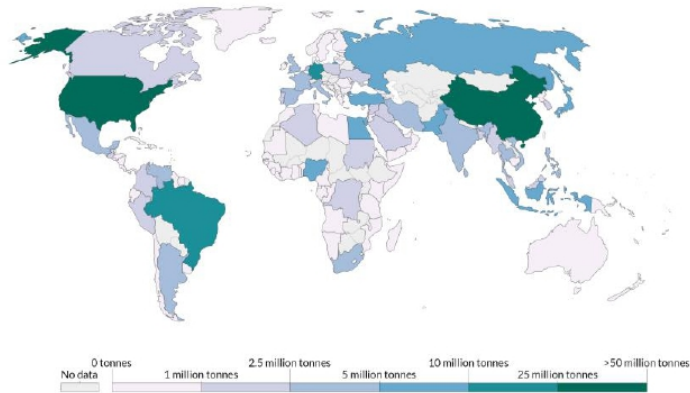
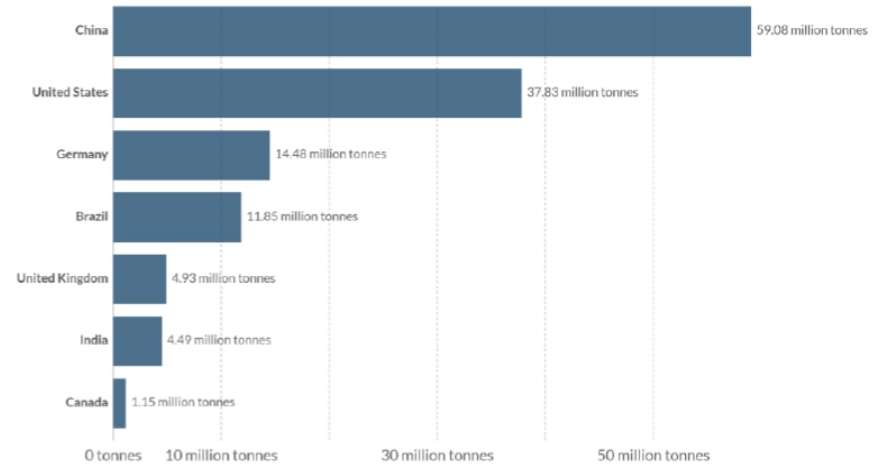


Fig 37: Plastic waste generation map
Source: [IR9]

Plastic waste generation, 2010

Total plastic waste generation by country, measured in tonnes per year. This measures total plastic waste generation prior to management and therefore does not represent the quantity of plastic at risk of polluting waterways, rivers and the ocean environment. High-income countries typically have well-managed waste streams and therefore low levels of plastic pollution to external environments.

Our World
In Data



Source: OWID based on Jambeck et al. (2015) & World Bank

CC BY

Fig 38: Plastic waste generation data
Source: [IR9]



Plastic pollution

- o Plastic waste production is maximum in the South Asian zone.

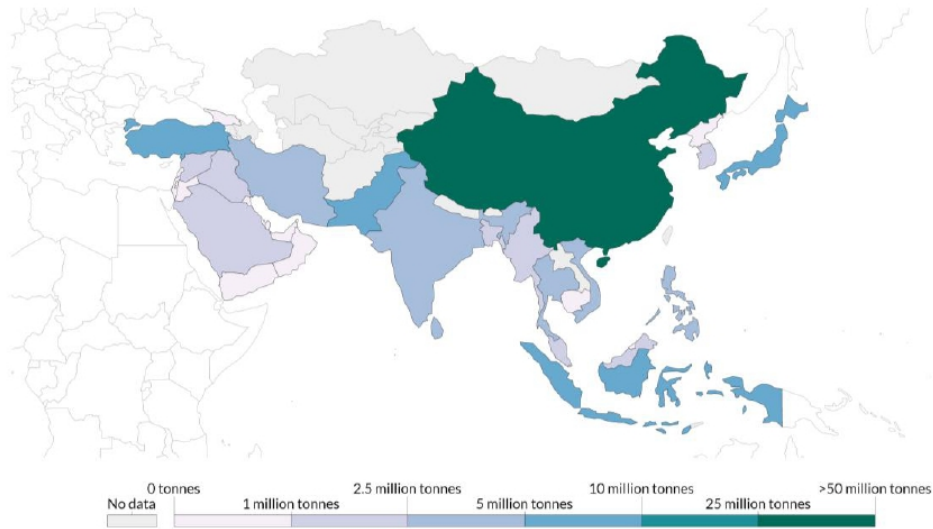


Fig 39: Plastic waste generation map (Asia)
Source: [IR9]

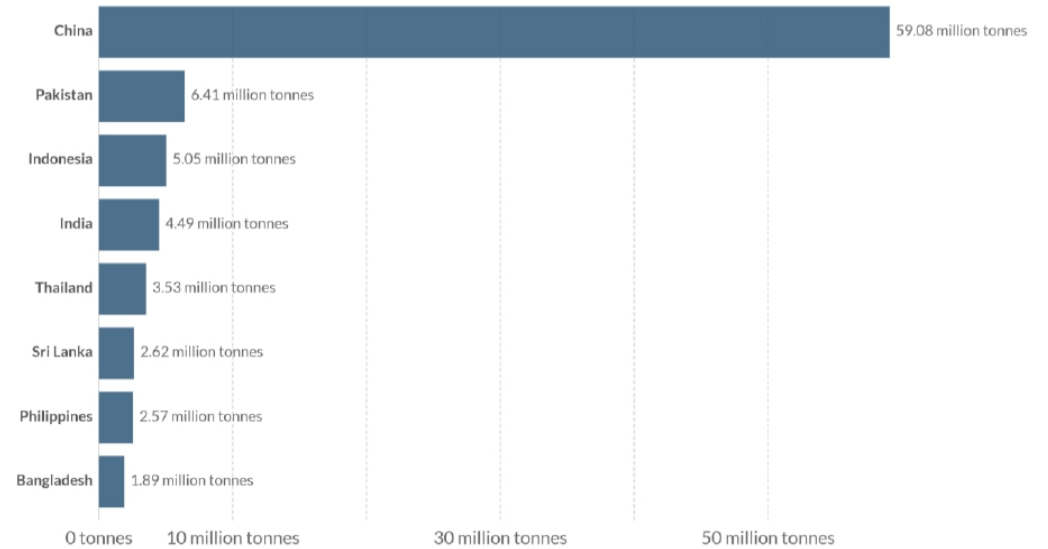


Fig 40: Plastic waste generation data (Asia)
Source: [IR9]



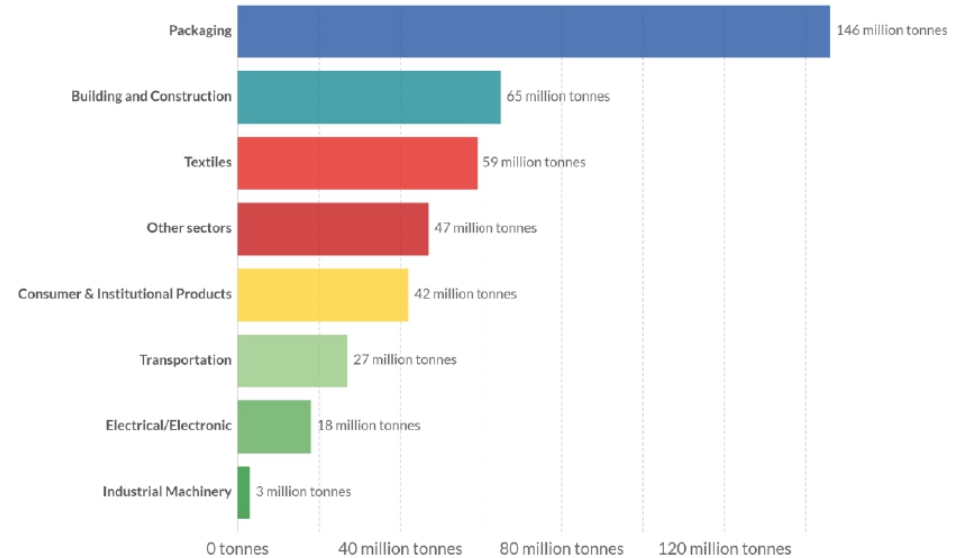
Plastic pollution

- The packaging industry produces a lot of plastic waste as seen in the chart.
- Packaging was the dominant use of primary plastics, with 42 percent of plastics entering the use phase.
- Packaging has a very short 'in-use' lifetime (typically around 6 months or less). This is in contrast to building and construction, where plastic use has a mean lifetime of 35 years.

Primary plastic production by industrial sector, 2015

Primary global plastic production by industrial sector allocation, measured in tonnes per year.

Our World
in Data



Source: Geyer et al. (2017)

CC BY

Fig 41: Plastic waste generation by different sectors

Source: [IR9]



Plastic pollution

Mismanaged waste is the sum of inadequately managed waste (that which is not formally managed such as disposal in dumps or open, uncontrolled landfills which could leak to the surrounding environment) and littered waste.

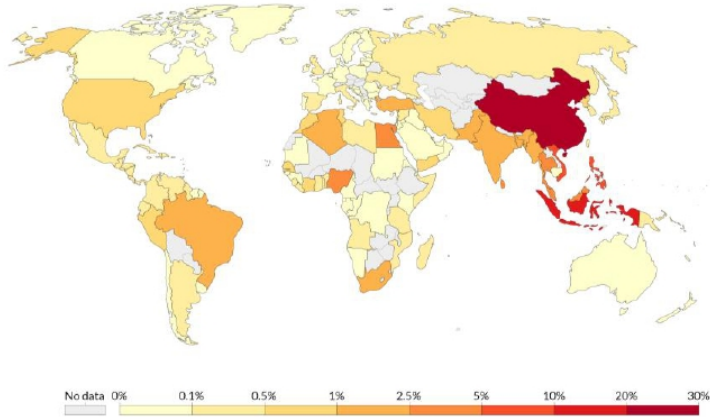
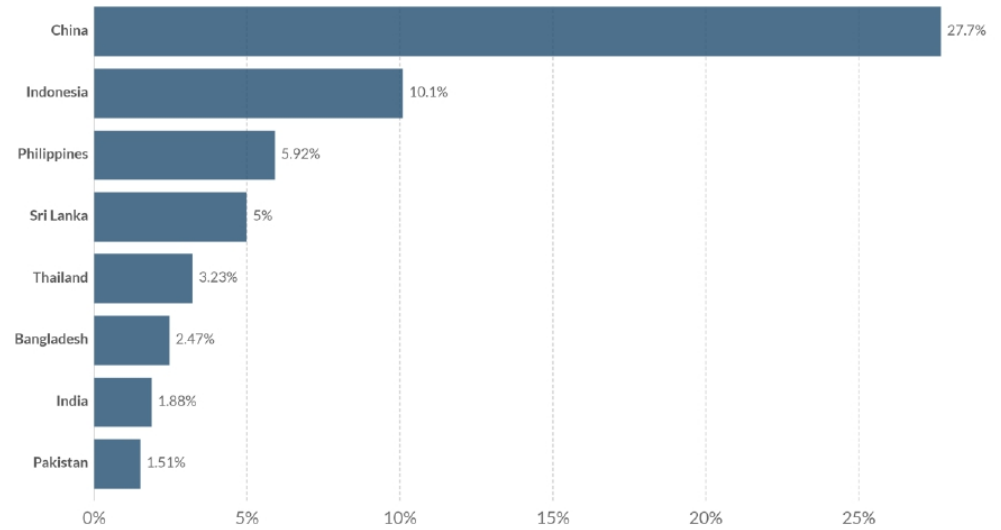


Fig 42: Mismanaged plastic waste
Source: [IR9]

Share of global mismanaged waste, 2010

Global share of mismanaged plastic waste derived from a given country. Mismanaged waste is the sum of littered or inadequately disposed waste. Inadequately disposed waste is not formally managed and includes disposal in dumps or open, uncontrolled landfills, where it is not fully contained. Mismanaged waste could eventually enter the ocean via inland waterways, wastewater outflows, and transport by wind or tides.



Source: Jambeck et al. (2015)

CC BY

Fig 43: Mismanaged plastic waste data (Asia)
Source: [IR9]



Plastic pollution

Projected mismanaged plastic waste in 2025.

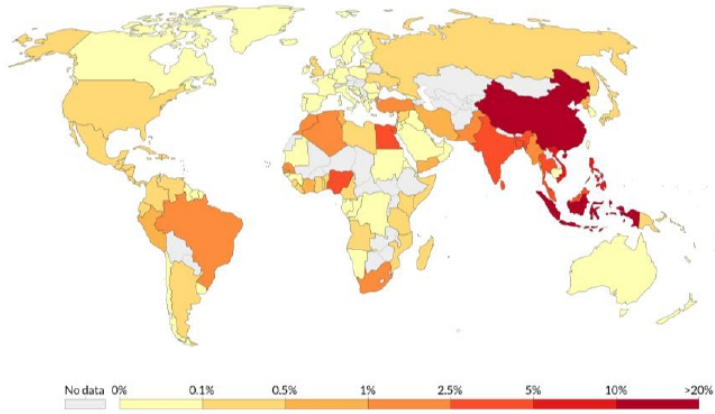
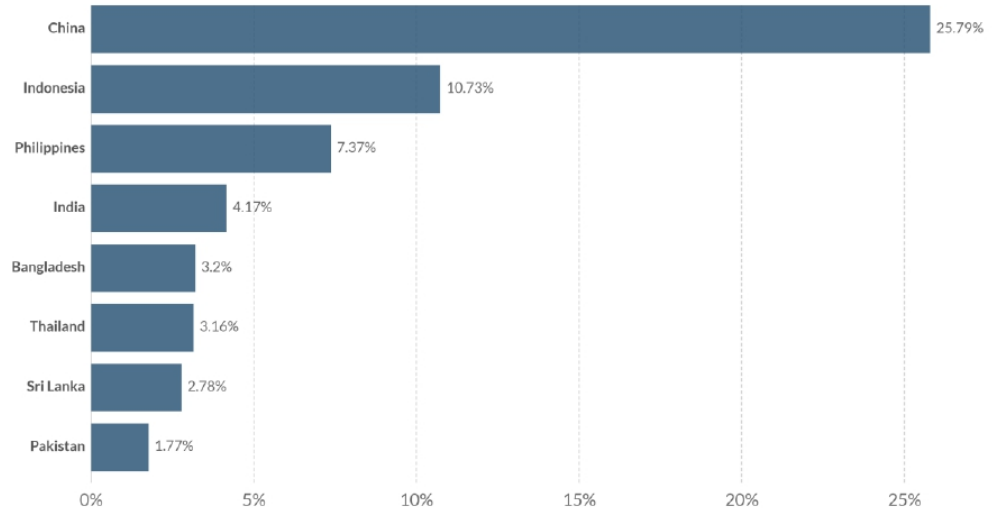


Fig 44: Projected Mismanaged plastic waste
Source: [IR9]

Projected share of global mismanaged plastic waste in 2025

Projected share of global mismanaged waste produced in 2025. This is measured as the total mismanaged waste by populations within 50km of the coastline, and therefore defined as high risk of entering the oceans. Mismanaged plastic waste is defined as "plastic that is either littered or inadequately disposed. Inadequately disposed waste is not formally managed and includes disposal in dumps or open, uncontrolled landfills, where it is not fully contained. Mismanaged waste could eventually enter the ocean via inland waterways, wastewater outflows, and transport by wind or tides."



Source: Jambeck et al. (2015)

CC BY

Fig 45: Projected Mismanaged plastic waste data (Asia)
Source: [IR9]



07. Analysis

Inference

- In recent times, natural fibres have been used to produce a wide range of products starting from traditional carpets and rugs to contemporary style furniture and accessories.
- In some cases, a combination of natural fibres and natural hard materials like bamboo, wood or metals have also been observed.
- Lots of e-commerce websites trying to empower local craftsmen by translating their work to produce a range of contemporary products.
- Packaging produces maximum plastic waste in the world.
- Asia has the maximum share of globally mismanaged plastic wastes and it is projected to increase only.
- Different types of techniques can be used for making different categories of products like weaving, macrame (knotting), etc.
- **The existing demand of the market has led to reimagining traditional techniques to produce different range of products.**



Techniques of using Natural fibres



Fig 46: Techniques using natural fibres
Source: [IR7]



Techniques of using Natural fibres



Fig 47: Techniques using natural fibres
Source: [IR7]



Techniques of using Natural fibres

This technique is presently used for making carpets mainly.

But the technique has properties of **modularity and geometric form** that can be used in different ways to achieve different products.

Hence, the aim is to study the **technique and come up with ways in which it can be utilised to a greater extent for making contemporary style products.**



Fig 48: Techniques using natural fibres
Source: [IR7]



09.

User Group Study

User Personas

The designed products are targeted for the urban market.

These are the various personas that have been created to give an idea about which type of users will be keen on buying this product range.



Architects, Designers, artists

- Characteristics – Educated in various contemporary and traditional art and craft forms.
- Income group – higher middle class to rich



Art enthusiasts

- Characteristics – Interested in various contemporary and traditional art and craft forms.
- Income group – higher middle class to rich



Eco-friendly product enthusiasts

- Characteristics – Interested in products made with eco-friendly materials.
- Income group – higher middle class to rich



10. Design Brief (Revised)

Revised Design Brief

Target User

For the urban market

Design Objective

“Designing a range of home and lifestyle products with natural fibres using a particular existing traditional technique and combining them with natural hard materials like bamboo, wood and metals.”

Design Brief

- Using combination of natural fibres and natural hard material.
- Using traditional techniques of local craftsmen and translating them into contemporary forms.
- Studying the traditional technique and ideating on different possible product solutions.
- Designing a range of contemporary home and lifestyle products.



 **11.****Design Directions and
Ideations**

Mind mapping

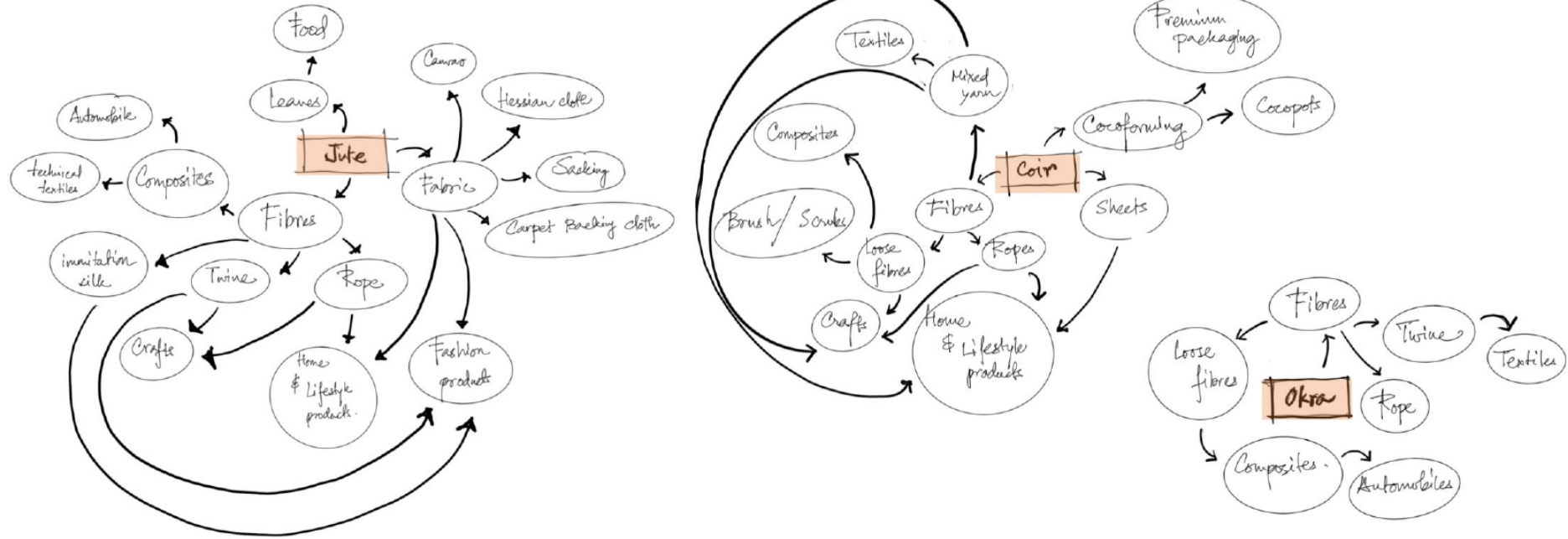
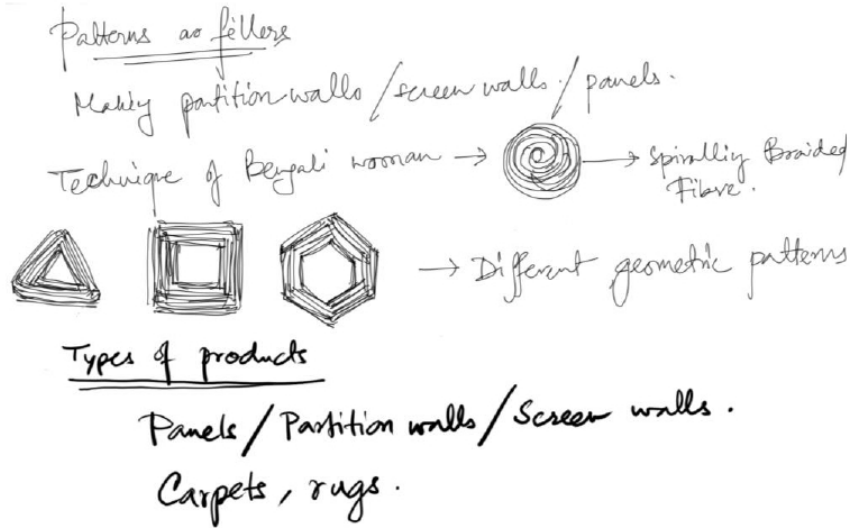


Fig 49: Mind mapping
Source: author



Design Direction

Exploring the technique of spiralling braided natural fibres and creating a range of contemporary home and lifestyle accessories.



Creating Different patterns:

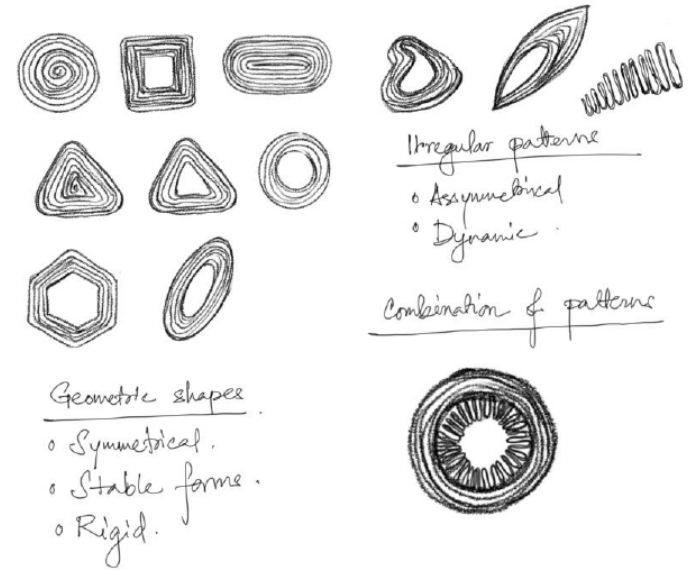


Fig 50: Design direction
Source: author



Design Direction and Initial Ideations

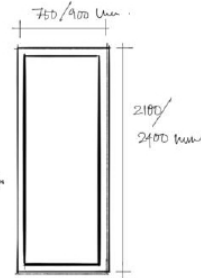
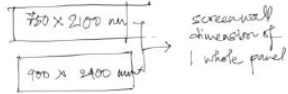
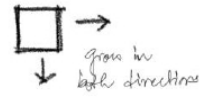
Direction 1

Using patterns as modules and generating panels.

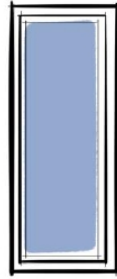
These panels can be used to make products like screen walls, partitions, wall deco, lamps.

The panel size fixed as 300 x 300 mm so that it can be used in a modular way and multiplied in both directions to produce larger panels.

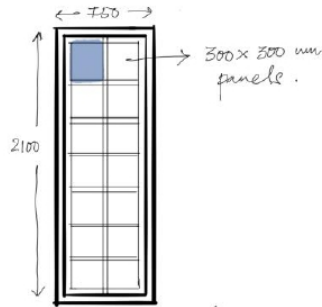
Patterns used as modules



2 Types



1 single panel.

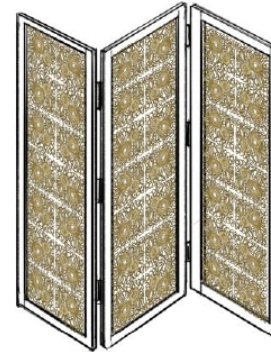


2100

300 x 300 mm panels.

Multiple panels.

IDEA 1.1



IDEA 1.2

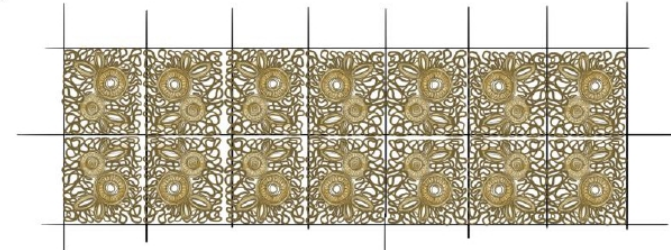
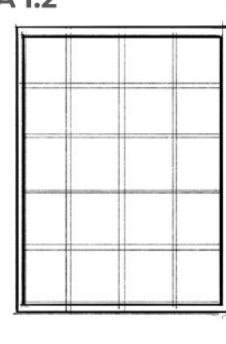


Fig 51: Design direction 1
Source: author

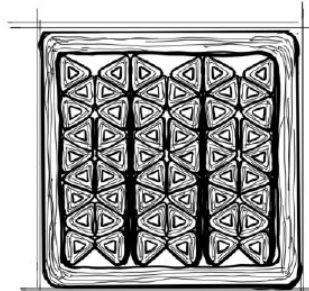
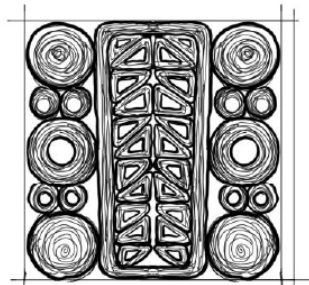


Design Direction and Initial Ideations

Direction 1

Creating jail works with natural fibres.

Stitching is used for fixing the natural fibre to the wood or bamboo frame of the panel.

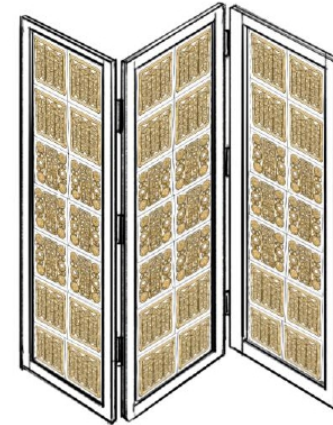


Patterns created with natural fibres using the technique of spiralling braided fibre.

INSPIRATION



INTEGRATE JALI WORKS IN EXISTING SCREEN WALLS.



Screen walls with mixed panels can be made to offer variation.

TYPES OF PRODUCTS :-

- SCREEN WALLS
- PARTITION WALLS
- WALL DECOR
- CARPETS & RUGS.

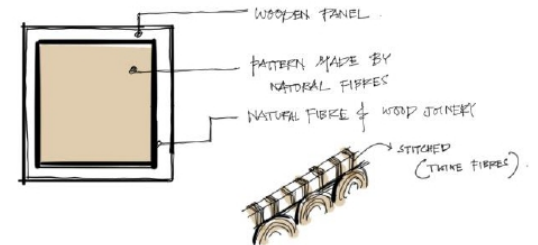


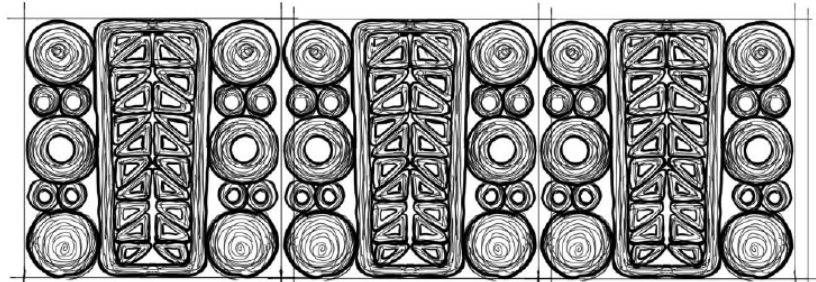
Fig 52: Design direction 1
Source: author



Design Direction and Initial Ideations

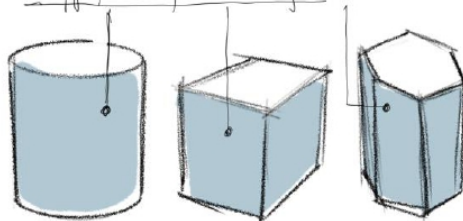
Direction 2

Using a long stretch of the patterns created and producing geometric forms by wrapping.



↻ ⊥ sketch of patterns

Wrapped around the surface



TYPES OF PRODUCTS

- LAMPS
- BAGS
- ORGANISERS

IDEA 2.1



Light will create an interesting shadows through the patterns.

IDEA 2.2



Fig 53: Design direction 2
Source: author



Design Direction and Initial Ideations

Direction 3

Using a long stretch of the patterns created and producing contemporary chairs and stools by the method of draping.

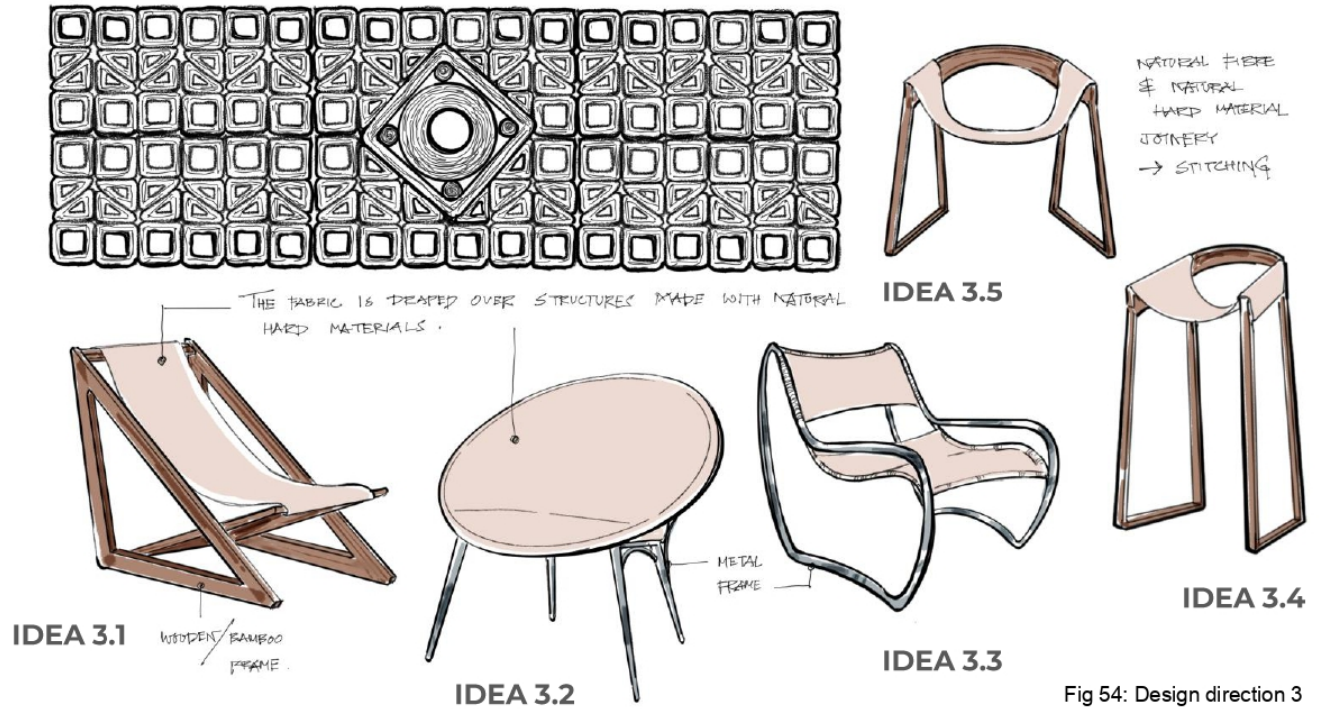


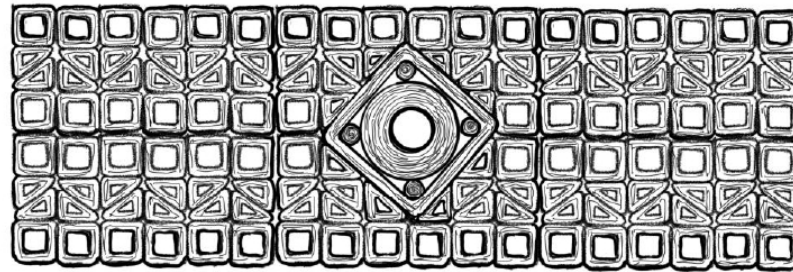
Fig 54: Design direction 3
Source: author



Design Direction and Initial Ideations

Direction 3

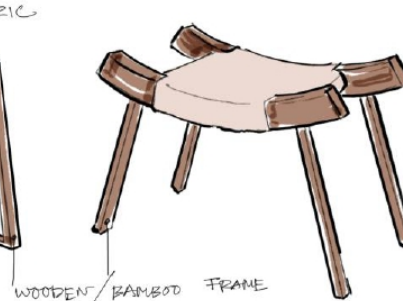
Using a long stretch of the patterns created and producing contemporary chairs and stools by the method of draping.



SAME TECHNIQUE USED TO DESIGN STOOLS.

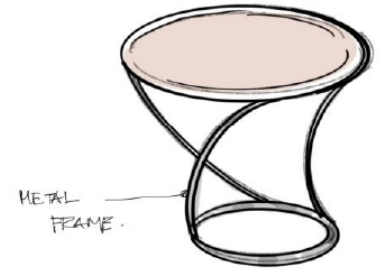


IDEA 3.6



IDEA 3.7

IDEA 3.9



IDEA 3.8

Fig 55: Design direction 3
Source: author

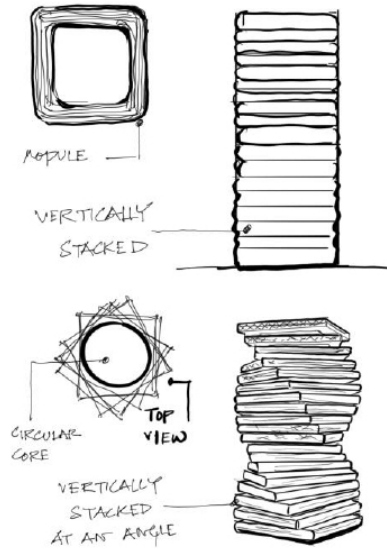


Design Direction and Initial Ideations

Direction 4

Using the technique to make interesting forms with the help of moulds or modularity.

USING THE TECHNIQUE OF SPIRALLING NATURAL FIBRES AND GENERATING INTERESTING FORMS. **IDEA 4.1**



TYPES OF PRODUCTS

- VASE
- LAMPS
- ORGANISERS

IDEA 4.2



USING BRAIDED FIBRE & SPIRALLING ON DIFFERENT SURFACE.

• CONTEMPORARY FORMS.

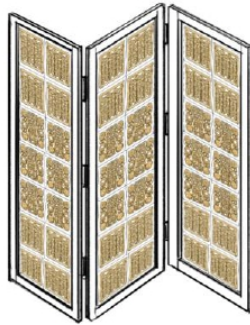
TYPES OF PRODUCTS

- BASKETS
- VASE
- LAMPS
- ORGANISERS

Fig 56: Design direction 4
Source: author



Comparing the Directions



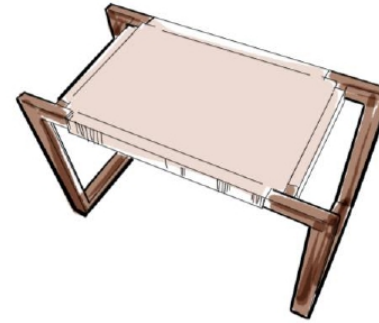
Direction 1 (Partitions)

- The traditional technique adds more value to the form.
 - Use of modularity
- Use of natural hard materials only for structural support.
- Wide range of forms can be achieved through simple craftsmanship.



Direction 2 (Lamps)

- The traditional technique adds more value to the form.
 - Use of modularity
- Use of natural hard materials only for structural support.
- Wide range of forms can be achieved through simple craftsmanship.



Direction 3 (Furnitures)

- Significance of the technique and natural fibres is lost.
 - Use of modularity
- Use of natural hard materials is more and required for achieving the form.
- Wide range of forms can be achieved but very skilled craftsmanship is required.



Direction 4 (Vase, organisers, baskets)

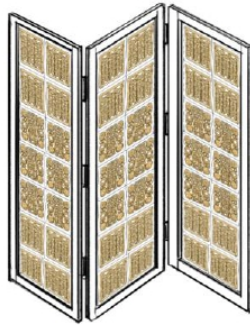
- The traditional technique adds more value to the form.
 - Modularity may or may not be used.
 - No use of natural hard materials.
- Limited range of forms can be achieved with the help of moulds.

Factors

- Importance of technique
- Modularity
- Structure and form
- Range



Comparing the Directions



Direction 1 (Partitions)

- The traditional technique adds more value to the form.
- Use of modularity
- Use of natural hard materials only for structural support.
- Wide range of forms can be achieved through simple craftsmanship.



Direction 2 (Lamps)

- The traditional technique adds more value to the form.
- Use of modularity
- Use of natural hard materials only for structural support.
- Wide range of forms can be achieved through simple craftsmanship.



Direction 3 (Furnitures)

- Significance of the technique and natural fibres is lost.
- Use of modularity
- Use of natural hard materials is more and required for achieving the form.
- Wide range of forms can be achieved but very skilled craftsmanship is required.



Direction 4 (Vase, organisers, baskets)

- The traditional technique adds more value to the form.
- Modularity may or may not be used.
- No use of natural hard materials.
- Limited range of forms can be achieved with the help of moulds.

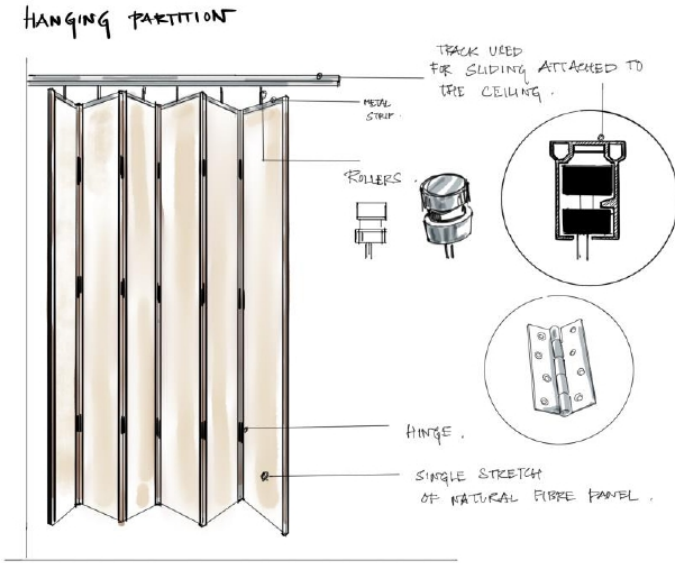




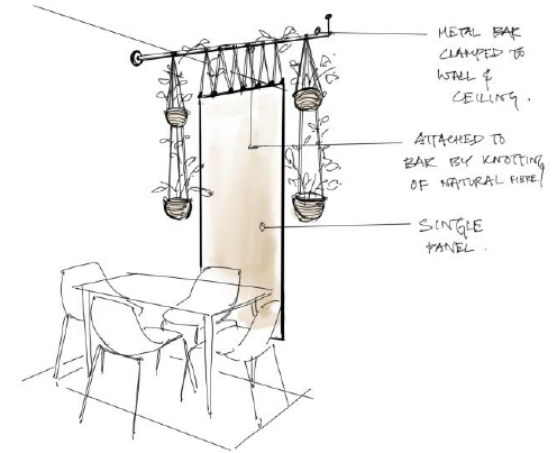
11. Ideations

Ideations (Direction 1)

Idea 1
Hanging partitions



IDEA 1.1 FOLDABLE HANGING PARTITION.
USED TO COVER LONG STRETCHES OF SPACE.
USE : BETWEEN LIVING & DINING



IDEA 1.2 DECORATIVE HANGING PARTITION.
USED MAINLY AS A DECORATIVE FEATURE
OR FOR SEGREGATING SMALL SPACES.
USE : LIVING OR DINING ROOM

Fig 57: Idea 1 (Direction 1)
Source: author



Ideations (Direction 1)

Idea 2

Foldable screen walls

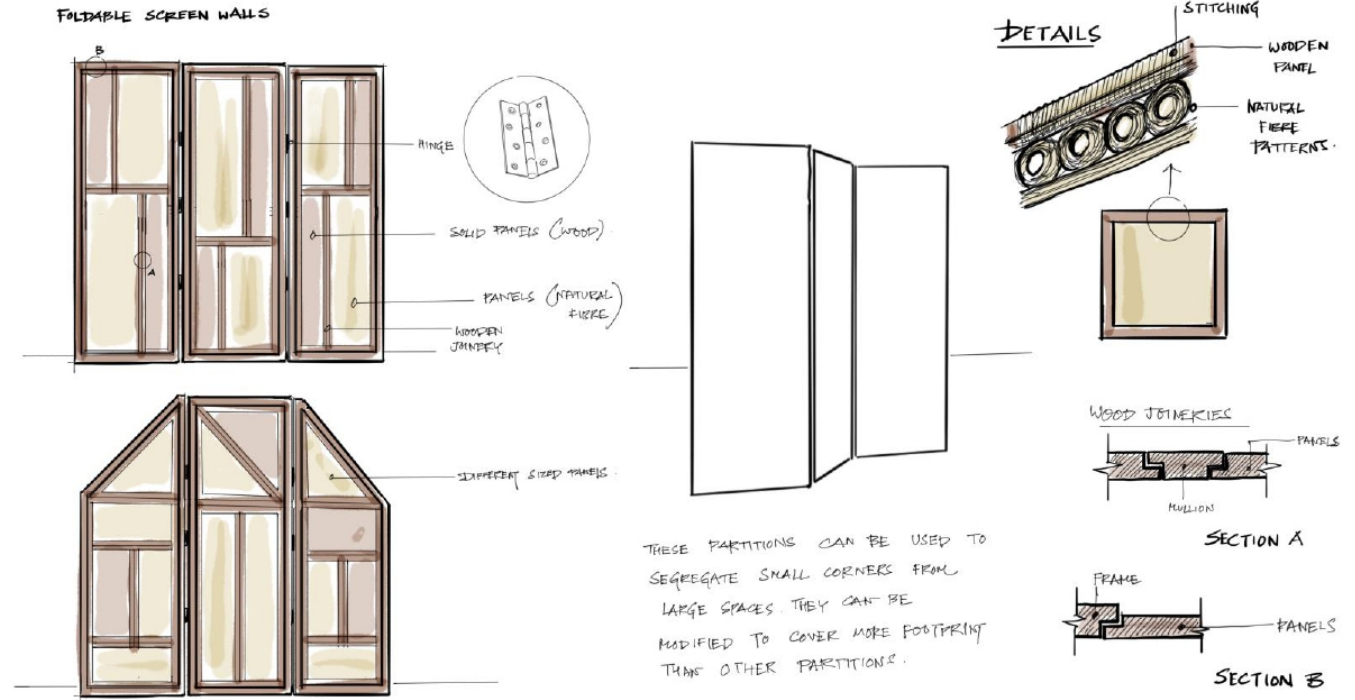


Fig 58: Idea 2 (Direction 1)

Source: author



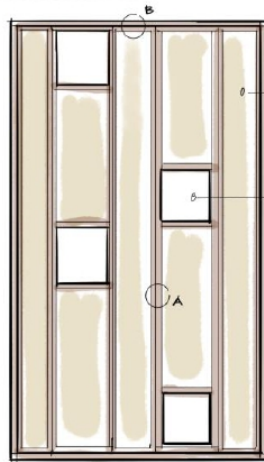
Ideations (Direction 1)

Idea 3

Fixed partition with different types of panels.

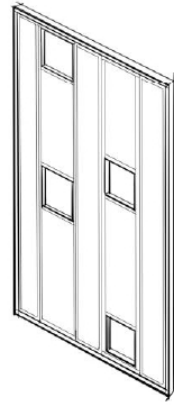
IDEA 3.1

FIXED PARTITIONS

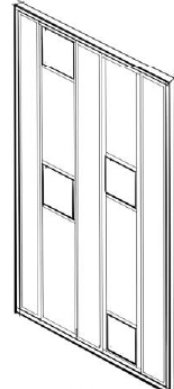


PANELS
(NATURAL
FIBRES)

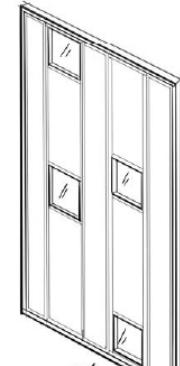
DIFFERENT
TYPES OF
PANELS
(SOLID/VOID)
(TRANSPARENT/
OPAQUE)



VOID PANELS



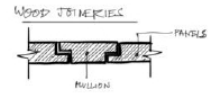
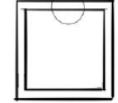
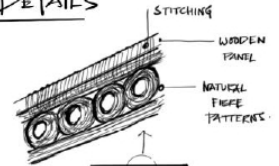
OPAQUE WOODEN
PANELS



GLASS/
ACRYLIC PANELS
(TRANSPARENT)

USED FOR SEPARATING SPACES PERMANENTLY.

DETAILS



SECTION A



SECTION B

Fig 59: Idea 3 (Direction 1)

Source: author



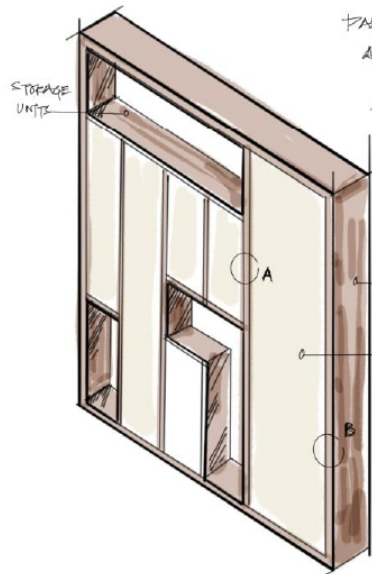
Ideations (Direction 1)

Idea 3

Fixed partition with different types of panels.

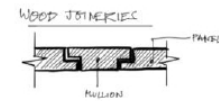
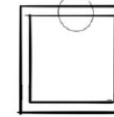
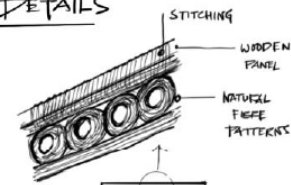
IDEA 3.2

FIXED PARTITION WITH STORAGE

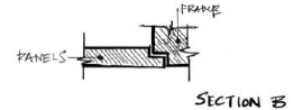


PARTITIONS CAN ALSO BE USED AS STORAGE UNITS MAINLY IN LIVING ROOM AREAS

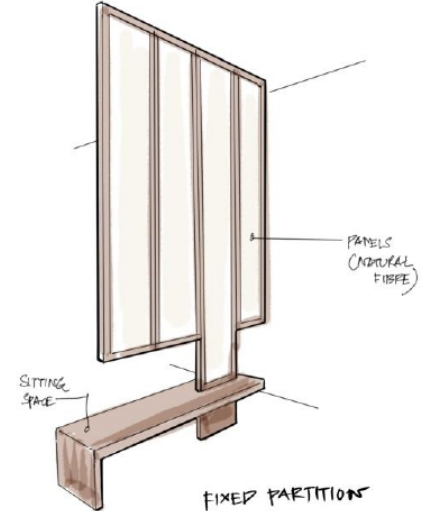
DETAILS



SECTION A



SECTION B



FIXED PARTITION WITH SEATING AREA.
• FOR CREATING A FOYER.

Fig 60: Idea 3 (Direction 1)
Source: author



Ideations (Direction 1)

Idea 3

Fixed partition with different types of panels.

IDEA 3.3

MULTIPURPOSE FIXED PARTITION

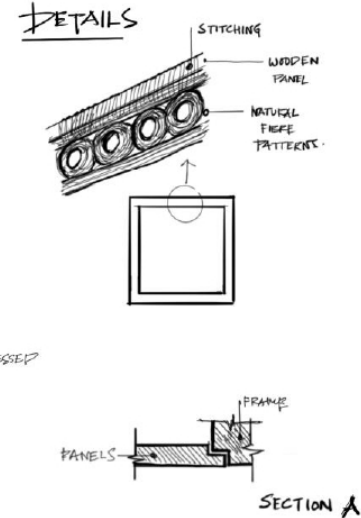
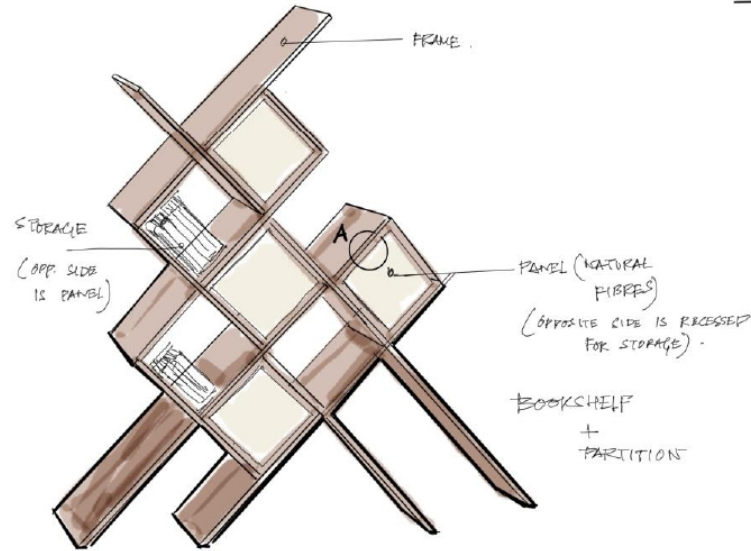


Fig 61: Idea 3 (Direction 1)
Source: author

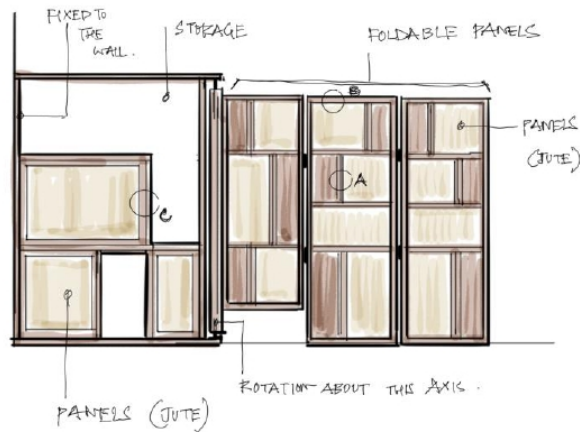


Ideations (Direction 1)

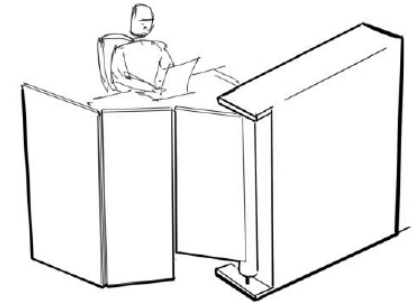
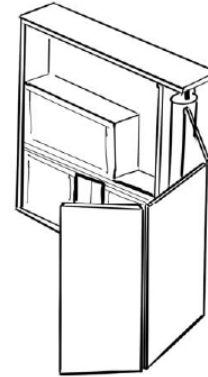
Idea 4

Fixed partition with storage and foldable screens.

FIXED PARTITION WITH STORAGE & FOLDABLE PANELS



CAN BE USED TO SEPARATE SMALL SPACES LIKE WORKSTATIONS, THE FOLDABLE PANELS CAN BE MANIPULATED ACCORDING TO THE USER'S PREFERENCE.



DETAILS

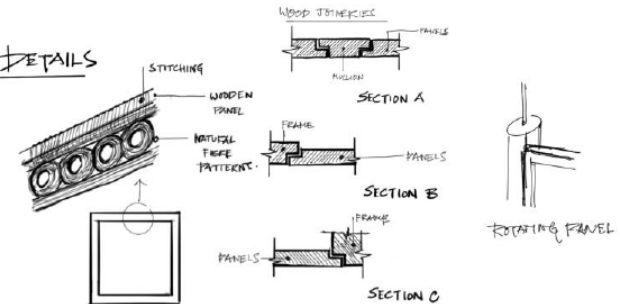


Fig 62: Idea 4 (Direction 1)
Source: author



Ideations (Direction 2)

Using a long stretch of the patterns created and producing geometric forms by wrapping.

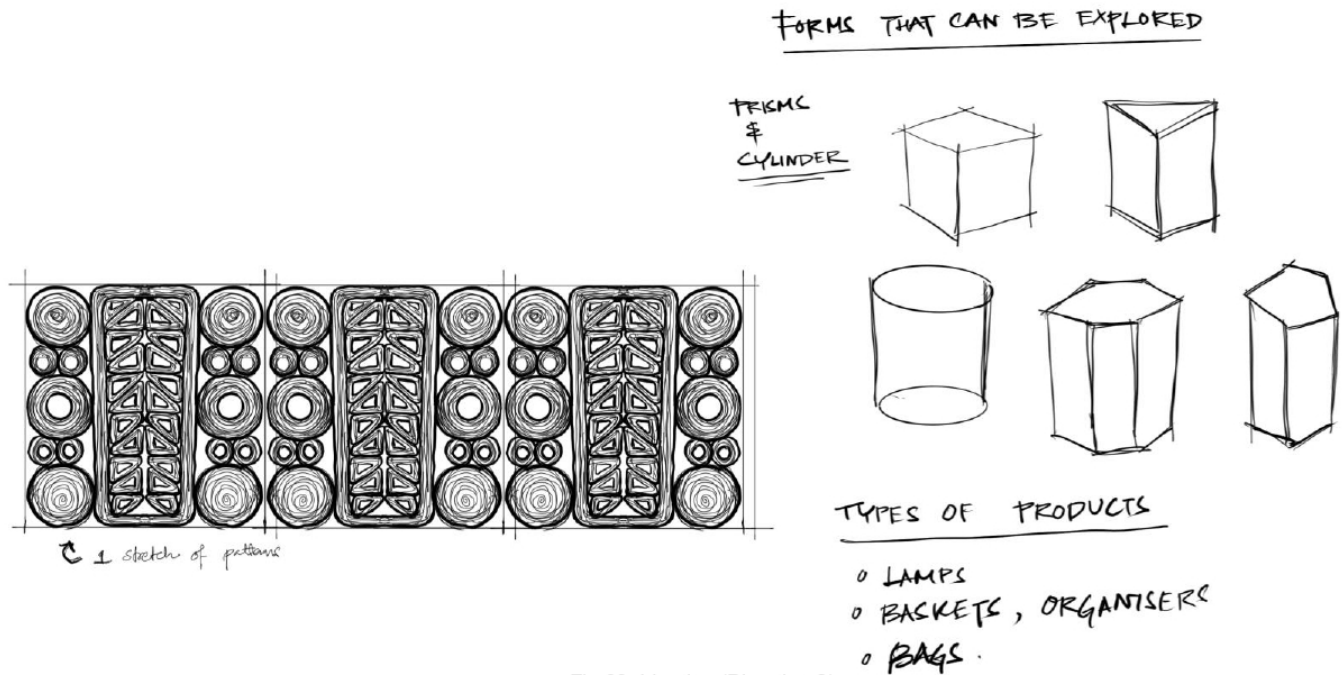


Fig 63: Ideating (Direction 2)
Source: author



Ideations (Direction 2)

Idea 1
Lamps

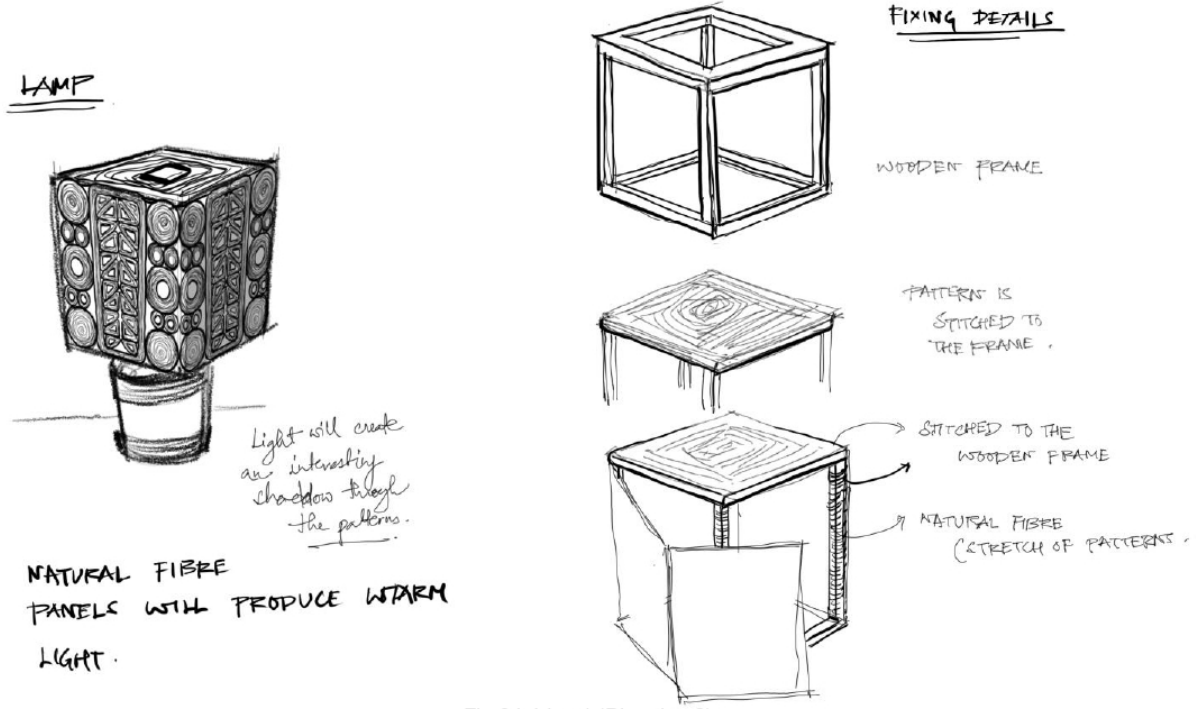


Fig 64: Idea 1 (Direction 2)
Source: author



Ideations (Direction 2)

Idea 2

Laundry bags, baskets

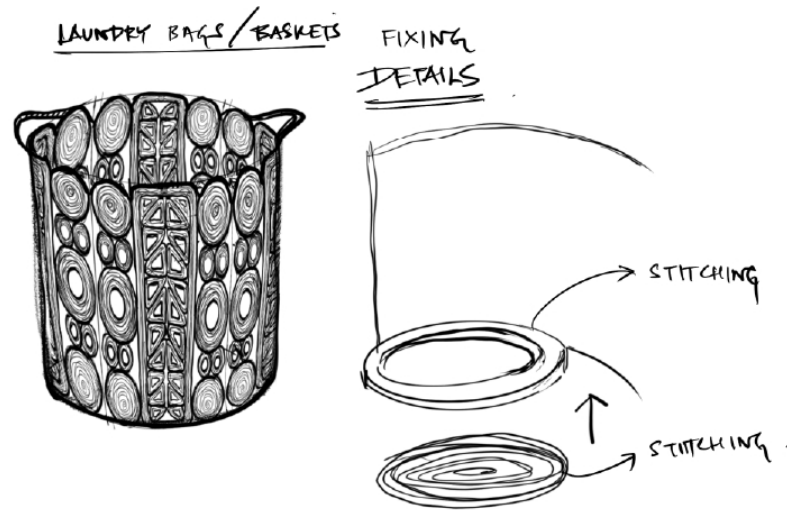


Fig 65: Idea 2 (Direction 2)
Source: author



Design Direction 1

- Among all the ideations, **Idea 2 (Foldable screen walls)** was selected to move forward to the conceptualization process.
- The factors for choosing the particular direction was its properties of **modularity, lightweight, easy mobility and malleability in terms of form and enclosure of interior spaces.**

Design Direction 2

- Among the ideations, **Idea 1 (lamps)** was selected to move forward to the conceptualization process.
- **The factors for choosing the particular direction was the value it adds to the interior spaces with the range of geometrical forms that can be achieved and also with the play of light and shadow through the fibres.**



12. Detailing

Details (Direction 1)

Detailing of the construction of the partition wall and stepwise process in both wood and bamboo.

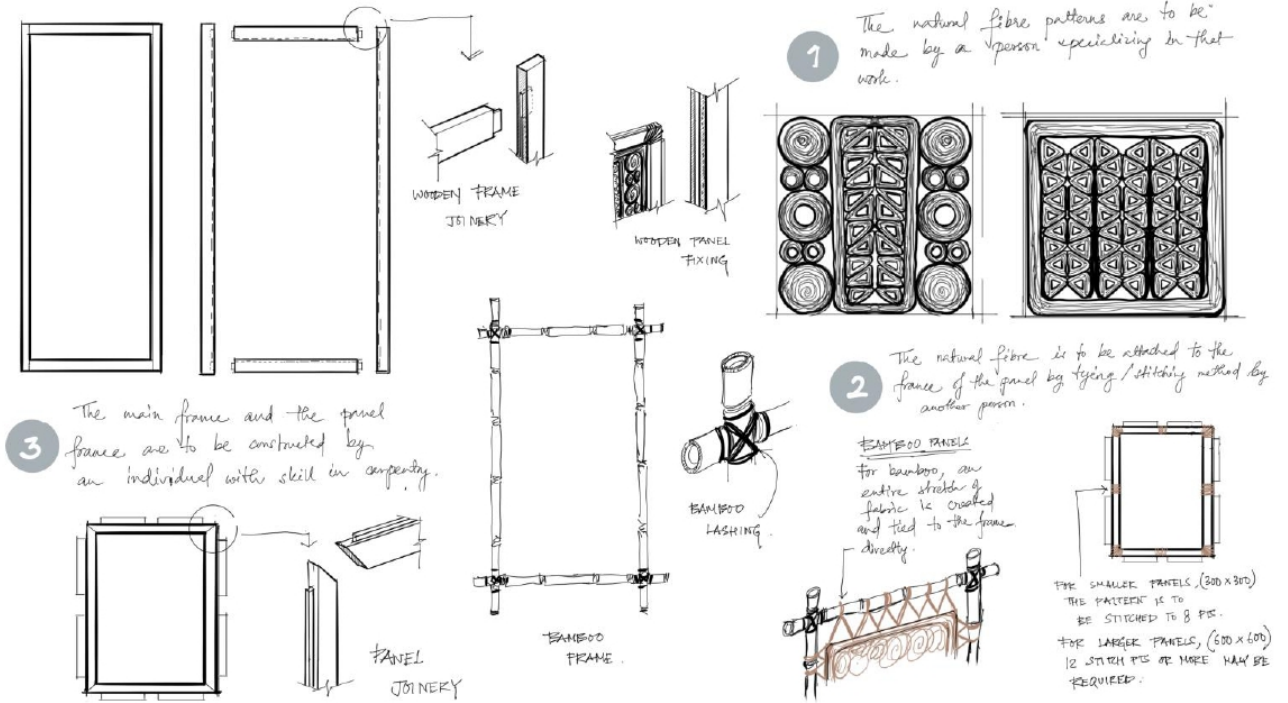


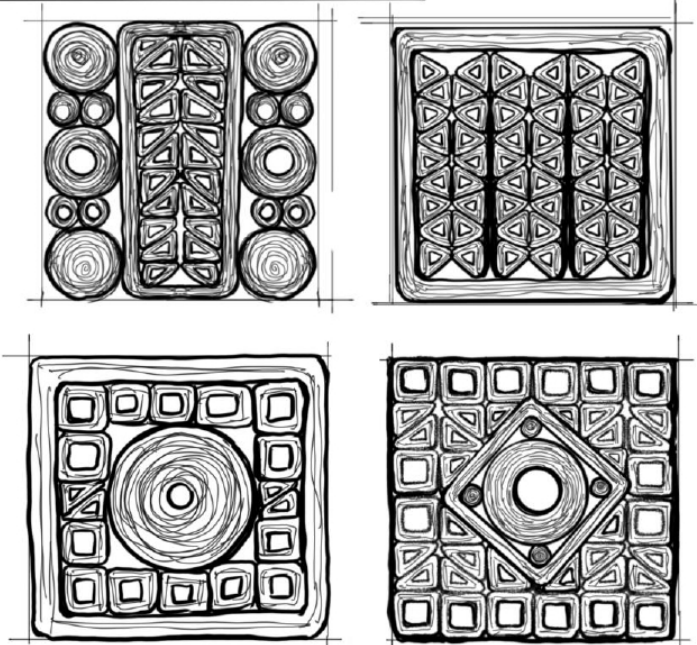
Fig 66: Detailing (Direction 1)
Source: author



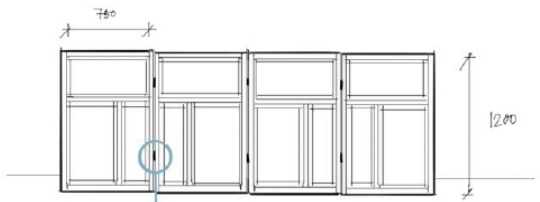
Details (Direction 1)

Creating jali works with natural fibres.

JALI PATTERNS WITH JUTE



EXISTING JALI WORK IN PARTITIONS.



HINGE.



Fig 67: Detailing (Direction 1)
Source: author



Details (Direction 1)

Process of making the panels.

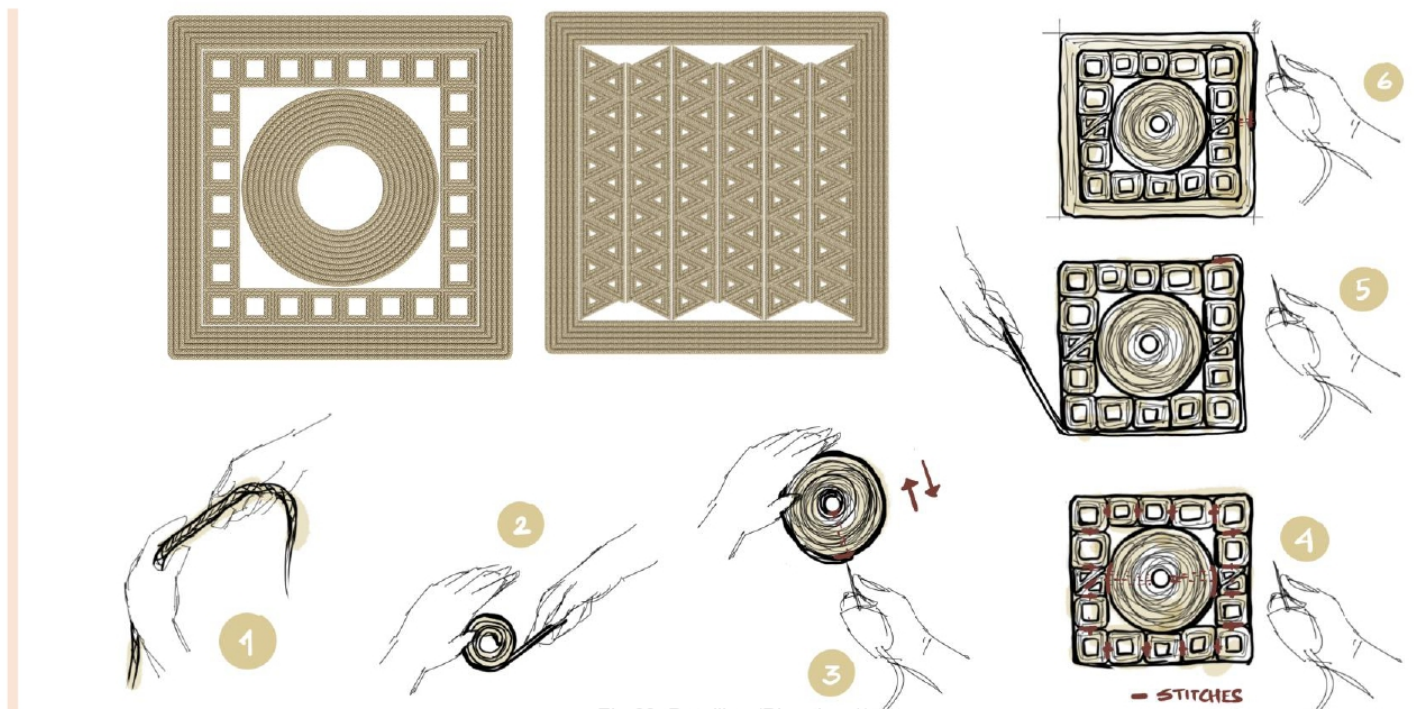


Fig 68: Detailing (Direction 1)
Source: author



Details (Direction 2)

Interior accessories – lamps

Using a long stretch of the patterns created and producing geometric forms by wrapping.

Detailing of the construction of the lamp and stepwise process in both wood and bamboo.

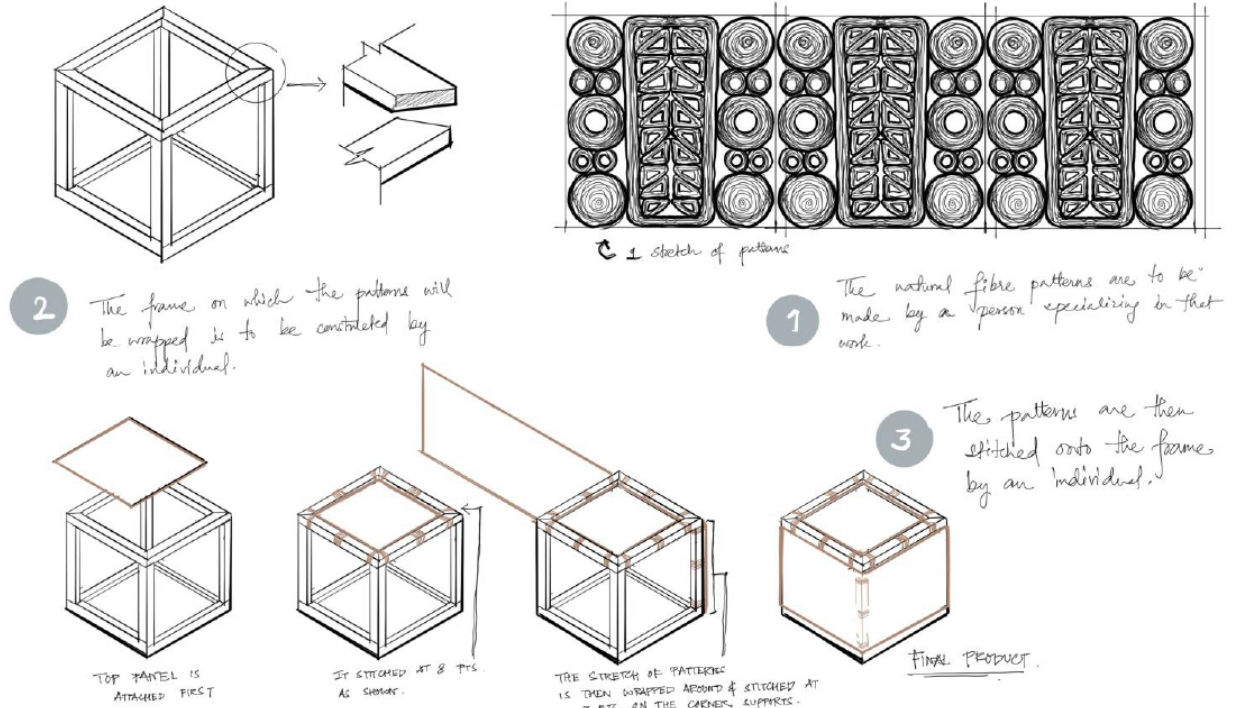


Fig 69: Detailing (Direction 2)

Source: author



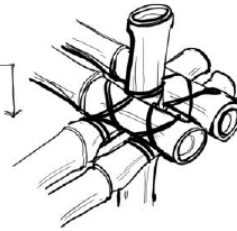
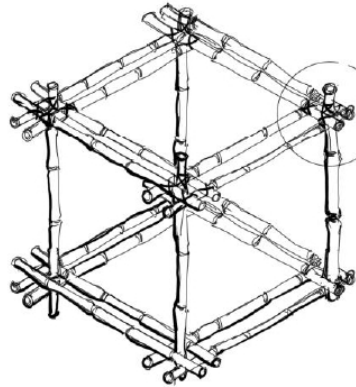
Details (Direction 2)

Interior accessories – lamps

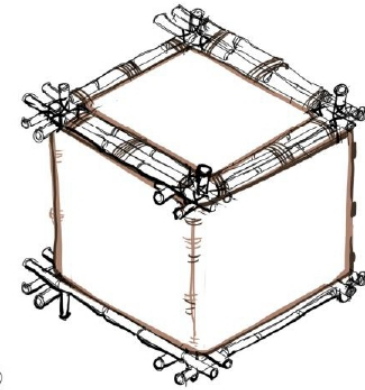
Using a long stretch of the patterns created and producing geometric forms by wrapping.

Detailing of the construction of the lamp and stepwise process in both wood and bamboo.

BAMBOO FRAME



BAMBOO JOINERY.



The remaining steps are the same for attaching the patterns to the frame.

Fig 70: Detailing (Direction 2)
Source: author





13.

Conceptualization

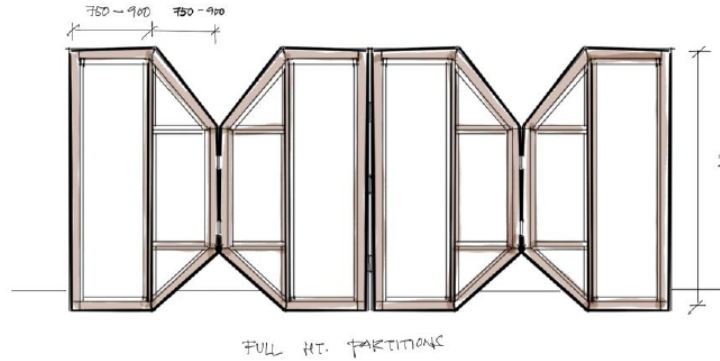
Concepts (Direction 1)

Interior spaces – partitions

Concept 1

Foldable screen walls with various panel designs.

1.1



1.2

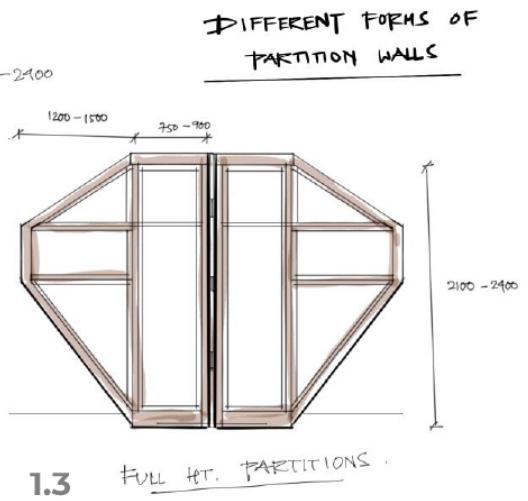
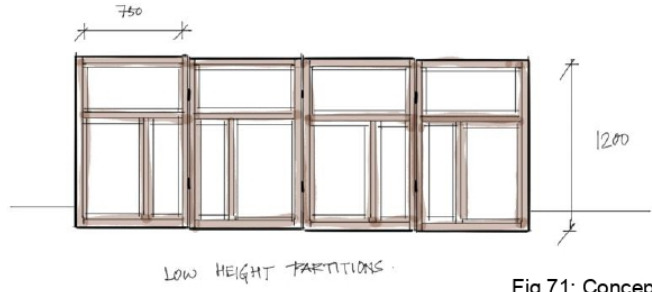


Fig 71: Concept 1 (Direction 1)
Source: author



Concepts (Direction 1)

1.4

Interior spaces – partitions

Concept 1

Foldable screen walls with various panel designs.

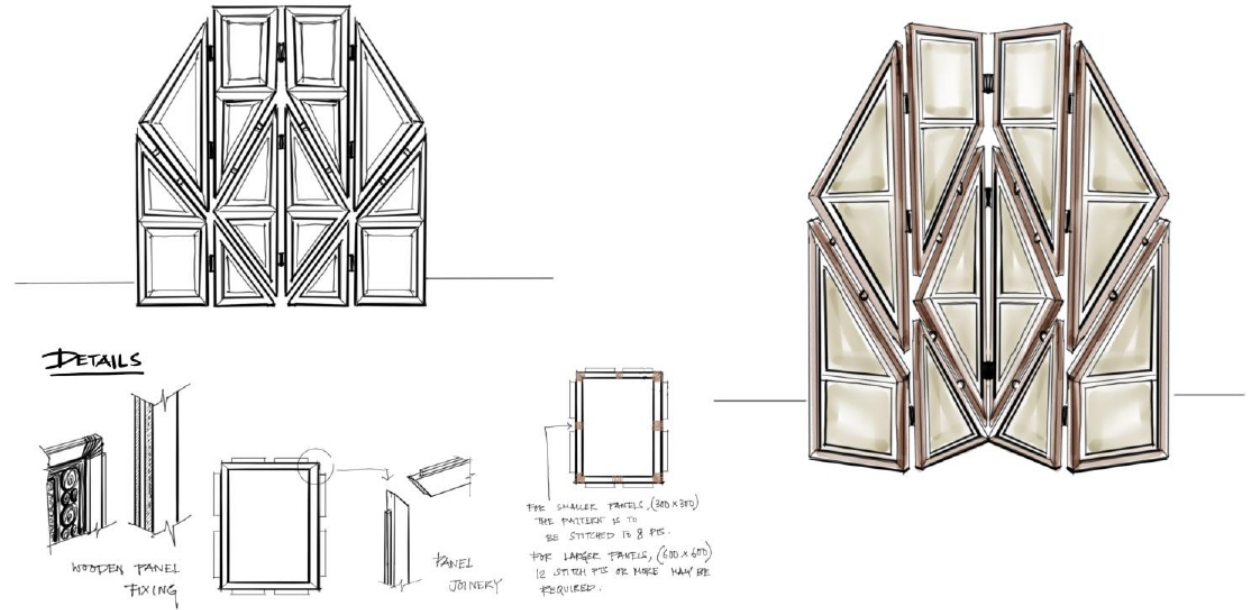


Fig 72: Concept 1 (Direction 1)
Source: author



Concepts (Direction 1)

Interior spaces – partitions

Concept 2

Foldable screen walls with full panel designs.

Hard natural material used for structure - Wood

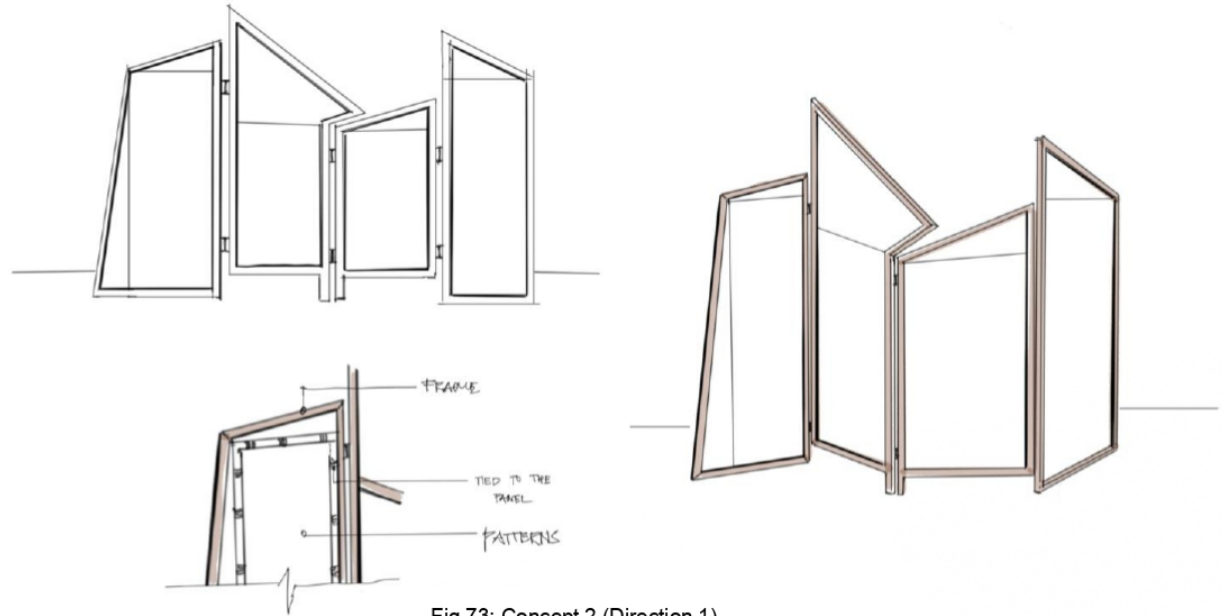


Fig 73: Concept 2 (Direction 1)
Source: author



Concepts (Direction 1)

Interior spaces – partitions

Concept 2

Foldable screen walls with full panel designs.

Hard natural material used for structure - Bamboo

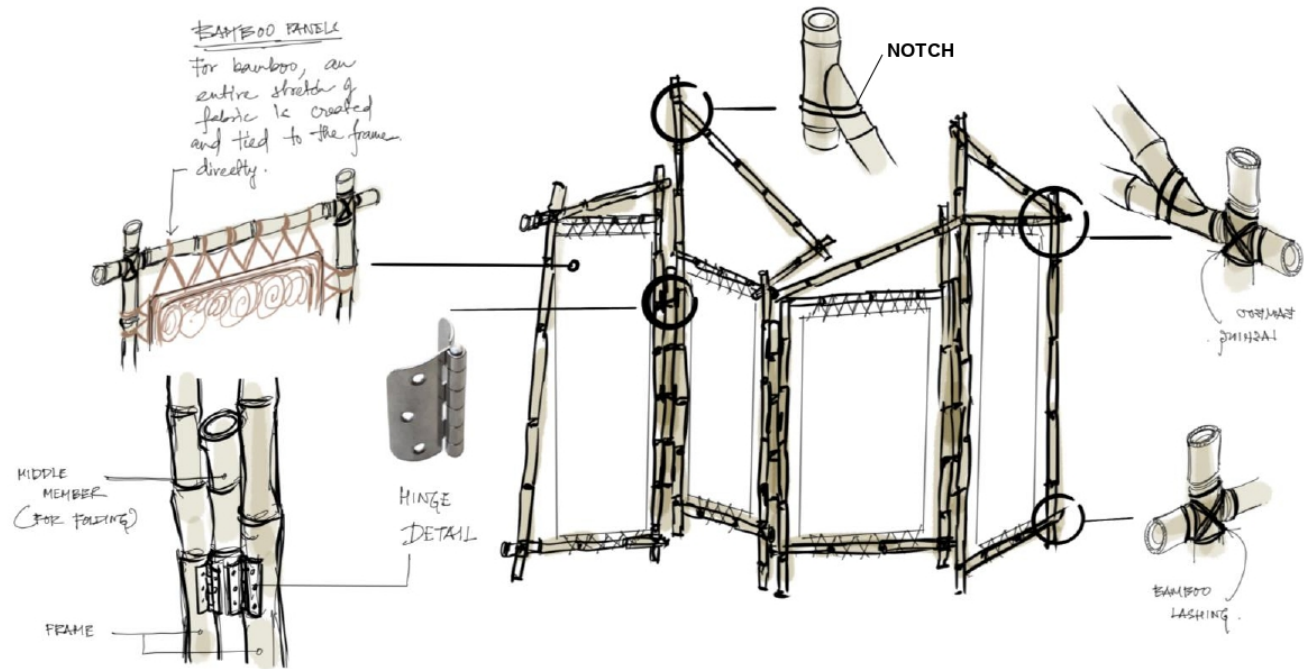


Fig 74: Concept 2 (Direction 1)
Source: author



Concepts (Direction 1)

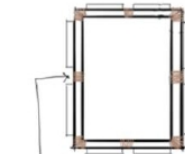
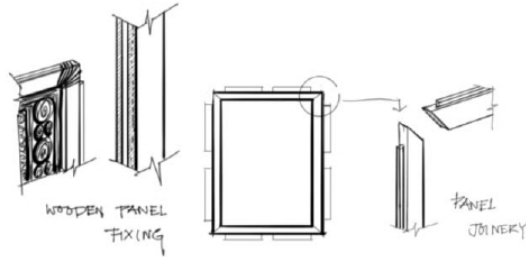
Interior spaces – partitions

Concept 3

Foldable screen walls with play of solid and void.

3.1

DETAILS



FOR SMALLER PANELS, (200 x 300)
THE PATTERN IS TO
BE STITCHED TO 8 PTS.
FOR LARGER PANELS, (600 x 600)
12 STITCH PTS OR MORE MAY BE
REQUIRED.

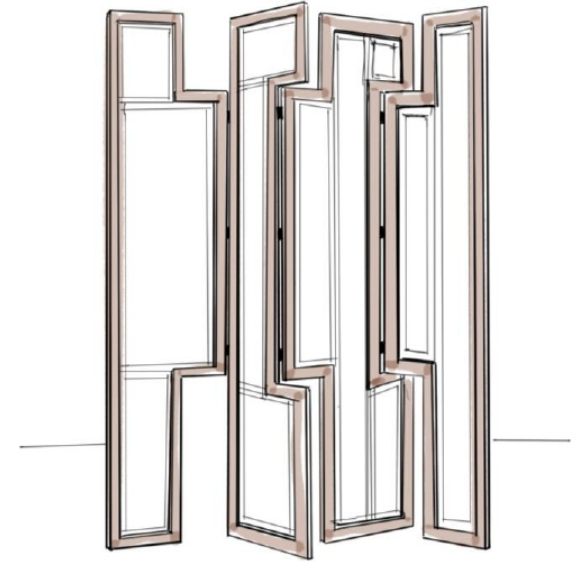


Fig 75: Concept 3 (Direction 1)
Source: author



Concepts (Direction 1)

Interior spaces – partitions

Concept 3

Foldable screen walls with play of solid and void.

3.2

DETAILS

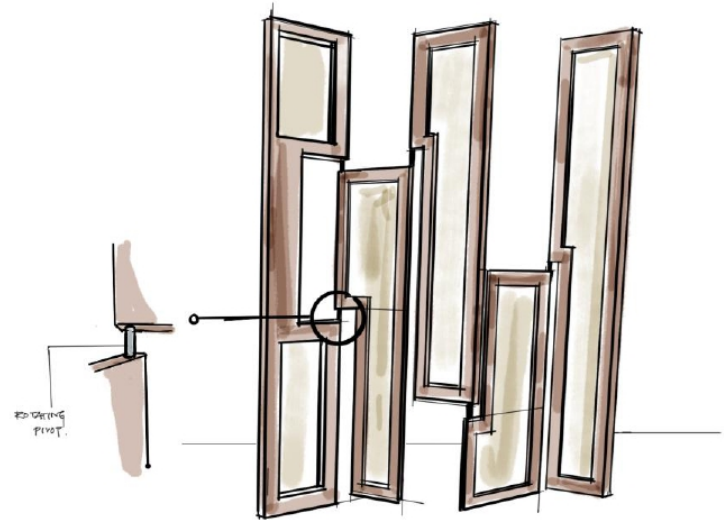
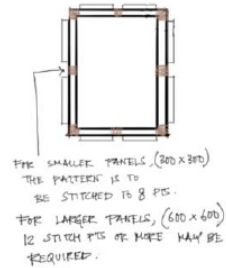
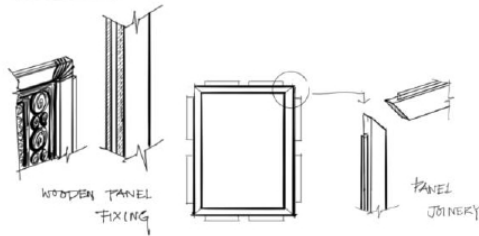


Fig 76: Concept 3 (Direction 1)
Source: author



Concepts (Direction 1)

Interior spaces – partitions

Concept 4

Foldable screen walls with the fabric of patterns tied directly to the frame.

4.1

FOLDABLE PARTITIONS WITH SINGLE STRETCH OF PATTERNS

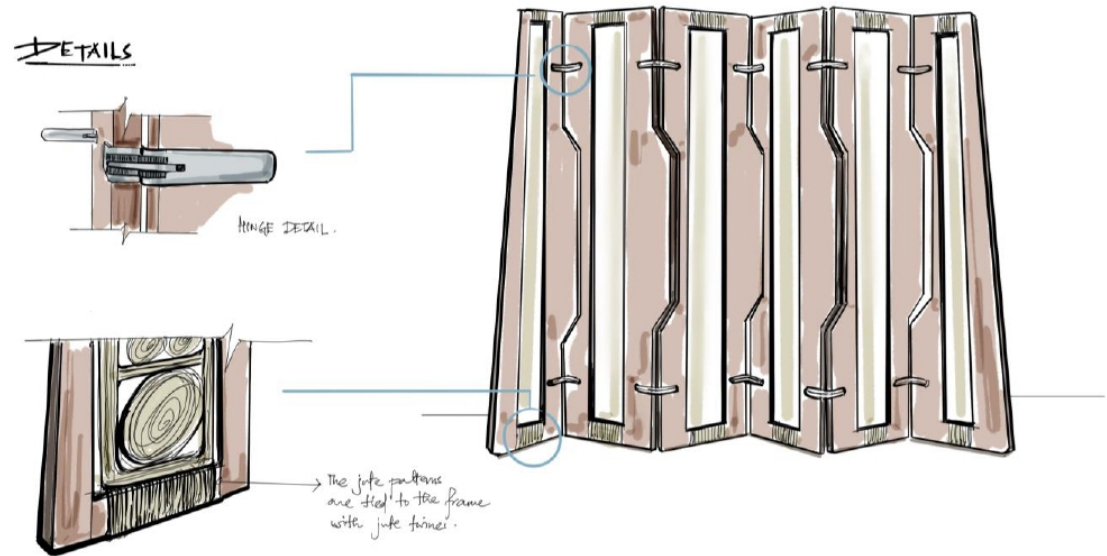


Fig 77: Concept 4 (Direction 1)

Source: author



Concepts (Direction 1)

Interior spaces – partitions

Concept 4

Foldable screen walls with the fabric of patterns tied directly to the frame.

4.2

FOLDABLE PARTITIONS WITH SINGLE STRETCH OF PATTERNS

DETAILS



BAMBOO PANELS
For bamboo, an entire stretch of fabric is created and tied to the frame directly.

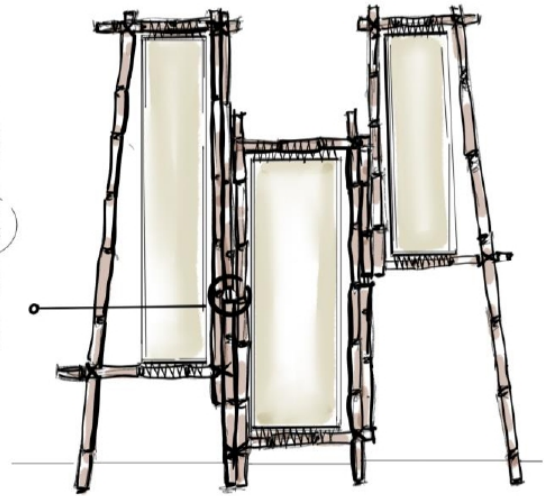
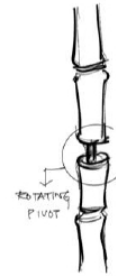
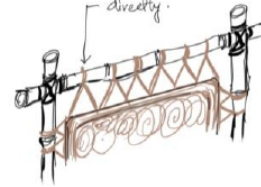


Fig 78: Concept 4 (Direction 1)
Source: author



Concepts (Direction 1)

Interior spaces – partitions

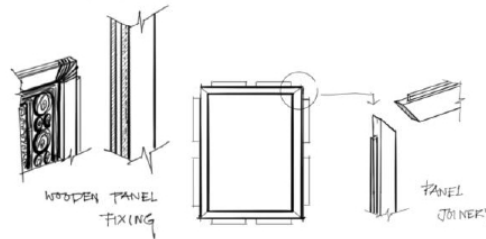
Concept 5

Foldable screen walls with storage spaces.

5.1

FOLDABLE PARTITIONS WITH MULTIPLE FUNCTIONS

DETAILS



FOR SMALLER PANELS, (300 X 300)
THE PATTERN IS TO
BE STITCHED TO 8 PIS.
FOR LARGER PANELS, (600 X 600)
12 STITCH PIS OR MORE MAY BE
REQUIRED.

ROTATING
PIVOT

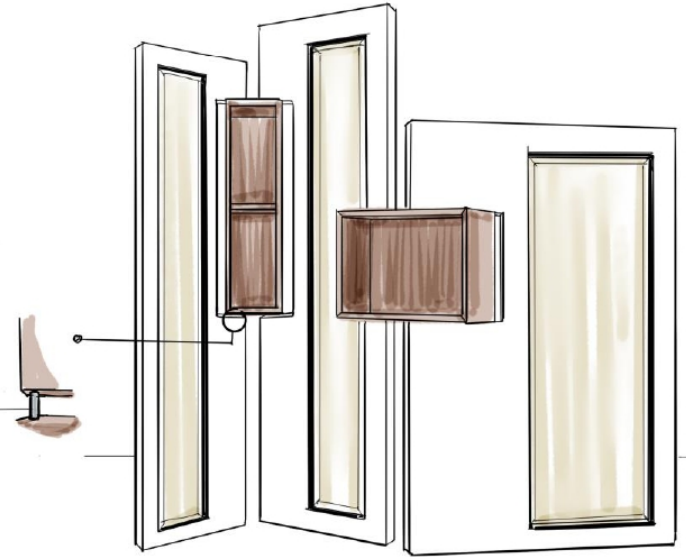


Fig 79: Concept 5 (Direction 1)
Source: author



Concepts (Direction 1)

Interior spaces – partitions

Concept 5

Foldable screen walls with storage spaces.

5.2

FOLDABLE PARTITIONS WITH MULTIPLE FUNCTIONS

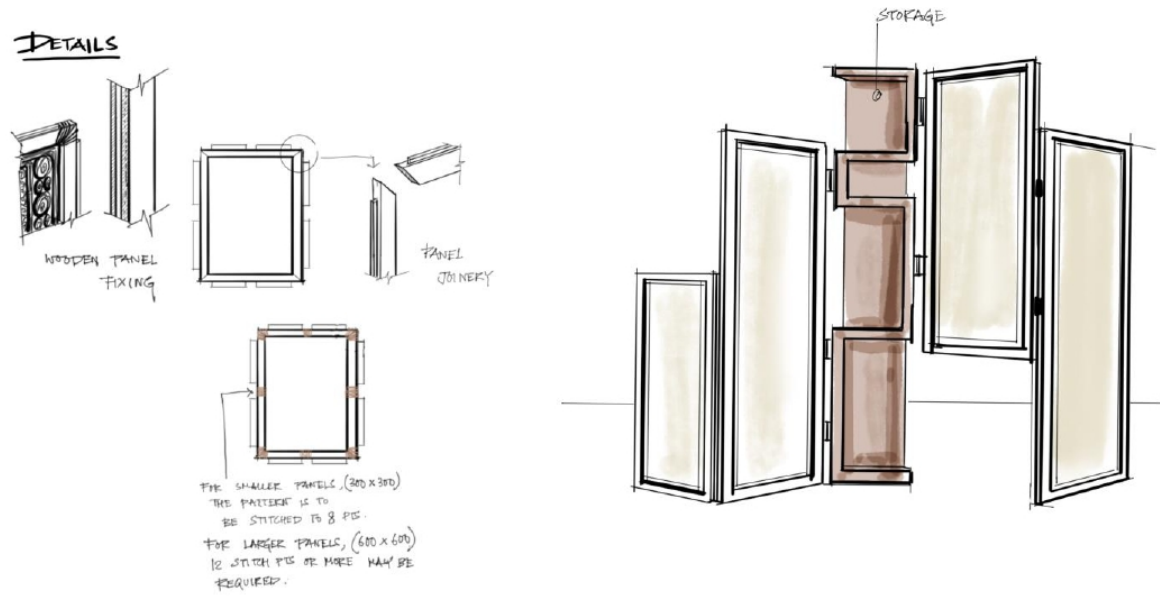


Fig 80: Concept 5 (Direction 1)
Source: author



Evaluation

- **Concept 2, Concept 3.1, Concept 3.2, Concept 4.2, Concept 5.2** have been selected for forming a range of foldable screen walls. 3D modelling and mock-ups have been made for visualization and understanding the mechanism respectively.
- **Concept 1, Concept 4.1, Concept 5.1** have been rejected on the factors of having more weight, less flexibility and feasibility.



Dimensional Analysis

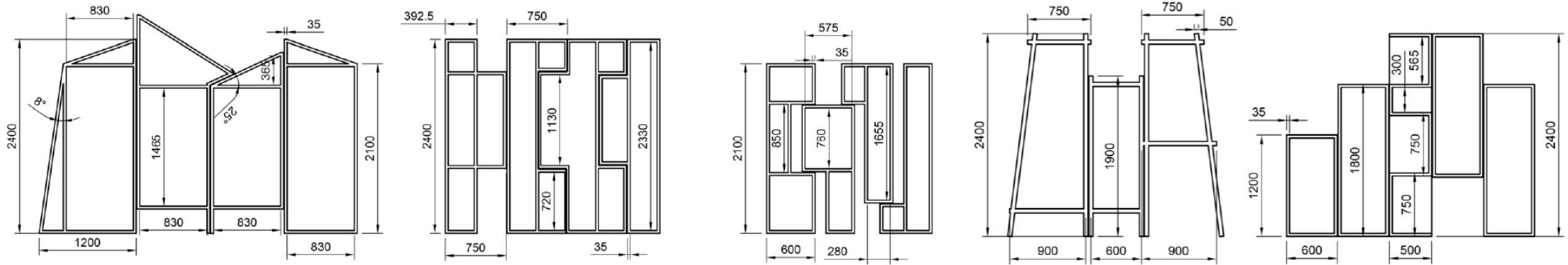


Fig 81: Dimensional Analysis
Source: author

All units are in mm



Mock-ups

Learnings

- Panels must fold to a position so that it can be easily manipulated in the interior spaces. It is also essential for storage and transportation of the panels.
- Hence the surrounding elements should be designed so that the design looks compact.

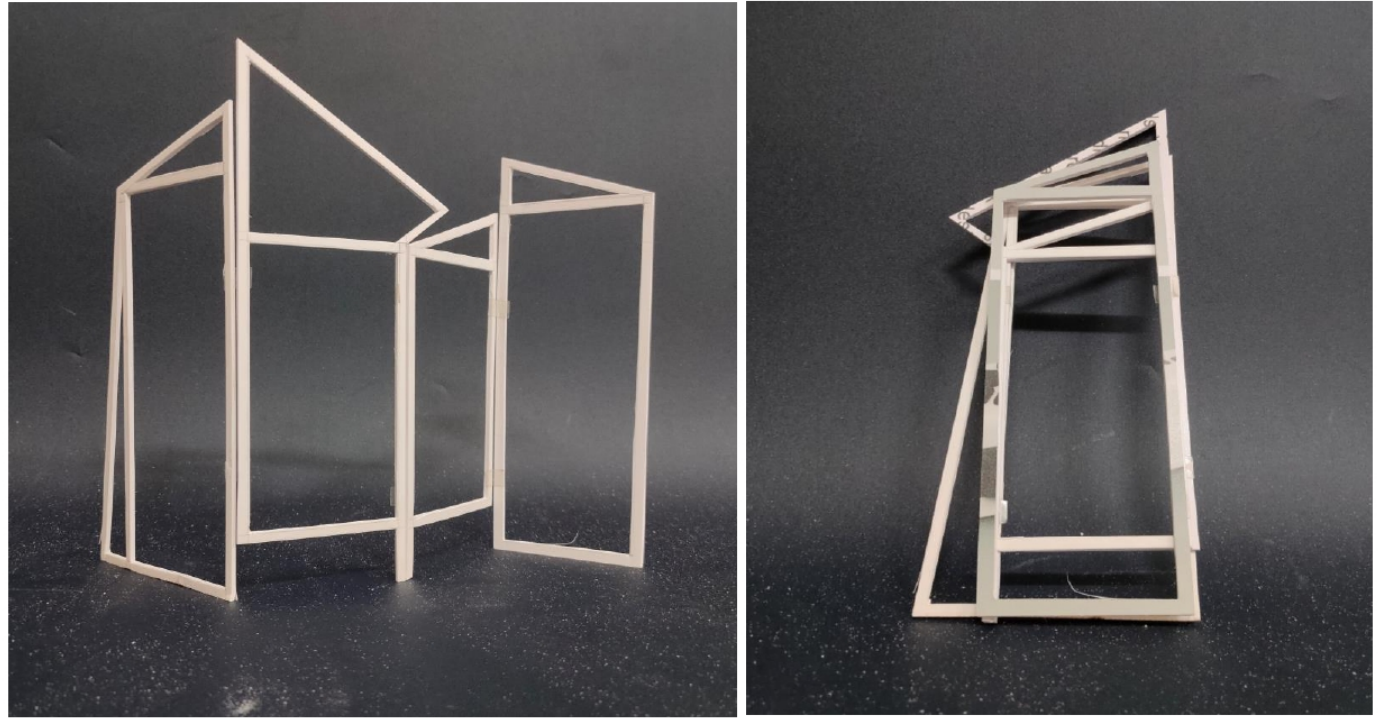


Fig 82: Mock ups
Source: author



Mock-ups

Learnings

- Panels must fold to a position so that it can be easily manipulated in the interior spaces. It is also essential for storage and transportation of the panels.
- Hence the surrounding elements should be designed so that the design looks compact.

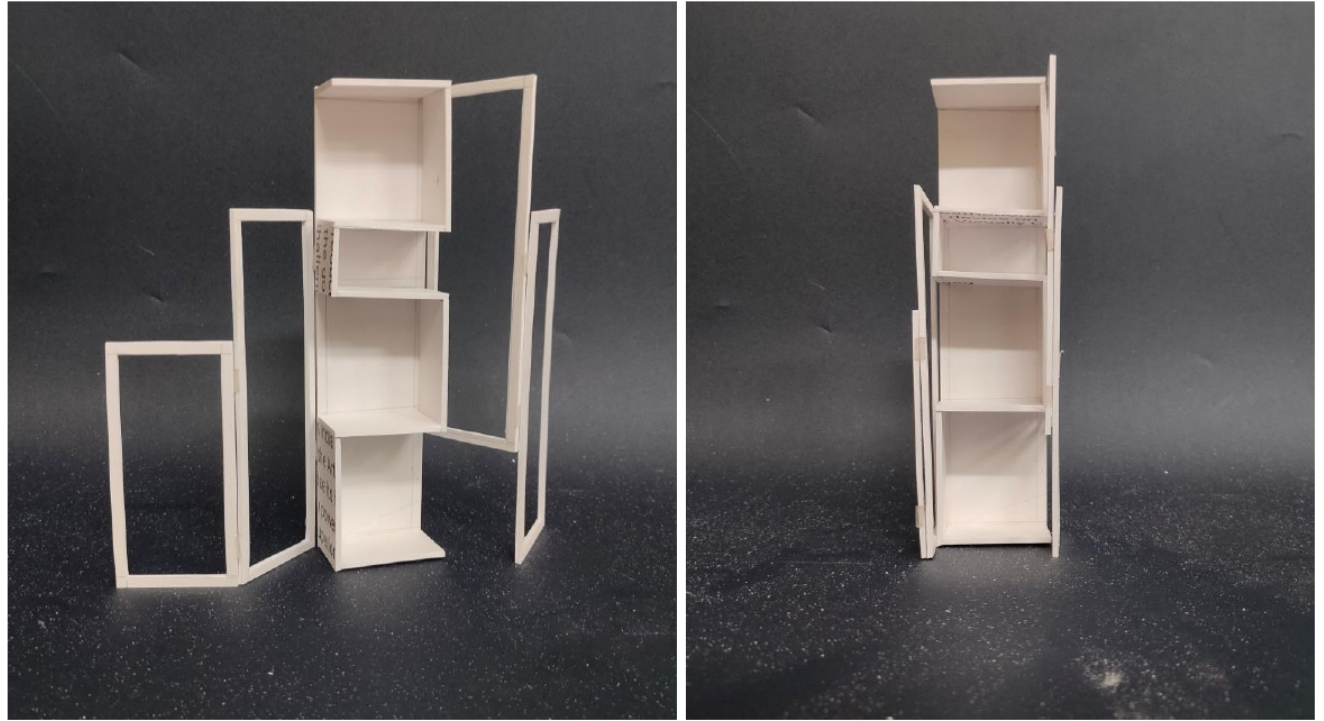


Fig 83: Mock ups
Source: author



Existing partitions and screen walls

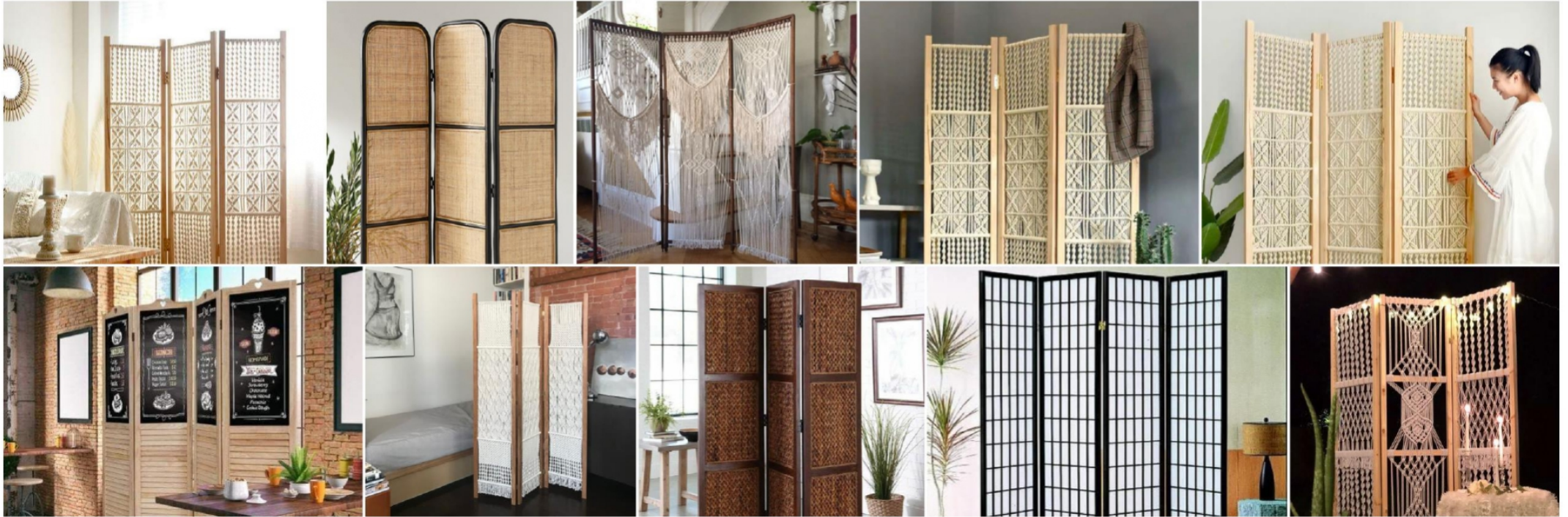


Fig 84: Existing partitions and screen walls
Source: [IR7]



Renders



Fig 85: Renders (Direction 1)
Source: author

Renders



Fig 86: Renders (Direction 1)
Source: author

| Renders

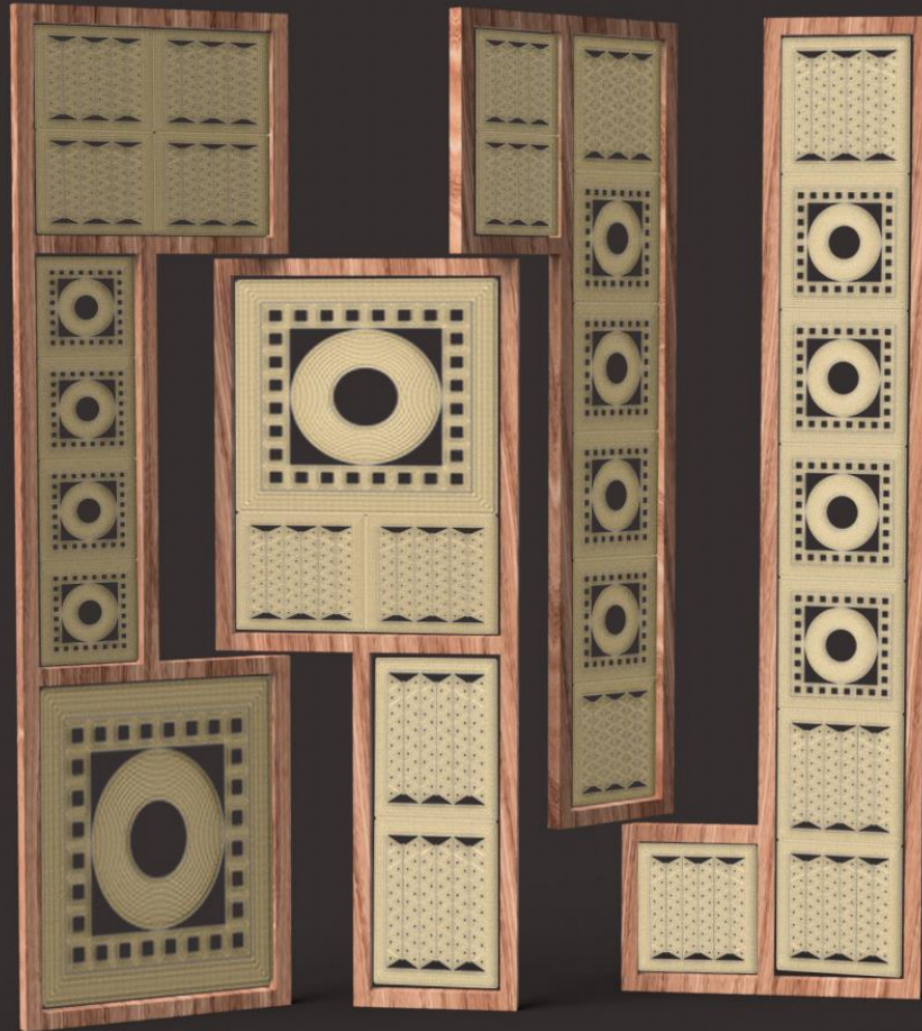


Fig 87: Renders (Direction 1)
Source: author

Renders



Fig 88: Renders (Direction 1)
Source: author

| Renders



Fig 89: Renders (Direction 1)
Source: author

Visualization in Interior spaces



Fig 90: Visualization in interior spaces (Direction 1)
Source: author



Visualization in Interior spaces



Fig 91: Visualization in interior spaces (Direction 1)
Source: author



Visualization in Interior spaces



Fig 92: Visualization in interior spaces (Direction 1)
Source: author



Design Feature - Compactness

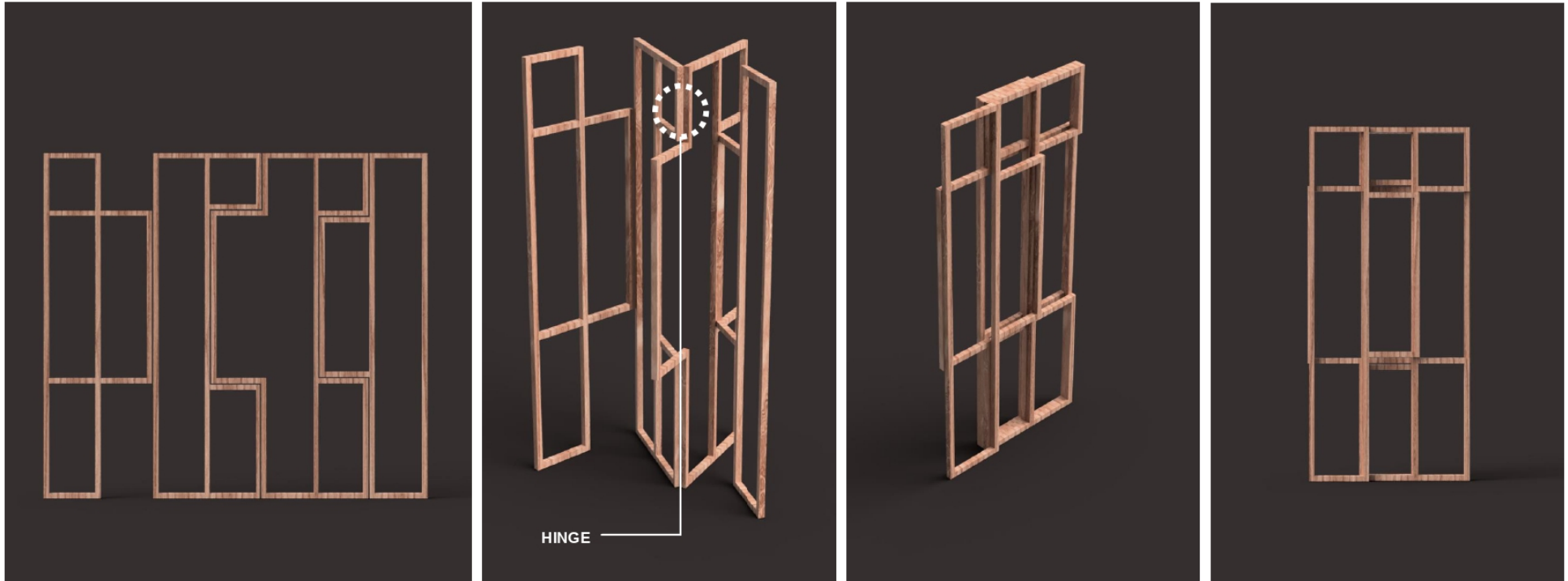


Fig 93: Design feature – foldability and compactness
Source: author



Concepts (Direction 2)

Interior accessories - lamps

Concept 1

Table lamps

1.1

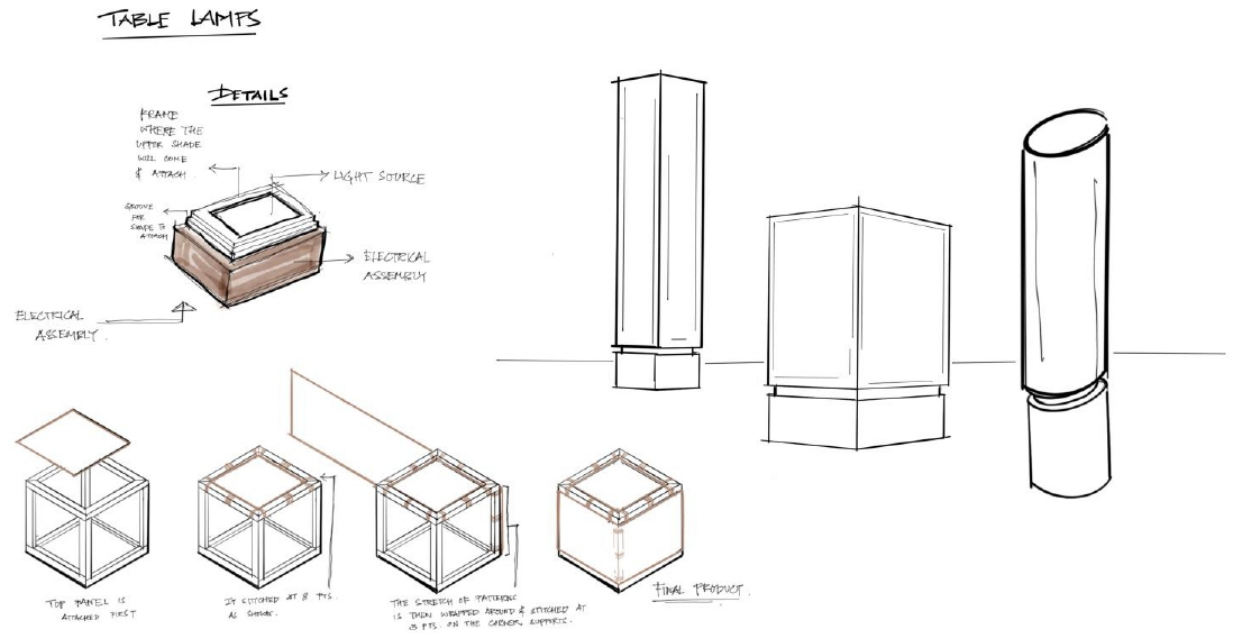


Fig 94: Concept 1 (Direction 2)
Source: author



Concepts (Direction 2)

Interior accessories - lamps

Concept 1

Table lamps

1.2

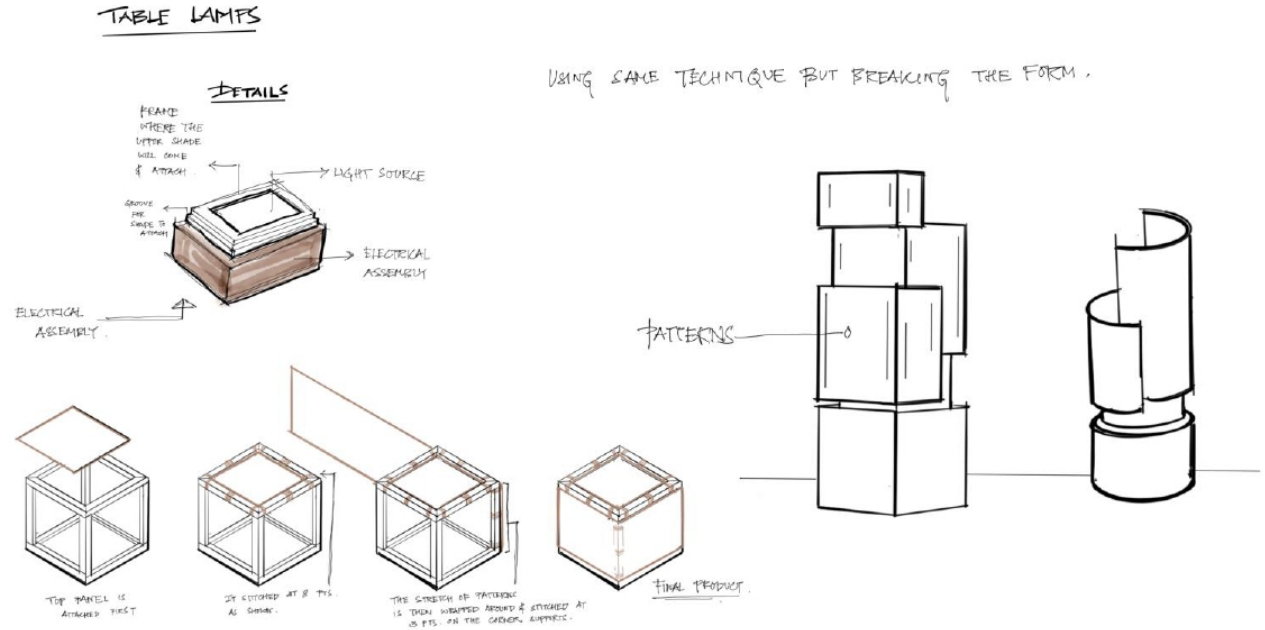


Fig 95: Concept 1 (Direction 2)

Source: author



Concepts (Direction 2)

Interior accessories - lamps

Concept 2

Pendant or hanging lamps

PENDANT LAMPS

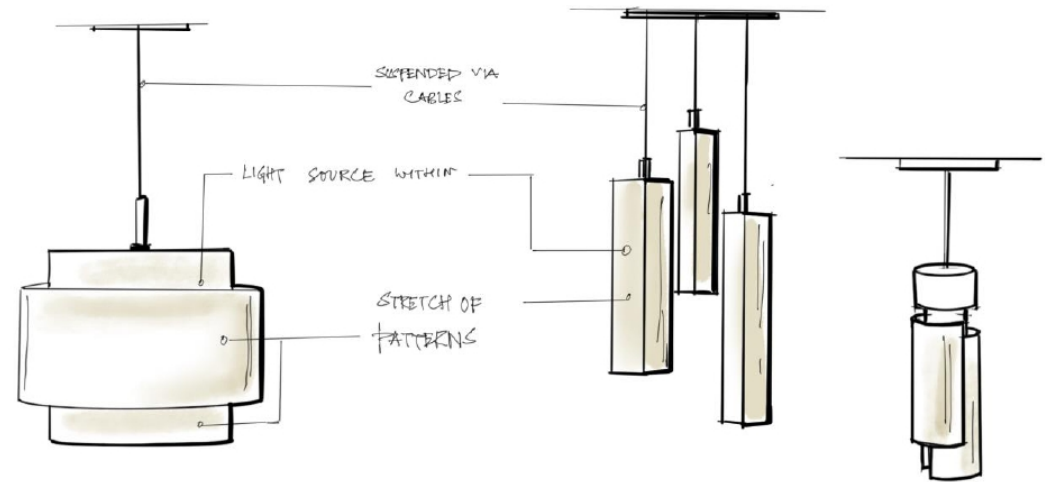


Fig 96: Concept 2 (Direction 2)
Source: author



Concepts (Direction 2)

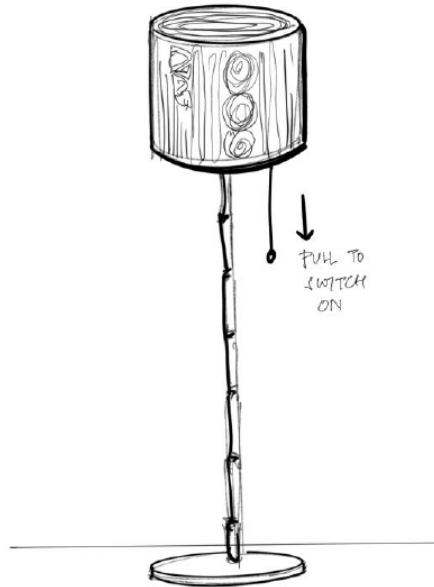
Interior accessories - lamps

Concept 3

Lamps used as decorative features like wall deco, etc.

3.1

FLOOR LAMP



3.2

WALL DECO LAMP

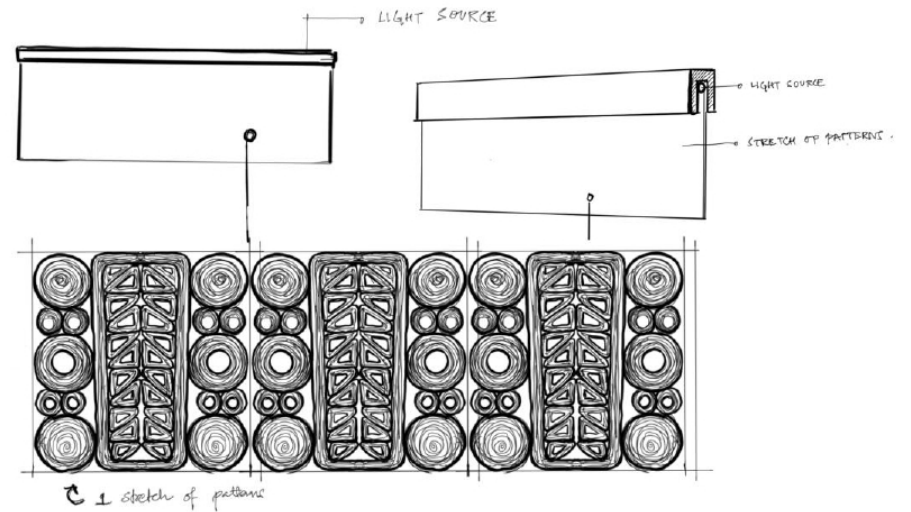


Fig 97: Concept 3 (Direction 2)

Source: author



Evaluation

- **Concept 1, Concept 2** have been selected for its possibility of wide range of geometric forms and flexibility.
- **Concept 3** was rejected due to the limitations in form.



| Renders

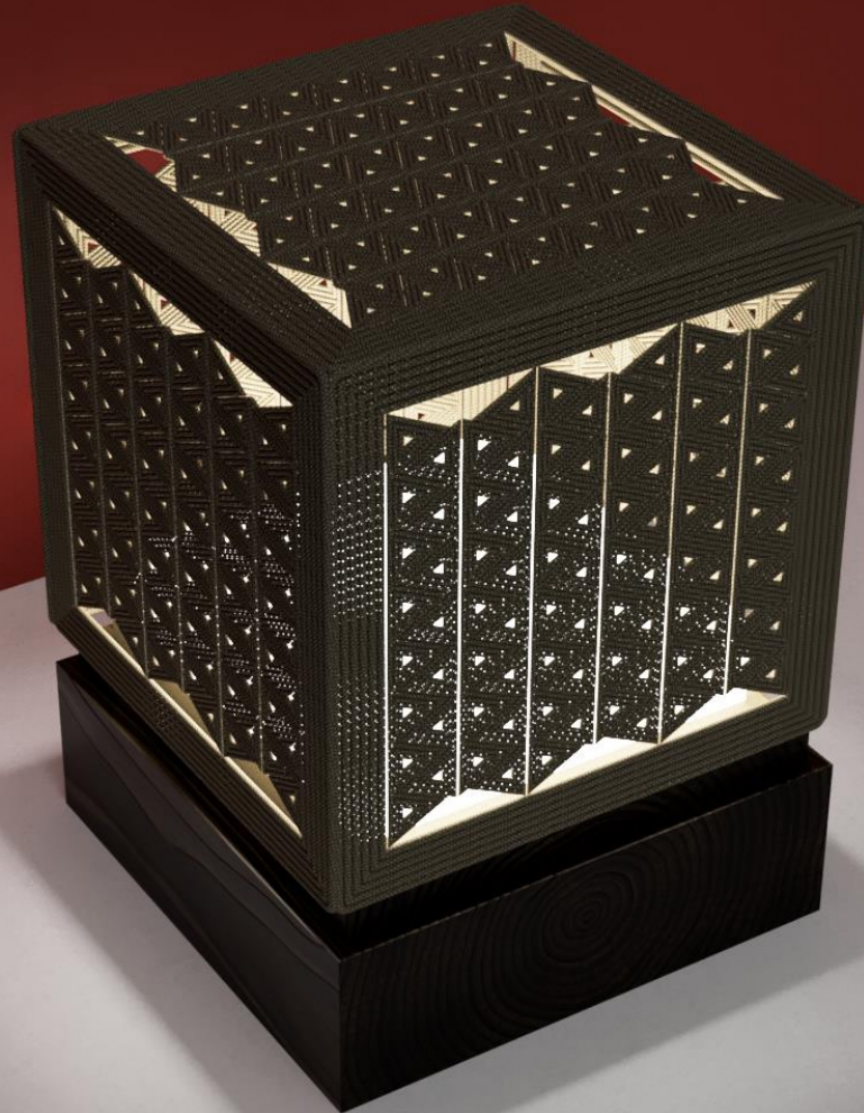


Fig 98: Render (Direction 2)
Source: author

| Renders

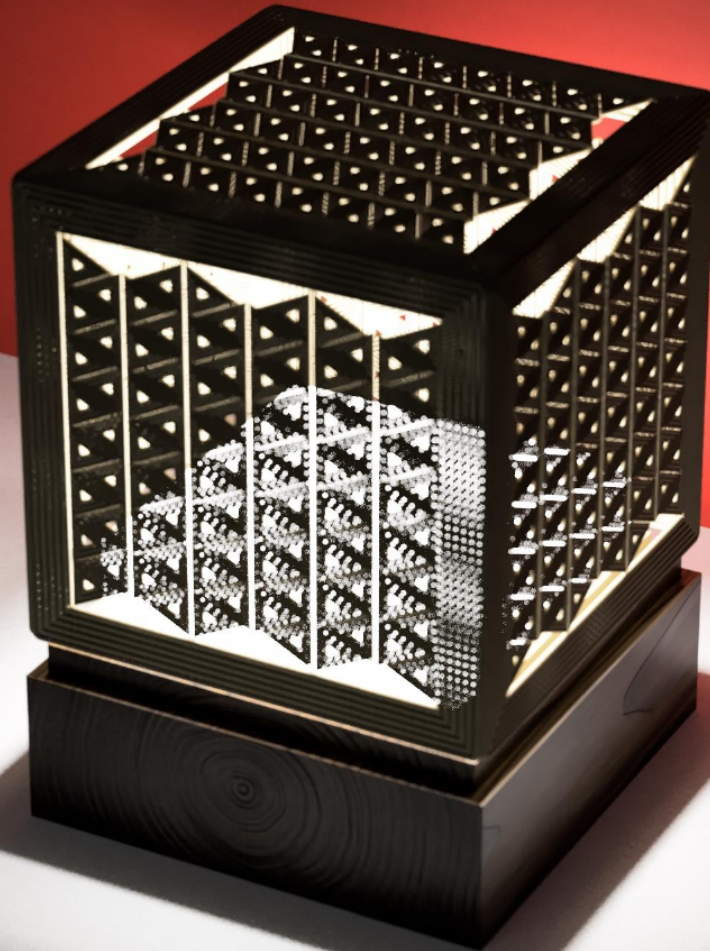


Fig 99: Render (Direction 2)
Source: author

13. Final Concept

Final Concept

Interior spaces – Partition and lamps

- Combination of lamps and partitions with natural hard materials and jute.
- Designing jute panels using existing technique of craftsmen.
- Focussing on a mix of ethnic and contemporary art and forms.

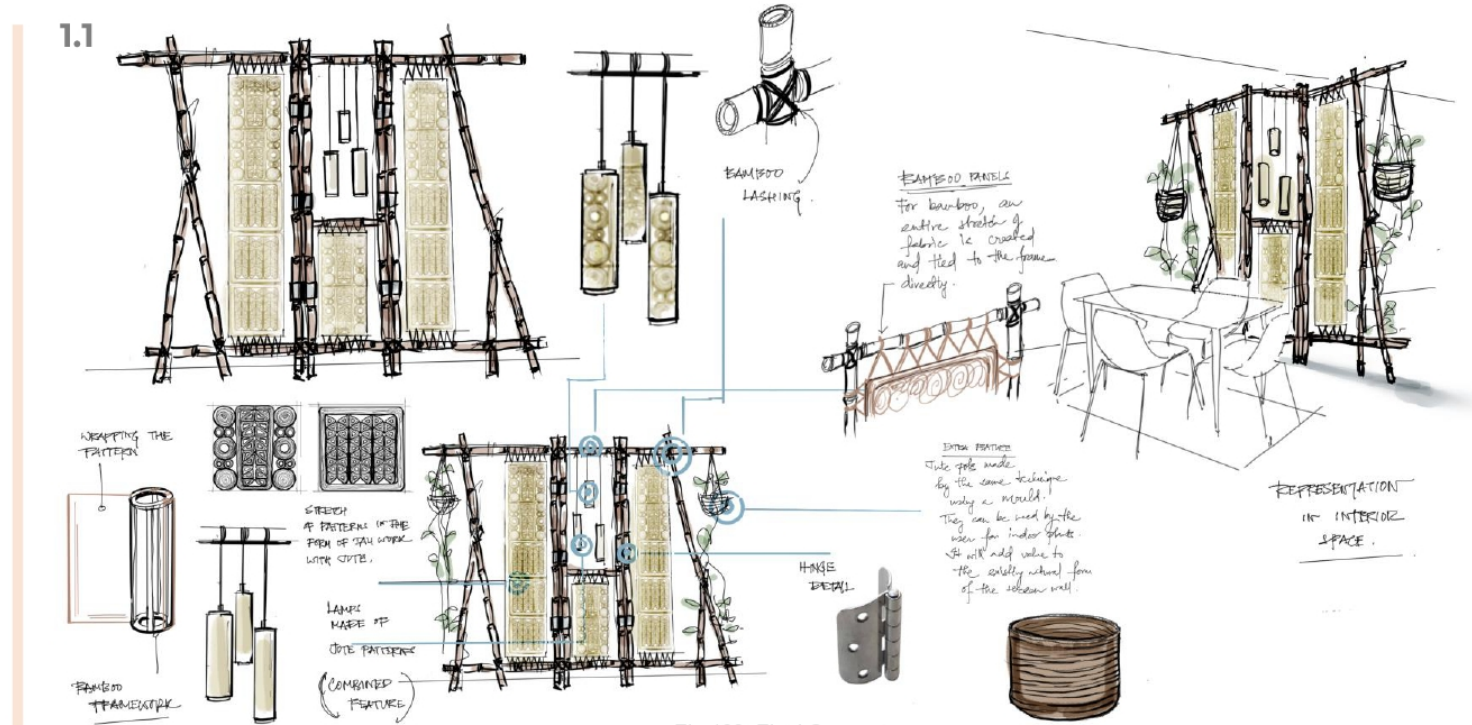


Fig 100: Final Concept
Source: author



Final Concept

Interior spaces – Partition and lamps

- Combination of lamps and partitions with natural hard materials and jute.
- Designing jute panels using existing technique of craftsmen.
- Focussing on a mix of ethnic and contemporary art and forms.

1.2

DETAILS

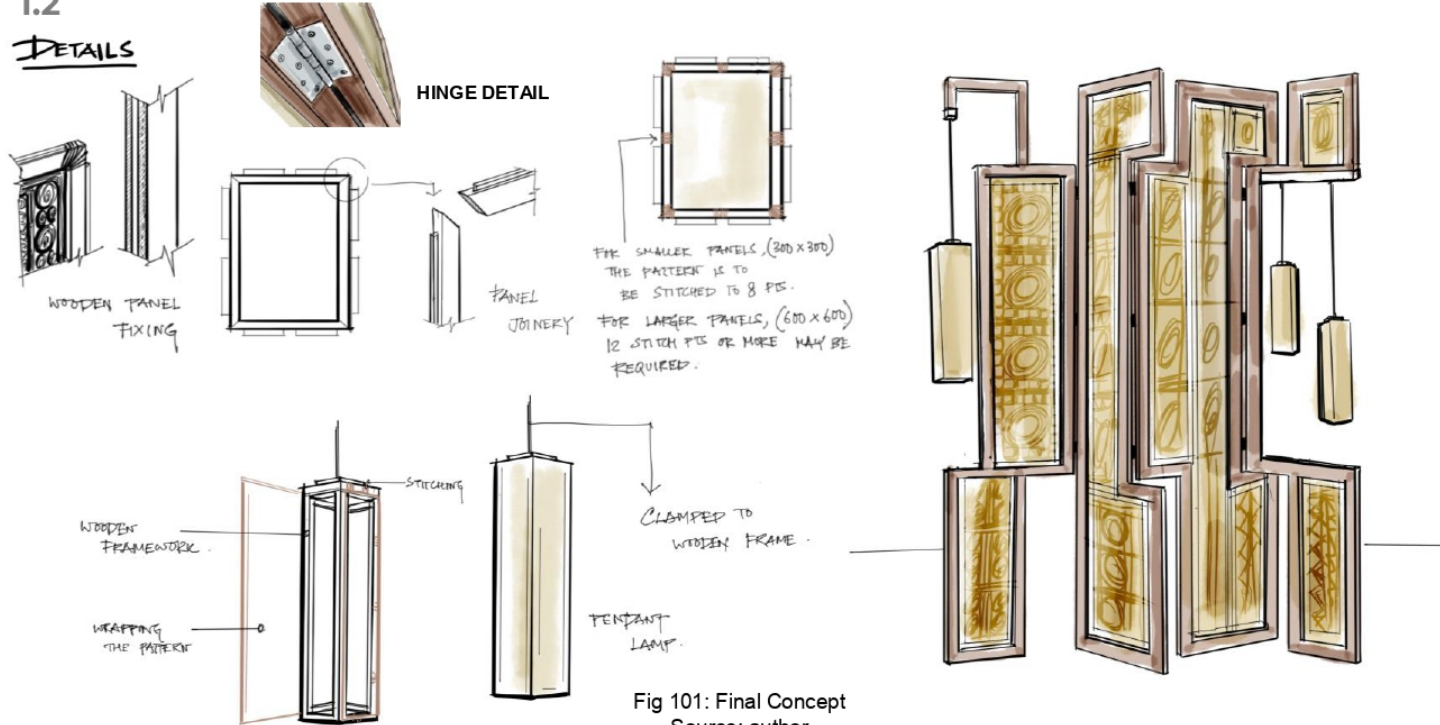


Fig 101: Final Concept
Source: author



Final Concept

Interior spaces – Partition and lamps

- Combination of lamps and partitions with natural hard materials and jute.
- Designing jute panels using existing technique of craftsmen.
- Focussing on a mix of ethnic and contemporary art and forms.

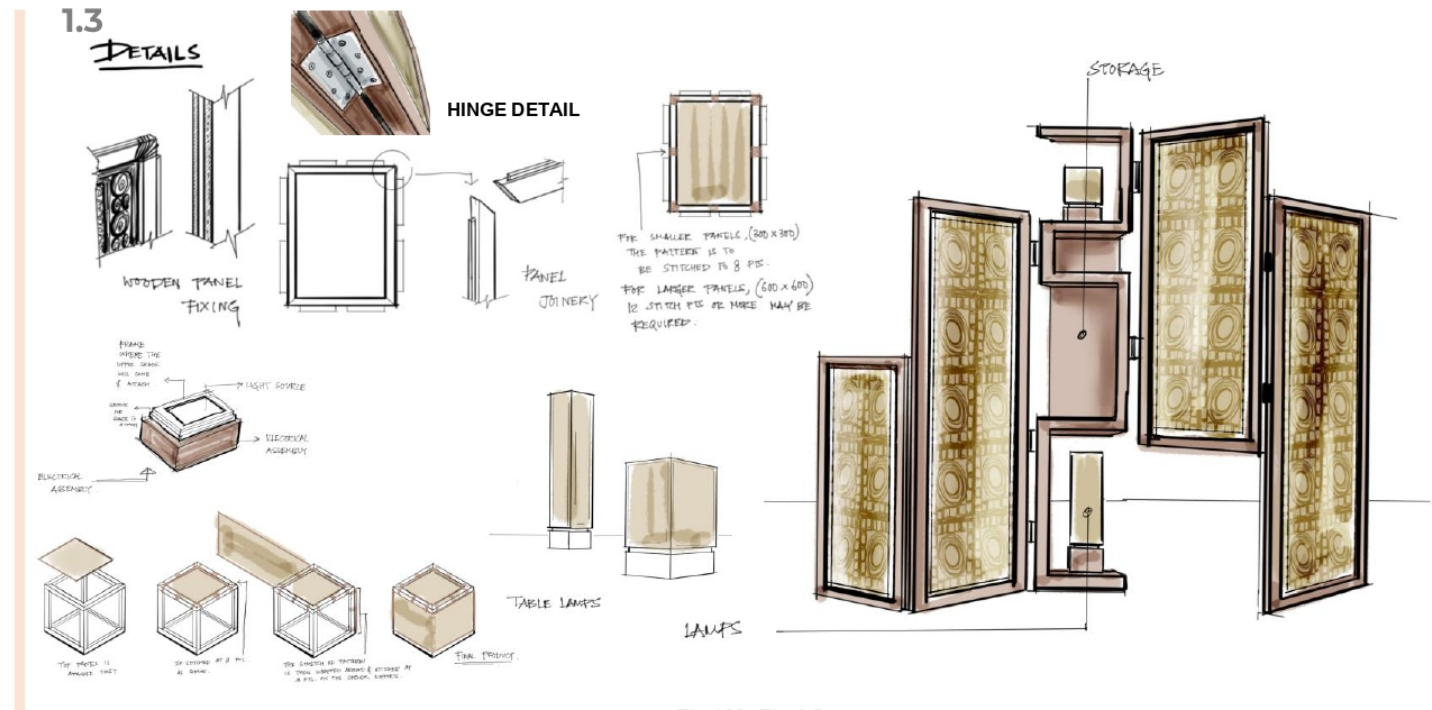


Fig 102: Final Concept
Source: author

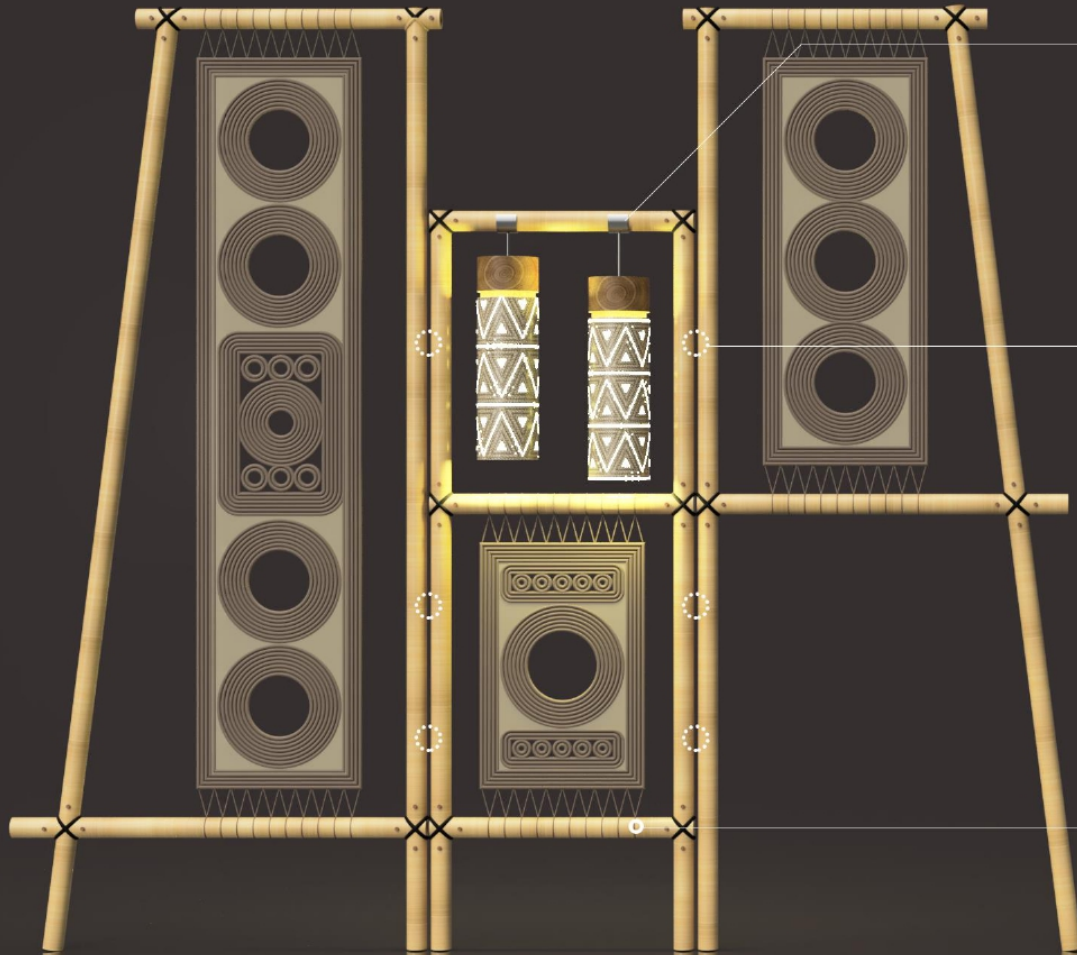


| Renders



Fig 103: Render
Source: author

Details



LAMPS ARE FIXED BY
CLAMPING THEM TO THE
BAMBOO

HINGES

PANEL TO FRAME FIXING
DETAIL



Fig 104: Details
Source: author

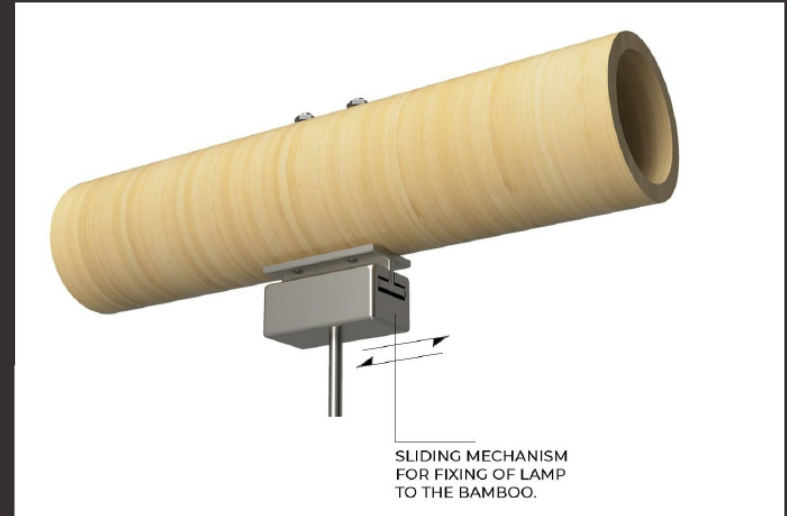


Fig 105: Details
Source: author

Details

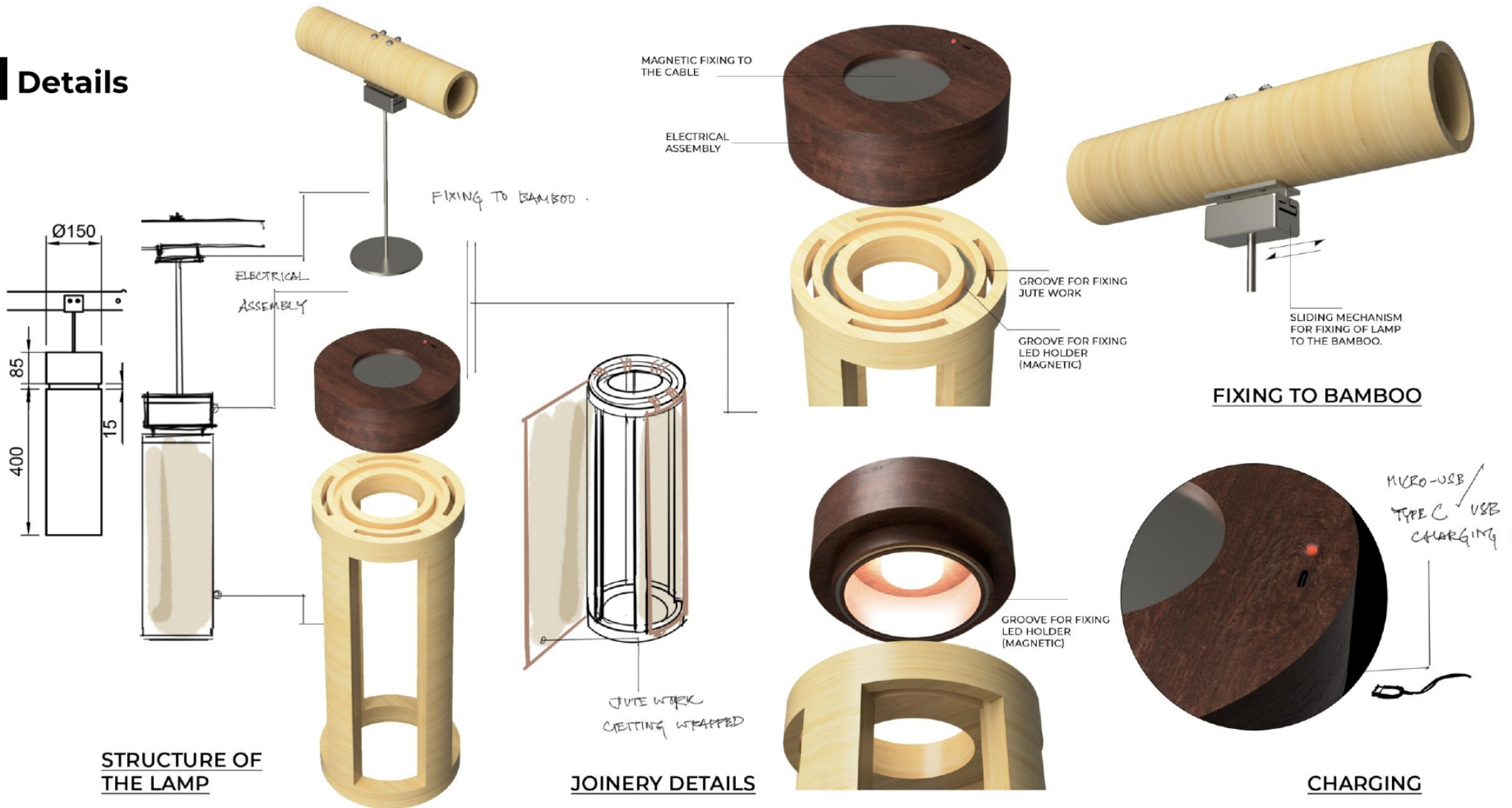


Fig 106: Lamp details
Source: author

| Renders



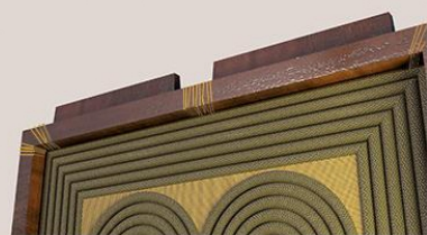
Fig 107: Render
Source: author

| Renders



Fig 108: Render
Source: author

Details



PANEL DETAIL

Fig 109: Details
Source: author

Details

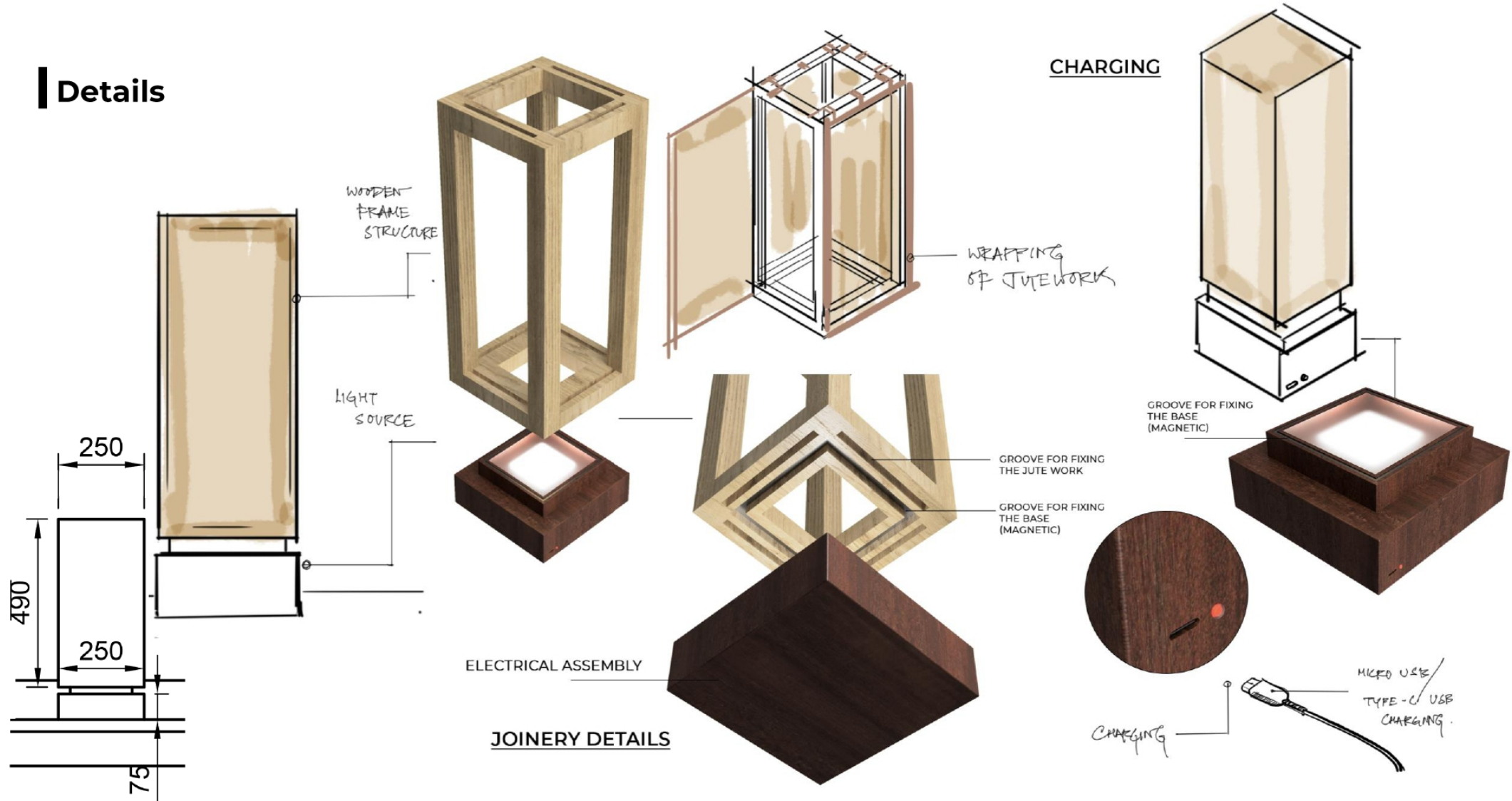


Fig 110: Lamp Details
Source: author

| Renders



Fig 111: Render
Source: author

Transportation and Storage

The panels and lamps will be transported separately and then assembled on site.

The panels will be folded as shown.

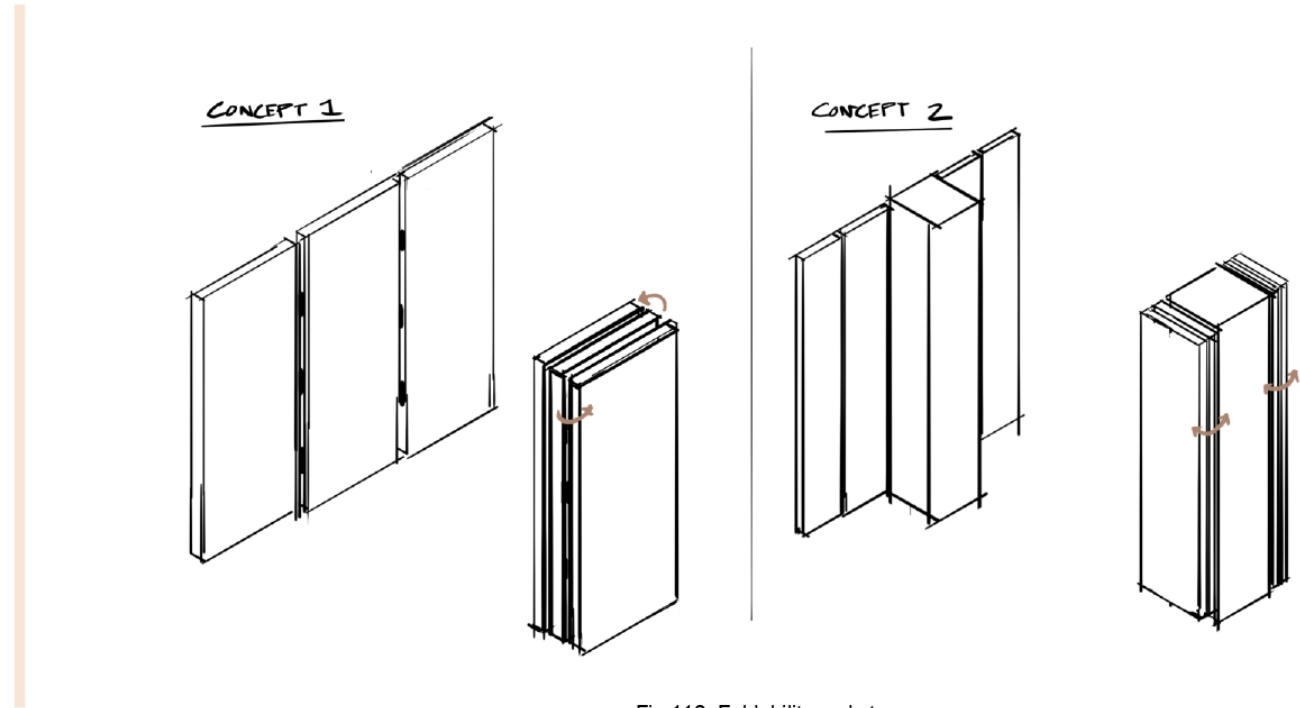


Fig 112: Foldability and storage
Source: author



Hinge detailing

The hinge is a major component of the product hence it is important to design the hinge such that it blends with the rest of the form of the partition.

Hence, in order to do that, it is important to look at existing designs and find inspiration from there.



Contemporary hinges

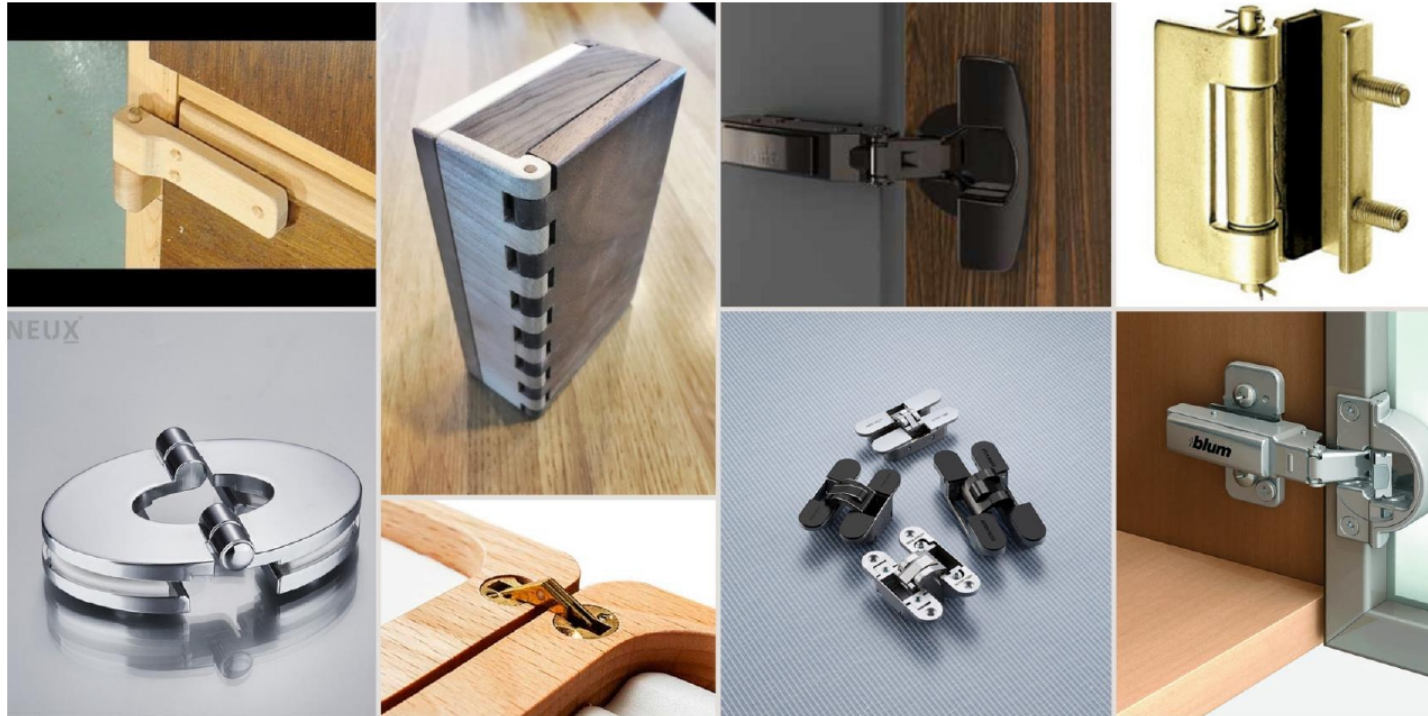


Fig 113: Contemporary hinges
Source: author



Traditional hinges



Fig 114: Traditional hinges
Source: [IR7]



Barrel hinge (for bamboo and wood)

The reason for choosing the particular type of hinge is to emphasize the jute work in the panels rather than the hinge. Hence, a concealed barrel hinge is selected that can be used for both wood and bamboo.



Fig 115: Barrel hinge
Source: author



Ideation

Other than the standard barrel hinge, ideations were done to integrate and find a similar expression in the form of the hinge and the partition.

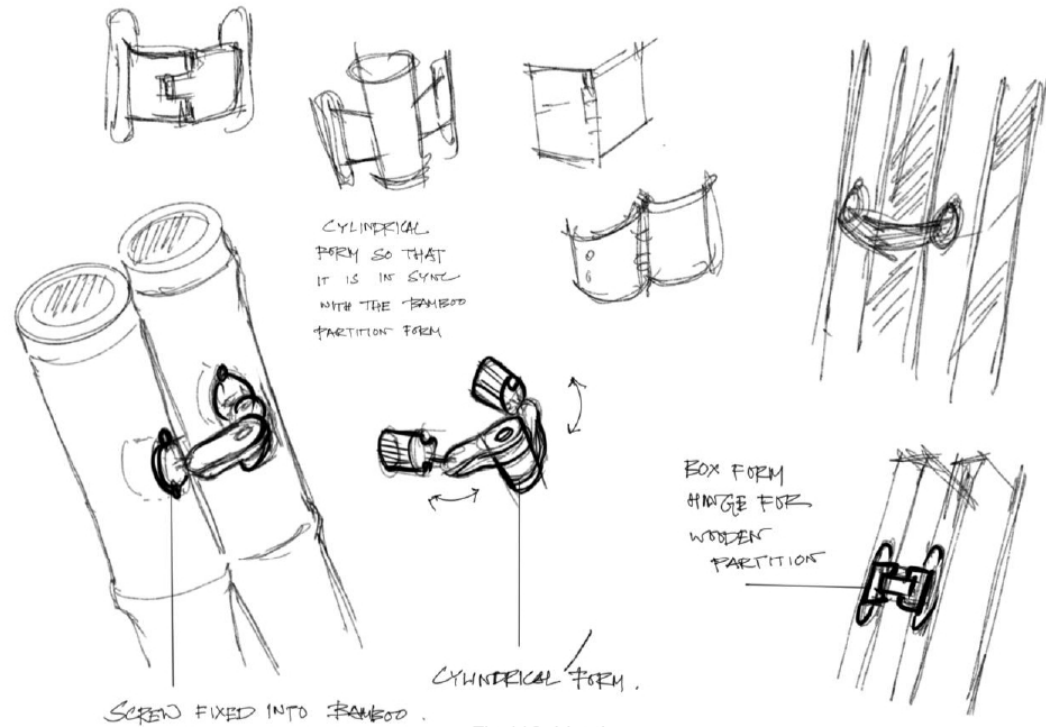


Fig 116: Ideations
Source: author



Hinge (for bamboo)

This is a type of decorative barrel hinge designed as a combination of wood and metal.

It is designed such that the form of the hinge is synchronous with the rest of the bamboo partition.

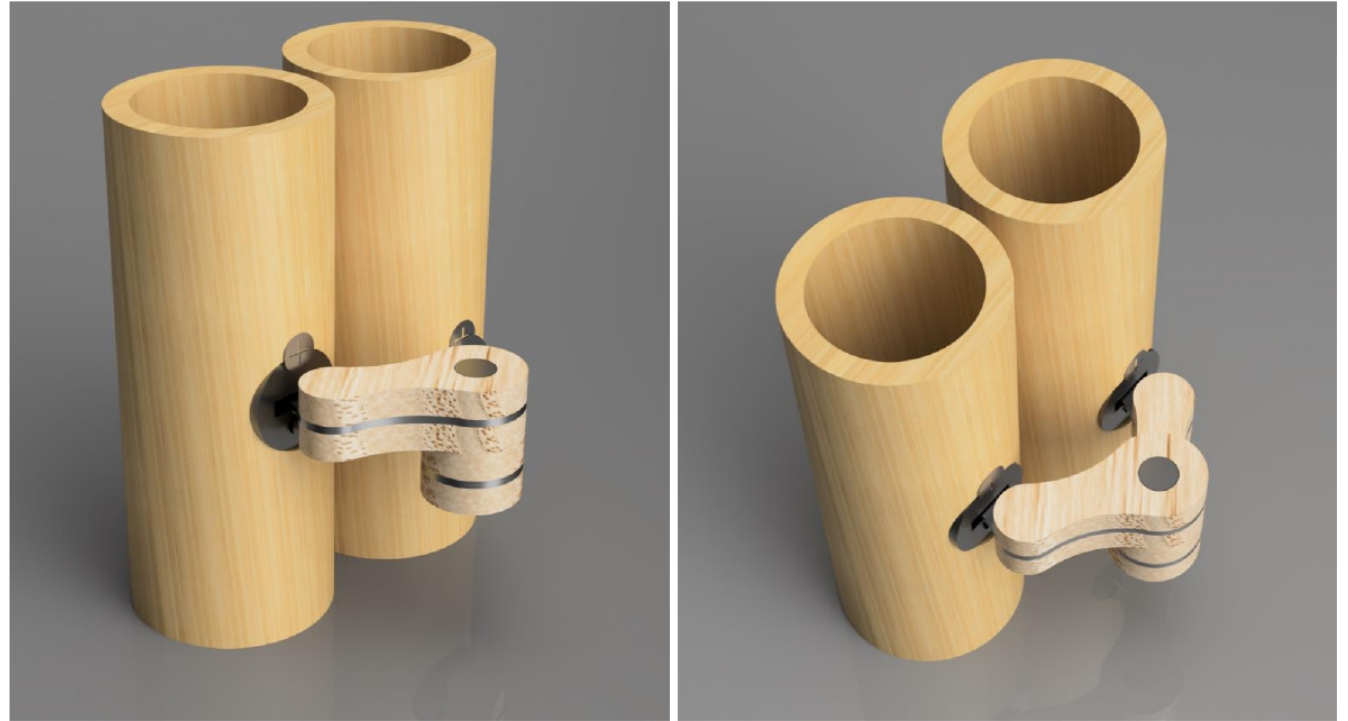


Fig 117: Hinge detail (for bamboo)
Source: author



Hinge (for wood)

It may also be used for wooden sections.

However, another type of hinge has been designed for the wooden partition (concept 2) which has similar essence as the form of the partition.



Fig 118: Hinge detail (for wood)
Source: author



Design of Jute work

The jute work is a significant part of the design.
The previous jute work panels appear static and repetitive due to geometric patterns.

Hence, different options need to be explored to come up with interesting panels.



Mural

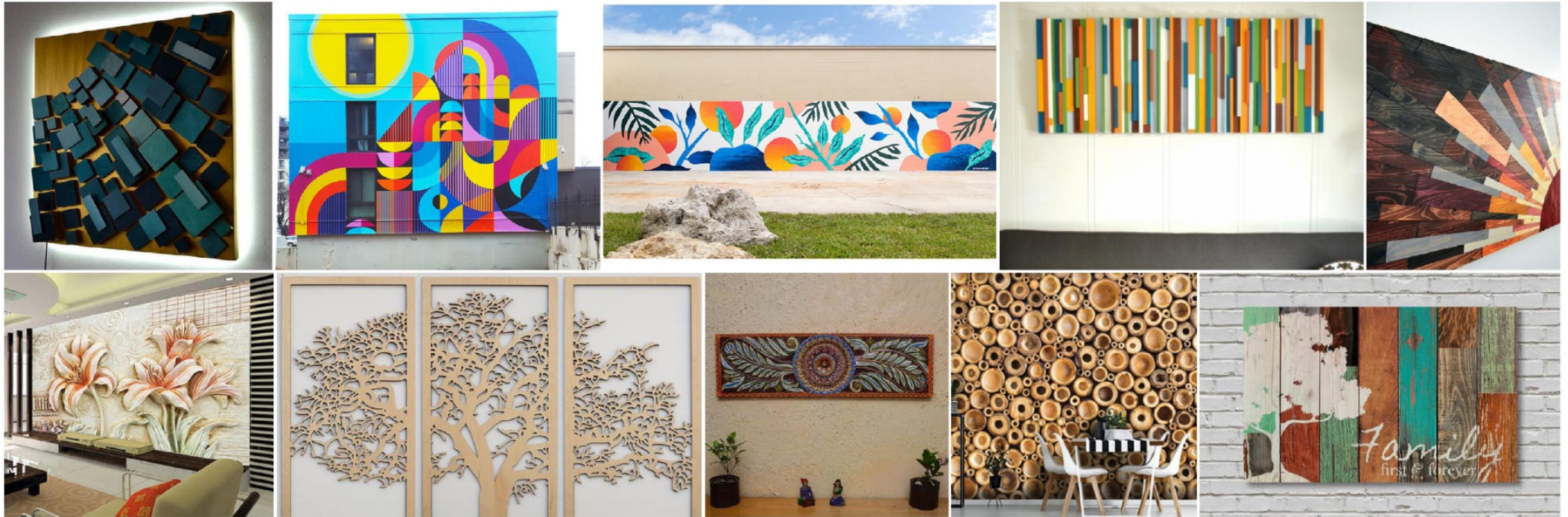


Fig 119: Murals
Source: [IR7]



Jute mural

The dynamic forms of the murals were studied and similar dynamism and visual language was attempted for the jute panels keeping the particular technique in mind.

The panels are designed such that a visual continuity could be achieved and the combination of them would appear like a single jute mural.

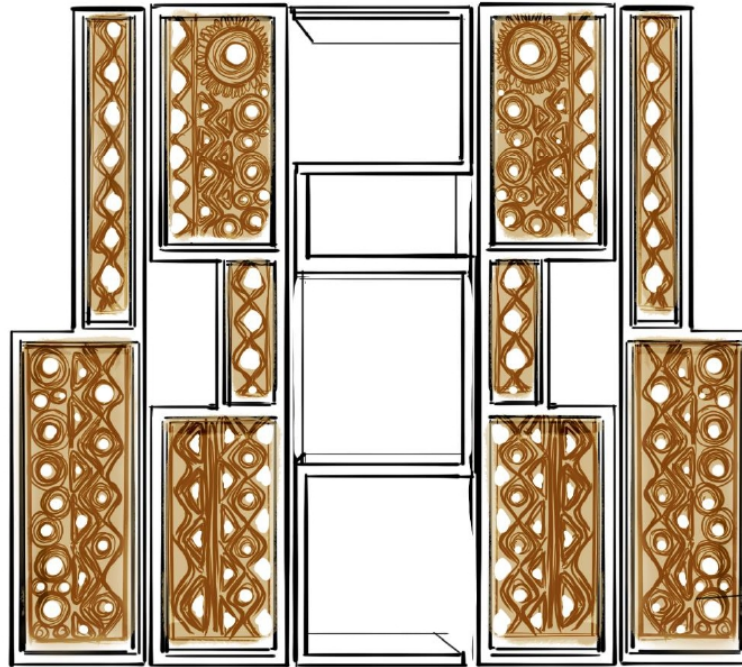


Fig 120: Jute murals
Source: author



Jute mural

The wooden panels are also designed in a similar as the previous concept.



GEOMETRICAL PATTERNS HAVE BEEN USED TO DESIGN A TRIBAL VISUAL LANGUAGE. THE PATTERNS TOGETHER GIVE A DYNAMIC INTERESTING LOOK & CONTINUITY.



THE FORMS USED HERE.

Fig 121: Jute murals
Source: author



14. Final Design

Scaled mock up

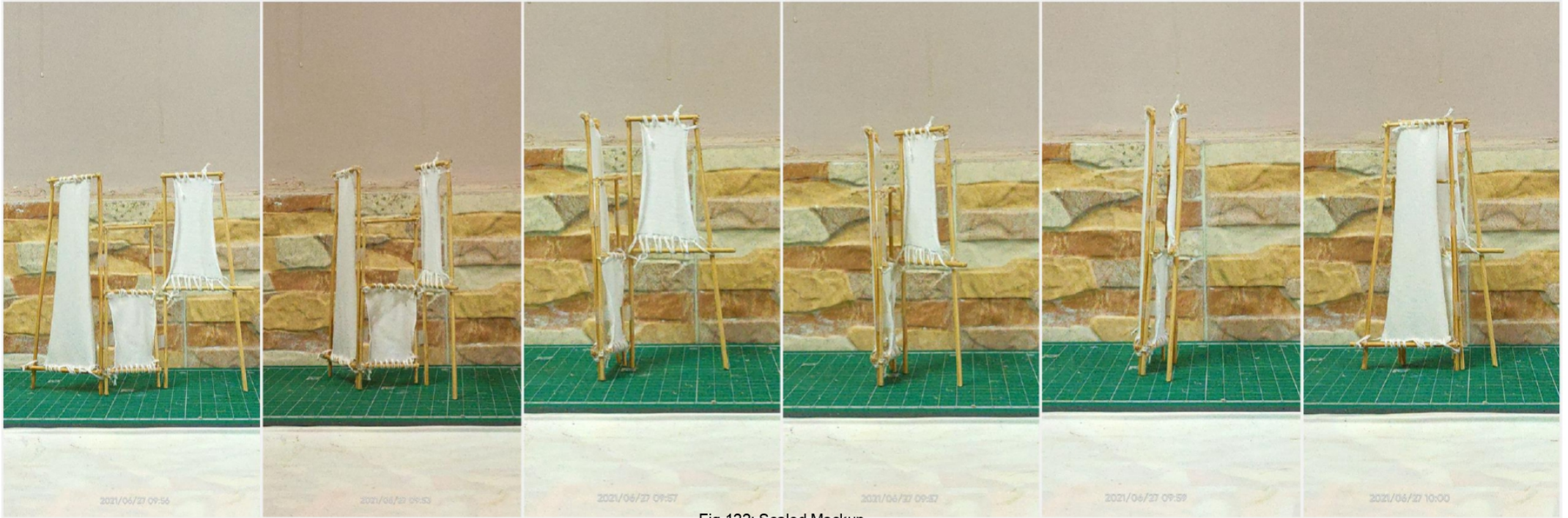


Fig 122: Scaled Mockup
Source: author



Prototyping



Fig 123: Prototyping
Source: author



Prototyping



Fig 124: Prototype
Source: author



Prototyping



Fig 125: Prototype
Source: author



Final Design

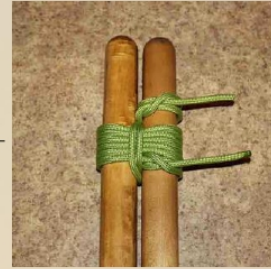
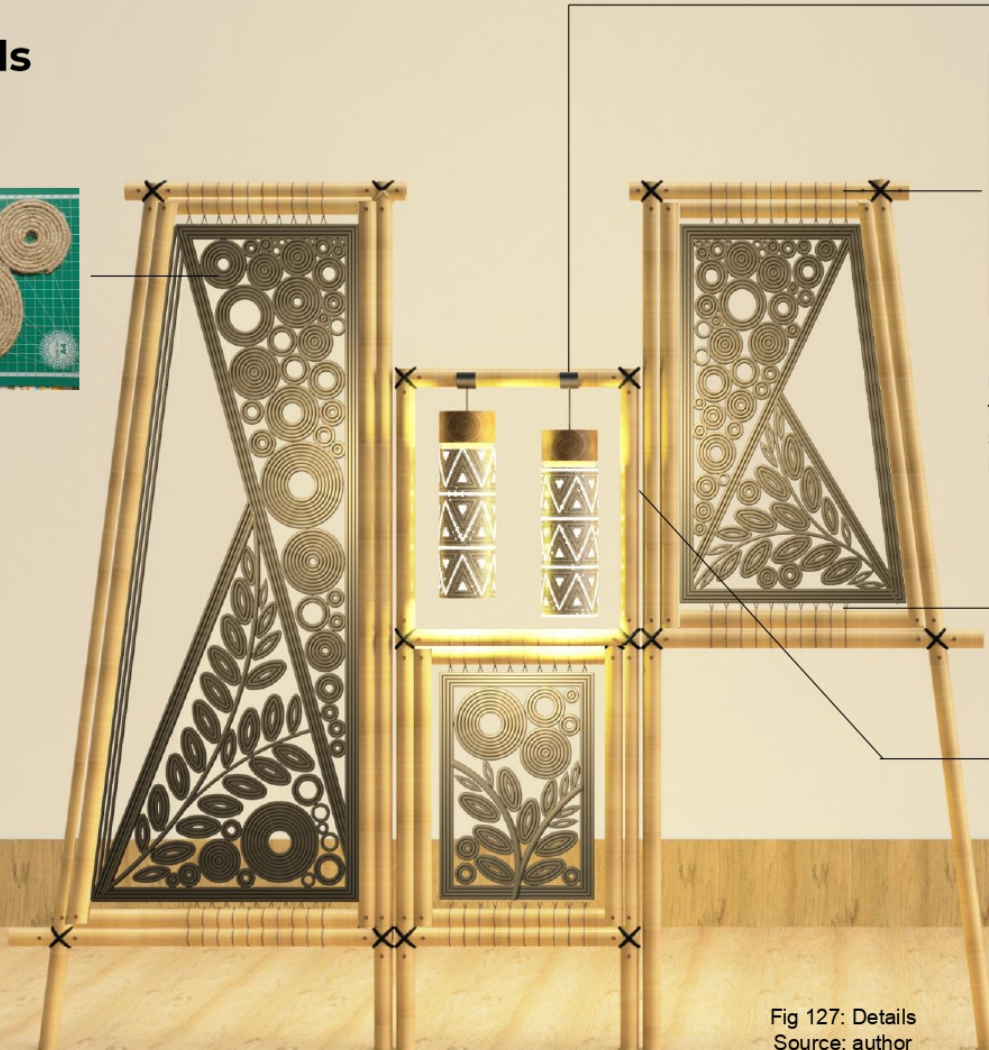


Fig 126: Final Render
Source: author

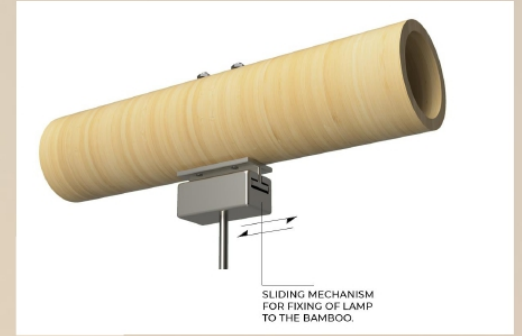
Details



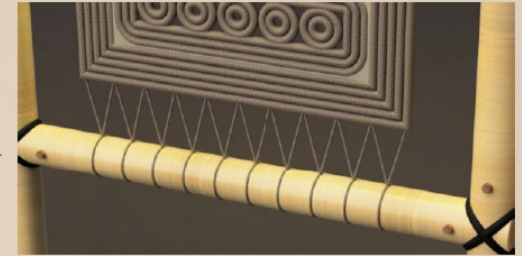
Jute mural



If bamboo panels are used, the panel will be fixed to the frame by shear lashing as shown in the figure.



Screw fixing of lamp fixtures.



Fixing of jute murals to the bamboo.



Barrel hinge

Fig 127: Details
Source: author

Details

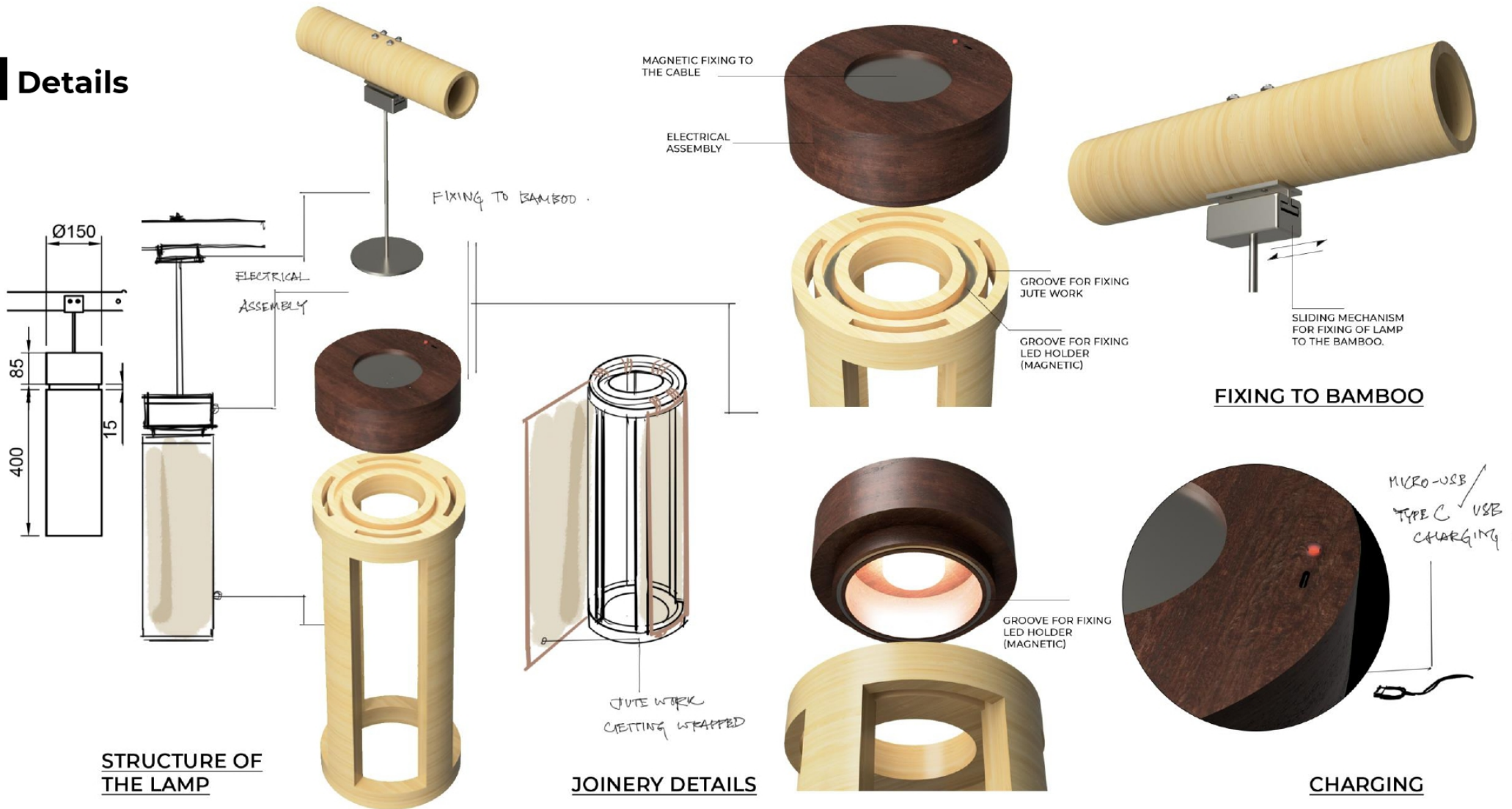


Fig 128: Lamp details
Source: author

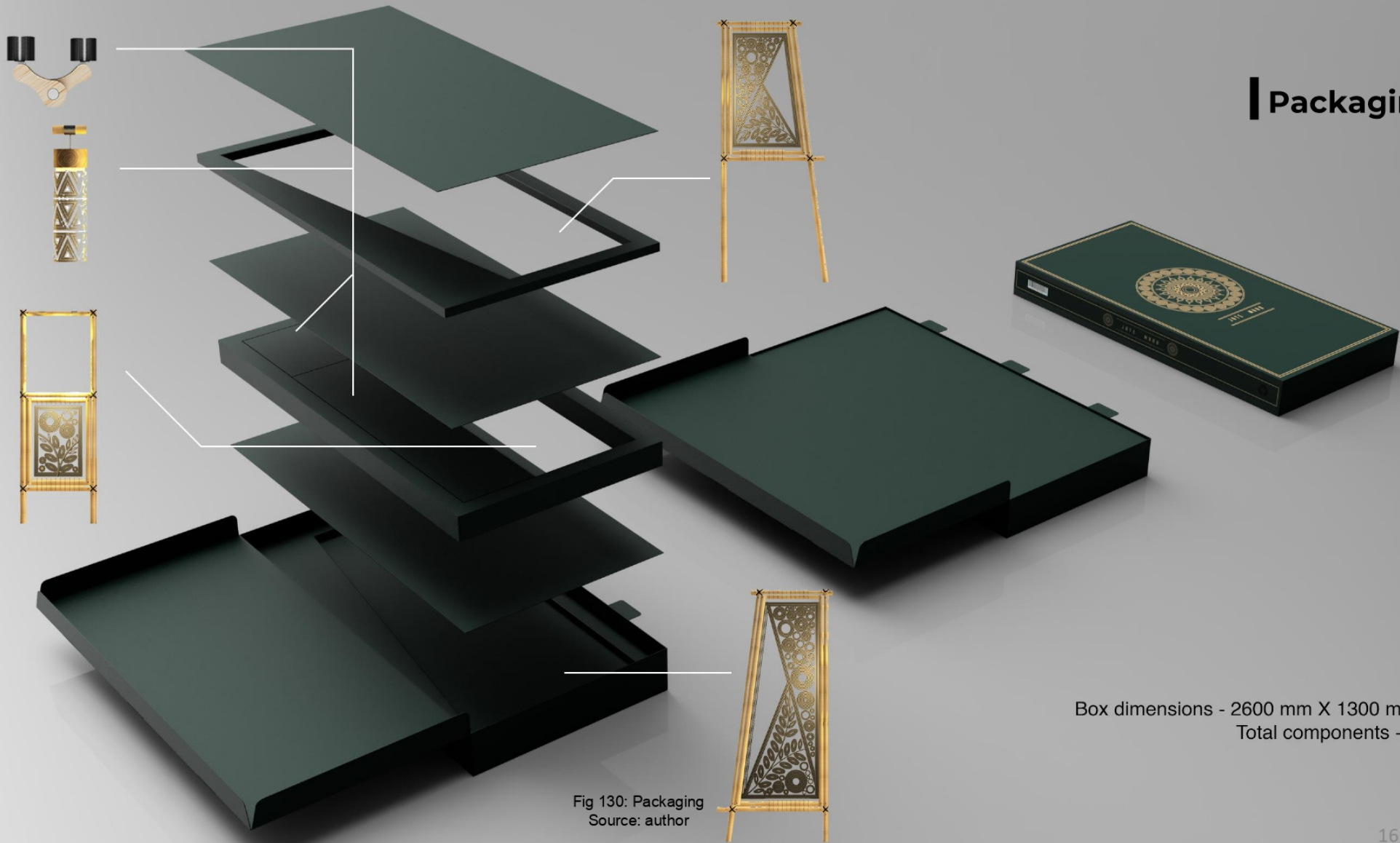
Different components



Fig 129: Components
Source: author



Packaging



Box dimensions - 2600 mm X 1300 mm
Total components - 9

Fig 130: Packaging
Source: author

Packaging



Fig 131: Branding
Source: author

Cost analysis

- Cost of bamboo (2 inch dia 20 to 25 ft pole) – Rs. 55 to Rs. 85/ piece (Referred from Indiamart)
- Cost of Jute fibres – Rs. 50 to Rs.100/ kg (Referred from Indiamart)
- Cost of softwood – Rs. 30/kg (Referred from Indiamart)
- Material required to manufacture a bamboo partition – 4 poles and 2.5 kg of jute fibres.
- Material required to manufacture a wooden lamp – 6.5 kg of wood

- Material cost of the bamboo frame – Rs. 220 – Rs. 340
- Material cost of jute – Rs. 125 – Rs. 250
- Hence total cost of material of one jute partition – Rs. 345 – Rs. 590
- Material cost of lamp – Rs. 195

- Total cost of the product – **Rs. 540 – Rs. 785 + (cost of electrical and electronic parts) + (cost of hinges and other fixtures) + (wages of craftsmen/ skilled labour) + (packaging cost) + (transportation cost) + (installation cost)**



15. System Design

System Design

- The panels will be made by various local craftsmen who are skilled in jute work.
- The jute work will be either fixed to the panels and then the panel to the frame or directly to the frame using jute twines.
- The products will be sold through e-commerce websites.
- The user can either purchase the whole assembled product or customize each part of the panel starting from the frame material, hinges to selecting the design of jute murals from a given range.
- There will be 2 different type of hinges for 2 types of frame material, wood and bamboo. The user can select based on the material of the panels the person is selecting.

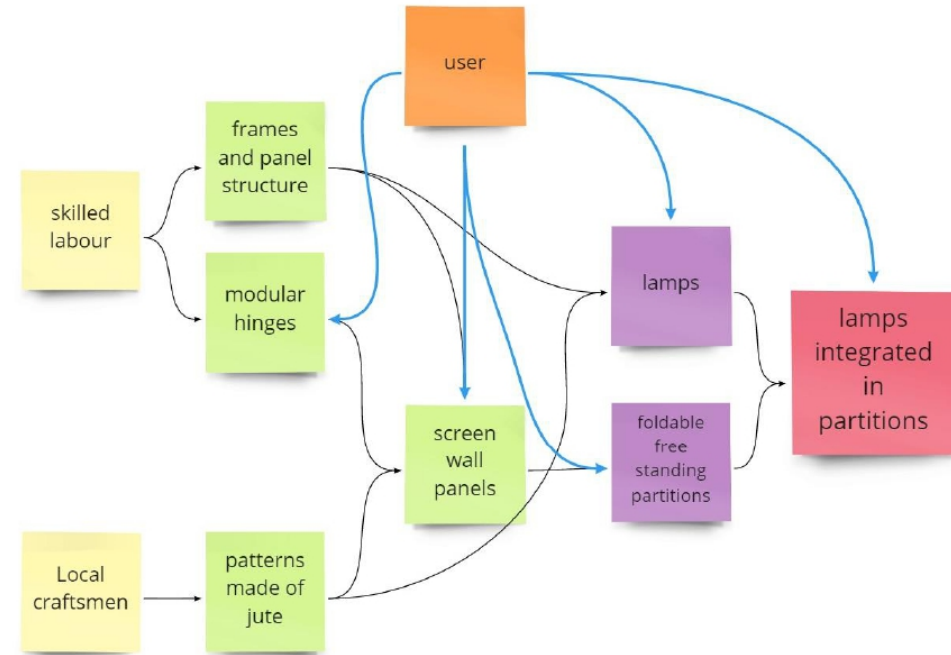


Fig 132: System design
Source: author



16. Conclusion

Unique Selling Point

- **Empowering the local craftsmen and incorporating the existing technique into designing new contemporary products.**
- **Using eco-friendly natural materials like jute, bamboo, wood and metals.**
- **Making a modular DIY system where the user can customize the product.**



Conclusion

The objective of the project was to design a contemporary product range of natural fibres using a particular technique. It was important to study the technique and come up with innovative design directions that would lead to wide ranges of products. It led to finalizing the jute partitions and lamps as the final concept. One of the main aspects was to integrate the user and design a modular system where the user will be able to customize the product. Another was that it was popularizing local craftsmanship and economically empowering them. It was important for the project was to emphasize the jute work and beauty of it. Mock-ups, prototyping and 3d visualization was used to understand the effect of the product in an interior space. The final design aims at creating an artistic jute mural through the panels of partition walls which will create a unique experience for the users.

Future scope:

- Smart technology could be incorporated in the lamps in order to customize the lighting.
- Research on different construction techniques may be done for easy, fast and better manufacturing of the panels.
- Certain DIY techniques may be incorporated.
- Design may be further developed through testing of the prototype.

17. References

References

Text references:

- P.K. Das, D. Nag, S. Debnath, L. K. Nayak. “Machinery for extraction and traditional spinning of plant fibres”. April 2010.
- “NATURAL FIBERS”, Swadesi, June 15, 2016, <<https://www.swadesi.com/news/natural-fibers/>> Accessed on 1st February, 2021.
- “Jute Bags Manufacturing Process”, Param Jute Products, <<https://www.paramjute.com/jute-bags-manufacturing-process>> Accessed on 1st February, 2021.
- “Jute Products Manufacturing Process”, Texnote, August 28, 2013, <<https://texnoteblog.wordpress.com/2013/08/28/jute-products-manufacturing-process/>> Accessed on 18th February, 2021.
- <https://okhai.org/products/dhaaga-handcrafts-round-mini-natural-aztec-sling-bag?variant=35336018755750¤cy=INR&utm_medium=product_sync&utm_source=google&utm_content=sag_organic&utm_campaign=sag_organic&gclid=Cj0KCQiA7NKBBhDBARIsAHbXCB6buEMT4vo3M7Ybwdnl_BoxJYxJqkSmBoYuAJtqXLC-D2cqEUS6634aAu6dEALw_wcB> Accessed on 19th February, 2021.
- <<https://okhai.org/>> Accessed on 19th February, 2021.



References

Text references:

- <<https://www.enkev.com/en/>> Accessed on 22nd February, 2021.
- <<https://www.indiamart.com/>> Accessed on 22nd February, 2021.
- <<https://www.wdoindia.org/single-post/2016/12/15/TECHNICAL-TRAINING-PROGRAMME-FOR-JUTE-NATURAL-FIBRE-CRAFT-CLUSTER>> Accessed on 22nd February, 2021.
- <<https://kidskottapuram.org/>> Accessed on 22nd February, 2021.
- Hannah Ritchie and Max Roser (2018) - "Plastic Pollution". Published online at OurWorldInData.org. Retrieved from: '<https://ourworldindata.org/plastic-pollution>' [Online Resource]



References

Image references:

- [IR1] - <https://link.springer.com/chapter/10.1007/978-3-319-07944-8_2>
- [IR2] - <<http://www.madehow.com/Volume-6/Coir.html>>
- [IR3] - <<https://www.indiamart.com>>
- [IR4] - <<https://www.enkev.com/en/>>
- [IR5] - <<https://kidskottapuram.org/>>
- [IR6] - <<https://www.wdoindia.org/single-post/2016/12/15/TECHNICAL-TRAINING-PROGRAMME-FOR-JUTE-NATURAL-FIBRE-CRAFT-CLUSTER>>
- [IR7] - <<https://in.pinterest.com/>>
- [IR8] - <https://www.youtube.com/watch?v=e_4CSRKBNDU>
- [IR9] - <<https://ourworldindata.org/plastic-pollution>>
- [IR10] - <<https://okhai.org/>>



Project 3

Thank You...

Sulagna Mukherjee | 196130015

Under the supervision of Prof. Sandesh R.
Final Report

IDC School of Design
Indian Institute of Technology, Bombay
2019-2021

