

REPORT

Journey with bamboo Industrial Design Project -I

Submitted by Arjun Prasanth-156130011



IDC- School Of Design
Indian Institute of Technology
2015 - 2017

Declaration

I declare that this written submission represents my own ideas and where other's ideas or words have been used, I have adequately cited and referenced the original sources. I also declare that I have adhered to all the principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any ideas/source/fact in my submission. I understand any violation of the above will be the cause for a disciplinary action by the institute and can also issue penal action from the sources which has been thus not been properly cited or from whom proper permission has not been taken where required.

Arjun Prasanth
156130011
IDC School Of Design
Indian Institute of Technology, Bombay

Approval

This project titled “Journey with bamboo” is prepared and submitted by Arjun Prasanth in partial fulfilment of the requirement for the degree of ‘Masters in Design’ in Industrial Design. It has been examined and is recommend for approval and acceptance.

Acknowledgement

The efforts which i have put into my project wouldn't have fulfilled without the help and guidance of amazing bunch of artisans in the centre. I would like to extend my sincere gratitude towards them.

For the attention and time they spent on me, rectifying my mistakes and guide me without being asked, I am specially grateful to them.

The co- operation and encouragement given by the members of the Uravu bamboo centre and uravu ecolinks helped me to progress my project.

My sincere thanks to Prof A.G. Rao Sir who has given valuable inputs throughout my design journey.

Special thanks to two of my friends Antik and Arnab who were with me , guiding and willingly helping me throughout the course of my internship and making one month worth it.

Abstract

An extensive exploration of the wonder material 'bamboo' is done at Uravu, Wayanad for a deep understanding of the possibilities that can be achieved through the manipulation of the material. Certain design solutions and suggestions, for an existing resort, were put forward as a development of the current scenario there.

During the course of one month staying at Wayanad with a bunch of bamboo enthusiasts around helped a lot in terms of design thinking and to acquire a deep understanding of the material which in turn helped to make toys made up of bamboo.

CONTENTS

Declaration	I
Approval	II
Acknowledgement	III
Abstract	IV
Introduction	1
Design solution to stabilise the strength of an existing bamboo chair	
Modular furniture set	
Brief	6
Background study	7
Scaled prototype	13
3D Renderings	14
Bamboo foldable chair	
Brief	18
Design options	19
Balcony roof design options	21
Bamboo toy exploration	25

Introduction

URAVU is a non-government organization working with people, governments and businesses to implement programs for sustainable employment and income generation in rural areas. Uravu is a non-profit trust, established in 1996, registered under the Indian Trusts Act. It is located in Thrikkaipetta village in Wayanad district, Kerala state, South India

Uravu promotes social enterprises based on value addition of local, natural resources, especially bamboo, the “green gold”. Uravu implements integrated, end-to-end programs in the bamboo sector, which include providing skill training in bamboo processing, establishing micro enterprises, marketing of bamboo handicraft, cultivation of bamboo and promotion of eco-tourism.

Uravu strives for empowering marginalized social groups, especially the traditional artisans, women and the Indigenous People.

Uravu is located in Thrikkaipetta village in Wayanad district, Kerala state, South India



Products made in URAVU

**DESIGN SOLUTION TO STABILISE THE
STRENGTH OF AN EXISTING BAMBOO CHAIR**

Design considerations

- Any extra joinery or member adding should not hinder the flow of the current design.
- The positive and negative space formed by the concurrent members should be maintained



Existing chair

Reasons for instability

- More number of bamboo segments for the legs
- Unequal radius for the curvature
- No connecting member for connecting all the 8 bamboo segments

Problems identified

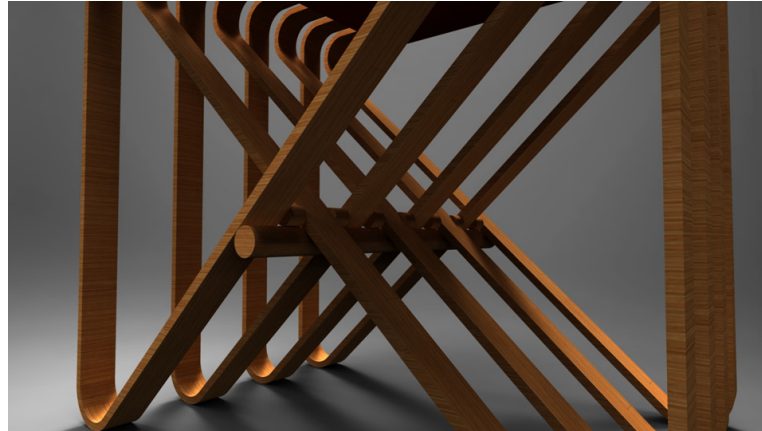
- The legs of the chair are shaking
- Tendency to fall backwards while sitting on the seat.
- Each of the segments stretch themselves when someone is seated.



Top view of the seat



Design solution



Rendered image of the chair

A bamboo rod connecting all the 8 bamboo segments.

Small pieces of bamboo rod are placed above the connecting rod filling the gap of the concurrent segments.

The connecting rod and small pieces of rods are connected using nut, bolt and washer.

It reduced the unstability of the chair to a considerable amount.

The solution doesn't hinder the beauty of the intersection of concurrent segments at the centre.



MODULAR FURNITURE SET

Design Brief

- To design a modular furniture set which caters its functionality in public semi-open space and compact residential spaces. e.g.:- outdoor coffee shops, studio apartments.
- To be used in areas with less circulation space, the furniture should consume very less space.
- To explore multiple uses of furniture and to find a different meaning in the stackability of it also.
- To explore the possibilities of bending of bamboo and to incorporate in the design.

BACKGROUND STUDY

Modularity as a concept

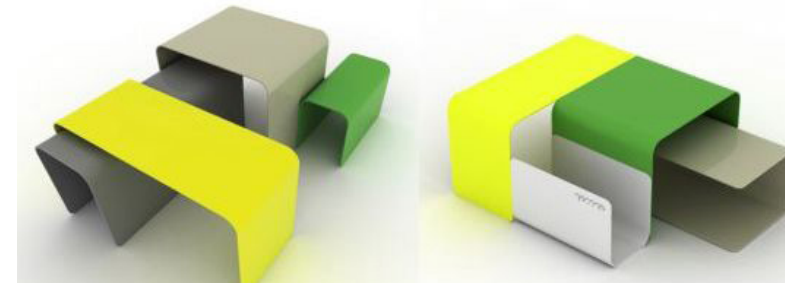
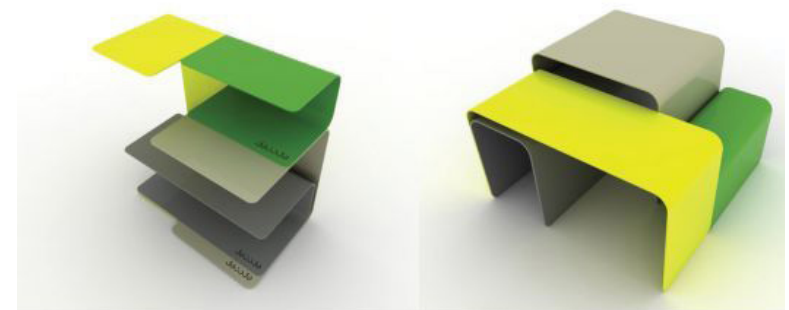
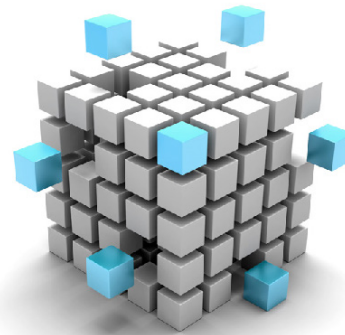
The concept of modularity refers to the subdivision of a system into different modules and can be used in another systems that serves different purposes.

Space saving and flexibility in design after standardisation of design helps in the manufacture which in turn reduces the cost. Increased performance with intelligent approach leads to efficient modularity

The interfaces between the modules should be smooth enough that the transition should be unnoticed.



conceptual images showing modularity



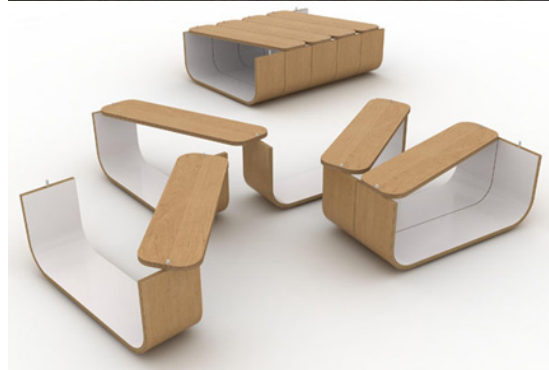
Modularity in furnitures

The modules are manufactured separately and serves different purposes when it is stand alone and also combined. The combination of segments plays an important role in the modularity of furnitures.



Space saving is an important factor of modular furniture.

Elephant bamboo strips are commonly used in bending for the making of bamboo furniture.v



images showing modularity in furnitures

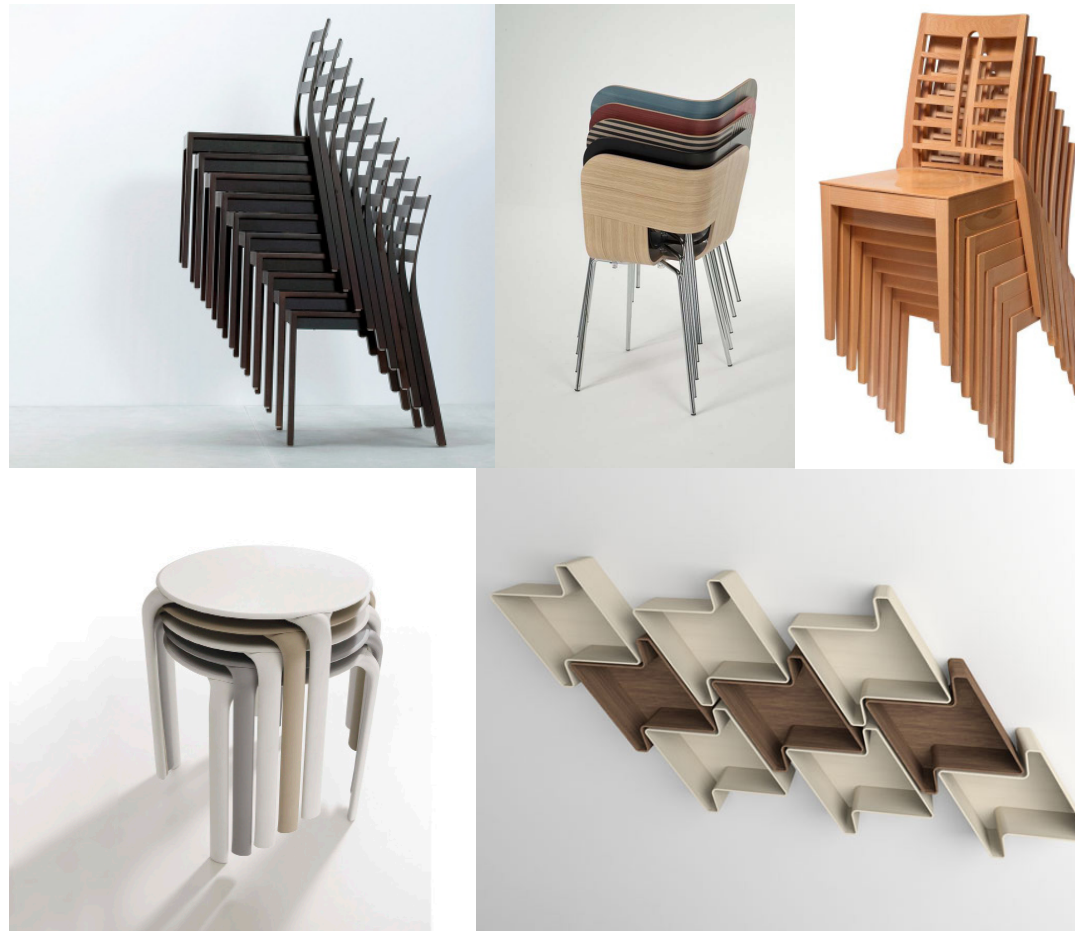


Stackability in furnitures

The positive and negative space to compliment each other to stack above the similar modules.

The portion in contact to each other modules should be designed effectively to avoid wear and tear during stacking.

Efficient while moving or transportation of furnitures.



images showing stackability in modular furnitures

Bamboo furnitures

The bending property of bamboo can be effectively used for the designing of furnitures.

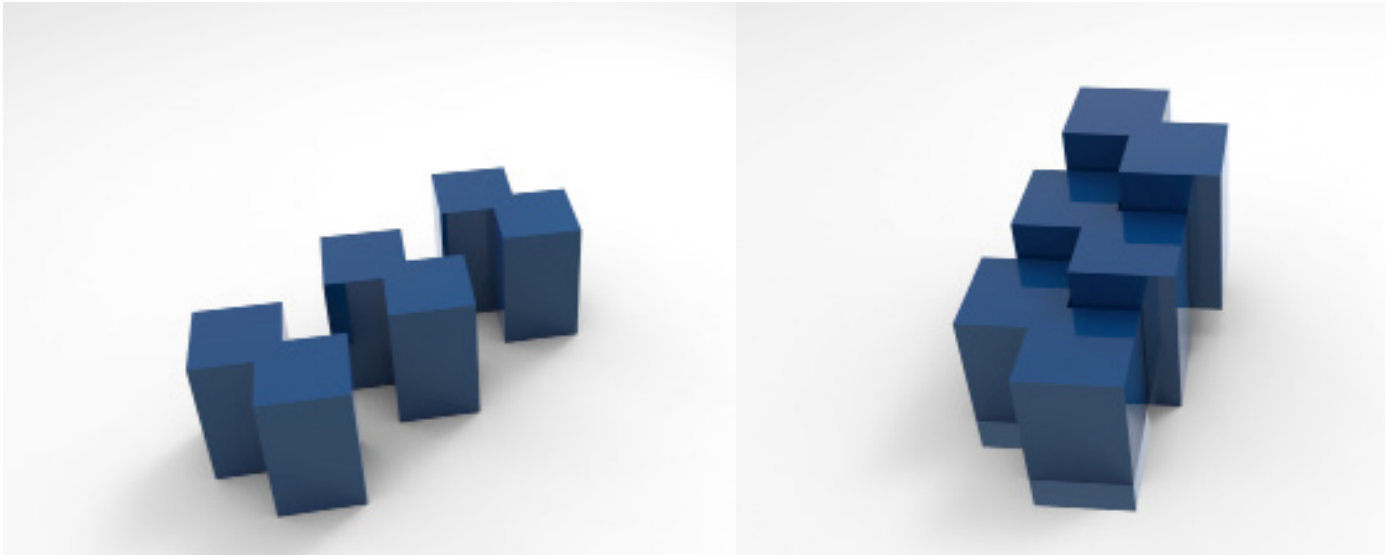
The strength of the portion in contact to the ground can be increased by force distribution of the adjacent vector members.

Triangular module has more strength in contact to the ground and has more stable force conversion factor.



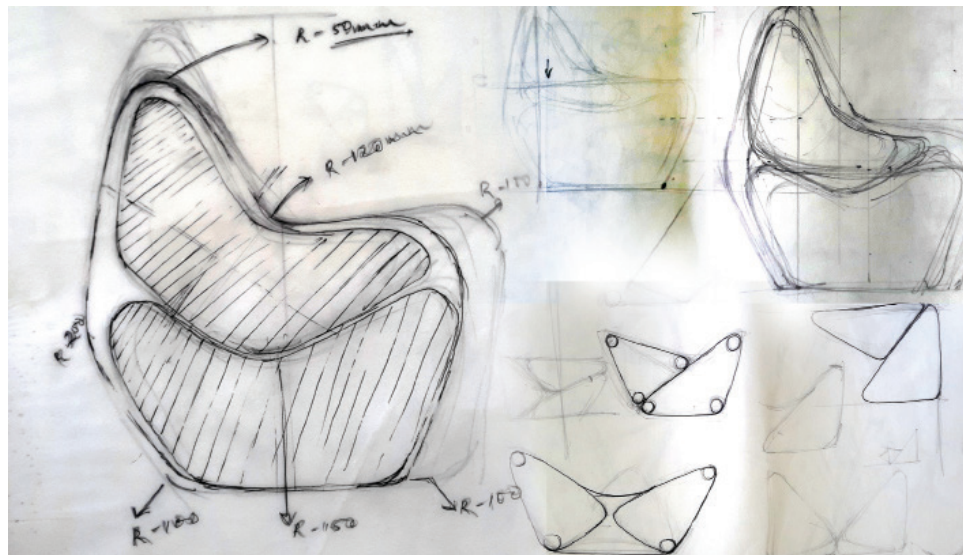
inspirational mood
board images

Modularity in stackability



Conceptual image depicting stackability of furniture set

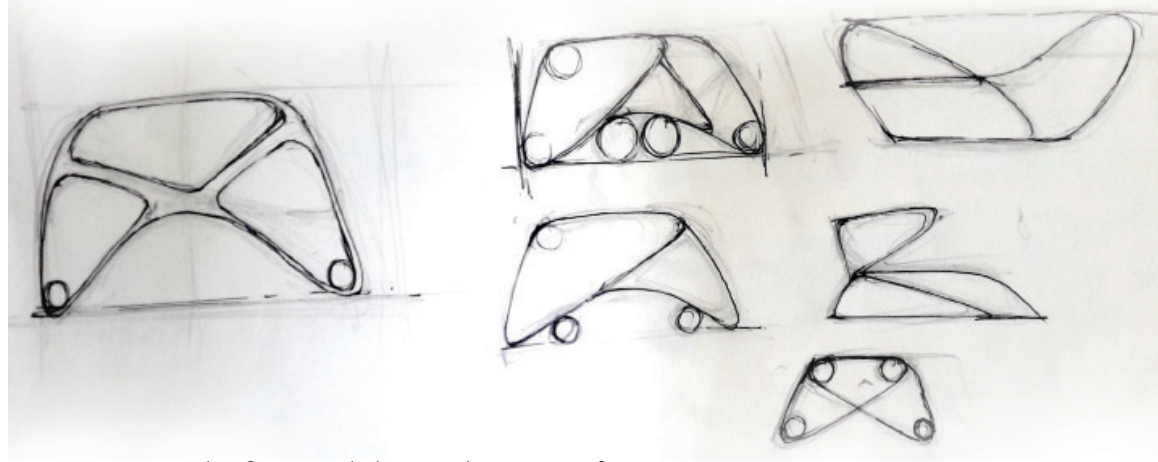
Initial design process



Initial conceptual sketches

The initial shape has been formed by the basic seating position and its ergonomics.

The two modular segments are designed in accordance to the basic seating position that compliments its basic form.

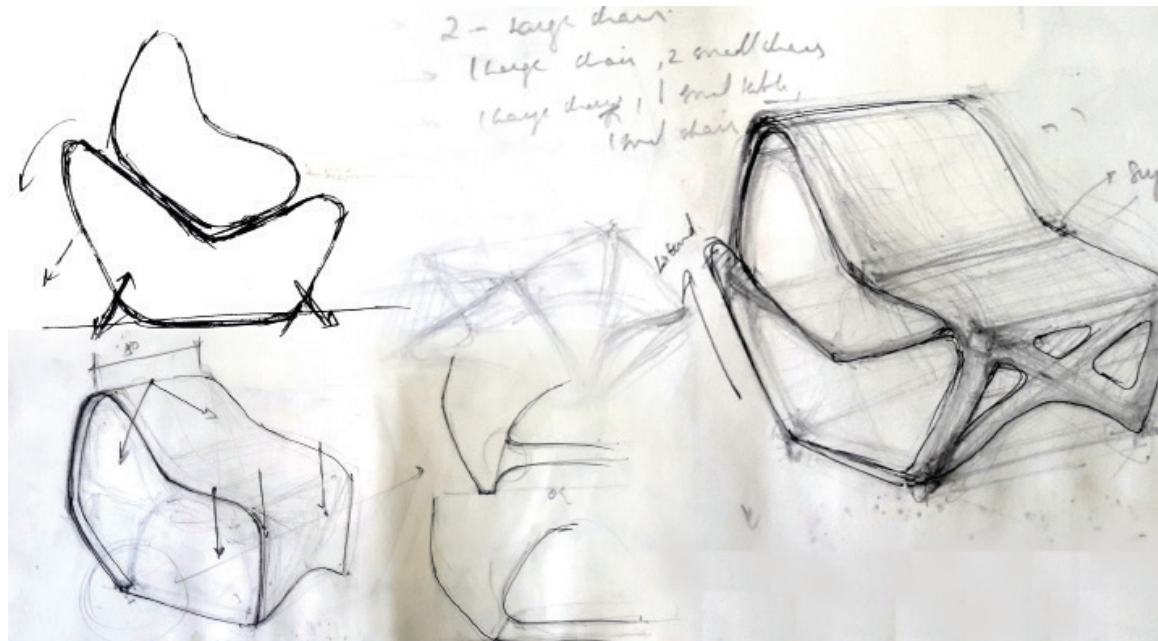


Geometrizing the form and the combination of joineries.

Determination of the strongest geometry that can be applied using bamboo bending for the legs to support load from the seat. The cancellation of loads are also figured out during the design process.

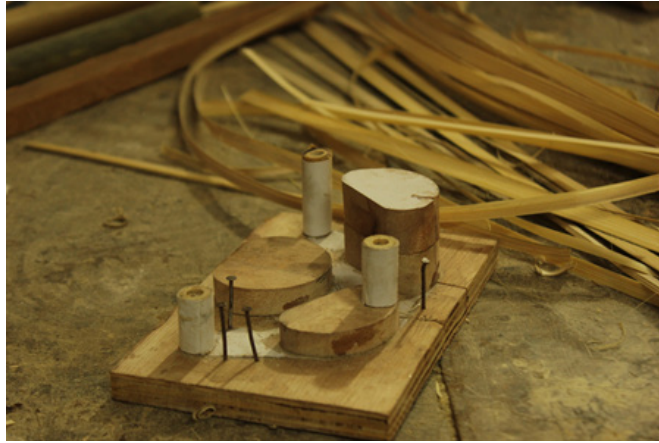
The number of segments to be combined to get the maximum stability when there is a load is also taken into consideration.

Minimalisation of bamboo usage and its members was also a main agenda during the process



Scaled prototype

The scaled model was made with bamboo reed wound around a mould made with wood, hollow bamboo and cane



Mold for making the scaled prototype



Scaled prototype



3D renderings



Low seating coffee chair



Low coffee table



Lounge chair

Provision for keeping books and magazines also designed in low seating chair.

Bamboo mat is also incorporated in the design

Expanded view of the modular segments when it is stacked to be converted into a seating chair



1



2



3



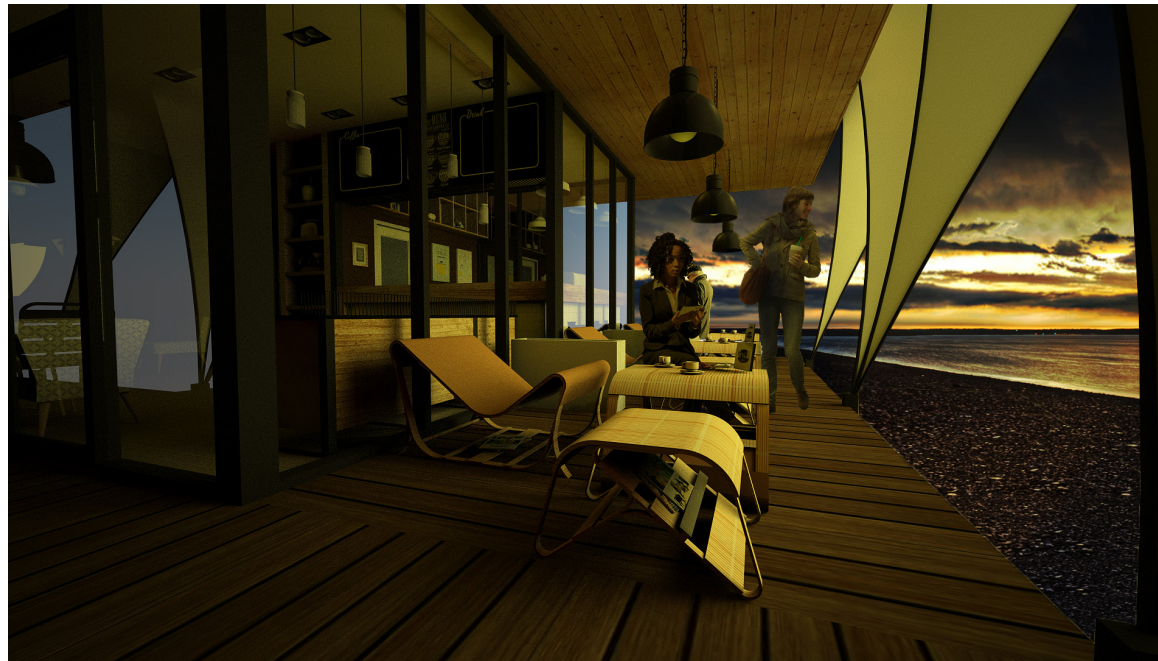
4



5



6



Representaion in one of the scenarios where the furniture set is used- semi open area in coffee shop

In places where the circulation space is low , it is difficult to move the furnitures while sweeping the floor, or moving the furnitures elsewhere. In order to rectify this problem stackability is one of the solution.

Durability is also increased .

BAMBOO FOLDABLE CHAIR

Brief Foldable chair for IAY (Indira Awaas Yojana) housing - low cost housing
Cost effective
Minimum usage of additional materials
Round bamboo to be the material used(not strips of bamboo cut and bend) to reduce the cost.

Design options

Keeping the basic foldable mechanism of structure of the chair as constant, seat and backrest has been made different design options



1

Plywood as seat and jute as backrest



2

Jute as seat and as backrest



3

Bamboo planks as seat and jute as backrest



4

Jute as seat and bended bamboo strip as backrest

Scaled prototype



In the process of 1:1 prototype

The smaller foldable leg has been shifted outwards as it pokes the person who is seated on the chair.

Jute seat idea has been discarded as it doesn't provide enough strength to withstand the load acted over it.

Final prototype



BALCONY ROOF DESIGN OPTIONS

Brief To design balcony roof for the existing resort (bamboo groves) as it is getting ruined due to heavy rains.
The roof should not be directly attached to the resort as the walls are built with mud and on top of it bamboo laminates are fixed.
The roof should withstand the heavy wayanad rains.
Very limited use of industrial products for the design of the roof as the resort follows the concept of sustainability.
The design should merge with the existing structure.



Rear view of bamboo groves resort

Design solutions

- Strictus bamboo with 10cm and 6cm diameter is used in the design
- Glass is also added in one of the design solutions
- Shera board is used as the roofing material.



Existing



1



2



3

SHADE FOR ENTRANCE DOOR

To design shade at the entrance door for the existing resort (bamboo groves) as it is getting ruined due to heavy rains. The roof should not be directly attached to the resort as the walls are built with mud and on top of it bamboo laminates are fixed.

The roof should withstand the heavy wayanad rains.

Very limited use of industrial products for the design of the roof as the resort follows the concept of sustainability.

Limited space to place a shade to withstand the heavy rains and the lintel height is also 240cm.



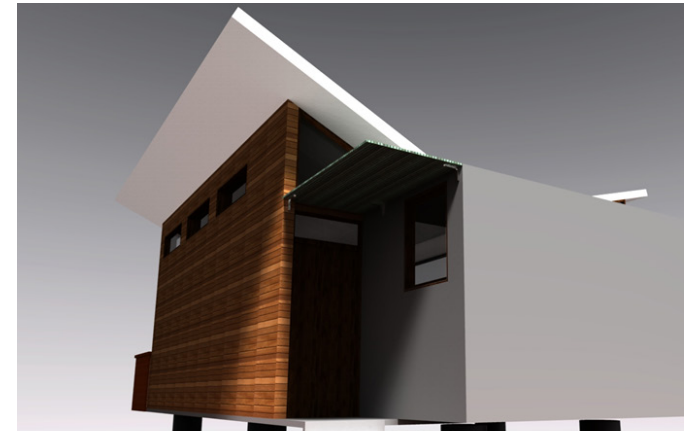
Front view of the existing resort

1. Steel sections are used to hold shera board and bolted together to the wall.

2. L steel clamps are used to hold the board



1



2

BAMBOO DIY TOY EXPLORATION



Brief To design a DIY bamboo toy with the concept of imageries of animals

Completely using bamboo joineries.

Geometricizing the design according to the imageries.



Some of the explorations made for the DIY bamboo toy.

