



DIY furnitures using Bamboo

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GUIDE : PROF R SANDESH

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for delivering the bamboo in his car so I do not have to pay for a taxi.

To **that Security Guard**
for saying 'beta, ja ke mood-i enjoy karo!'

Thank you.



DECLARATION

I hereby declare that this written submission represents my idea in my own words and where others' ideas have been included; it has been adequately cited and referenced the original source. I declare that I have adhered to all principles of academic honesty and integrity and have not misinterpreted or fabricated or falsified any data/idea/facts/sources in our submission. I understand that any violation of the above entitles the institute to take disciplinary action against us to which I shall be answerable to.


07/01/15



APPROVAL SHEET

The project titled as "DIY furnitures using Bamboo" by Shreelekha Lakshmipathy is approved in partial fulfilment of the requirement for the degree of 'Master of Design' in Industrial Design.

Guide:



Internal Examiner:



External Examiner:





DESIGN BRIEF

To design a Furniture system using Bamboo with post modern approach using bamboo poles and joineries that could be assembled by the user post an online purchase.





Called **Underconstruction**, the system includes two different joints that can be used to build and configure tables, coat pegs and storage rails with bamboo poles. Exactly what they end up being used for is down to the needs and imagination of the customer, but almost anything is possible due to the system of a basic frame and accessories that can be added or removed as necessary. The collection has taken a different approach to furniture design; rather than provide a fixed solution to a given functional requirement, this is instead a toolkit that can be adapted to any eventuality. Key to this system are the removable accessories that have been made from a mix of materials - metal mesh, Bamboo weaves - so if your furniture needs an extra surface, it can be added.

This project is also a manifestation of an experimentation with materials and how these can be distanced from their common assumptions and be placed in new contexts, where the goal was to combine bamboo and plastic within a functional structure by looking for the most suitable form and state of plastic in order to make it utile. The number of different components is kept to a minimum and the various pieces within the series are easy to assemble, requiring no specific tools.

The design comprises of a series of lightweight pieces that aim to both change existing perceptions of bamboo (from a 'ecoresort'y, touristy, crafty product to a everyday product that fits into a contemporary lifestyle setting) and rekindle interest in the traditional material and its various possibilities by the design boasting exposed joinery and bold bursts of vibrant color. Adding weaved baskets and other details blend the concept of Furniture and 'miscellaneous interior goods thereby including craftsmanship, a major aspect related to the material which would bring in the 'Bamboeness' into the product. The collection includes side table, console table and hang rack and majorly focuses on a minimalist, airy design.



The project started with an idea of designing a furniture that is transformable; one that interacts with the user on a regular basis and allows the user to manipulate it. Possible directions for the project were identified and assimilated based on aspects that are mentioned in the later stages of the report. The project is redefined to a DIY furniture using Bamboo and product areas's are identified and chosen.

TRANSFORMABLE FURNITURE in BAMBOO

Bamboo	Type of Transformation	Area of Work
Poles Splits Flats Weaves	Knock down Alternate Function Multiple Function Space saving Sculptural	Usable Nostalgia Poetic Transformations Design by use / Self construction

DIY furnitures in Bamboo for a contemporary urban dwelling

Product Area
Stools | Accent chair | Coffee Table | Console Table | Bar Stools | Wall Shelves | Bookshelves and Display Units | Entryway and Foyer



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This section is an attempt at understanding the concept of transformability through existing project references.

Examples are categorised into five aspects of transformability, namely :

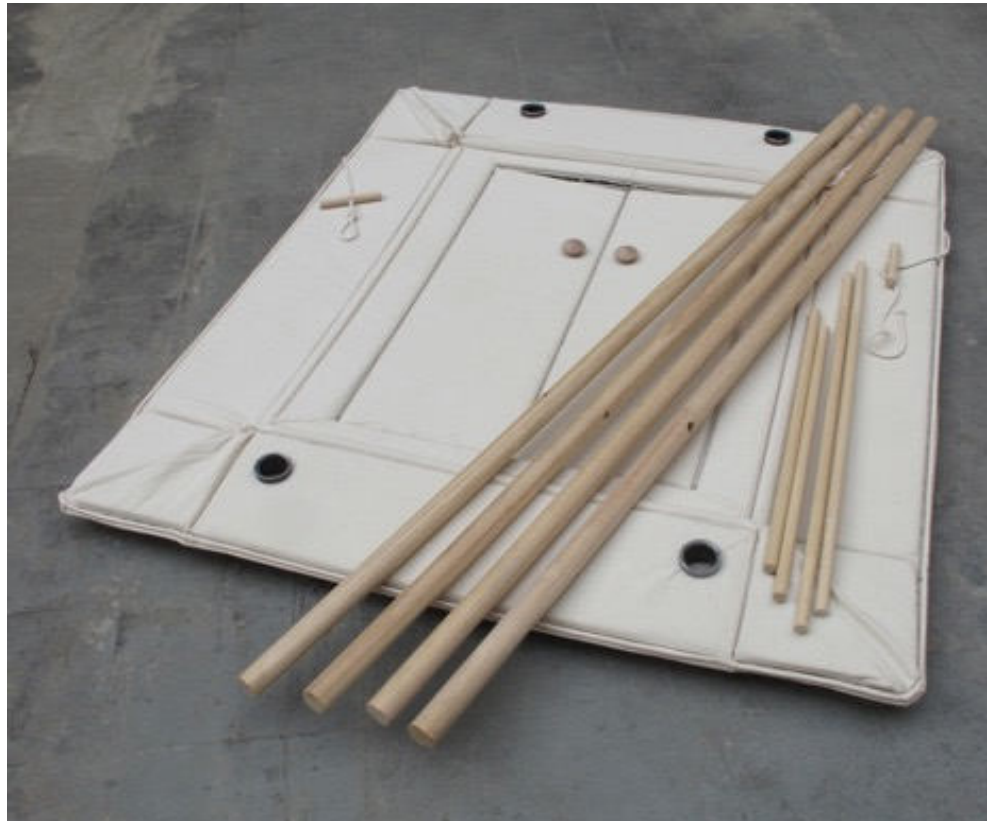
1. **Knockdown** - The one-time transformation happens while setup and involves the user
2. **Alternate function** - The products transform for an alternate purpose providing a two-in-one advantage to the user.
3. **Multiple Function** - The products are designed to serve more than one purpose catering to user choice.
4. **Space-Saving** - Transformations serves the purpose of saving space
5. **Sculptural**- Transformation for inducing an everyday awe in the user.

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TRANSFORMABLE FURNITURES | KNOCK DOWN

**POP-UP LINEN
WARDROBE**

Renate Nederpel



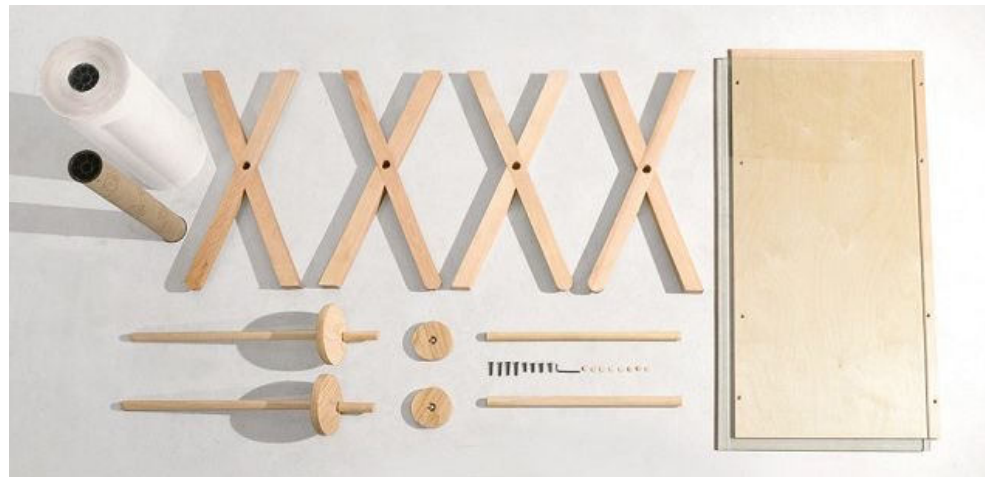
What Works :

- The ease in assembly (no screws/rivets/small pieces)
- Stability by locking the structure

The wardrobe, is made from fabric panels that fold flat when its wooden poles are removed. Nederpel created the wardrobe "to be produced and transported efficiently" The soft foldable cabinet sits atop four high pinewood legs, that cross through the fabric structure to hold it in place. Creases were integrated into the top, bottom

and side panels – along with extra flaps of material at the corners – so that the front and back can be pushed together and the whole piece lays flat. Smaller sticks span between these legs to hold up the base of the padded linen box and also where the large poles cross to form a clothes rail.

ANALOG MEMORY DESK
Kristen Camara



This piece of furniture, Analog Memory desk is designed by MCAD student Kristen Camara with a built-in analog memory system, in the form of a kilometer-long spool of paper. This Memory Desk is a tool to record all the small items you write down once, but intend to forget tomorrow. The desk is

designed as a Knock-down and the drawings released on a common forum where interested people can build one on their own. She built her desk from hard maple, a huge roll of butcher paper and a glass panel. The desk is a simple innovation with a greater purpose to enable storytelling.

What Works :
 -Integration of the concept with the furniture
 -Making it a possible DIY (Addresses user with common interest)

A1

TRANSFORMABLE FURNITURES | ALTERNATE FUNCTION

FIGO NATURAL Fresh Futon



Futon is a Modern multi-position convertible lounge-bed for sleeping, lounging, or relaxing through a quick adjustment that reclines Figgo down a little bit further to different levels of adjustment. The chair strikes an eye-catching pose with its long diagonal lines and a variety of brightly colored futon pads complete the look.

What Works :

- Type of Transformation suitable for the purpose
- Providing color options to the user for the furniture to fit in their environment.



GRO^ Christian Troels, Michael Knap

GRO^ is a new interpretation of the classic rocking horse, with a simple aesthetic that speaks to adults and with a simple function that speaks to children. It is a frame that follows the child in the early years of its life. The first step is the crib for the newborns. A seat can be added in the frame when the child turns two. for making a simple rocking horse and to buckle a balance board in the bottom of the frame. which gives a little more challenge and fun for the older children aged five and above

What Works :

- Simplicity in aesthetics
- Increased usage life for the product

FUSILLO STORAGE SHELF
and ViceVersa



Fusillo appears to be a solid piece but in fact, it's made up of smaller sections that pivot on a central axis and can be moved up and down to be used as bookends or hooks. Each section has a notch out of it so that it can hold a coat, hat or even a bike. It is an artisanal piece made of solid oak and polished stainless steel.

What Works :
-Transformability at user's will
-Simplicity in production

A1

TRANSFORMABLE FURNITURES | SPACESAVING

EXPANDABLE STOOL Karthik Poduval



What Works :
-Cue's that it is extendable
-Bringing the Concept across as 'Sharing'

Along the concept of the expandable table are these extendable stools, a space-saving furniture for both public and domestic use which in use, becomes a fun and innovative way to share space – rather than save it. It encourages the user to interact with it through visual and physical cues.

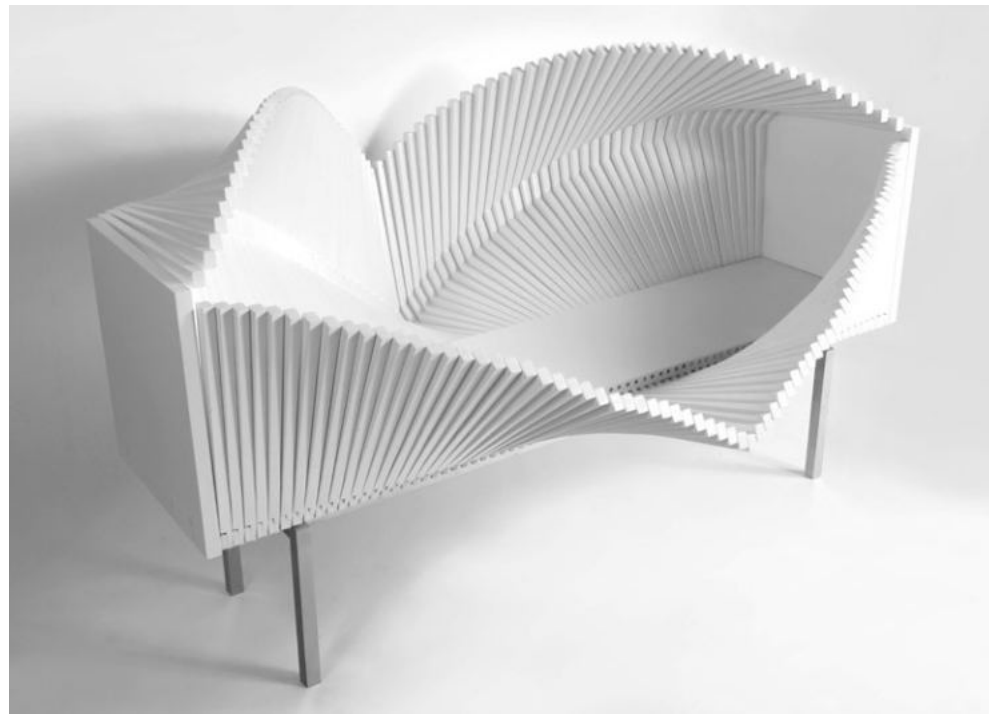


The set of three drawers are designed with legs so that they either form three separate cabinet tables around the house or form a one large chest of drawers. Colours and wooden pegs add contemporary feel to the otherwise classic function.

STACKABLE SHELF



What Works :
-Integration of colors and wood
-Stack-ability



What Works :
 -Adding drama into an everyday action
 -Normalcy when closed

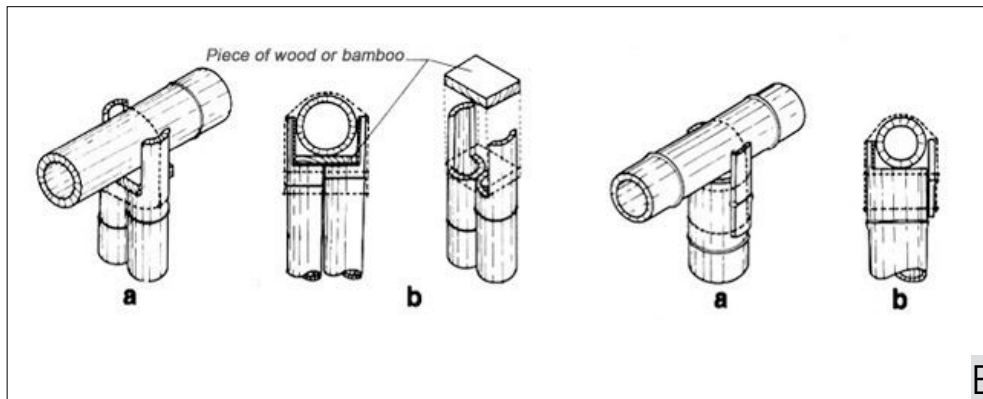
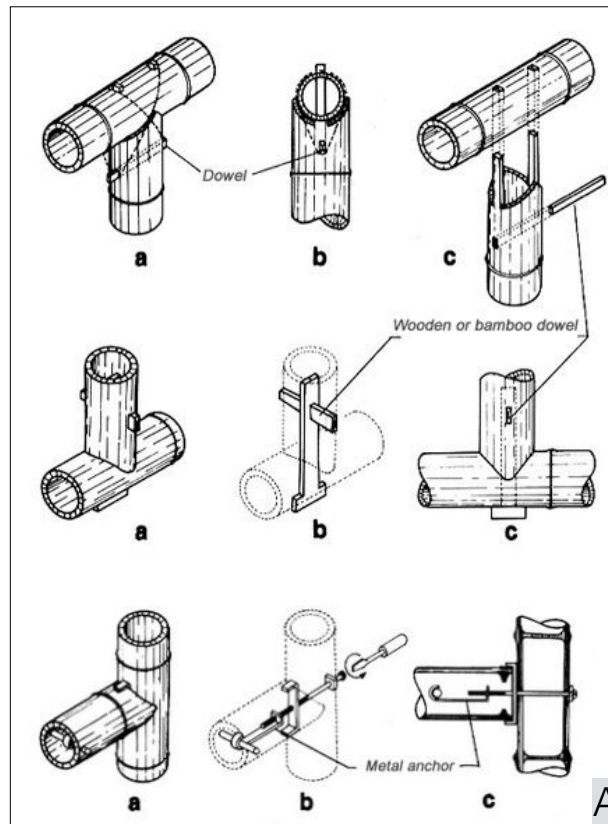
WAVE CABINET
EXPLOSION CABINET
Sebastin Errazuriz

Instead of opening with traditional doors, the Wave Cabinet is accessed by pulling back one of the many slats along its length to create an opening in the form and a fan-like pattern across the surface. Each wooden element is connected to its neighbours, so moving one starts a chain of motion that ripples along the unit. With multiple configurations that allow for various options of aperture, the artist has re-engineered the familiar process of opening and closing, into rotating and undulating adaptations. Explosion cabinet is sculptural wooden cabinet that slides apart to look like it has exploded. sections at the front, back and top open with a push that triggers the movement of a series of slats that extend out from the main structure to make it appear as if the object has been frozen in mid-explosion.

Bamboo as a material has a set of basic do's and dont's that are required to be known prior working with the material. This section deals with understanding the material, the availability, types, basic techniques of joinery and terms.

BASIC PRINCIPLES

Cuts, Nodes

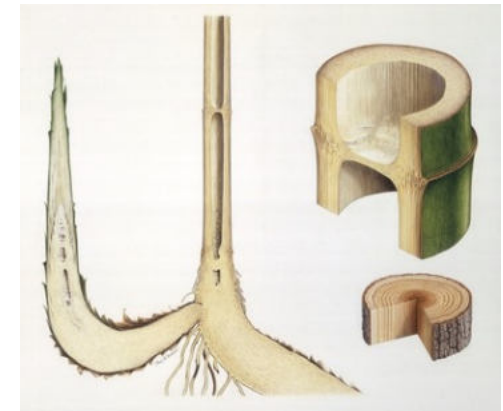
JOINERIESHorizontal with Vertical
Dowel and Anchor

Do's and Dont's :

-Do not use green, fresh cut bamboo. Bamboo has to be completely dry.

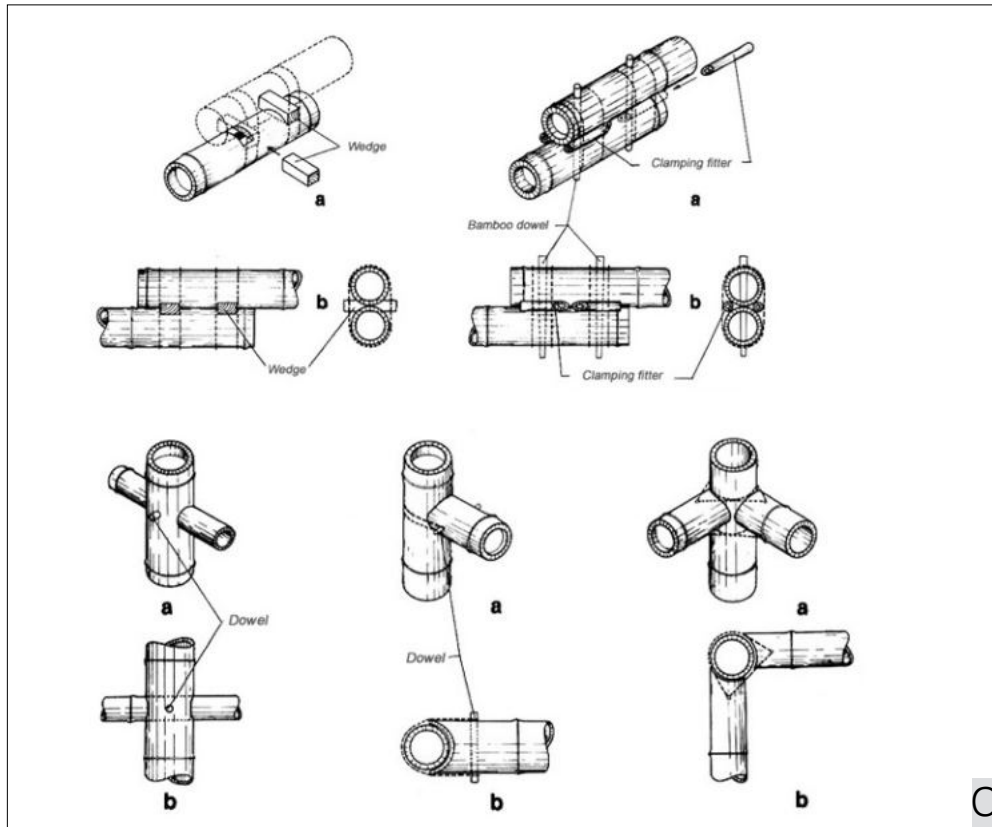
-Use bamboo of appropriate diameter and wall thickness.

Making good and aesthetically pleasing bamboo joints is rather complicated because bamboo is hollow, tapered, has nodes at varying distances, and it is not perfectly circular. It is important to keep all these constraints in mind when designing a bamboo joint. In case of joining with the use of dowels and pegs (box A), Dowel with lashing, fish mouth with pegs, using metal and wooden anchors are existing possibilities. Traditionally used joints (box B) such as Joint with one or two ears, Flap joint and fish mouth joint were looked into

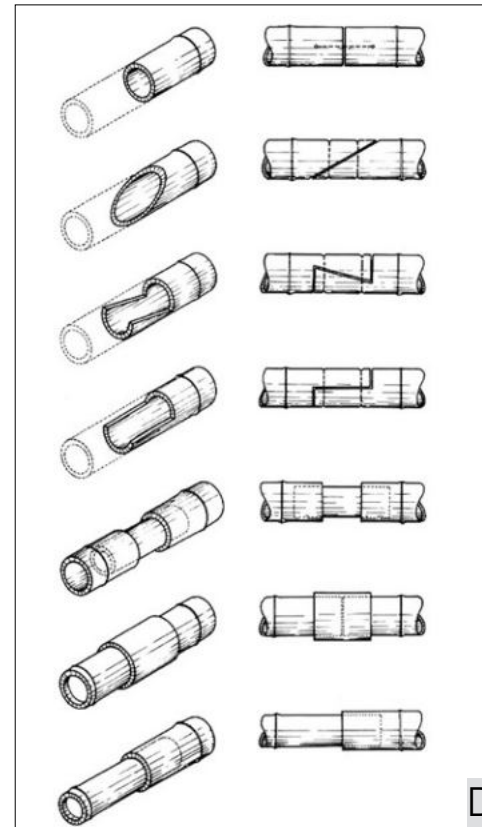


JOINERIES
Fixing poles

SPLICING



Five joinery techniques of fixing bamboo poles where noted : 1. Joint with double wooden wedge; 2. Joint with dowels and clamping fitters; 3. Cross joint with dowel; 4. Lateral joint with dowel; 5. Corner joint.



Seven splicing methods where identified ; 1. Top splicing; 2. Bevel splicing; 3. Ray splicing; 4. Half bamboo splicing; 5. Splicing with internal union; 6. Splicing with external union; 7. Telescope splicing.

This section looks at the existing products made using bamboo,

- How the advantage of the material is put to use,
- How the constraints of the material have been tackled,
- How the material visually looks true to itself,
- What other materials work with bamboo.

WORKING WITH POLES

The Rocking horse (above) designed by Gajanan Upadhyay and MP Ranjan or the stool (right) designed by the former, both stay testimony for the pure use of bamboo structures as design. The structure itself is designed as a form and creates of a unique category of aesthetic. Personally witnessing

the Rocking horse at Prof R Sandesh's house, the strength and finish provided by the material and the simple dowel joinery is remarkable. On the left is the Rattan circular shelf by Magical thinking that presents the possibility of positioning bamboo on a contemporary front.

What Works :
 -Structural integrity
 -Structure as an aesthetic

WORKING WITH SPLITS

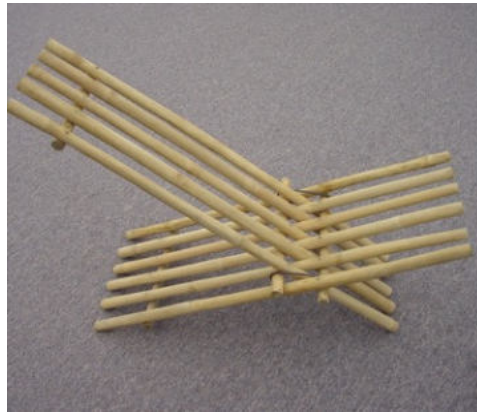


The Samuel Misled chair (top left) and the Ching Chair (top right), suggest the use of bamboo as both a rigid and a flexible material. The Nodes of the bamboo are used at appropriate locations for additional strength and lock. The curvature of the split bamboo with its vertical grain provides strength and

stability against buckling in the Ching chair. The Rocking bull (left bottom), designed by Sandeep Sangaru, incorporated the truss system using bamboo. The above examples offer varied possibilities of form, structure and strength by manipulating the material to suit the purpose.

What Works :
-Flexibility and Rrigidity, a strong aspect of bamboo

BAMBOO TRANSFORMABLES



What Works :

- Simplicity in Design
- Transformation

Similar to the other folding chair in Bamboo, the chair/recliner designed at NID also uses a similar technique of rivetting, whilst instead of using horizontal slats or weaves, the end frames repeat to create the seat and the back itself. Bamboo pole horizontals hold the vertical together in place and also act as a stopper while in recline.

Designer Carlo Contin created this bowl in a quest to arrange sticks into a geometric form in the simplest way possible. Striking, with a simple design and visual impact, the Satellite Bowl makes a dramatic centrepiece or decorative object. A circle of lacquered spokes are pinned together and twisted open to create its unique form.

WEAVES and MIXED MEDIUM

Nendo Tokyo's furnitures integrates Bamboo weaves with other materials such as wood and metal, repositioning the material and its use in a contemporary space. The richness in the bamboo weave contrast the bluntness in the other material making bamboo the star in the product even though the structure and stability is managed by the other materials. The natural material's elastic properties makes it ideal for the back supports of the chair. The 'tokyo tribal collection' is comprised of simple chairs, shelves, stools and tables that have been conceived in compact sizes in order that they fit in well with the contemporary urban living space.



What Works :
 -Blend of traditional craft and mass manufacturing
 -melded small homeware goods with furniture, contrasting conventional concepts of interior design.

The section identifies the possible directions the project could take, the advantages it possesses and eventually choose a concept based on the opportunities it provides as a learning exercise in the available time frame.

- 1 POETIC TRANSFORMATIONS**

To design a piece of furniture in bamboo that transforms to serve a purpose whilst the act of transformation is poetic
- 2 USABLE NOSTALGIA**

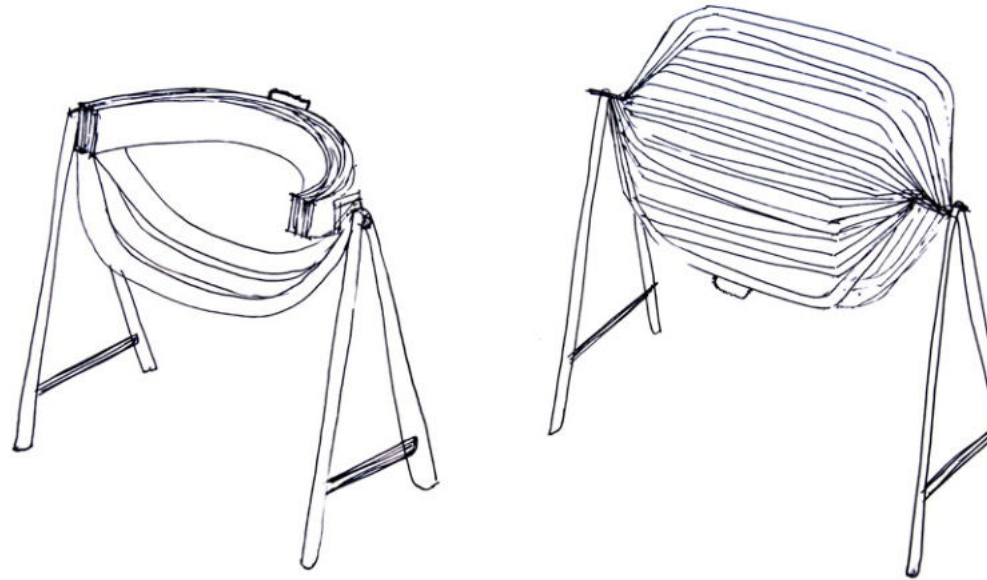
To design a multipurpose children furniture that evolves through life so that one continues using nostalgia
- 3 DESIGN BY USE / SELF CONSTRUCTION**

To design a modular bamboo system that can be mass produced (standardised) and yet used to construct unique products

CHAIR STORE

Design Possibilities:
Slat links, Stand/Legs
Form when open and close
and the in-between

Issues:
Lack of a stronger
purpose for
transformation

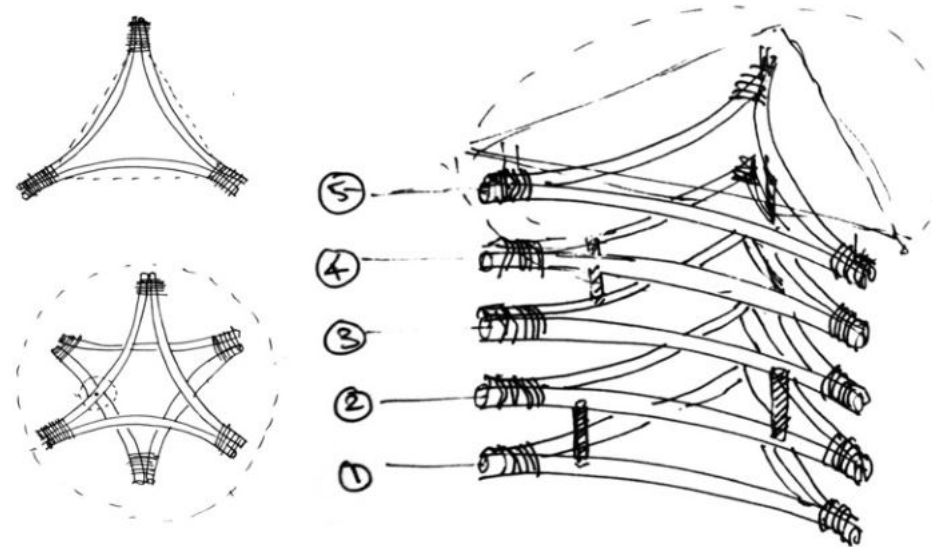


Flattened bamboo slates are bent, woven and held at two ends of a stand to form a storage compartment. These slats when altered to be fixed in a particular manner form a seater.

PATTERN TABLE

Design Possibilities:
Form (based on location
of the hinges)
Frame design

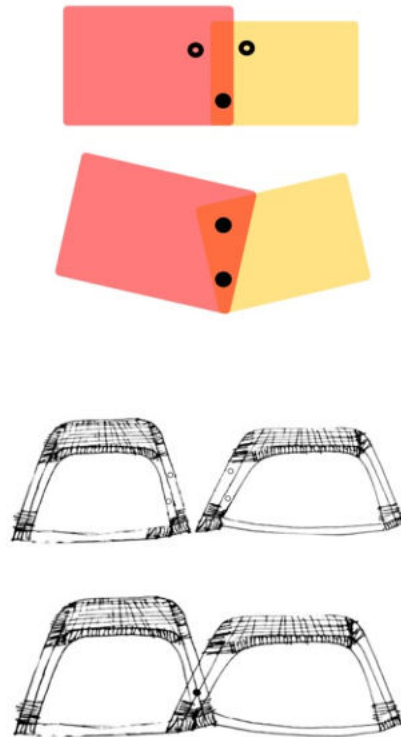
Issues:
Visual Transformation
only



Independent triangular frames formed with bamboo poles are stacked and hinged at multiple points in order. A glass plate on the top completes it as a table. The frames when moved create multiple patterns within the table that create a visual effect which could be altered at the user's will.

PLAY FURNITURES

Foot-Stool Rocker



Bamboo stools of two different heights are created where one could be used as a seater stool and the other, a foot stool. These when put together and hinged at two points create a curve converting the pieces into a single rocker. Minimalistic details could be added to these stools to suggest the nature of play.

Design Possibilities:

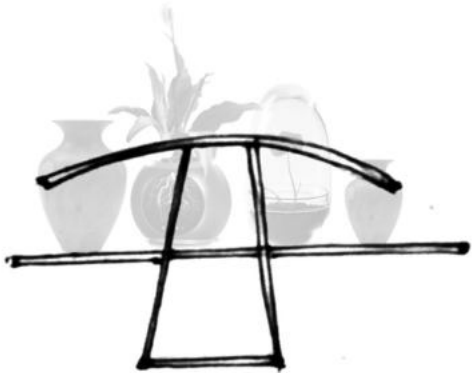
Hidden Details
Minor suggestives

Issues:

Design of a piece
Lack of opportunity for
play of form

PLAY FURNITURES

See Saw Console



Design Possibilities:

Form and Frame

Material Use

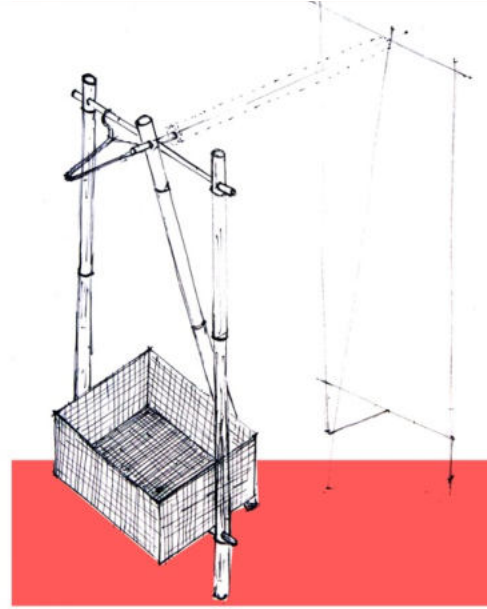
Issues:

Workability

Two bamboo pole frames are held together by a bamboo slat bench. When the straight pole takes the position of the base, the piece acts as a console table and when the curve acts as the base, it can be used as a see-saw.

KNOCKDOWNHangracksExcess wardrobe

Hang racks that offer a 'quick setup and store' space. It stows neatly on the side or expands to create a place to hang, shelves, and a place for shoes. Multiple variations could be achieved in terms of the language of design. They could be poles joined through hardwares pipes (Figure a) or two sizes of bamboo used



to form a interlocking stable structure (Figure c and d). Variations could be made by splitting the bamboo at the node to form legs (Figure b). The idea is to create as minimum a structure which serves a utilitarian value and the transparency in the structure forms the aesthetic.

**Design Possibilities:**

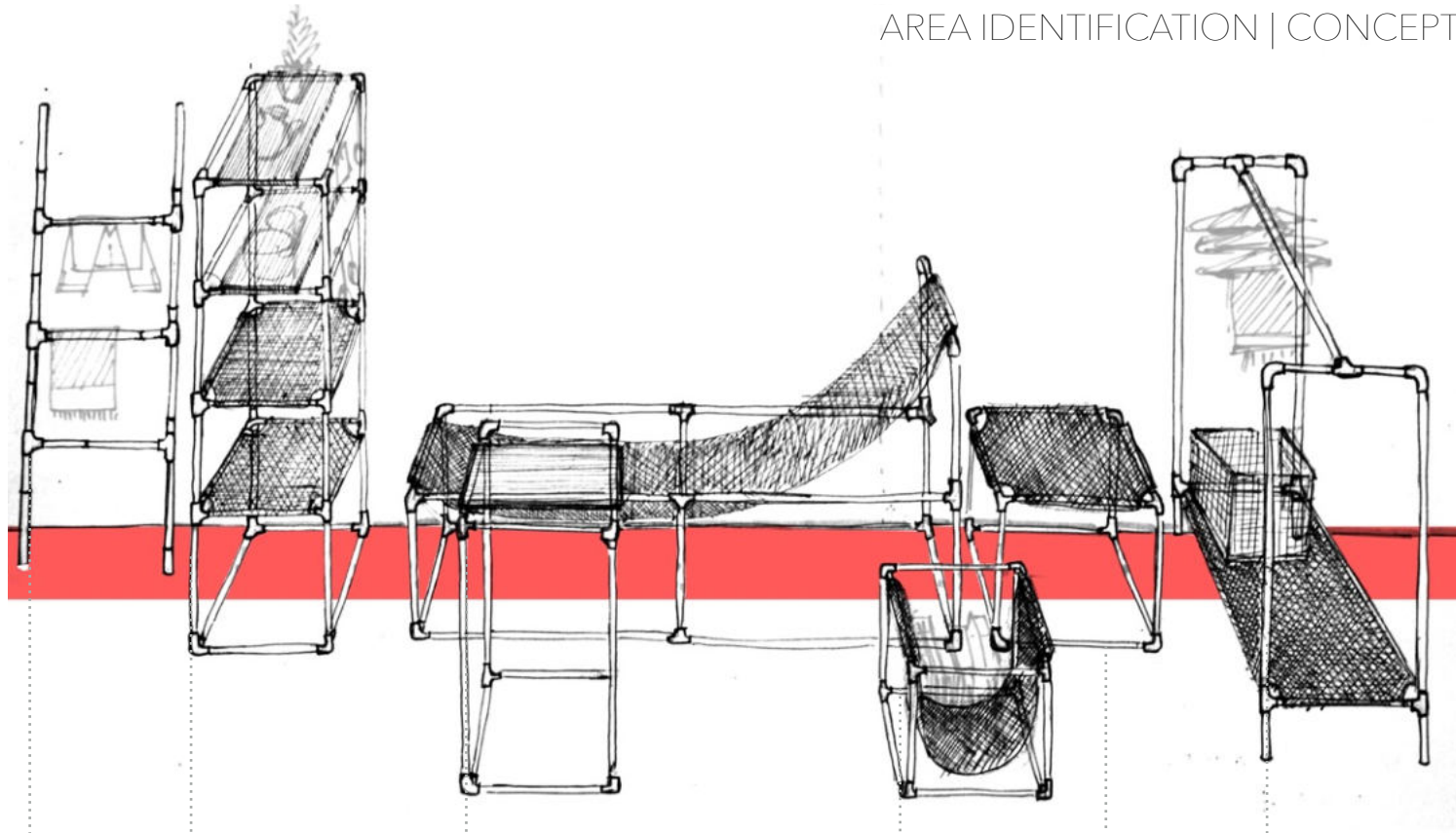
Joineries
Structure design
Range and Language

Issues:

Stability
DIY joinery
no of pieces

FRAMEWORKS

Basics



SHELF

38M
12 4W, 4 3W
+ 2 Ply
+ 2 Felt

SIDE STAND

4L, 8M
8 3W
+ 1 Ply

MAGAZINE RACK

12M
8 3W
+ Felt

HANG RACK

8S, 7L, 2M
4 4W, 2 3W,
4 LB
+ Felt / Ply

TOWEL RACK

11M
6 T

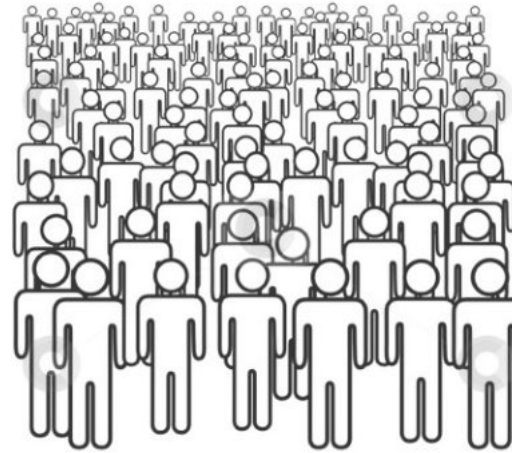
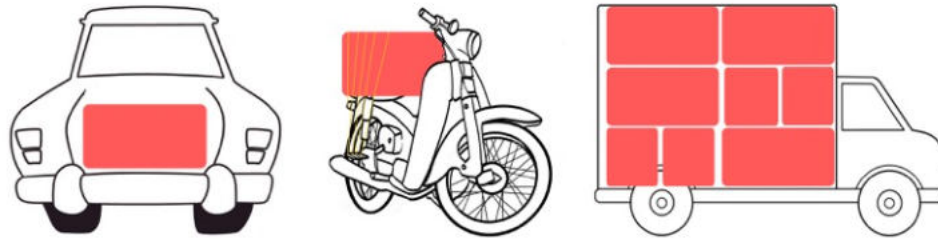
RECLINER

8L, 12M
12 3W, 2 LB
+ Felt

STOOL

12M
8 3W
+ Felt

To design a modular system that can be mass produced yet used to construct unique products where the user interacts with the object while setup. The flexible furniture seeks to merge the concepts of solid and ethereal, creating practical and minimalist configurations for utilisation. When standard sizes of poles - XS, S, M, L, XL are combined with joints (these are explored in the later stage), a range of furniture could be possible.

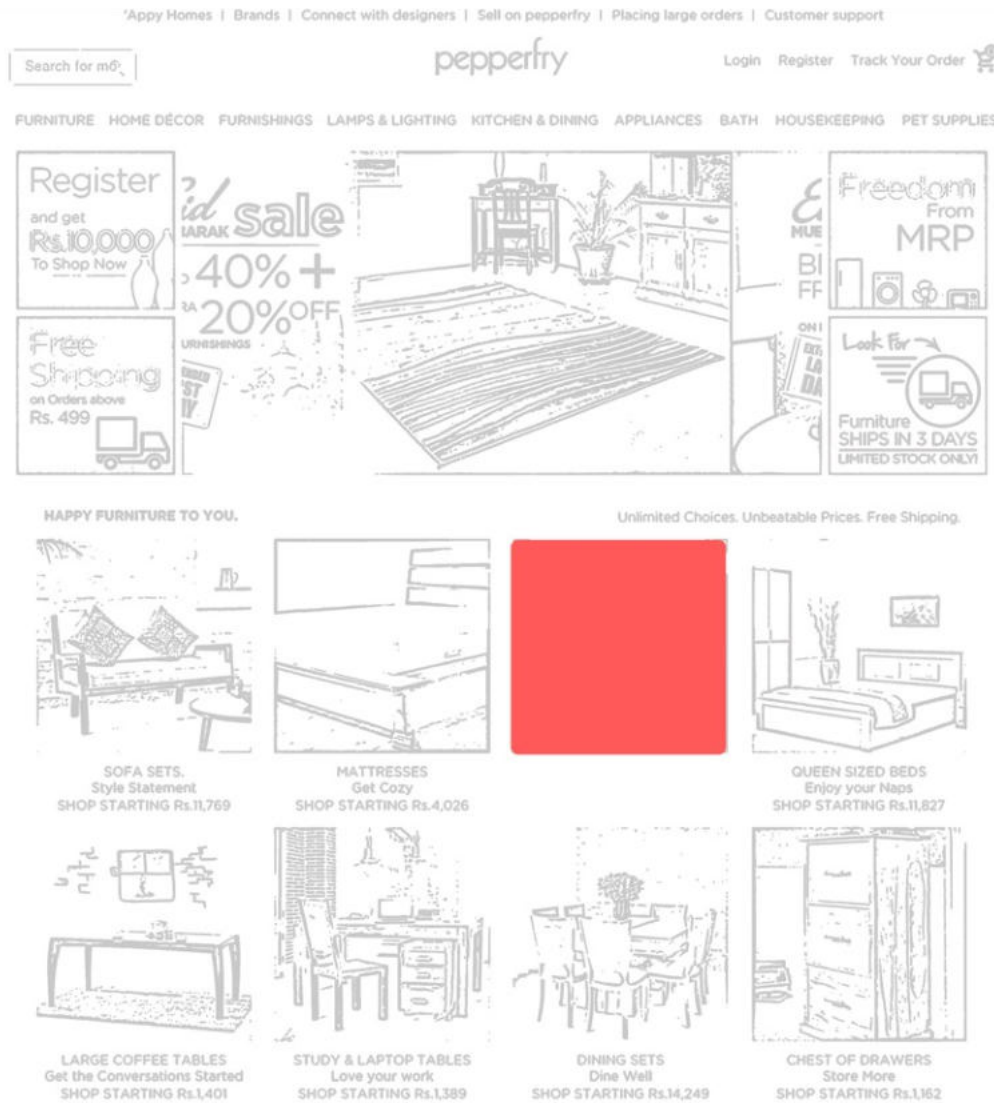
**Advantage:**

- Using existing platforms
- Ease of Transportation
- Standardisation
- Design Possibilities and Range
- Broader user base
- Augmented material and craft base
- 10 X Value

+ Sustainability
+ India map

The model, as a concept offers 10 X Value on multiple levels. It offers multiple possibilities in terms of product placement, as this could be altered to fit in a home or in a retail scenario, thereby, brooding the user base. In terms of product area, seating, display, storage functionalities could be explored. Multiple design languages could be designed to suit multiple purpose and the thereby offers more in less as a Product design and also as Product development serving as an advantage for all - the designer, the manufacturer and the user. Being DIY, gives a transportation advantage that is required for the material and product in the current scenario.

Easy transportation and positioning the material provides online accessibility to the product. The furniture could be sold through websites along with other contemporary furnitures for home and beyond. Such a concept would dissolve the material and craft into a wider platform. Situating bamboo in a contemporary urban furniture scenario also provides a sustainability advantage. With its concept of DIY, material and unique visual aesthetics, the product can affordably create its own niche in the market segment. Combining this with craft, collaboration opportunities with craftsmen and artisan can be a possibility.



- Advantage :**
- Manufacturability
 - Market Niche
 - Online Accessibility
 - Collaboration
 - Sustainability

Sofas	Chairs	Tables	Storage	Balcony & Outdoor
Fabric Sofa Sets	Lounge Chairs	Coffee Tables	Bookshelves & Display Units	Balcony Chairs and Tables
Leatherette Sofa Sets	Accent Chairs	Study & Office Tables	Wall Shelves	Balcony Sets
Wooden Sofa Sets	Dining Chairs	Small Coffee Tables	TV Units	Outdoor Swing Chairs
Leather Sofa Sets	Benches	Side & Console Tables	Shoe Racks & Entryway	
L Shaped Sofa Sets	Stools	Living Room Sets	Living Room Sets	
Loveseats	Study & Office Chairs	Study Sets	Prayer Units	
All Sofas	Ottomans	Laptop Tables	Storage Solutions	
Sofa cum Beds	Kids Chairs & Stools	Nested Tables & Stools	Cabinets & Sideboards	
Recliners		Bar Units & Stools	Bar Units & Stools	
Day Beds & Chaises		Kids Study & Play Tables	Entryway & Foyer	
Home Trial For Sofas				

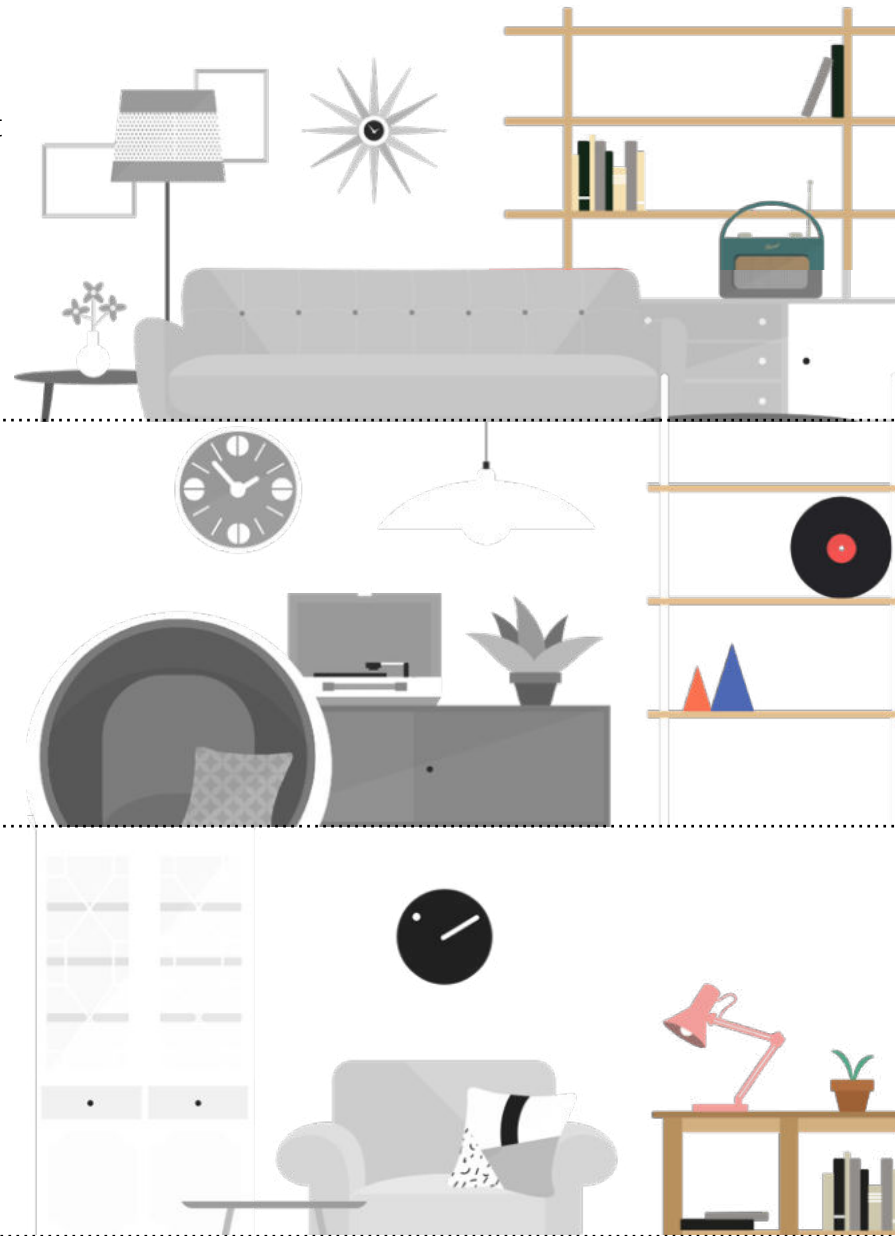
Positioning the product for a contemporary urban household and choosing online sales as a possible medium provides us with a existing categories of furnitures. The concept serves to be advantageous for certain typology of furnitures and these are identified as follows :

- Stools
- Accent chair
- Coffee tables
- Console Tables
- Nested Tables
- Bar stools
- Wall Shelves
- Bookshelves and Display units
- Entryway and Foyer

LIVING ROOM	BED ROOM	STUDY ROOM	KIDS FURNITURE	BAR FURNITURE	
SEATING Sofas Recliners Sofa Cum Beds Chairs Settees Benches Stools Pouffes Bean Bags STORAGE Cabinets & sideboards	Hutch Cabinets Entertainment Units Shoe Racks Magazine Racks Trunks & Boxes TABLES Large Coffee Tables Small Coffee Tables Coffee Table sets End Tables Console Tables Set Of Tables	Beds Wardrobes Bedside Tables Chest Of Drawers Dressing Tables Bedroom Sets Mattresses Linen Trunk Boxes MODULAR WARDROBE <small>NEW!</small>	Book Cases Book Shelves Study and Laptop Tables DINING & KITCHEN Dining Sets Dining Tables Dining Chairs MODULAR KITCHEN	Beds Mattresses Bedside Tables Cradles Wardrobes Seating Tables Storage OFFICE FURNITURE Seating Tables Storage Cabinets	Bar Cabinets Bar Units Wine Racks Bar Chairs & Stools Bar Trolleys OUTDOOR FURNITURE Swings Chairs Loungers Outdoor Settees & Benches Tables Outdoor Sets
30 Days Money Back GUARANTEE	Get Easy EMI ON ALL ITEMS	Register & GET COUPONS WORTH Rs. 10,000 TO SHOP	LOOK FOR XpresShip SHIPS IN 3 DAYS	Free Shipping OVER Rs. 499	

Choosing the typology of the furniture through this method provides insight into the existing demand for these products and also provides opportunity to design a set or range that could fit into multiple areas, widening the user base.

Certain design decisions were made in-order to derive a product language that would suit not just the concept but also the positioning of the product.



FUNCTION

The furniture must have a utilitarian value associated with it without compromising its aesthetic factor.

MINIMALISM

The product is designed to serve as a basic structure which enables the user to transform the product for use. Certain details must be provided to visually suggest the purpose of the product.

SETTING

The furniture should blend along with the other furnitures within a contemporary setting. Bamboo must be treated in combination with other materials and colors to shift its position into a contemporary everyday product.

DIY

The form of the product must suggest the assembled aspect and the setup must not serve as a hindrance to the user.



JOINERY POSSIBILITIES

Multiple joineries were looked into that would suit the concept and the positioning of the product. They ranged from simple and effective joints using basic stationaries - zip ties, rubber bands and strings to silicon and 3D printed joints. Joineries used for wood (majorly poles) served as reference.



Seven chosen joineries were attempted to check the stability and aesthetics. The following factors were considered for the choice of these seven :

Easy Availability

The easy availability of the material decides the business, manufacture and production model of the furniture

Cost

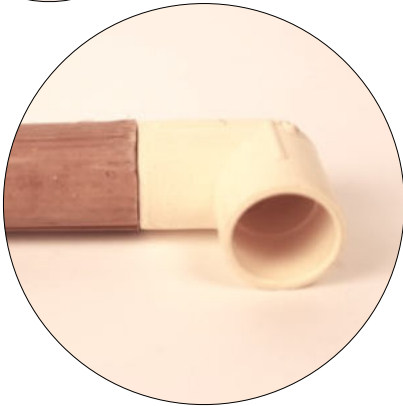
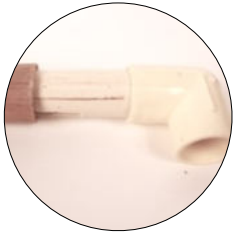
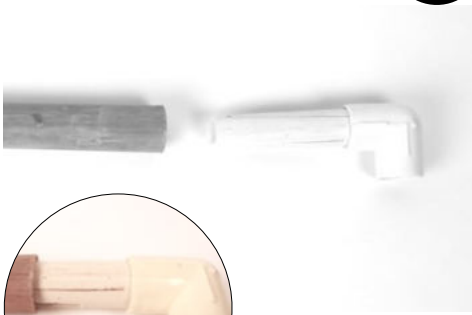
The concept being DIY, the furniture must be cost-effective in-order to compete with the existing products in the market.

Workmanship involved

The product requires master craftsmen, semi-skilled labour or unskilled labour is decided by this aspect.

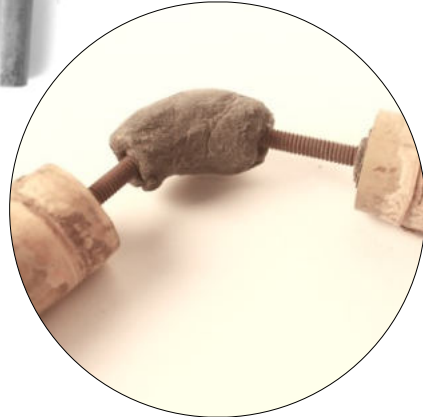
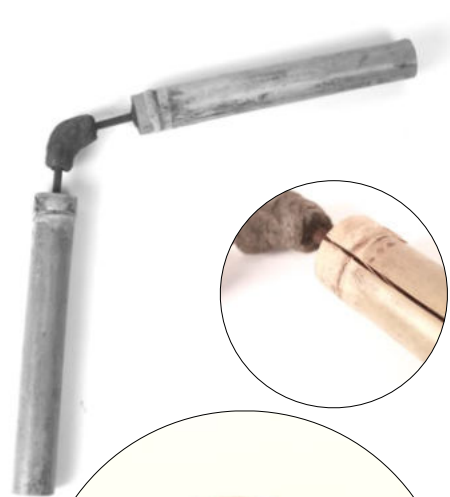
Material friction

The friction in internal detail that is caused when a natural material, bamboo is combined with a industrial joint. Not just in terms of detail but also if the joint loos visually fit for the product and material.



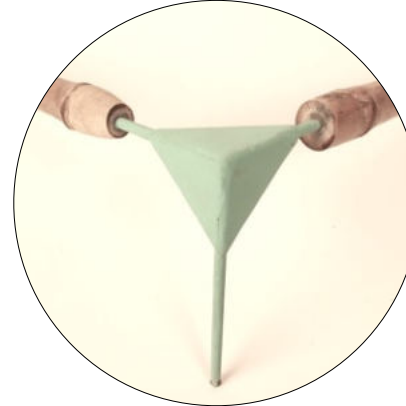
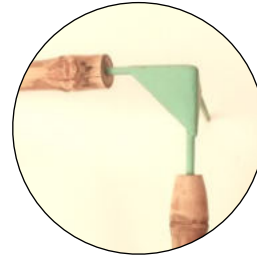
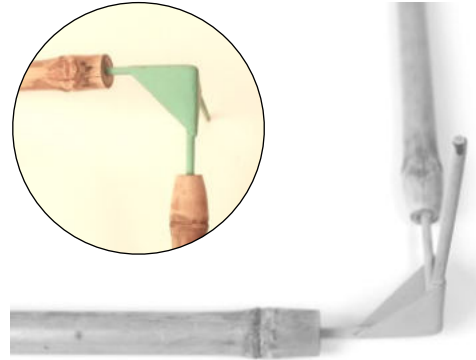
Pipe and Pipe fittings

Slits were cut in the pipe so that pipe could adjust itself to the internal diameter of the bamboo.
 adv - The hidden internal pipe connection allowed a even flow in product form.
 disadv - Strength of the joint weakened due to the flexibility offered by the pipe



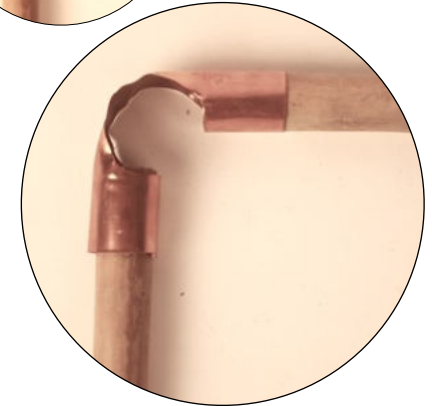
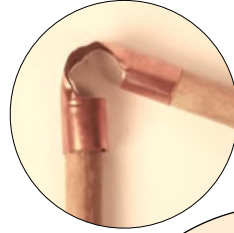
Resin and Screws

Screws are embedded within casted resin joineries. Nuts are nested with the bamboo.
 adv - Varied forms are possible because the resin can be casted in any angle
 disadv - Finish



Metal Rods with corner details

Bamboo is filled with resin to a certain distance and a hole of appropriate diameter is drilled into it. The rods of same dis are used as joining elements.
 adv - less material friction and workmanship
 disadv - no locking mechanism



Copper joineries with corner details

Similar to the pipe fitting, metal joineries are manufactured with corner cuts. Bamboo poles are sharpened and fitted within these.
 adv - clean aesthetic
 disadv - expensive material and manufacturing technique

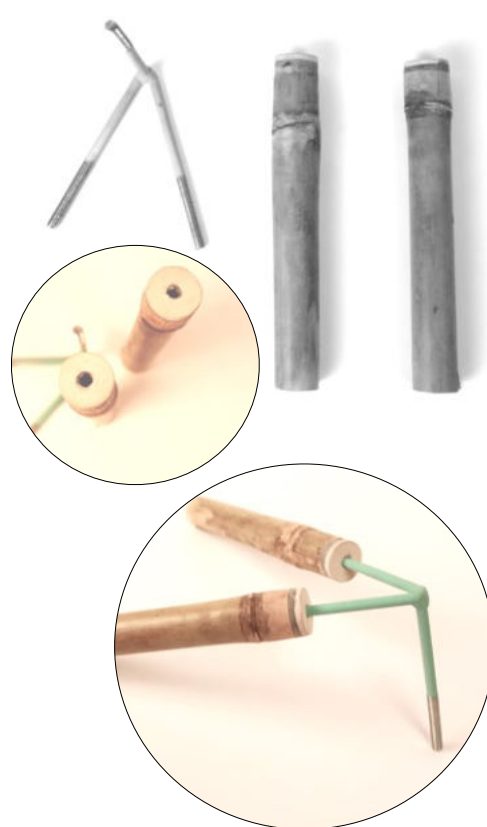


Plastic Pipe Fittings

Bamboo poles are sharpened and fitting into existing pipe fitting.

adv - simplicity and cost effective

disadv - experimental aesthetics



Nut and Bolt welding

Bolts are welded to form joineries which can then be connected with nuts embedded in bamboo poles

adv - clean finish and strength varied forms as the joinery can be welded in any angle

disadv - includes another step in the process



Plastic Fittings

The contours within the plastic allow the fitting to be impacted with bamboo poles.

adv - allows a certain range of internal diameter

disadv - availability in varied sizes

METAL

BOLTS AND WELDING

MATERIAL

Nuts, Bolts, Rubber based resin
Circular metal plates, dowel pins

PROCESS

Bamboo poles

Bamboo of required length is cut
A bamboo dowel is inserted at
an appropriate length from ends
The nuts are impregnated within
the internal hole and the gap is
filled with resin.

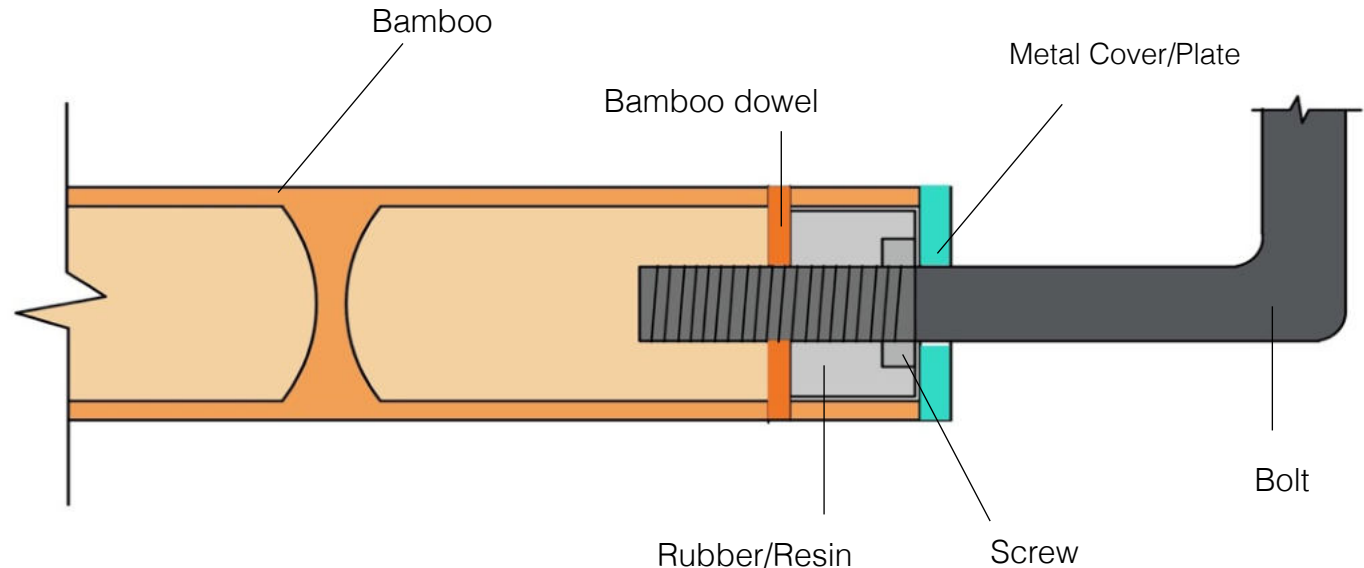
An end cap/metal plate, hides
the detail giving a cleaner finish.
The end cap with locked with
dowel pins.

Joinery

Bolts are welded at required
angles and painted.

DESIGN POSSIBILITIES

Product Form



ADVANTAGES

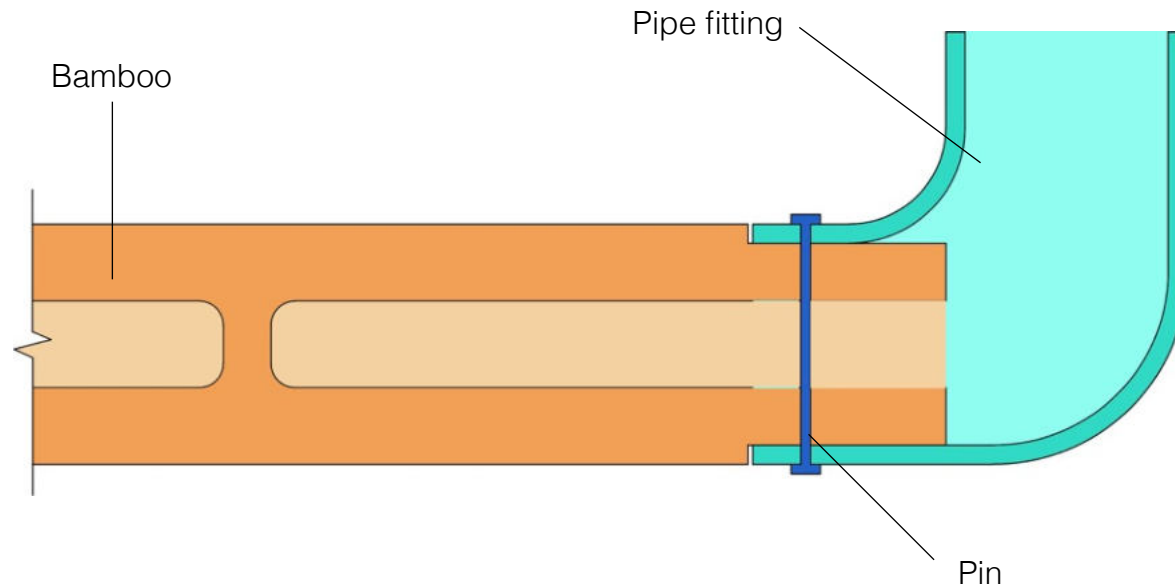
- Bamboo of any internal and external diameter can be used.
- Multiple diameter of bamboo can be used in the same product.
- Load bearing compared to other joineries

- Any forms can be designed due to the possibility to weld in varied angles

DISADVANTAGES

- Includes additional steps in the process
- Expensive when compared to the other joineries.

PLASTIC
PIPE FITTINGS



MATERIAL

Hardware fittings - Elbow and T

PROCESS

Bamboo poles

Bamboo of required length is cut and the ends are sharpened to appropriate length and diameter suitable to that of the fitting.

Joinery

The fittings are purchased and painted to represent a aesthetic that would befit a contemporary household.

Additional nut and bolts are provided to lock the fitting in place.

DESIGN POSSIBILITIES

Finish of the fitting -Color, form and shape within the fitting - minor detailing

Designing within the constraint of elbow and T

ADVANTAGES

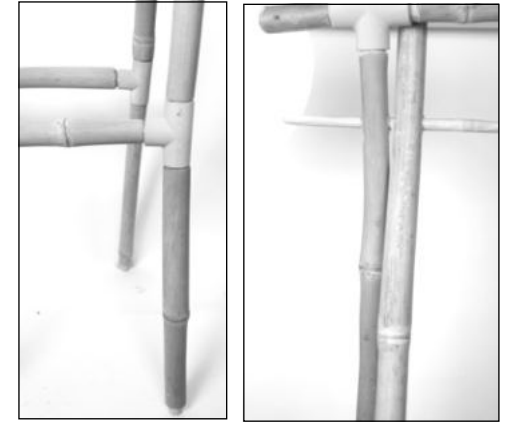
- Easy and simple process
- Visually simpler aesthetics that suit the concept of DIY
- Cost effective as compared to the rest
- Skilled labour not required.

DISADVANTAGES

- Restricts the use of bamboo to certain defined range of thickness.
- Single diameter could only be used
- Constraint to design using only L and T.



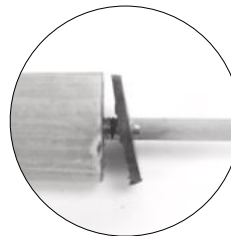
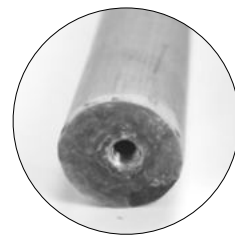
A entryway and foyer furniture - coat rack was attempted using the pipe fittings. The design comprised of two simple ladders hinged at a point. The design offered the possibility of flat packing the furniture after initial setup.



ISSUES

- Stability
Multiple pieces and multiple joints compromised the stability of the structure.
- The skin of the bamboo must be removed ignored to get a even finish

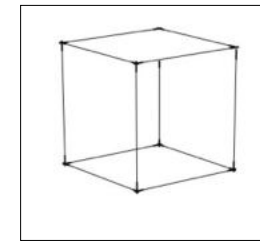
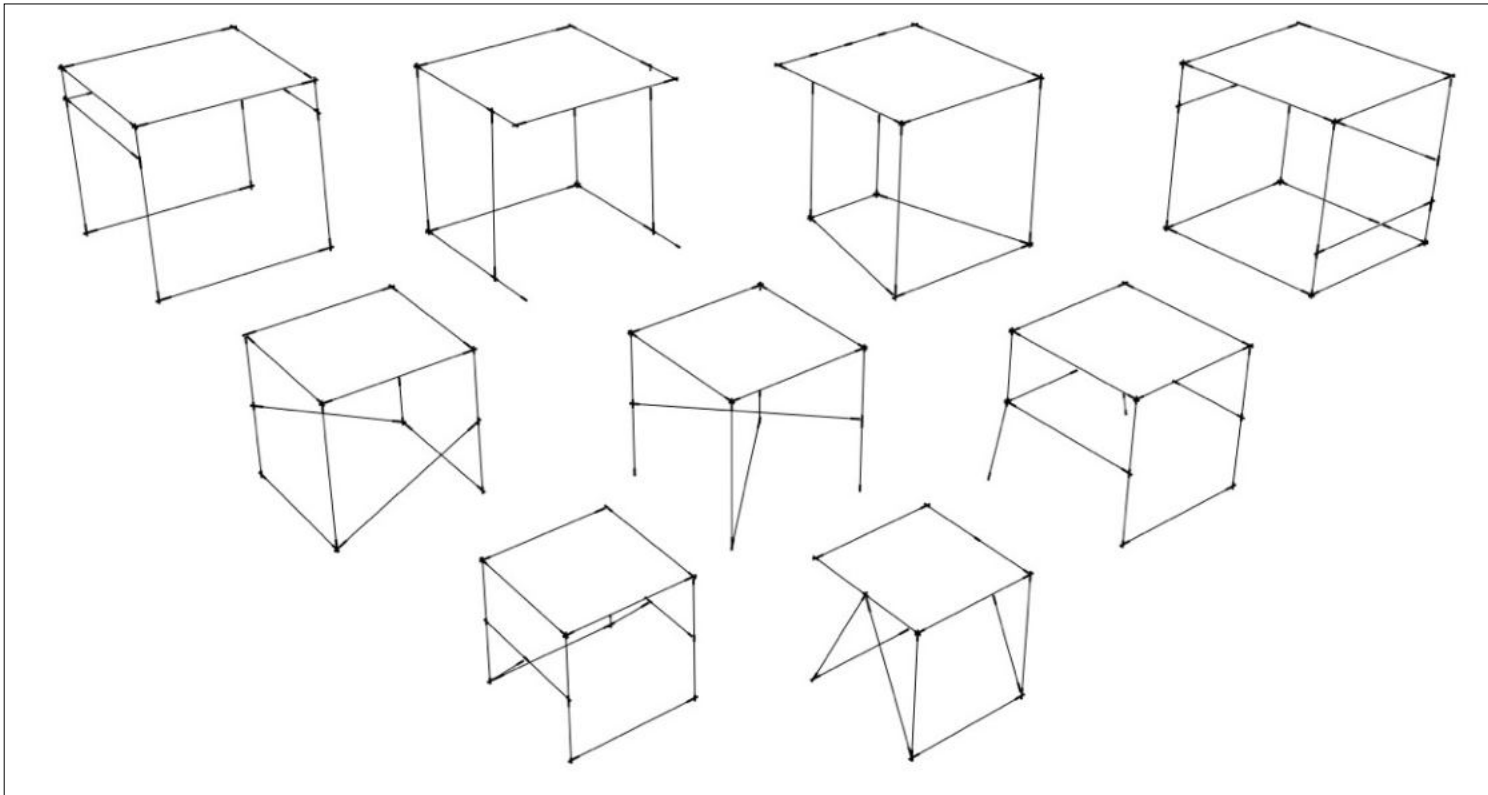
- The bamboo must be straightened before use.
- Though pieces were directly used to adopt a sketchy feel to the product, the uneven lines created distraction in product form.



Dues to the time constraints, instead of making a larger furniture, a simple swing was attempted to test this joinery. The joinery was able to take a dynamic load and could be used to design seating.

ISSUES

- Dowel pins are required to keep the metal plate / end cap in place



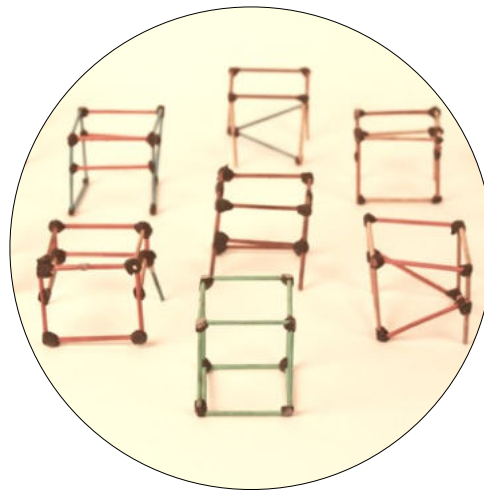
Since the structure itself forms the aesthetic for these typology of furnitures and to derive a Product language, multiple designs for a stool were attempted both as a digital render and as bamboo stick models. A basic cube was taken as a starting point and the number of legs and their connections were altered.



The following aspects were identified:

- Dynamic Load : Could this joinery take a dynamic load
- Comfort : Will this seating provide greater comfort than the existing ones in the market.
- Cost : Would this typology of furniture be worth its cost especially when it does not provide enough durability and comfort as far as seating is concerned.
- Assembly : Would the number of pieces become a hindrance rather than fun for the user.

Using these as modules, other members of the range, such as display units could be designed which would suggest by increasing the number of pieces and joineries, or purchasing additional elements, the user could convert his existing product into another product.

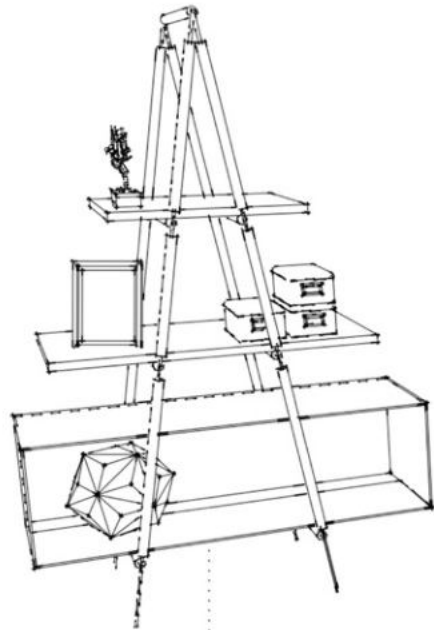


Considering the above aspects, the typology was shifted from seating to furnitures that allow static load - Storage units, Display units, Hangracks etc.

The design showcases mainly three pieces - a display unit, a console table and an open wardrobe/hangrack. These serve as representatives for their range.

The wardrobe includes a shelf, hooks for handbags and clothes, a slot for keys etc. The display unit combines a shelf, plane and hang racks to store and display. The console elevates your plane and provides a home for books, small entryway essentials and collectibles. The pieces are minimal and slick, looking more like tripods than storage.





A1
 1m x 0.5m x 1.5m
BAMBOO POLES
 5# 40cm
 8# 30cm
 16# 15cm
JOINERIES
 12# T
 2#
 3#
ACCESSORIES
 Plank
 1# 40cm x 50cm
 1# 40cm x 80cm
 Basket Box
 1# 1m x 0.5m x 0.3m

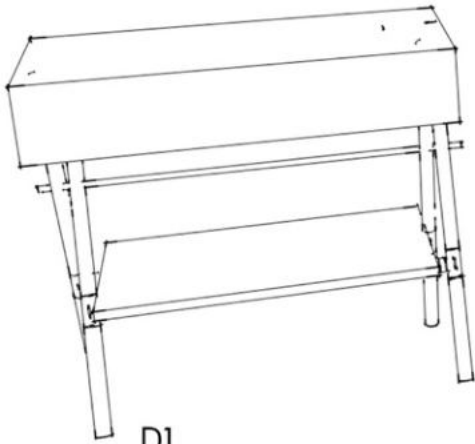


A2
 1m x 0.5m x 1.5m
BAMBOO POLES
 8# 60cm
 10# 40cm
 4# 15cm
JOINERIES
 8# T
 2#
 2#
ACCESSORIES
 Plank
 1# 35cm x 50cm
 Basket Box
 1# 1m x 0.5m x 0.3m
 2# 25cm x 50cm x 10cm
 2 Poles
 1 Mirror

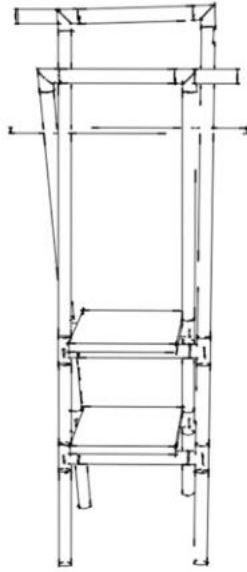


A3
 1m x 0.3m x 0.7m
BAMBOO POLES
 4# 50cm
 6# 40cm
JOINERIES
 3#
 2#
 2#
ACCESSORIES
 Basket Box
 1# 1m x 0.3m x 0.3m





D1
 0.7m x 0.3m x 0.7m
BAMBOO POLES
 4# 40cm (A)
 16# 20cm (B)
 4# 15cm (A)
 1# 80cm (B)
JOINERIES
 12#
 4#
ACCESSORIES
 Basket Box
 1# 70cm x 30cm x 30 cm

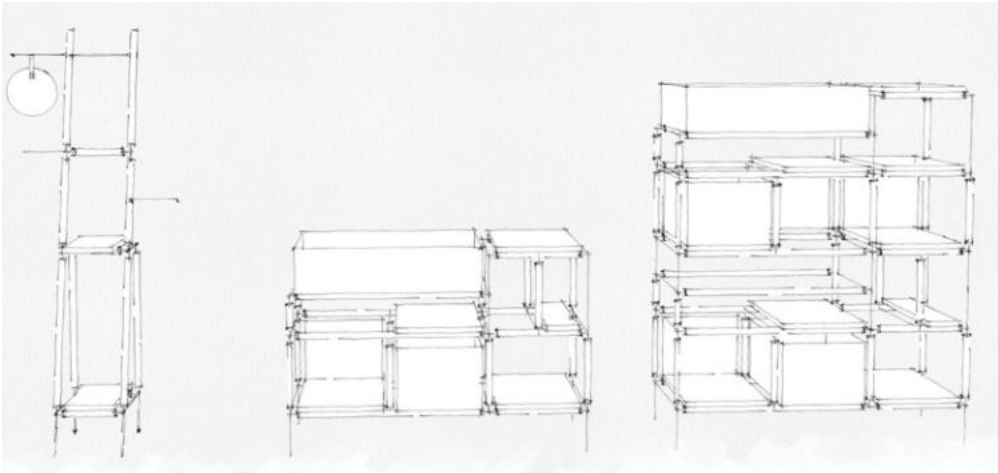
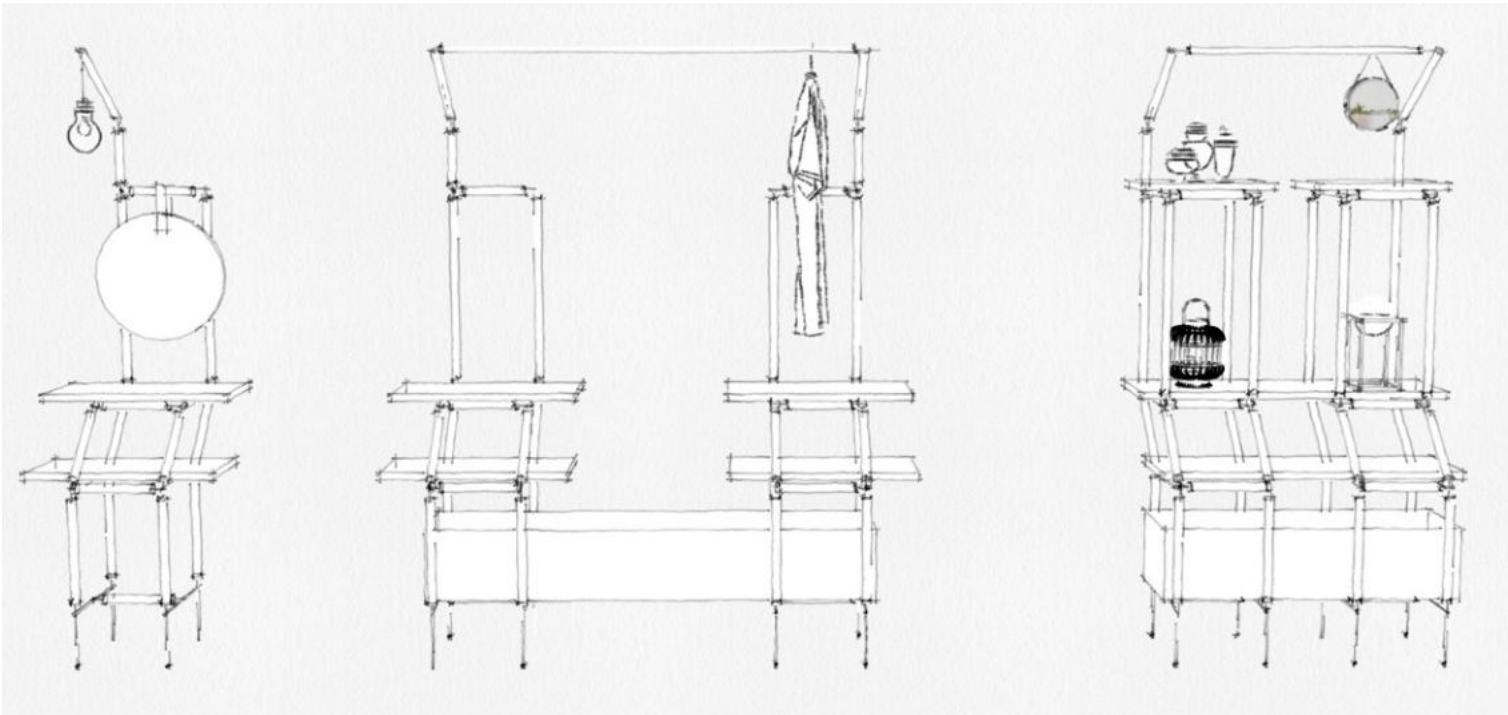


D2
 0.3m x 0.3m x 1.5m
BAMBOO POLES
 2# 65cm (A)
 2# 50cm (A)
 14# 20cm (A)
 1# 50cm (B)
 1# 25cm (B)
 1# 15cm (B)
JOINERIES
 8# T
 4#
ACCESSORIES
 Plank
 2# 25cm x 25cm

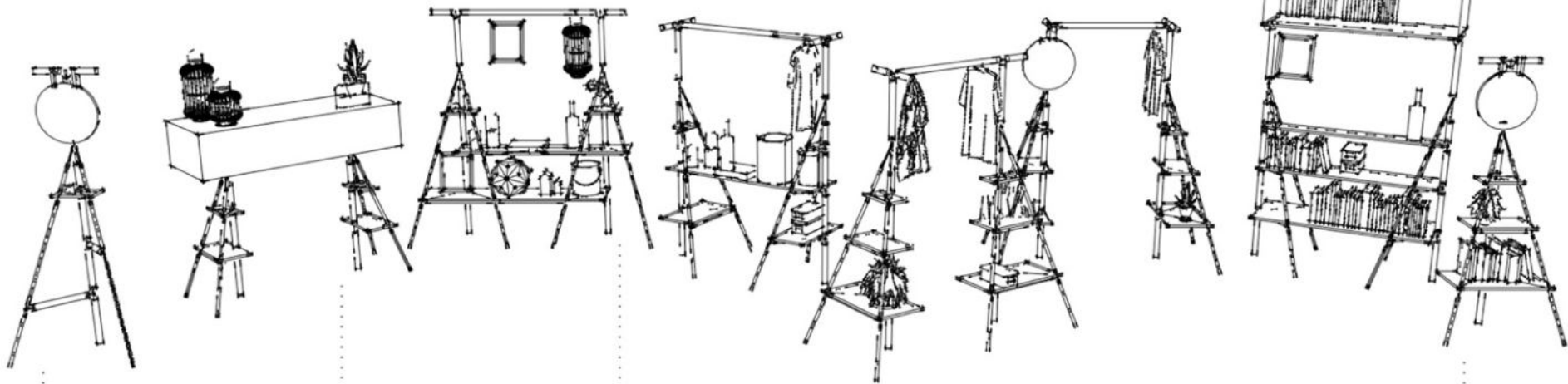


D3
 0.7m x 0.3m x 1.5m
BAMBOO POLES
 4# 65cm (A)
 8# 20cm (A)
 12# 30cm (A)
 2# 25cm (B)
 1# 15cm (B)
JOINERIES
 8# T
 4#
ACCESSORIES
 Plank
 2# 25cm x 60cm
 Basket Box
 1# 70cm x 30cm x 30cm









E1a

0.4m x 0.3m x 1.5m

BAMBOO POLES

- 6# 25cm (A)
- 3# 12cm (A)
- 2# 50cm (B)
- 2# 25cm (B)
- 2# 12cm (B)

JOINERIES

- 4#
- 1#
- 1#
- 1#

ACCESSORIES

- Plank
- 1# 20cm x 10cm
- Mirror

E2

0.7m x 0.4m x 0.7m

BAMBOO POLES

- 1# 60cm (A)
- 12# 12cm (A)
- 4# 25cm (A)
- 10# 25cm (B)

JOINERIES

- 6#
- 2#
- 2#
- 2#

ACCESSORIES

- Box
- 1# 70cm x 40cm x 20cm

E3

0.7m x 0.3m x 1.5m

BAMBOO POLES

- 12# 25cm (A)
- 6# 12cm (A)
- 4# 50cm (B)
- 4# 25cm (B)
- 4# 12cm (B)

JOINERIES

- 12#
- 2#
- 2#
- 2#

ACCESSORIES

- Plank
- 2# 30cm x 70cm

E1b

0.7m x 0.3m x 1.5m

BAMBOO POLES

- 6# 25cm (A)
- 3# 12cm (A)
- 2# 50cm (B)
- 2# 25cm (B)
- 2# 12cm (B)

JOINERIES

- 6#
- 1#
- 1#
- 1#

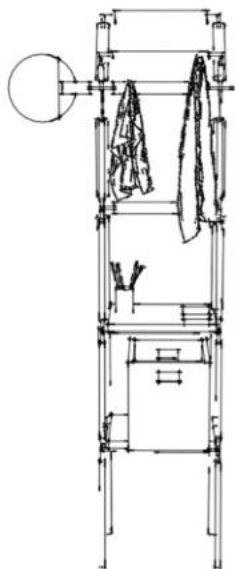
ACCESSORIES

- Plank
- 1# 20cm x 10cm
- Mirror

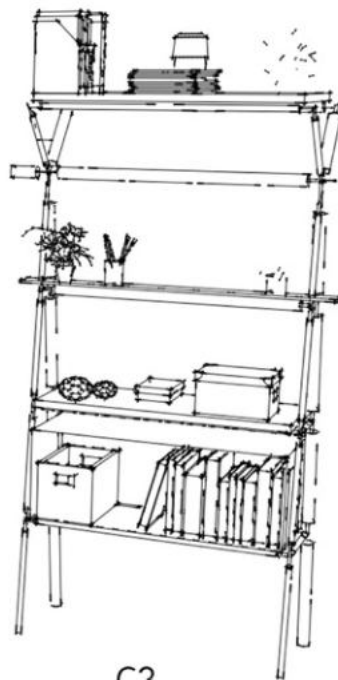




C1
 0.7m x 0.3m x 0.7m
BAMBOO POLES
 1# 60cm (A)
 4# 25cm (A)
 6# 20cm (A)
 1# 60cm (B)
 6# 20cm (B)
JOINERIES
 4#
 2#
 2#
 2#
ACCESSORIES
 Basket Box
 1# 0.7m x 0.3m x 0.3m



C2
 0.3m x 0.3m x 1.5m
BAMBOO POLES
 13# 20cm (A)
 13# 20cm (B)
 4# 10cm (B)
 2# 5cm (B)
JOINERIES
 8#
 4#
 2#
 2#
ACCESSORIES
 Plank
 2# 24cm x 25cm



C3
 0.7m x 0.3m x 1.5m
BAMBOO POLES
 2# 60cm (A)
 14# 20cm (A)
 4# 60cm (B)
 4# 10cm (B)
 4# 5cm (B)
JOINERIES
 8#
 4#
 2#
 2#
ACCESSORIES
 Plank
 1# 70cm x 10cm
 1# 70cm x 20cm
 Basket Box
 1# 70cm x 30cm x 30cm

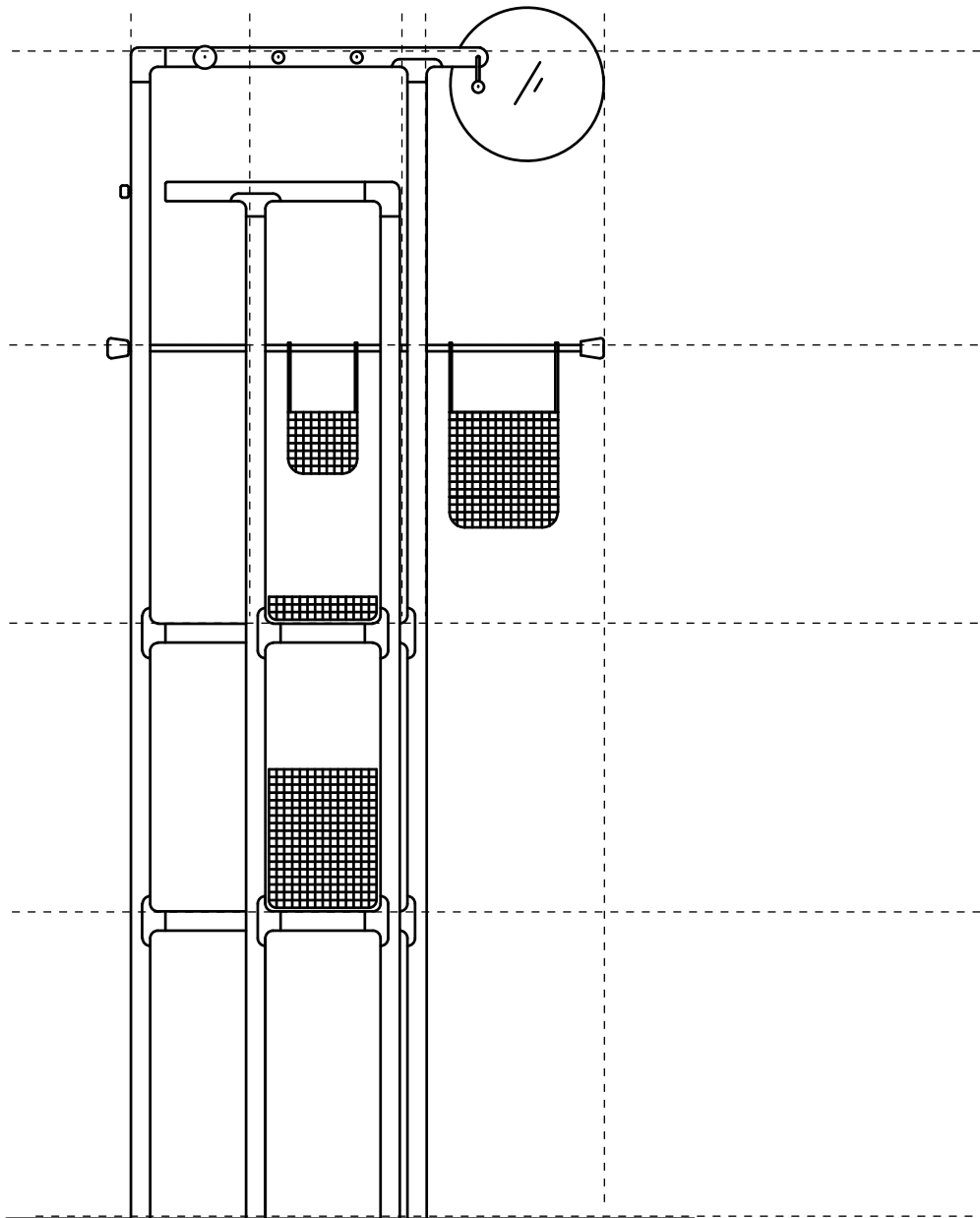
Design 2, as compared to the rest has lesser number of pieces that guarantee's faster assembly. It also has the advantage of becoming a flatpack after initial assembly.

In addition to using the bamboo poles as structural elements, A console table, a Entryway hang rack and a side stool represent the range.

C1

DESIGN



**HANGRACK****ASSEMBLED SIZE**

35cm x 35cm x 150cm(ht)

COMPONENTSPoles :

2S, 3M, 2L, 2XL, 2XXL

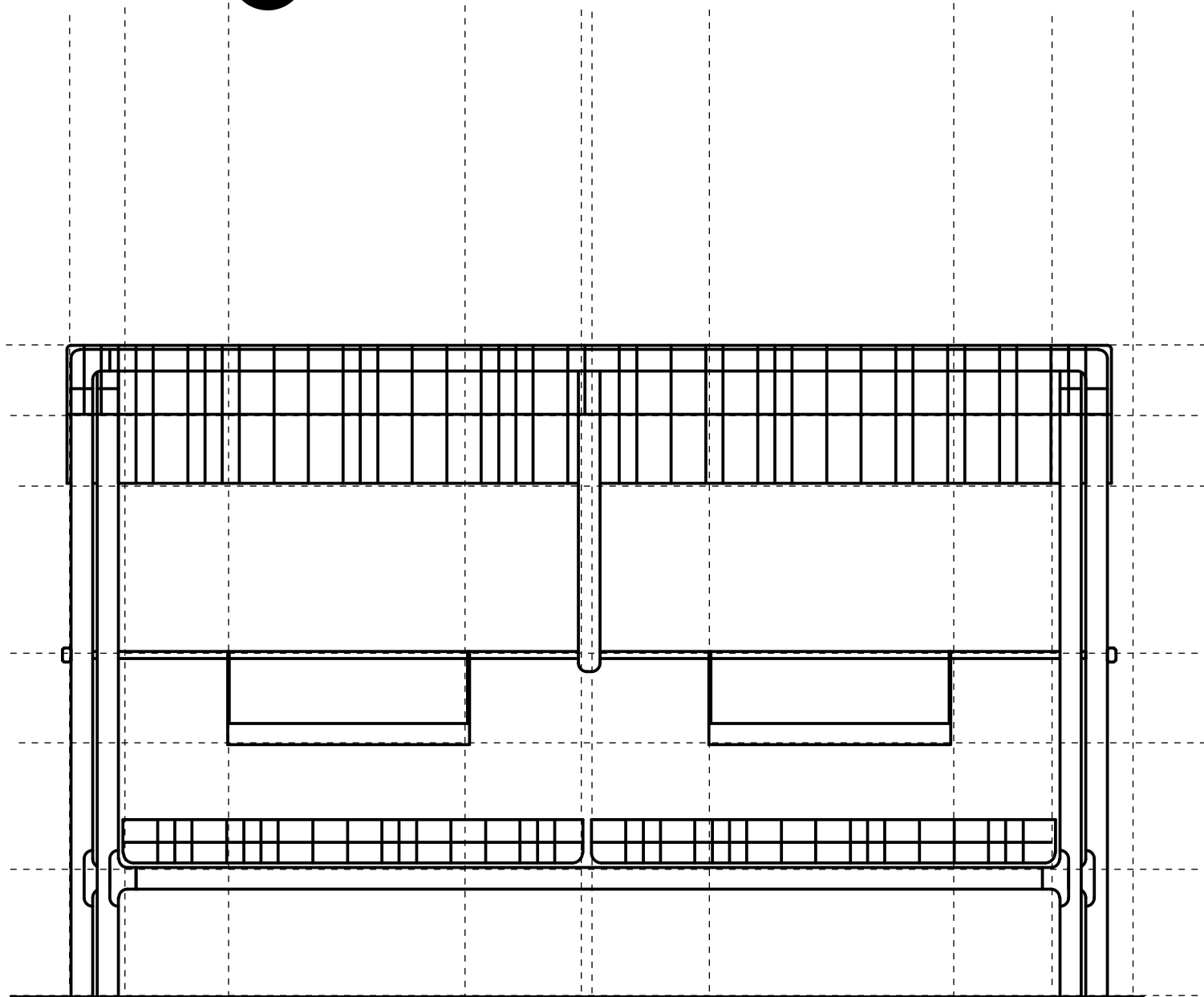
Joints:

2L, 10T, 1 Hinge Pole

Accessories :

- 1 small hanging basket
- 1 medium hanging basket
- 1 small tray
- 1 medium box
- 1 Mirror

C1 DESIGN SPECIFICATIONS



CONSOLE

ASSEMBLED SIZE
120cm x 30cm x 70cm(ht)

COMPONENTS

Poles :
1S, 1M, 4L, 4XL

Joints:
4L, 7T, 1 Hinge Pole

Accessories :
1 large metal mesh box
2 medium hanging basket
2 medium metal mesh trays

SIDE TABLE**ASSEMBLED SIZE**

30cm x 30cm x 60cm(ht)

COMPONENTSPoles :

1S, 1M, 4L

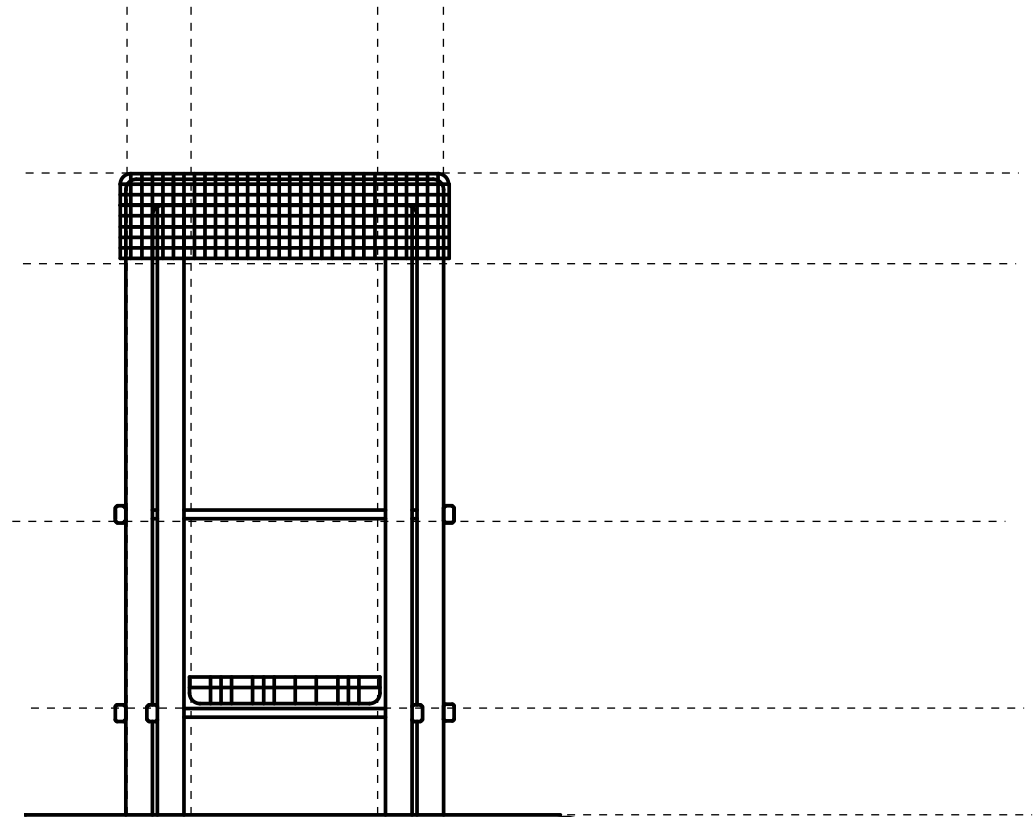
Joints:

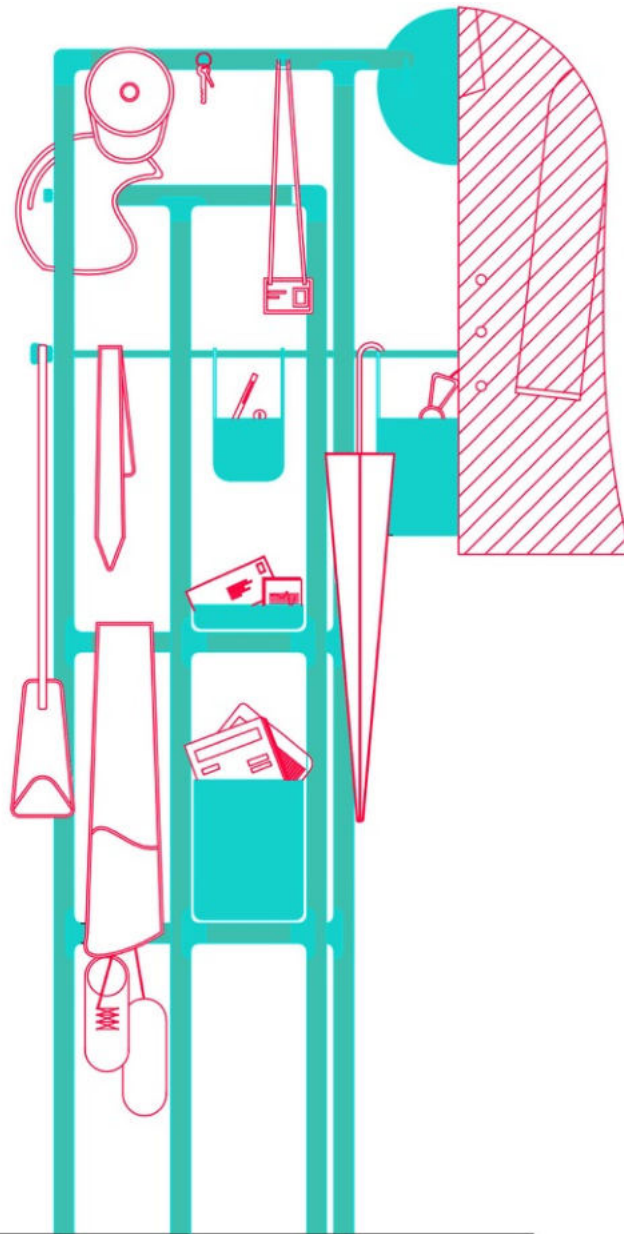
4L, 3 Hinge Pole

Accessories :

1 medium bamboo mesh box

1 small metal mesh tray

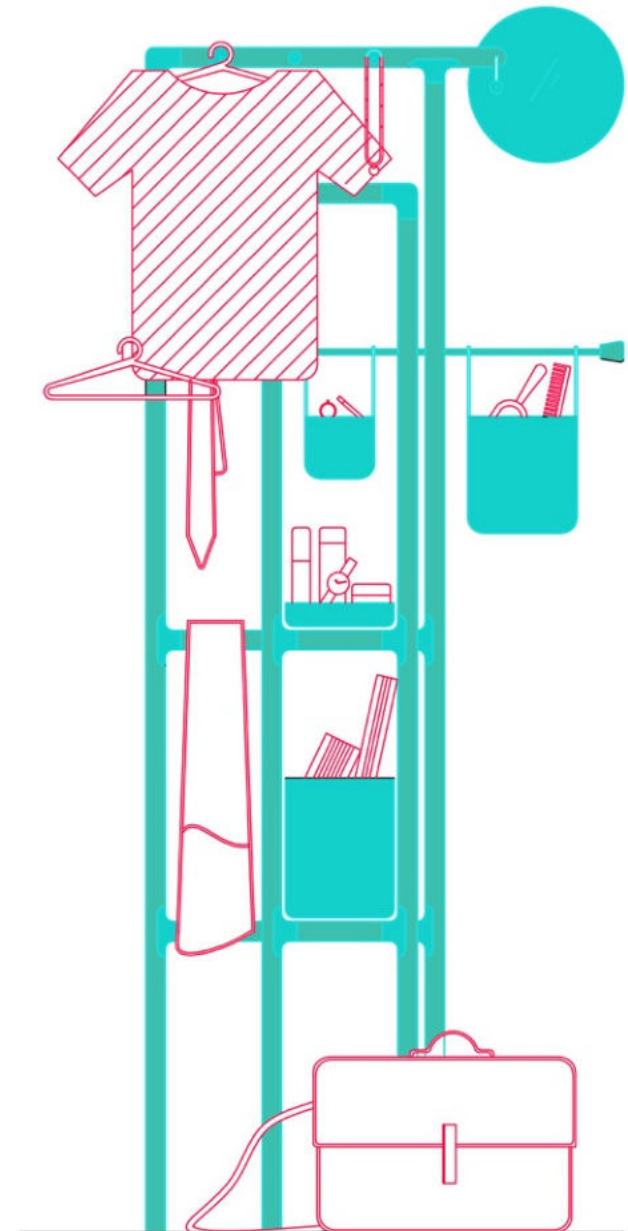




The Illustration represents the items that the product caters to.

As a entryway furniture, it could be used for hanging helmets, bags, caps, hats, coats, umbrellas, id's, keys, shoes and also provides trays and smaller storage baskets for stationaries, postit's, coins, locks. The larger box serves for newspapers and magazines.

As a dresser, clothes ties, shawls, accessories, jewellery, bags could be hung while the tray provides space for comb, watch, toiletries, perfume etc.



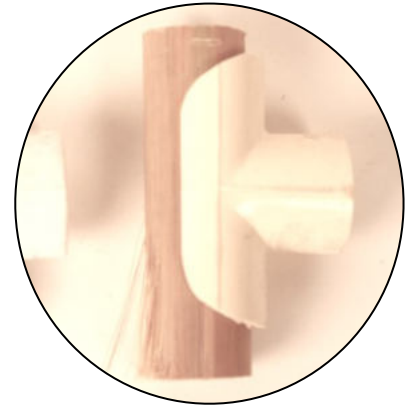
Bamboo knobs were added that indicated a visual suggestion of the purpose of the structure.



Half T joints were used instead of T joints. This reduced the number of pieces and increased the stability of the product.

HANGRACK | PROTOTYPE

C2



The Illustration represents the items that the product caters to.

As a entryway furniture, it could be used for placing helmets, bags, stationaries and books. The smaller storage trays for socks, polish etc while the larger trays provide space for shoes.

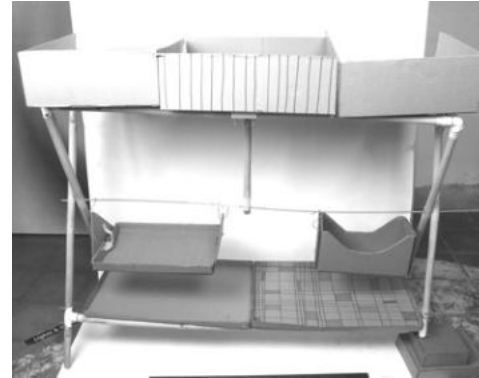
As a display side table, it provides space for collectibles and acts as a bookshelf.



CONSOLE | PROTOTYPE

C2

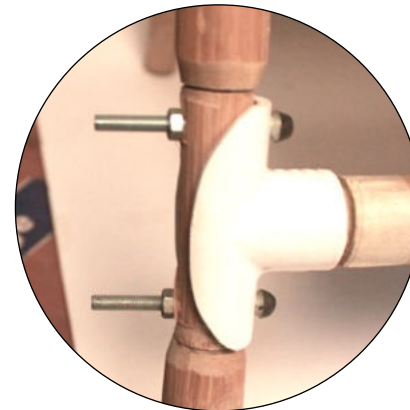
Large single metal mesh box also acts as a packaging where the components could be housed prior assembly. Inversion also adds structural stability



The single large box can be replaced with multiple organiser trays thereby altering the typology of a table into a storage.



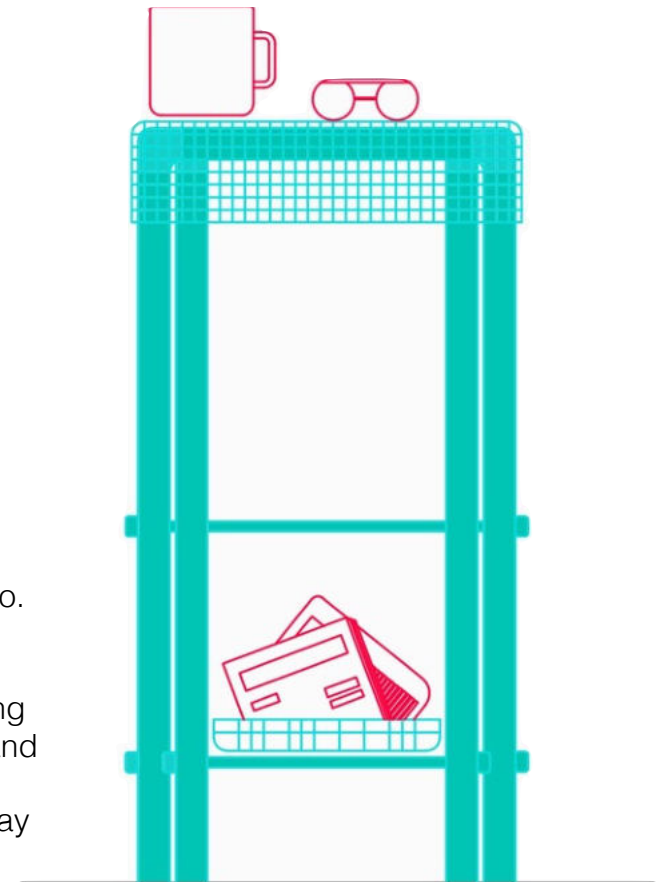
The vertical middle element holds the long hinge pole.



62

The Illustration represents the items that the product caters to.

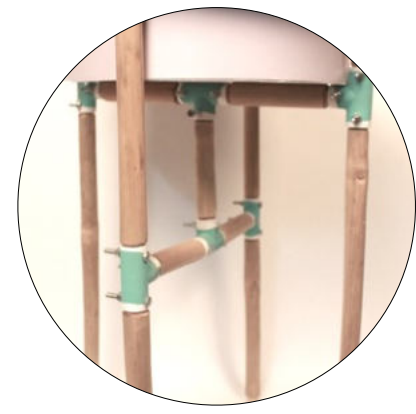
As a side, it could serve as a coffee table to hold the morning newspaper, reading glasses and a mug with few magazines, books and stationary on the tray below.



SIDE STOOLS | PROTOTYPE

C2

The number of T joints are reduced and replaced into hinge poles considering the size, the proportion, function and the visual weight of the stool



A fourth piece, a side table was designed and prototyped to showcase the possibility of reorienting the product as not just being a functional solution but a raw sculptural side. The legs add deliberate drama while the inverted

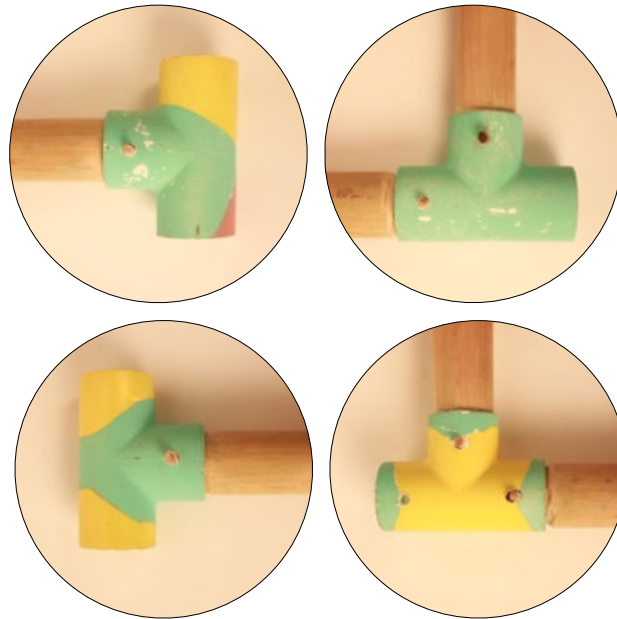
trays on top with the long legs suggests an aesthetic different from the other range. It serves as a storage and a tray. The inverted tray becomes a tray top.

64



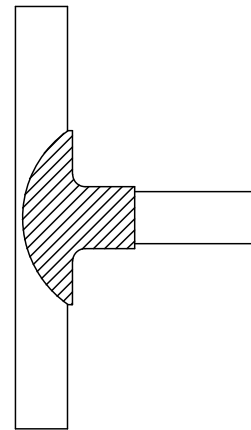
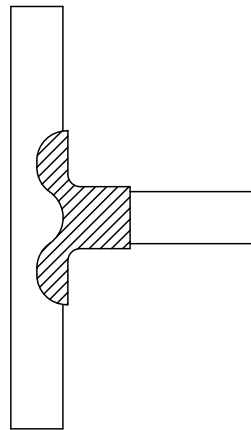
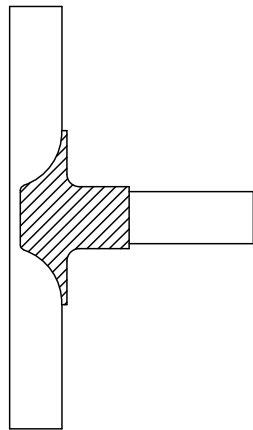
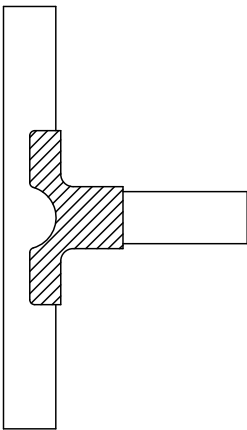
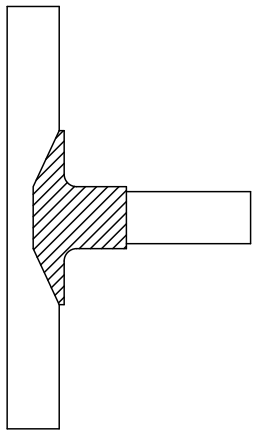
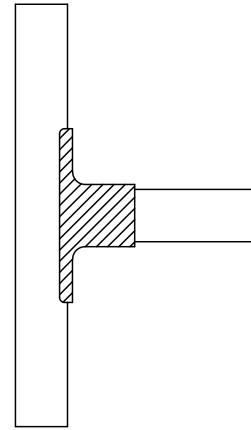
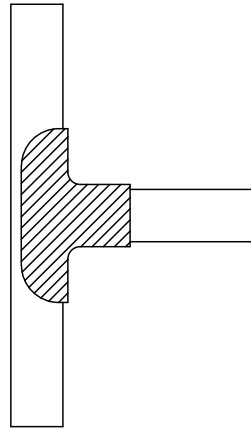
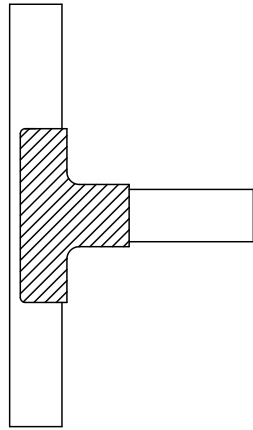
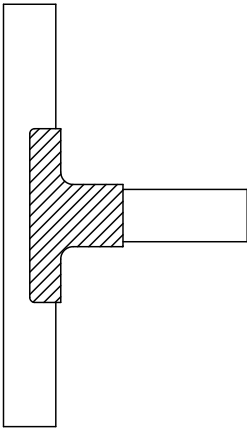
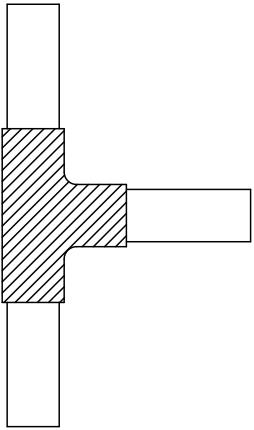
Though the bamboo poles are sharpened and snapped into plastic fittings, rivets, bolts and screws are required to keep the fitting in position. Dowels would be a one time fit and it would require hammering. Screws with heads offer greater durability. Screws with round heads, wings and cylinders are tried but the issue was that these gave a mechanical construction oriented perception. The idea was to use a screw with internal thread and a plain external surface. The longer the thread, the more flexibility it provided in-terms of usable bamboo width and tightening.



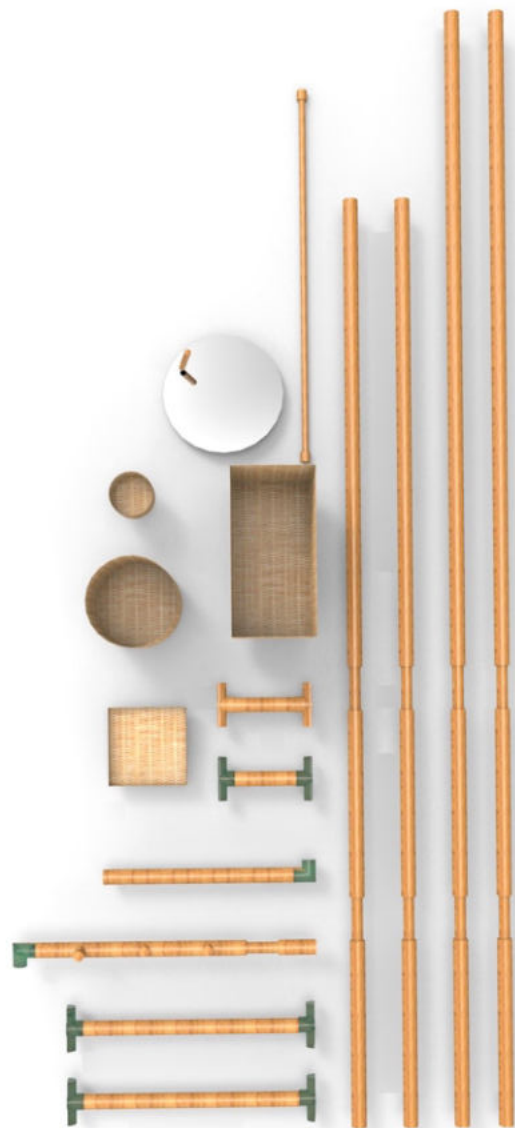


The joining elements form the link and showcase the contest between industrial and natural, ethnic and modern and are hence highlighted and celebrated with bright colors and patterns. Patterns revolve around utilising the horizontal dowels as a part of the pattern. Different stains are attempted on the bamboo poles.

Colors offer customisation for the user and widens the user base. The colors can range from neons for a young and free-spirited setting to back and gold for a more luxurious setup.



Since the joinery distinguishes itself from the main structure through color and material, multiple shapes of cuts were attempted in the PVC joints.



COMPONENTS

C3

HANGRACK

ASSEMBLED SIZE

40cm x 25cm x 150cm(ht)

COMPONENTS

Poles :

2S, 2M, 4L, 1A, 1B

Joints:

6T, 2L

Accessories :

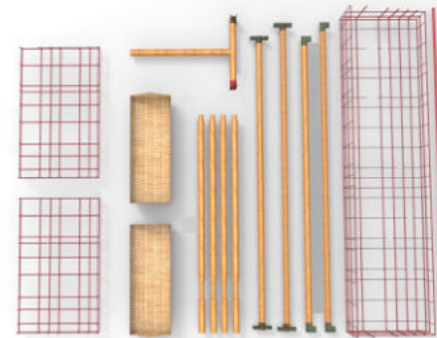
1 Mirror

1 Small Basket

1 Medium Basket

1 Medium Tray

1 Large Tray



CONSOLE

ASSEMBLED SIZE

150cm x 30cm x 100cm(ht)

COMPONENTS

Poles :

4S, 2M, 2L, 1T

Joints:

6T, 4L

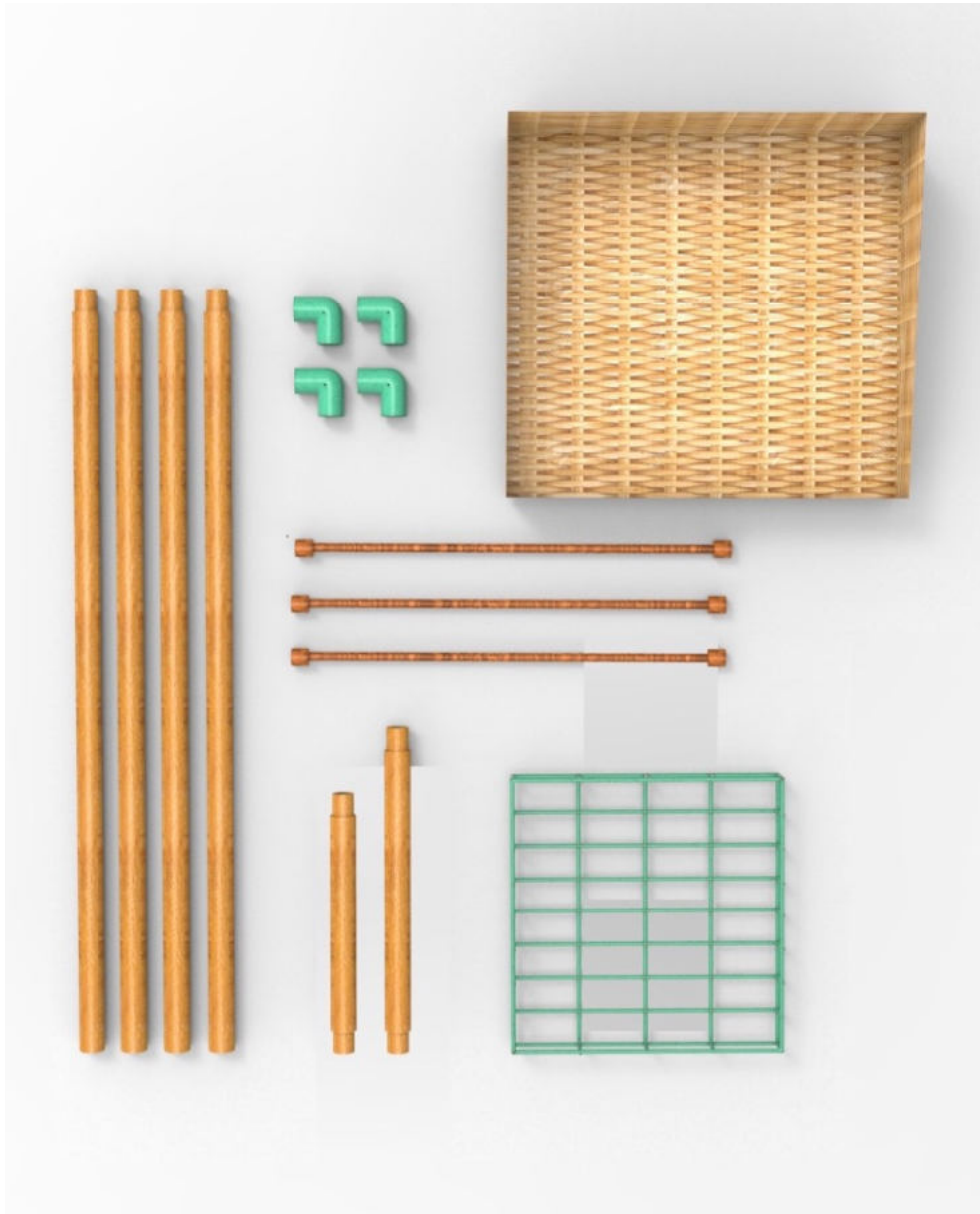
Accessories :

2 Medium Mesh Basket

2 Medium Tray

1 Large Tray

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**SIDE TABLE****ASSEMBLED SIZE**

30cm x 30cm x 60cm(ht)

COMPONENTSPoles :

1S, 1M, 4L

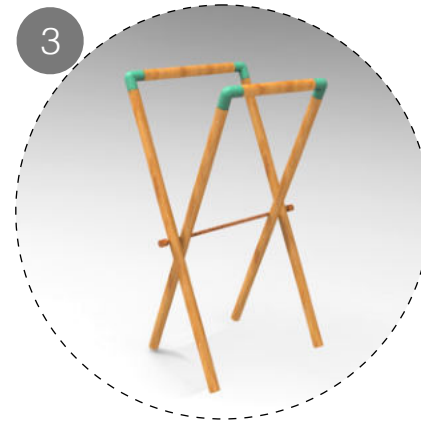
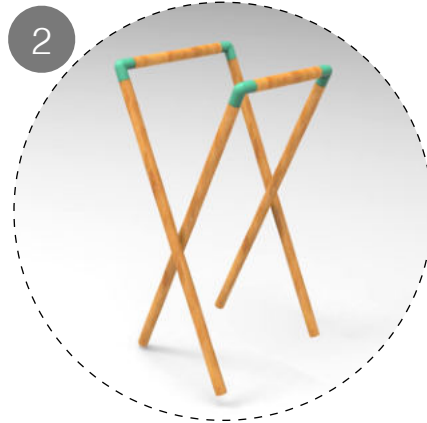
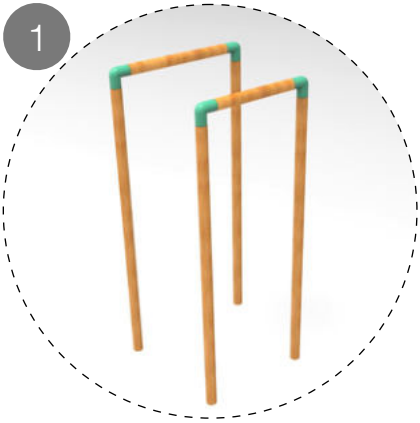
Joints:

4L, 3 Hinge Pole

Accessories :

1 medium bamboo mesh box
1 small metal mesh tray

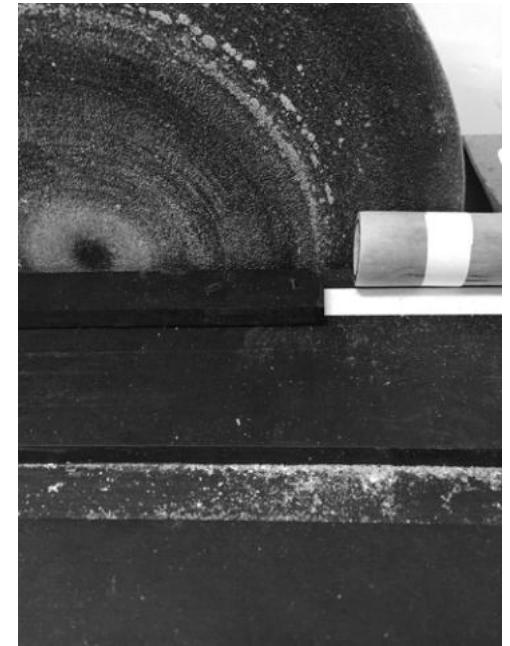
Being DIY, instructions for assembly is an important aspect of the product experience. The image shows the components for the side table kit.



1. Use the elbow fitting and the poles to create two frames; one using 2L and 1M, the other using 2L and 1S.
2. Insert the smaller frame within the larger one
3. Use the hinge pole to lock the two frames
4. Invert the bamboo mesh basket on top of the two frames. This secures the frames in position
5. Add the other two hinge poles in the slots provided on both frames
6. Use these poles to place the metal mesh basket

C3

PRODUCT MAKING





The following visualisations showcase the possibility of the furniture fitting into a contemporary urban setting.

C4

RENDERS



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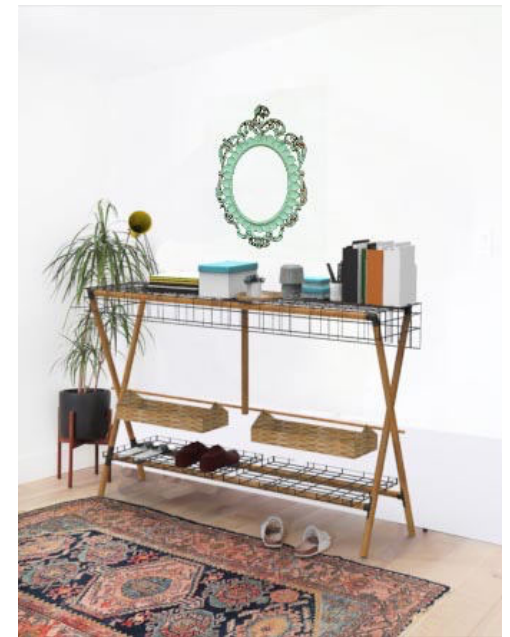


C4

RENDERS



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This sections presents photographs of the prototype showcasing the design intent.

C5

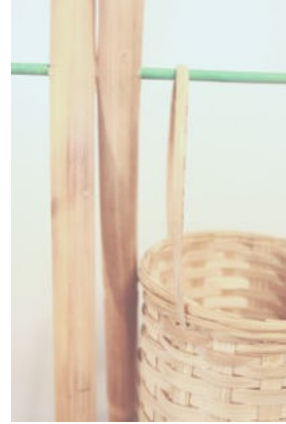
PRODUCT PHOTOGRAPHS













This sections identifies the possible models for developing manufacturing and marketing the product

PRODUCT USP**DIY**

Presenting a piece of furniture as a puzzle set and positioning it in an affordable range where the user can afford to attempt it.

PRODUCT MIX and RANGE**TYOLOGY**

On the basis of the category of furniture, it could extend into other areas of household.

STYLE

Finishes on the plastic fitting determine the style of the product, from rustic to pop.

TECHNOLOGY PLANNING**UTILIZING THE EXISTING**

The product can be made using the available existing technology. Certain jigs could be additionally designed to make the process easier

MARKET SEGMENT**PRODUCT POSITIONING**

Choosing online interfaces as the way of access to the product by itself secures a section of the market the product caters to.

MANUFACTURING SETUP**MODEL 1****DESIGN PREPOSITION**

Certain NGO's and bamboo workplaces currently working on the bamboo furnitures are identified. The joineries could be sourced and workshops could be conducted for manufacturing the designs. They could be manufactured by these agencies in different parts of the country and sold through a common website.

MODEL 2**ENTREPRENEURSHIP**

A workspace is setup at an appropriate location. Primary materials such as bamboo poles, plastic joints and screws are sourced from multiple locations and are manufactured within this setup.

MARKETING STRATEGY**PUZZLE PACKS**

Scaled versions of the furniture, as puzzles could be sent as a promotional material along with other orders prior launch.

RETAIL STOREFRONTS

Using these structures in storefronts of retail outlets and other exhibitory setups.

LABOUR**SKILLED/UNSKILLED**

The furniture is deliberately designed as independent components with fixed dimensions. These components and accessories require multiple levels of craftsmanship, the maximum being the weaved bamboo boxes and bowls.

FURTHER OPPORTUNITIES FOR DESIGN

**OPTIMISATION**

Deciding if certain joints could remain fixed or could they be assembled from scratch depending on user testing.

VISUAL COMMUNICATION

Communication elements need to be incorporated along with the furniture that are suggestive of the setup. Assembly instructions as graphic manuals or downloadable must be designed to assist the user.

WEAVES

Different weaving patterns could be incorporated with colors and fabrics. The bamboo weaves could be replaced with cane weaves and metal meshes. Patterns in metal mesh are also a possibility

PACKAGING

The user's first experience to the product if through its package. The package has to be designed for easy transportability.

THEME

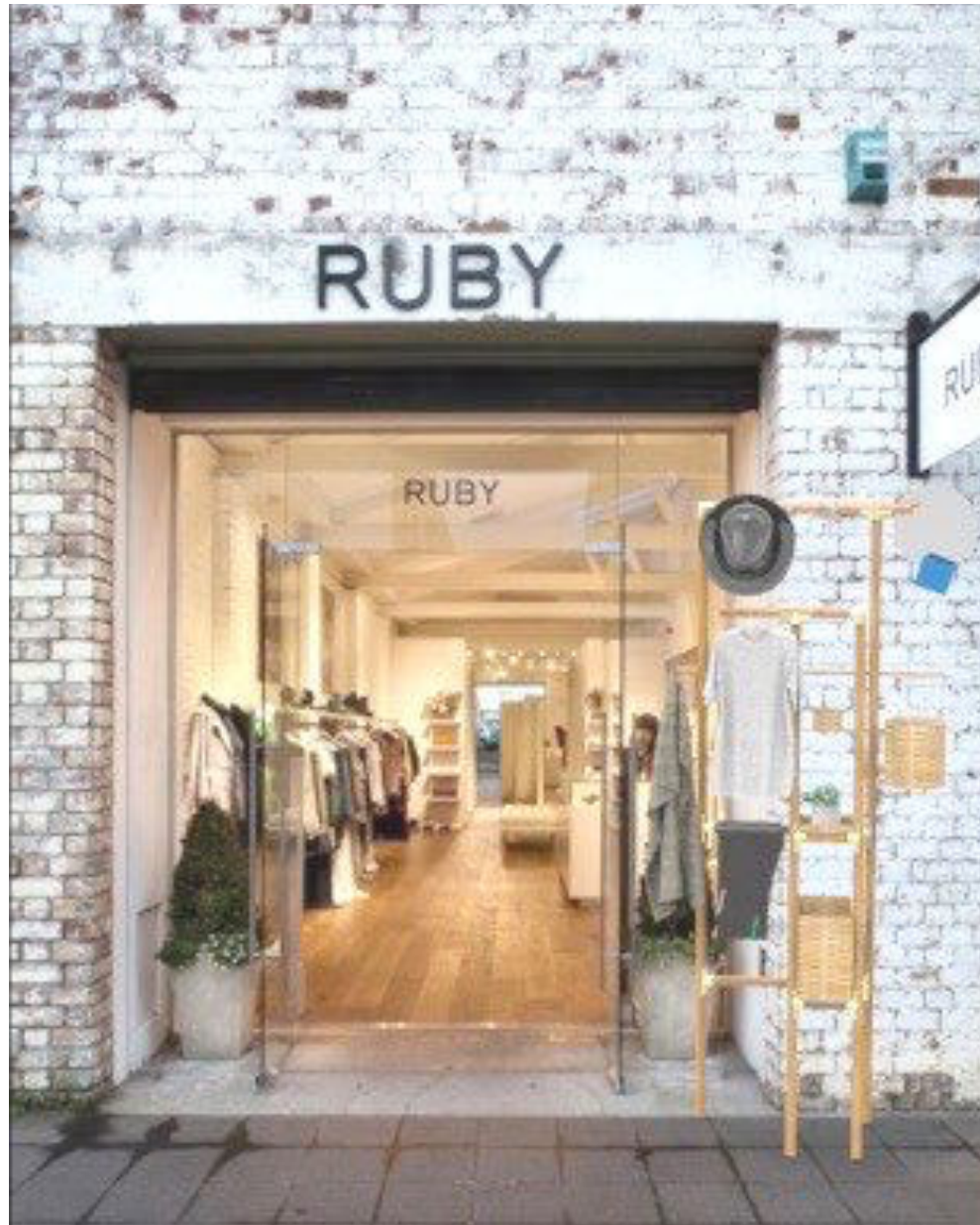
Color sets of the joinery can be introduced based on themes

SCALED PUZZLES

As a part of marketing and promotions, scaled versions of the furnitures could be designed and made with bamboo sticks or alternate materials.

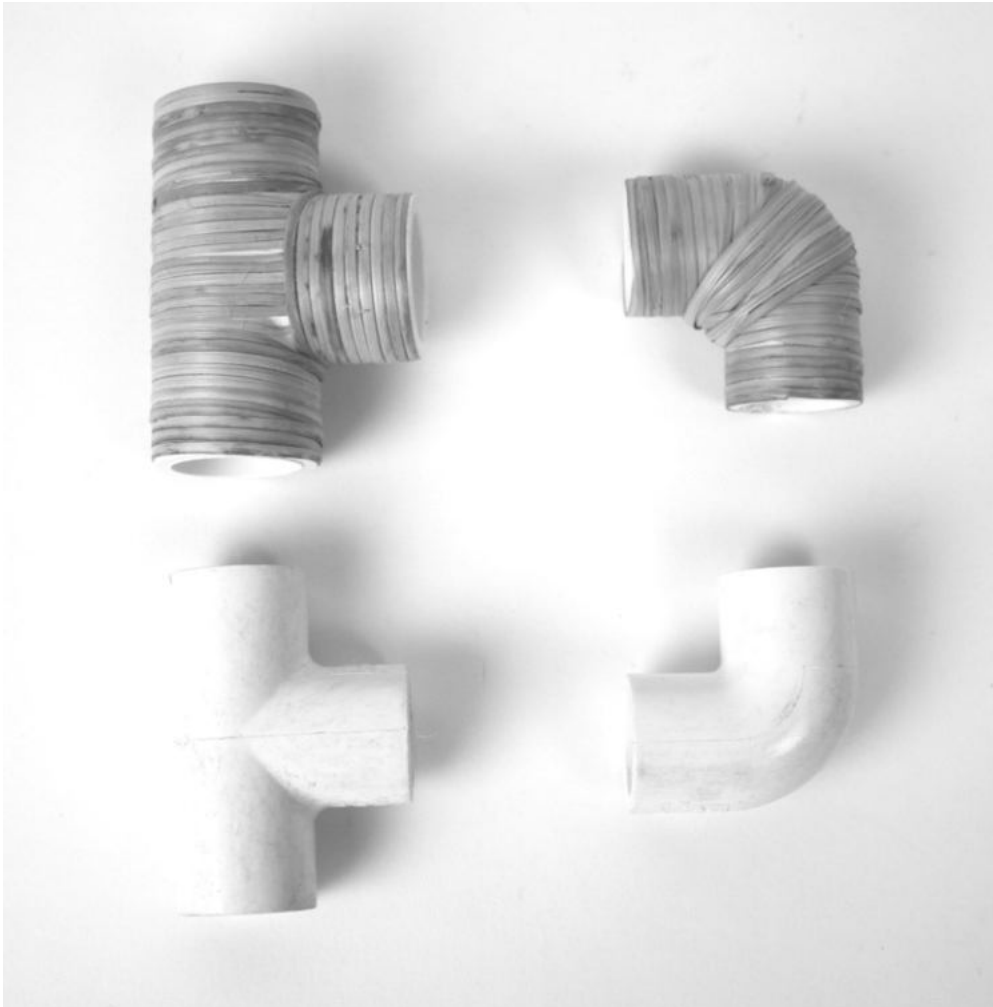
D2

RENDERS



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Prof. A G RAO

ON CONCEPT

The concept represents a postmodern approach where the traditional craft oriented material is combined with industrial materials and this combination could lead to interesting possibilities and unique aesthetics.

ON JOINERY

Attempt cane coil and tying techniques on the plastic joineries as finishing. This methodology looks at using plastic as a hidden detail where the furniture projects itself on traditional aesthetics with easy and faster manufacturability and transportation.

ON DIY

DIY concept requires more detailing on individual components in terms of visual suggestions for assembly for the user, graphic manual is easier method to achieve this. Giving the user an option or coupons where assembly could be done by members will provide a larger user base.

ALTERNATE PRODUCTION MODEL

The sourced plastics and accessories could be given to craftsman providing them with more job opportunities. These could then be sourced back and put together, setup and sold in an entrepreneurial structure.



A feedback form was provided along with the display of the product at IDC and students were requested to fill questions considering the intended user Profile - Will they purchase? Will they Assemble? and about the idea of DIY, Material Fusion and Suggestions. They were also asked to evaluate an appropriate pricing for

COMMENTS

- For anybody with the willingness to make things
- Yes, I can assemble this with the help of instruction manual
- Material Fusion is cool
- Minimal joinery does not dominate bamboo
- Material mix brings out contemporary feeling
- Like the idea of airy design, brings out bamboo's properties
- Hangrack is a very useful and relevant product

SUGGESTIONS

- Assembly videos could be uploaded on youtube
- Might require some tweaking to cater to both sexes
- Structure feels quite unstable. Console requires more members
- Give screwdriver or make bolts using hex bolts

USER STUDY

The requirement for design and minor details were designed mainly based on intuitions and study of parallel products in the specified area. This approach though necessary to the product was not considered as part of the project in its current stage.

USER TESTING

The assembly was not tested across different categories of people in different age groups and altered/optimised accordingly. This could have been included during the prototype stage.

USING HOLLOW BAMBOO

Some of the furnitures could have been attempted using hollow bamboo with appropriate dimensions as specified.

JIGS and FIXTURES

Appropriate sharpeners, jigs could have been suggested.

BAMBOO

Kashaba Jadav Marg
Parel
Mumbai

FITTINGS

Dev Kripa Sanitary
Yadav Chawl, Gokhale Nagar,
Powai

SCREWS

New Age novelties
Nagadevi street
Kalbadevi
(near Crawford)

METAL MESH

Vijay Steel Art
Prince Palace, LBS Marg
Ghatkopar(W)

BAMBOO WEAVED BASKETS

Gangamma
Spring Mills
Dadar

BAMBOO POLES FINISHING

Rudrapaul
Bamboo Studio
IITB



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