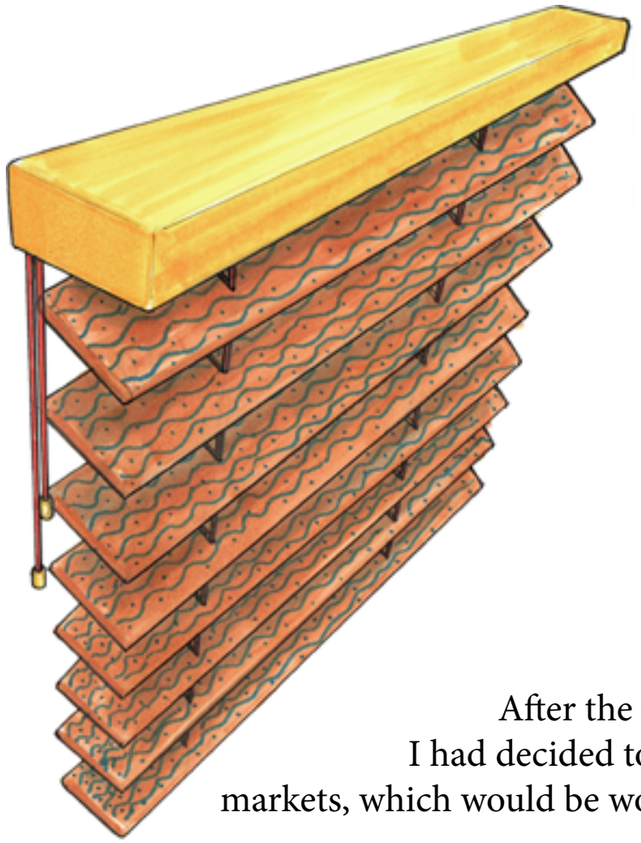
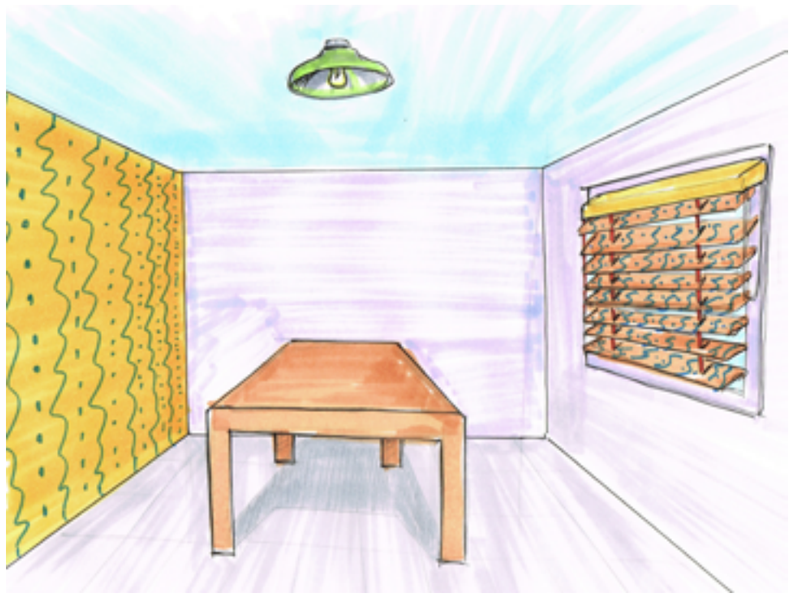
The Sajana Blinds bring
a sense of cultue into the
homes of the western
market consumers.
This product enlightens a
traditon and tells
a story visually.

Similarily, I will now
enlighten you about the
process taken to achieve
the final outcome,
from design concept to
final prototype.
I will tell the story of
the Sajana Blinds.





Picking up where I left off, from the Mid Semester.
After the mid-semester presentation, I recieved advice and feedback.
I had decided to continue to make a product that would be sold to western markets, which would be worked by Artisans and they would recieve a fair trade profit.

I was going to work on Venetian Blinds
as my primary product,
and wall papers as my secondary product.

This was the only authentic Artisan printing bloack that I could get my hands on.
I found it in Ishka, Chadstone Shopping Centre for $35.
I became aware that a good idea would be to make my own print blocks.

After interacting with an authentic, artisan printing block, I was further inspired to physically print on my final prototypes.

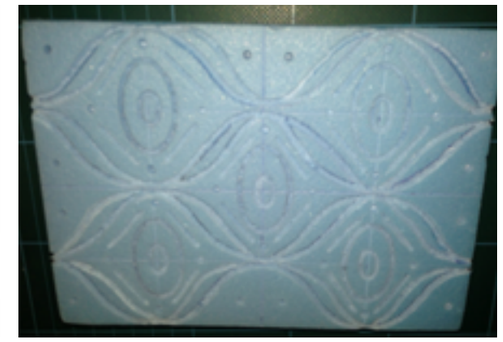
The Printing Block was out of my budget and did not even have a nice looking pattern that I could use so I decided to make my own printing block.

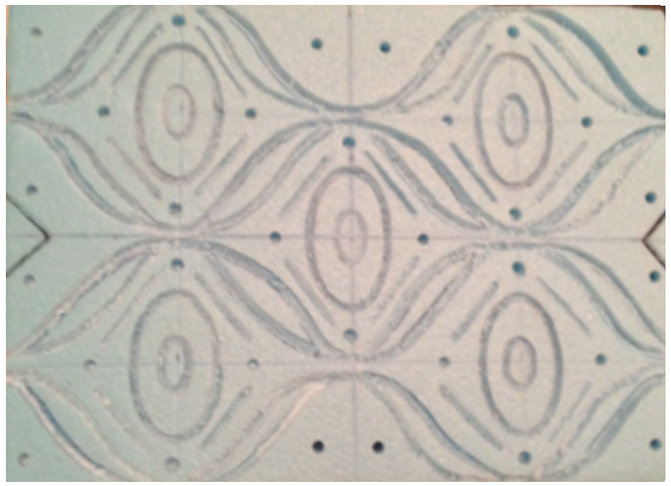
My first iteration of a printing block is evident above and to the left. I purchased a furniture foot from bunnings for $5, just because it was made from pine and had an ergonomic, curved form which would be easy to hold and work with.

I used a triangle file to make initial lines and indents, and used a bottle caps to mark out circles. I later used a dremel to effectivly remove material from desired areas, and then sanded the top flat.







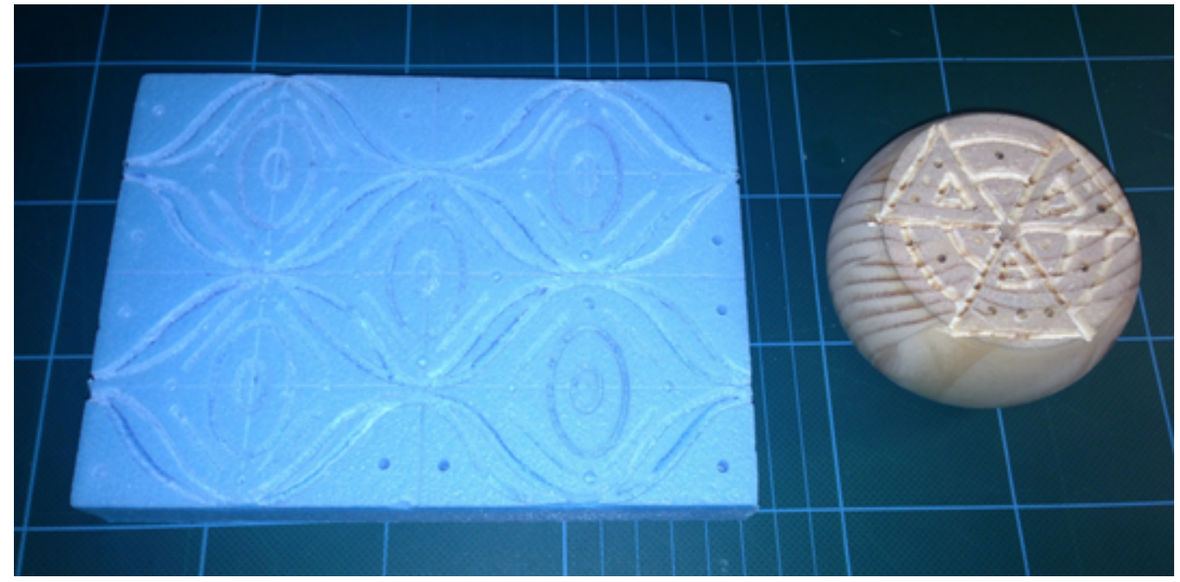


My second iteration of a printing block was made from blue foam. I cut out a rectangle with the hot wire, then drew a grid on a flat surface. I then drew a pattern onto this surface in pencil

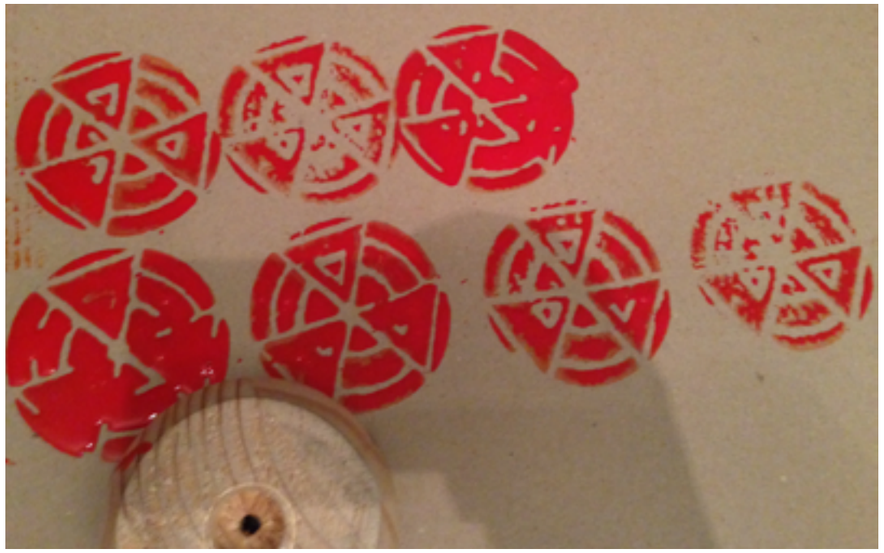
I used a dremel to remove material from the marked lines. I added further detail as evident in the surrounding pictures.

I then made a handle from an off cut of 25mm bamboo veneer, which I attached with double sided tape. At this stage I had two blocks ready for print testing.

I had to consider what materials I could print on, what paints, dyes or coatings I could used and apply with my blocks, as well as monitor the percision in the prints.



My first print testing attempts were unsuccessful because I mixed the paint with too much water. The paint did not sit on the top surface of the printing blocks properly, nor did it print properly.



I tested the prints on various materials. Evident on this page is example of testing prints on cardboard, and 1.5mm natural narrow grained bamboo veneer. The bamboo absorbed the paint niceley.

After testing the prints numerously on different materials, I began to master the technique. As evident above an below, a visually interesting pattern began to appear, created from the blue foam printing block.

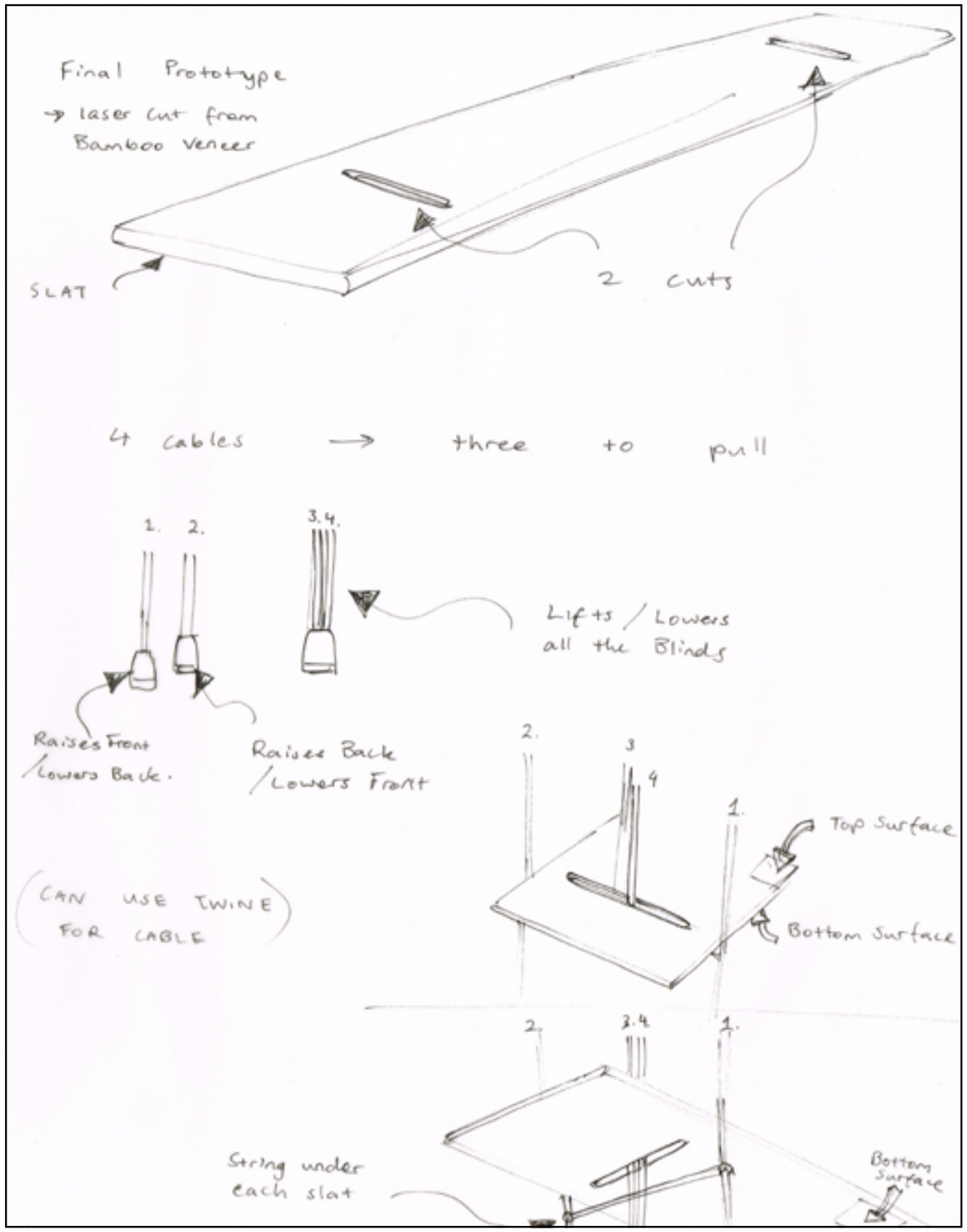
Tested printing with a different colour.
Also tested printing of a surface that has already been painted with a contrasting colour.

The example above is showing how sould stand on the block to press the print onto the wood surface firmly.

The example to the left visually works well, but does not give a natural and organic look that I desired.

The example to the left has a nice organi look. Material used was luan Plywood, however it was not suitable for laser cutting.

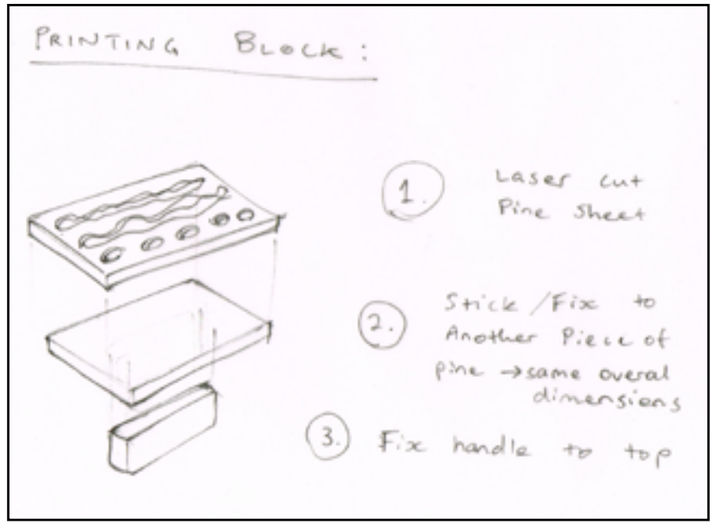
The example to the right was of bamboo veneer, and worked very well.

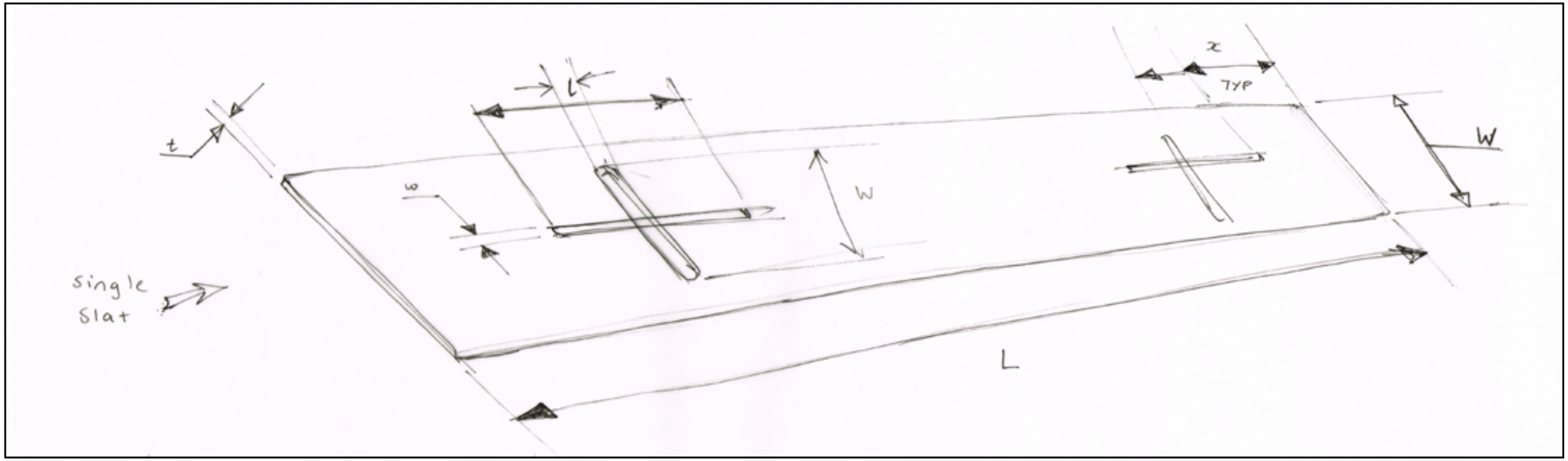


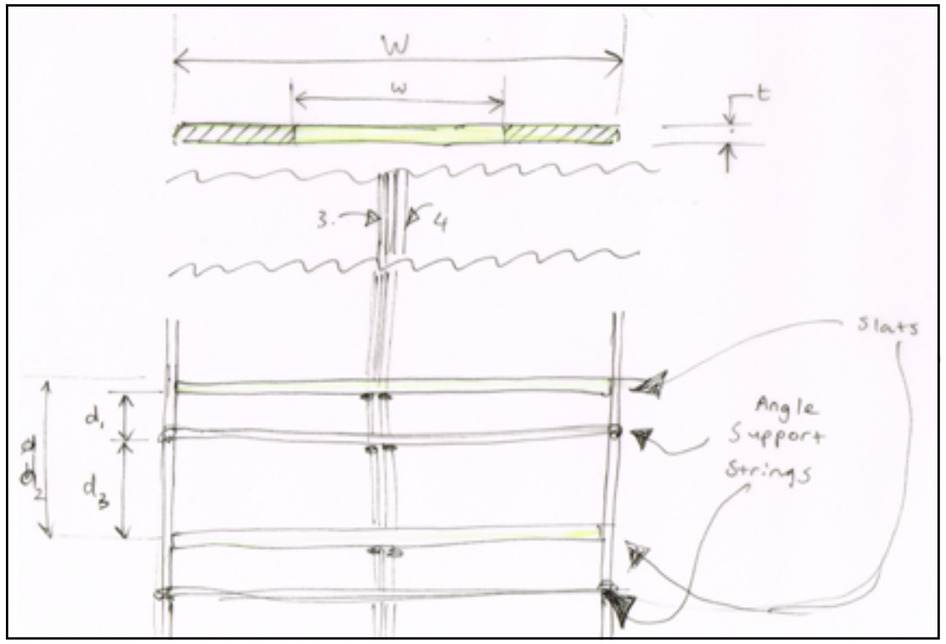
After testing materials, I had decided that bamboo veneer would be ideal.Not only because bamboo is sourced locally in Gujarat and a veneer version would be a similar and good representation, but also because of the way it worked with my printing technique and the paint I used. However I had to make a decision on what thickness I anted, as the thicker 2.5 mm was more expensive than the 1.5mm.
I decided to go for the 2.5 mm as it would look much better, be smore sturdy, durable and rigid. Also because I could order in a carbonized version which darkness the surface and gives it a nice wooden colour.

To the left - Preliminary sketches showing how I planned to make certain parts and how they would function. Detailing where cables are located and what the purpose of each cable is respectivly.

Below is a diagram of how to make the laser cut printing blocks.

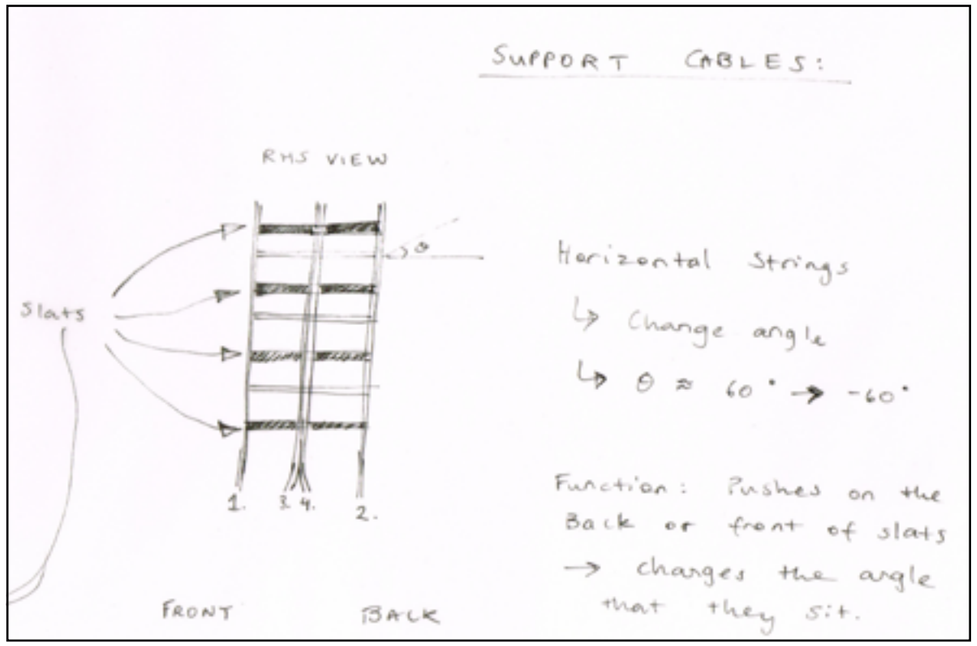


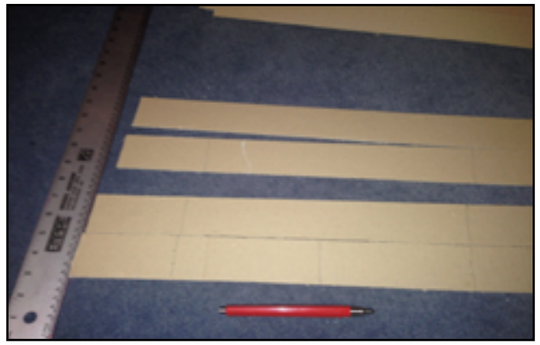


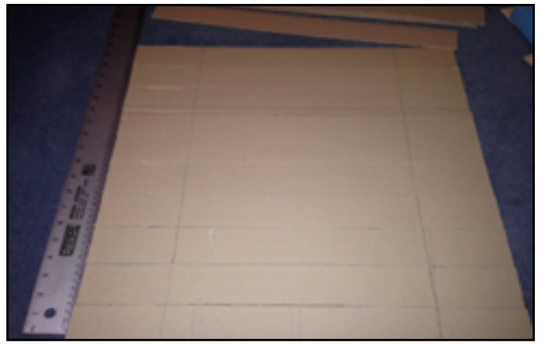


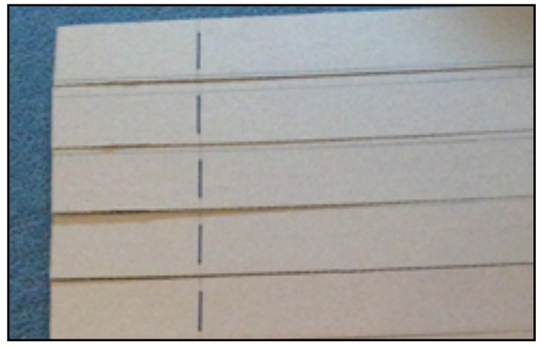
Detailed sketches where I allocated algebraic variables to main dimensions.

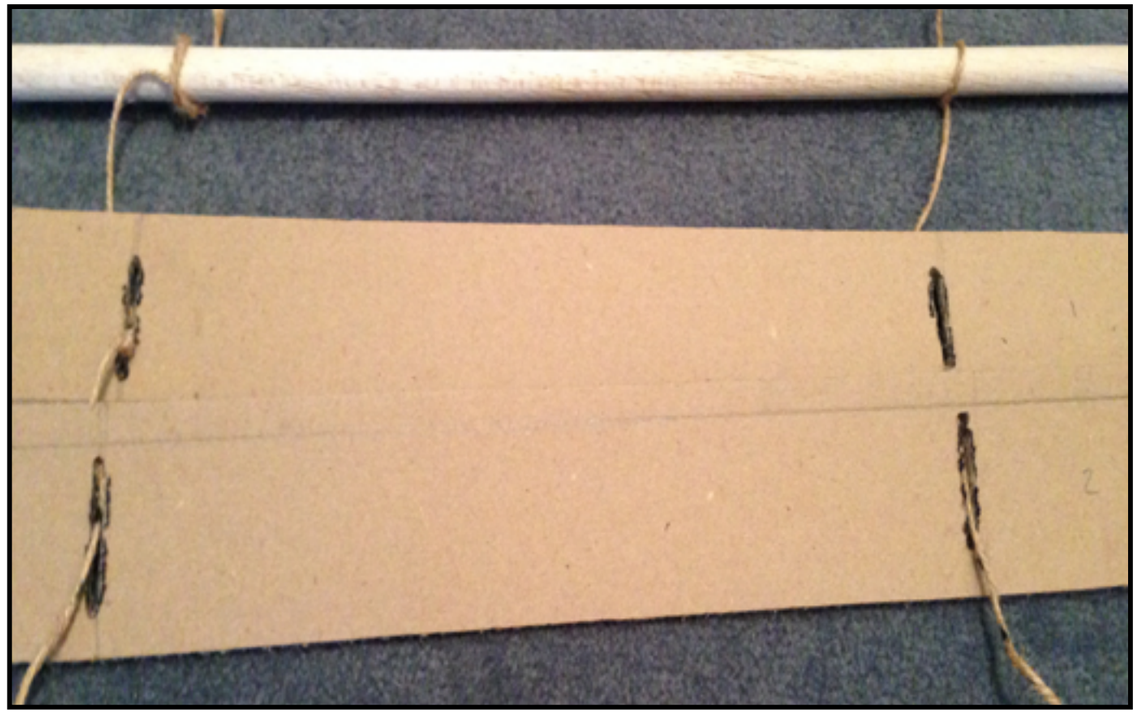
This was very useful for prototyping and making modifications to dimensions of components.











First Iteration of my Prototype.

I started by making a card board mock- up. I first planned on paper, given me rough dimensions to work with.

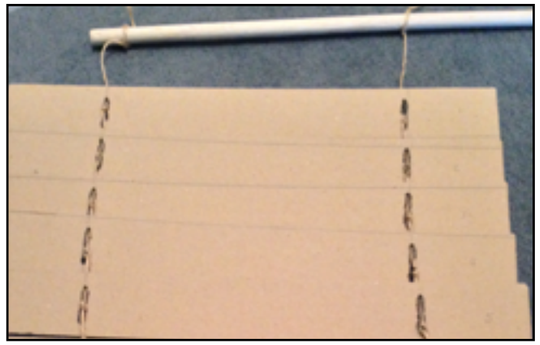
Marked out a certain number of slats, and then cut them with a stanley knife and steel ruler.

I then measured and marked out where each slot was to be located on each slat.
Drilled holes in these locations and created a empty area for cables to go through.

I then used twine as my main cable, and tied knots under each slat.

The twine was connected to a shaft made from balsa wood, to support my blinds.









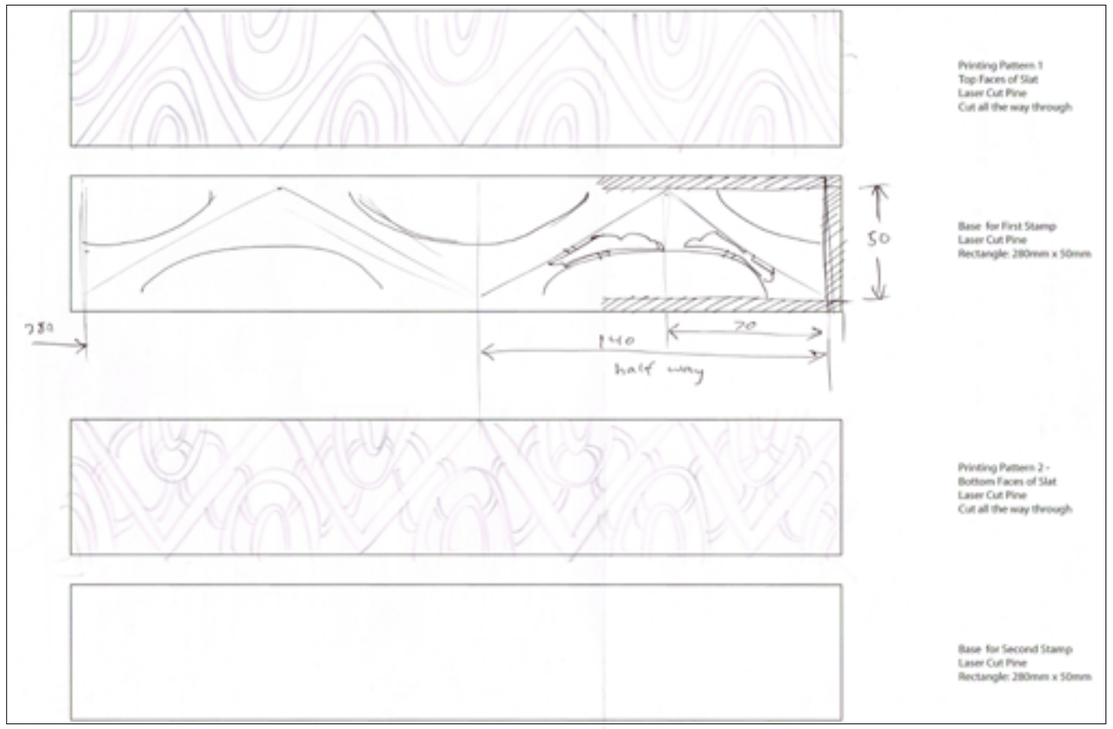
I would lift the system up gradually to be sure that all the slats were held in place by their knots.

I would measure dsitances from the end of a knot to where the next knot should be located, then mark it with a permanent texture, and then tie the knot there.

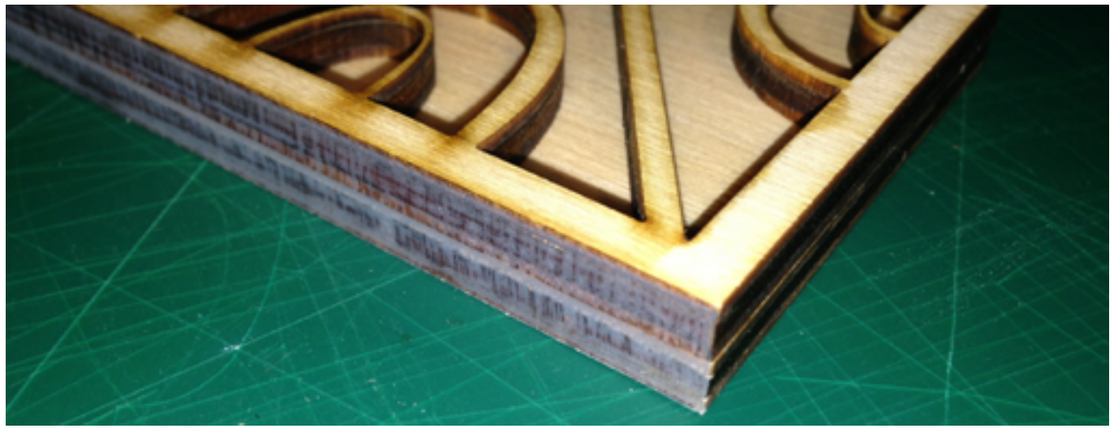
I became aware of how percise this system has to be in order for the final product to function well.

After all the knots were tied i held the unit up, and it looked great for a cardboard mock up.

I became aware that there was also an issue with scale, and thus I would need to increase some of my dimensions.



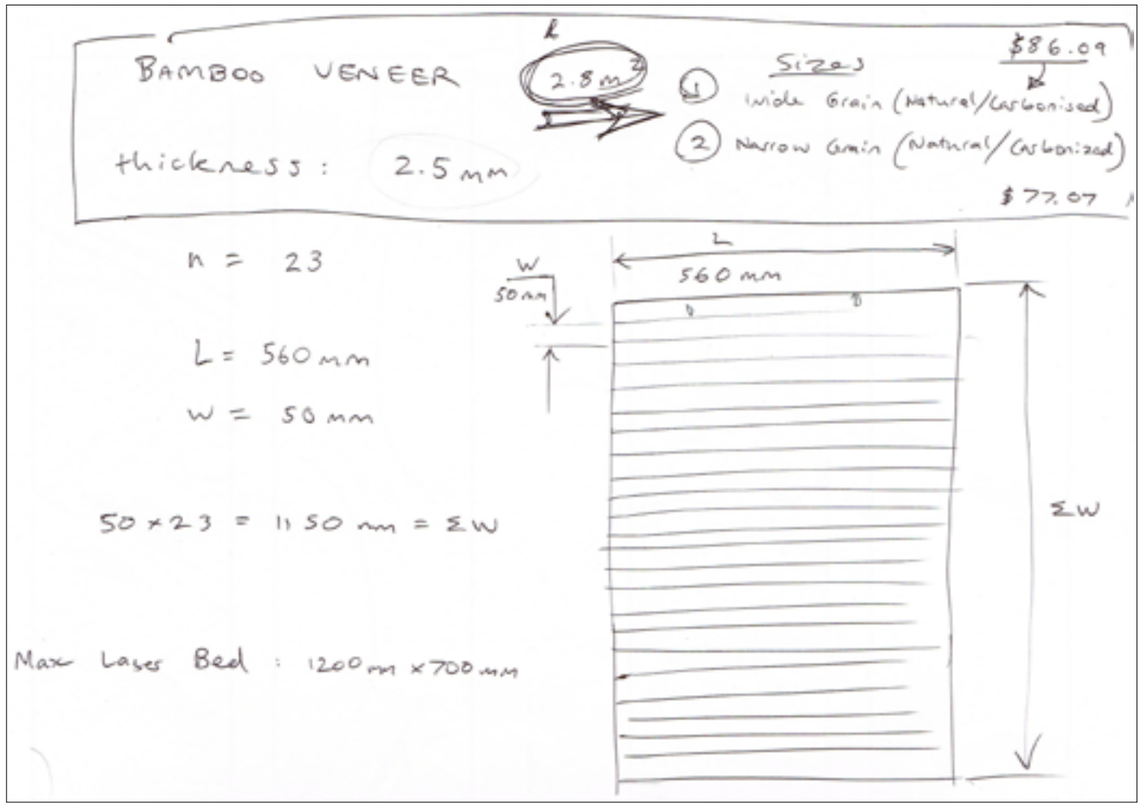
My third iteration of printing blocks. I made a template to plan out what patterns I could use for my prints, evident above, which would then be laser cut and fixed to eachother



I measured my blinds at home, and used the dimensions to modify my set variables.

The number of slats, width of each slat, and length of each slat was important to find out home much area I needed to laser cut, and thus how much cost I would have to pay.

I also became keen to use my final product in replace of the existing blinds displayed here, in my own bathroom at home.



It is evident with my picture to the left that common, existing venetian blinds, appear very boring and lack visual interest.

Thus there is a market gap for he Sajana Blinds.

The Drawing above displays the price of bamboo veneer boards that I was considereing, and decided on getting the narrow grain natural carbonised board.
I needed to laser cut an area of 560mm x 1150mm
--> Which fitted nicely on the laser bed: 1200mm x 700mm

The 2.5mm thick bamboo veneer board was delivered directly to the workshop, and cut to a wrokable size on the table saw.

The image to the right displays how the board appeared after being laser cut. The part simple pop out.

Most of the Slats were imperfect after laser cutting. The dimensions were accurate however, the material had warped and the slats began to bow. To fix this problem I subjected them to a heavy distrubuted load. This was applied with weights (total of 250 N +)

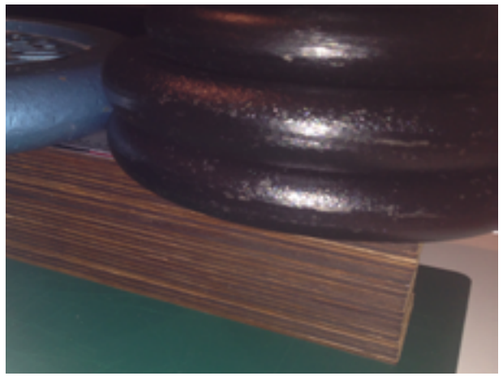
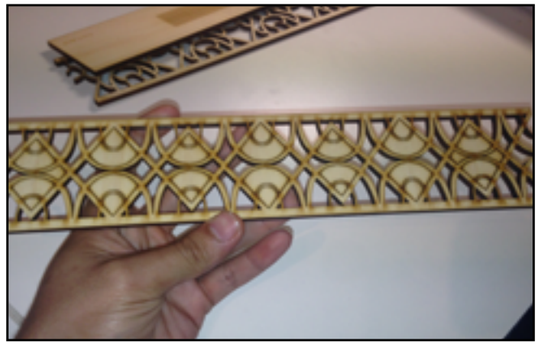


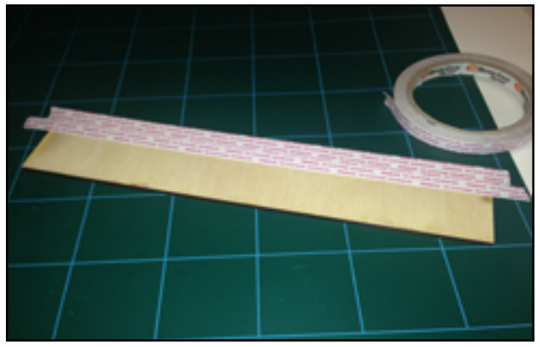
Image to the left displays how the laser cutter would burn some of the edges giving an undesired dark colour.

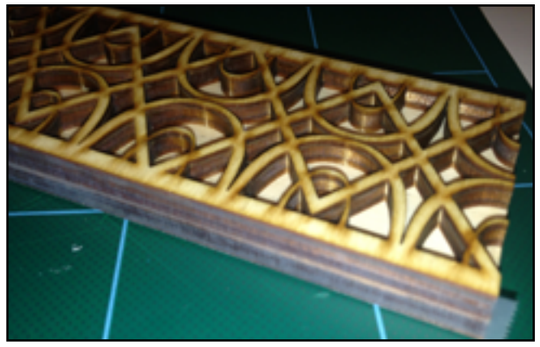
Image to the left displays how the lase cutter cut some additional undesried paths on some slats.











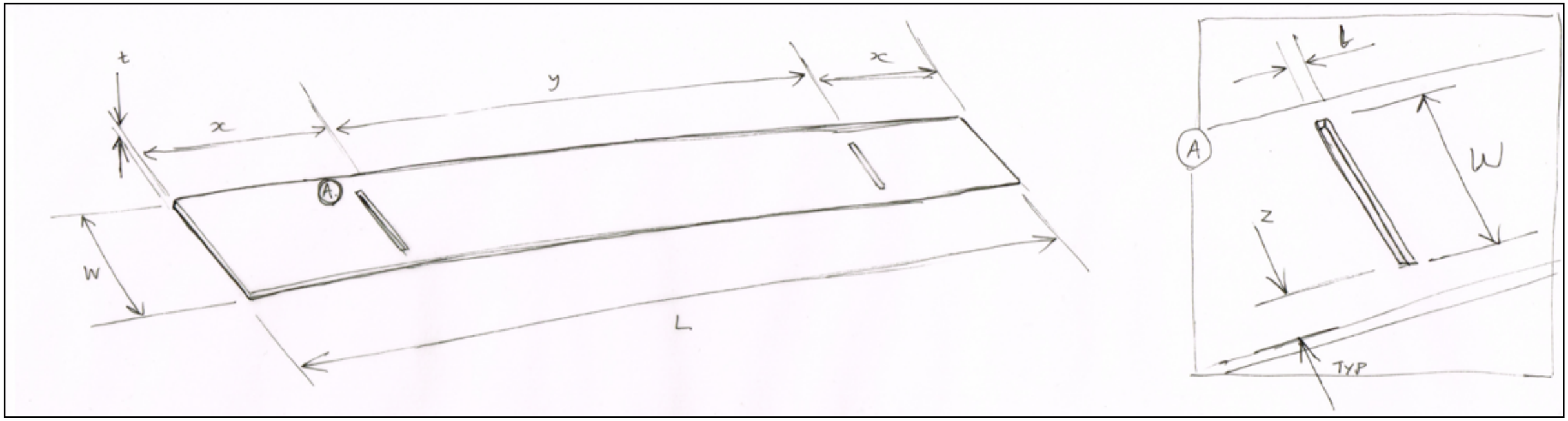

As an extension to my third iteration of making printing blocks, I added further detail to the design to create a more elaborate pattern.

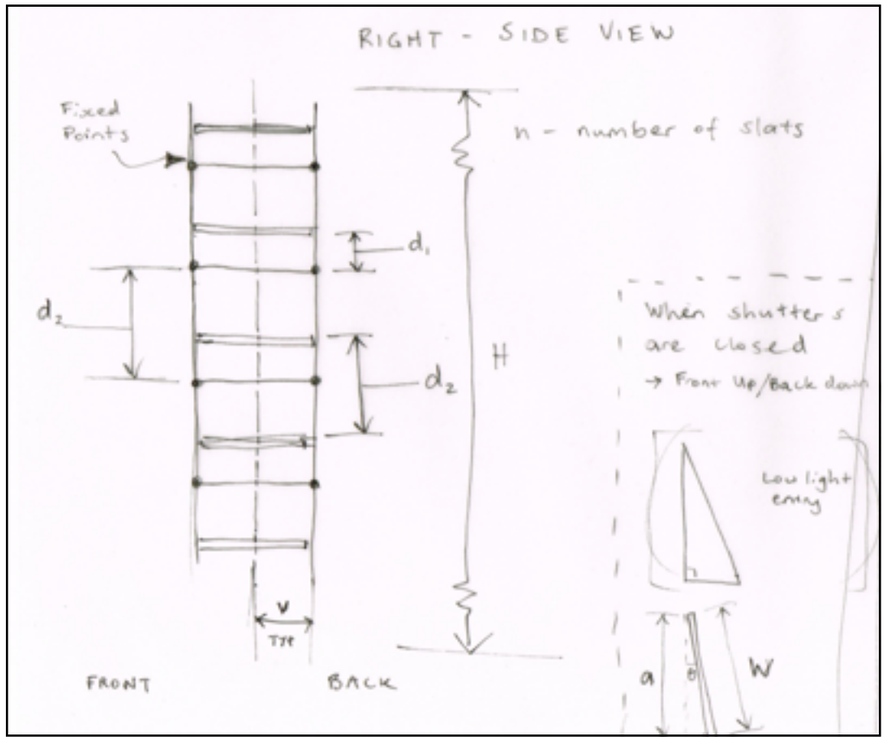
Some of the defects as well as the method of assembling the final printing blocks, are displayed to the left.

Some paths did not laser cut all the way through. I used a swivel scalpel to cut the portions that were still connected. Most the sections poped out easily though.

Then used double sided tape to fix a pattern to a board with the same overall dimensions.

An early attempt had many defects; burnt edges, misalignment and brocken sections.

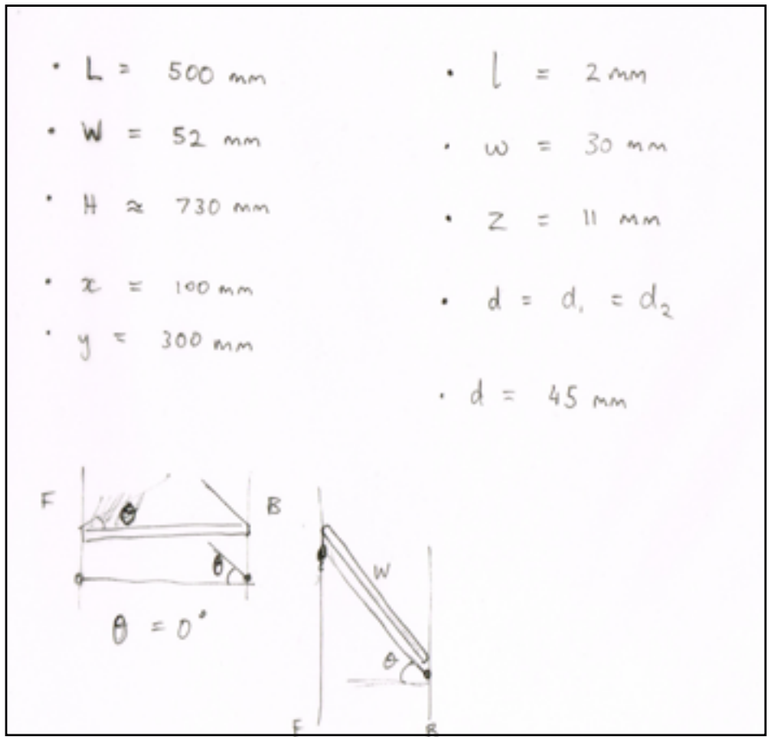




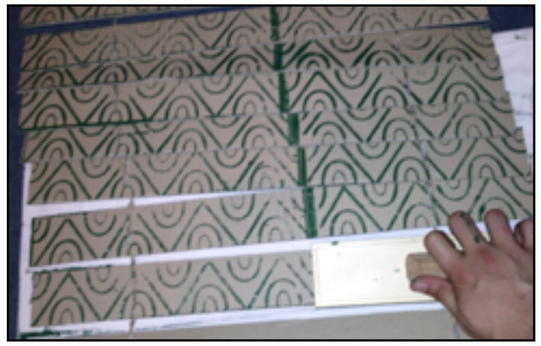
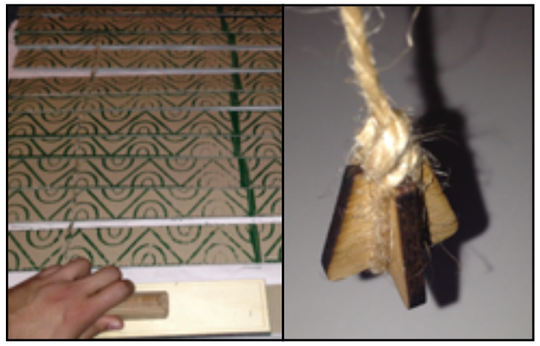
After my first prototype, I learnt that some dimensions that I had set woudlve not had met standards, and the overall product was slightly out of proportion.

I then set the variable dimensions to be equivalent with those of my existing product.

I worked out the desired angle and the achievable angle as well.

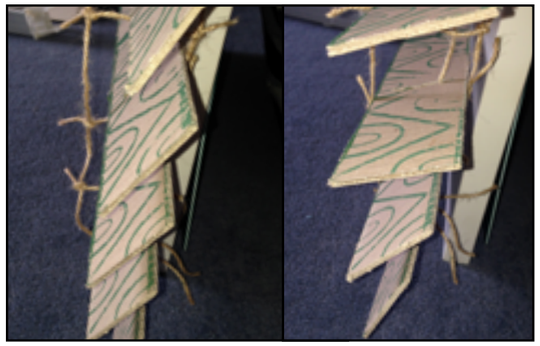








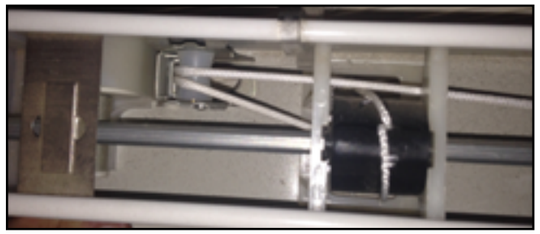


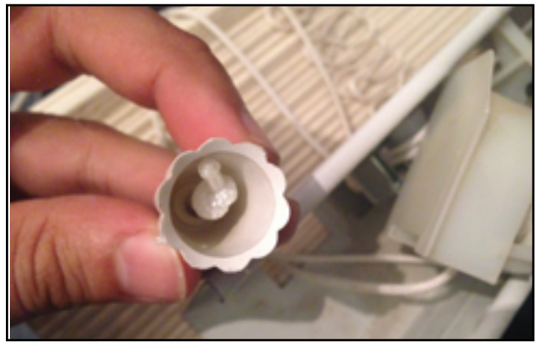
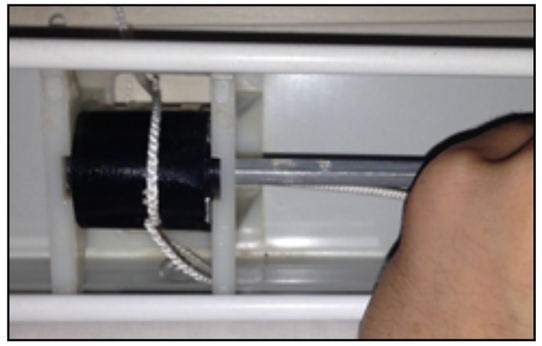
Second Iteration of my Prototype.

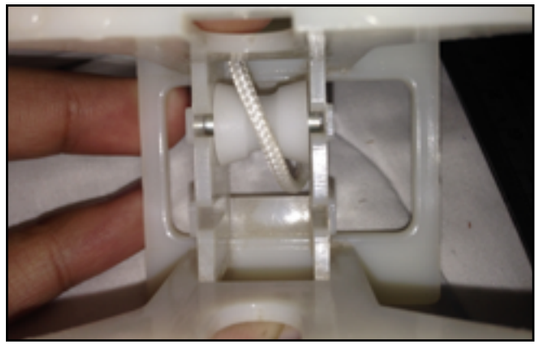
I continued to work on and further develop my cardboard mock-up.

I used my first laser cut printing block with green acrylic paint.
The width of the cardboard slats was 50mm, which was the same as the inner width of my printing block, which worked terrifically.
One major error that arised was the line runing down the middle of all the slats. This was a very importnat thing that I learnt from prototyping, and became aware that I had to change my laser cut design so there would be no side borders.

I also introduced the angle alteration cables, made from twine, to the system to test out how it works. This was proven to work, however a very accurate wire frame had to be made with percise locations of knots, and I decided that it would be best to use the wire frame from my existing blinds.






Reverse Engineering of Existing Venetian Blinds.

This was a very important stage in the process, as I became aware of all the bits and pieces required to make a functional system.

The photos show main components such as the pulley and gear systems, cable wheels, main shaft, roller bracket system, bottom plate and plug, and many more.

I became aware that many of these smaller components need to be of good quality with high percision, and it would be ridiculous to try and make them by hand or from upcycling components from other products.

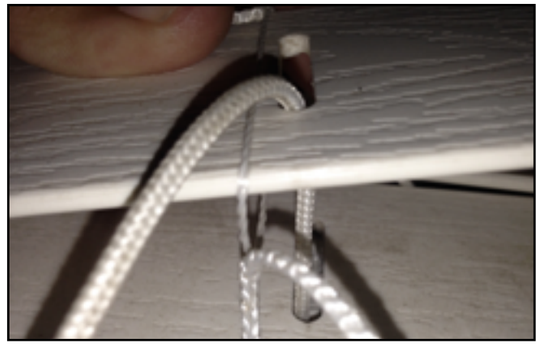
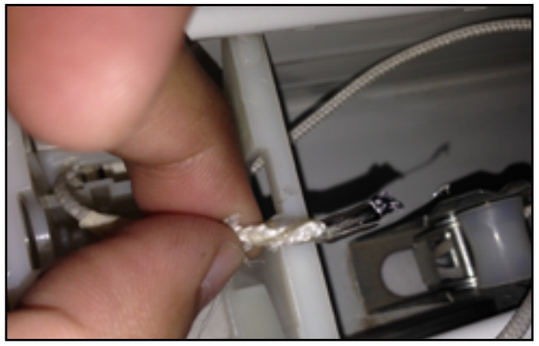
Thus I decided that I would need to source components from China, however majority of my product will still be made in India.

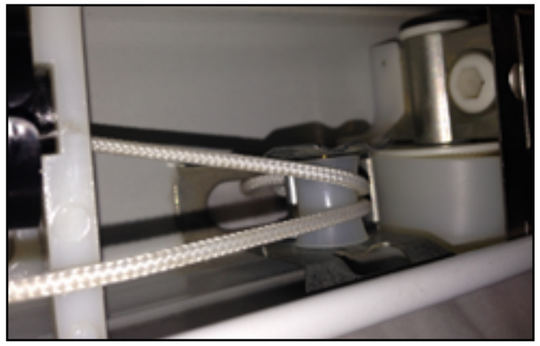
Reverse Engineering of Existing Venetian Blinds.

One this page there is photographs showing further detail on components found within the mechanisim housing.

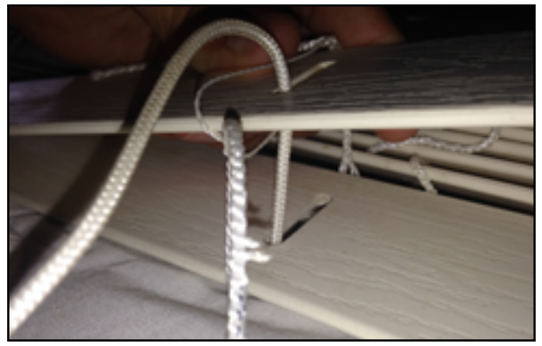
The metal cable retainer shown in the top right was quite dirty and rusty. I used a dremel to clean and polish the surface.

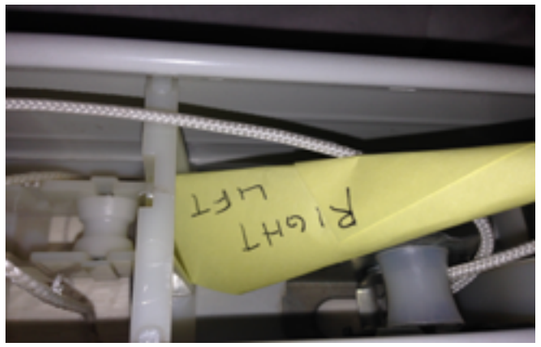
The top and bottom left show detail on how the wire frame and main cable are in contact with each in dividual slat. The main cable ensures the the slats can not move and fall out from the left or right, whilst the angle alteration wire frame ensures that the slats can not fall straight down.

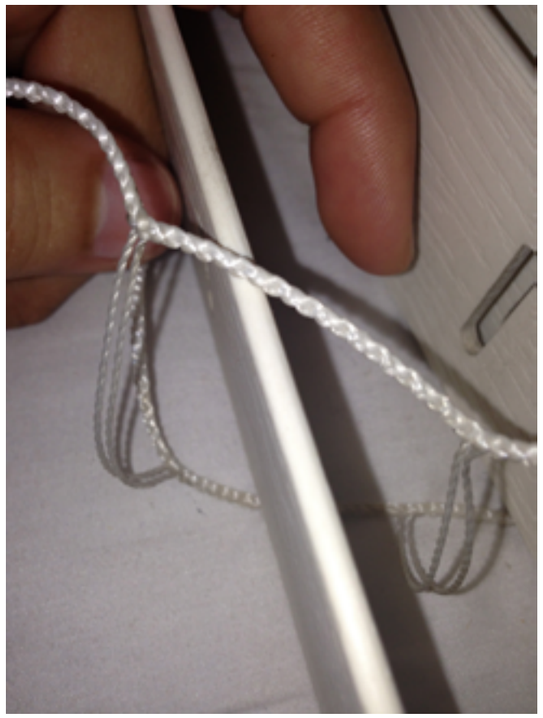



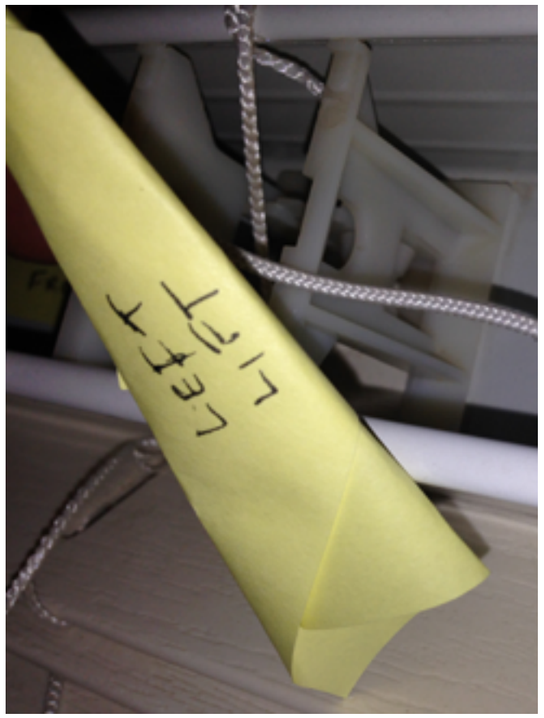



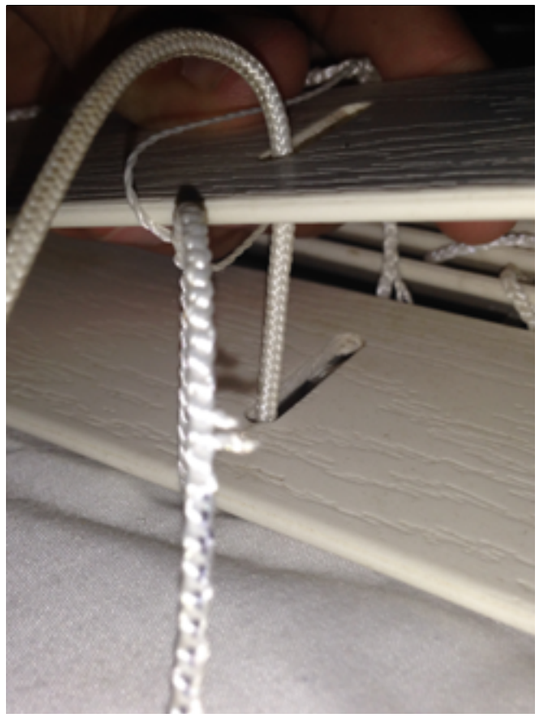










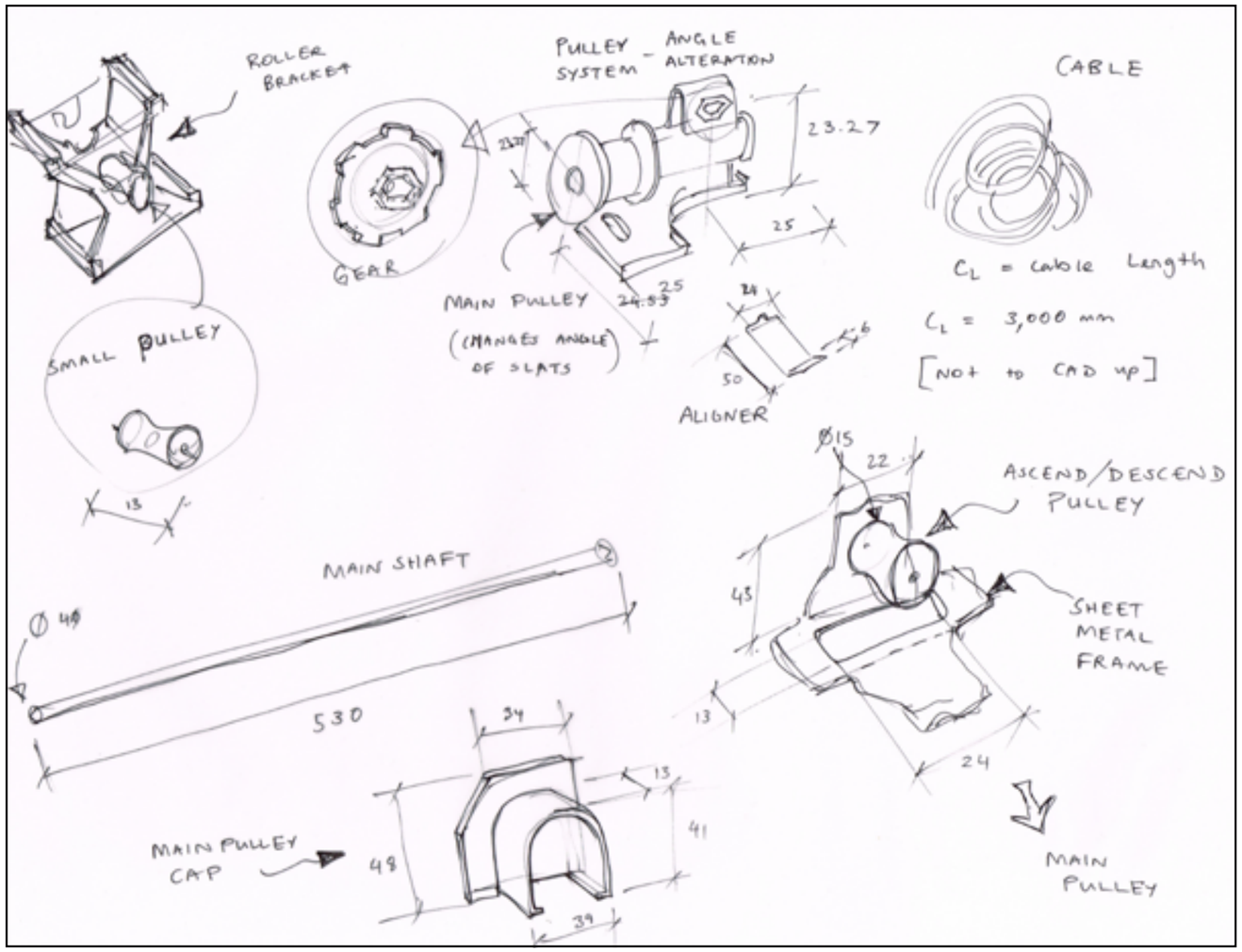


Reverse Engineering of Existing Venetian Blinds.

This Slide shows greater detail on the angle alteration wire frame and how the slats fit together and are supported by the cables.

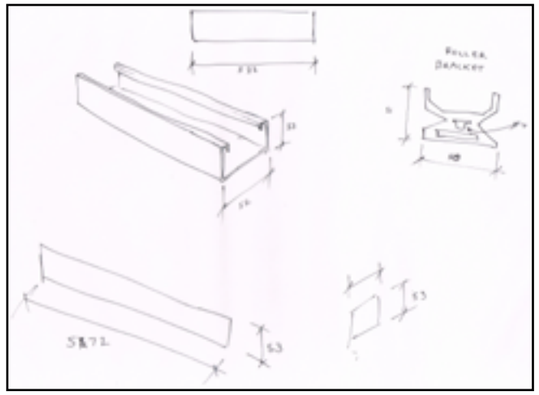
In the bottom right, you can see that the main cable going directly through a hole, this hole is located on the bottom plate, which compolelets the system and is where the ends of the cables meet, are tied , and then connect under the base plate, which is then hidden under a plug.

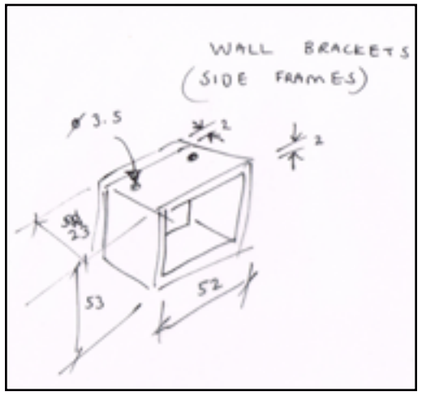
I used post it notes to label different cables so I could be sure which cable each on was when feeding the back through the system.



I had sketched out the main components with the appropriate dimensions to consider if simplifed versions could be made locally in Gujarat. Some parts such as the mechanism housing, wall brackets base plates coulbe be made for local bamboo.

The Sketches made it easier to CAD the components of the final model, where I could the virtually assemble them to see how things fit in place.

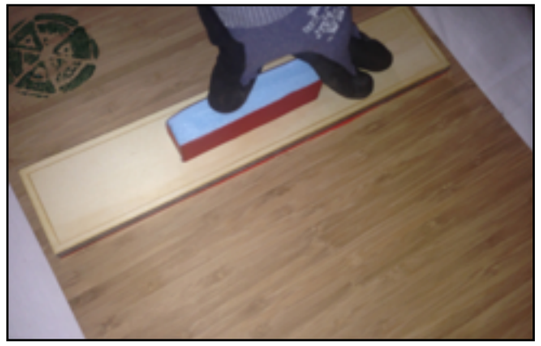




I cut 25mm bamboo veneer to create blocks, which were then sanded and attached to my printing blocks. I champered the edges so there would be no sharp corners that would hurt or injure the hands when applying pressure to print.









Final Print Testing

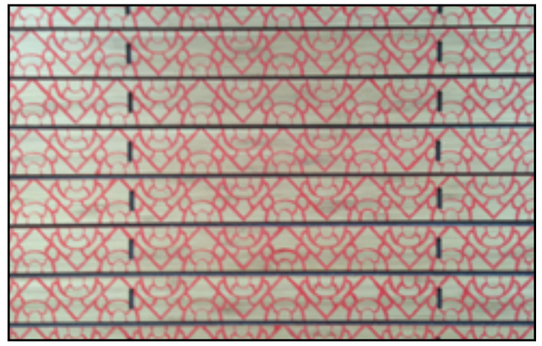
I cut a piece of my bamboo veneer (2.5 mm thick, carbonized narrow grain) the same material that I ordered in and was to use for my final slats.

I then used my first two printing blocks to test how see how the material works with my acrylic paint. I also was able to experiemnet with colours. Decided to use red and in Hinduism it symbolises sensuality and purity, and blue on the other side as it symbolises nature and power.

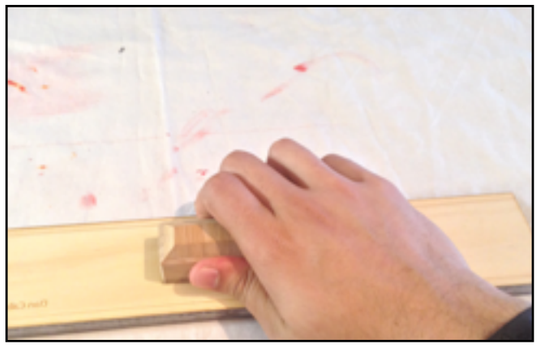
I also experimented with varnish to coat the bamboo after it has had a paint print applied to it.

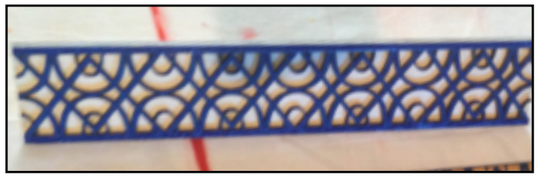
The varnish I purchased was too dark for my liking, as the carbonised bamboo was already dark, I just required a low gloss finish with no stain nor colour alteration.

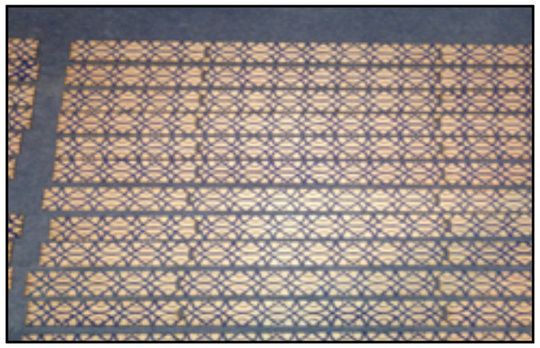
Final Prints - Red Side

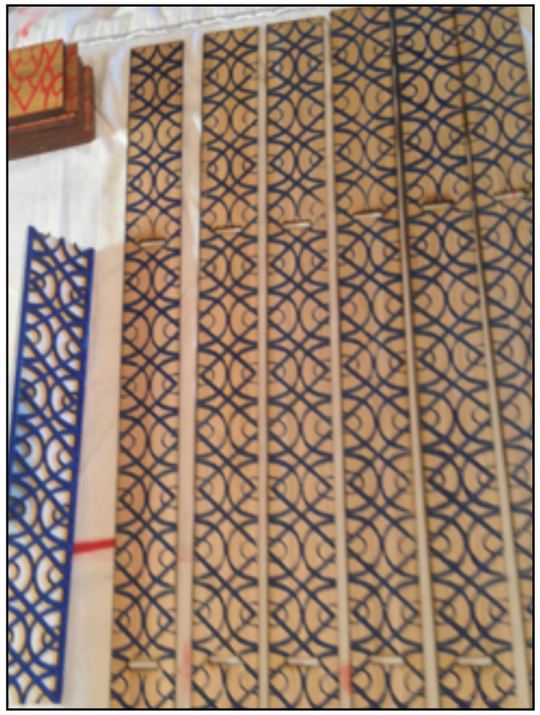


Final Prints - Blue Side

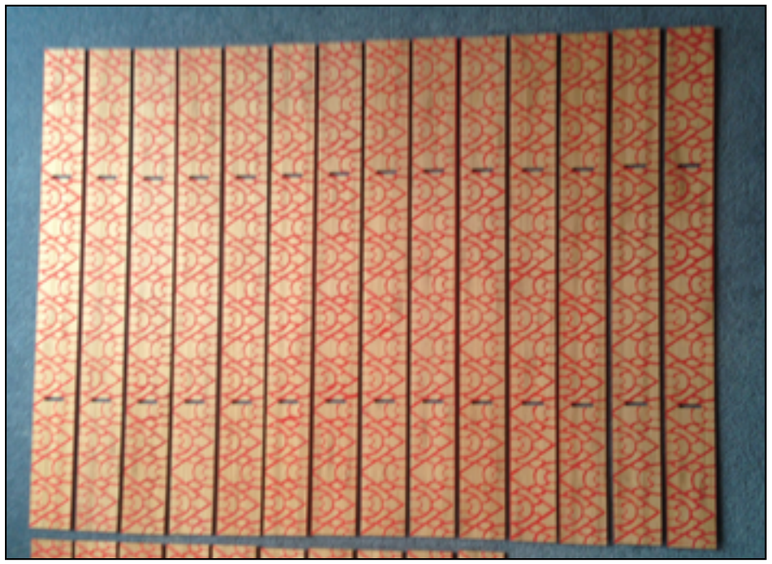


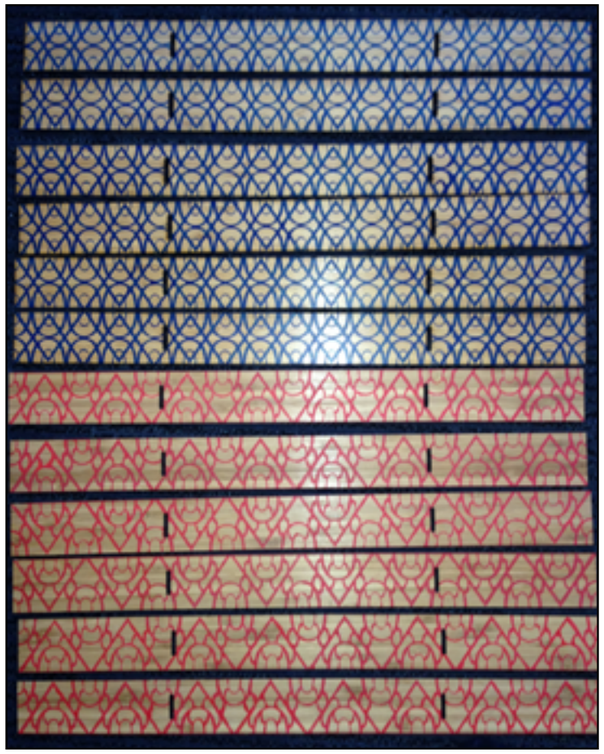



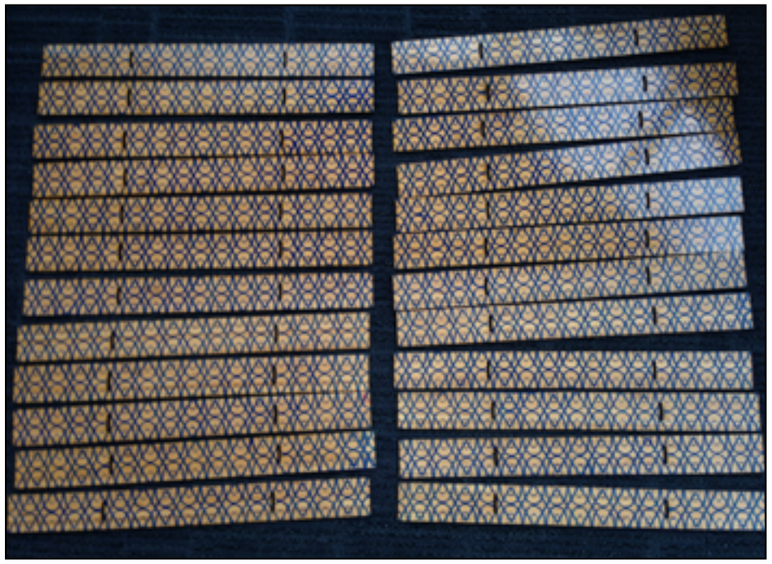




The final slats were coated with low gloss spray on fixitive. Each side of each slat was coated between 8 - 10 times each. Each coat was applied quickly and with a consistnt thin layer, then once dried I would recoat.







The profile of the original top plate is shown above - top, and the one below it shown the modified top plate profile, which has an edge sanded down so I could easily attach my new bamboo bfront plate to it.

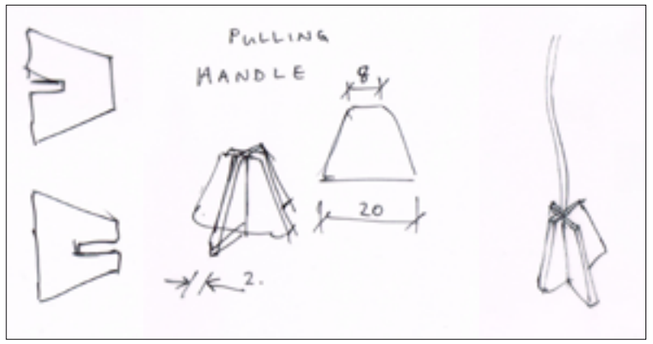
The front plate with no coating.

The front plate with varnish applied to darken and give shine.

I applied hot glue in the gaps, and allowed it to dry to use it as a quick and easy filler material. I then layed down a strip of double sided tape, ideally used between two wooden surfaces. Then stuck the first half down.

I then lifted the fixed half up and held it up by using leverage. This gave me enough room to rip of the other half of the double sided tape. I then stuck down the final half.

My top plate was the complete and ready to clip onto the mechanism housing.



I designed a simple pulling handle that could be interefence fitted with two simple laser cut components.

Some parts broke when filing them down.
They are quite delicate.

Quality Control, to ensure each of the component meets standards set.

The final handles were varnished and connected to existing cables with the use of a hot glue gun.









The base plate was one of the most difficult parts to make.

Initially I thought I could just tie the final knots under the bottom/ last slat, however I came o find the they were stragically hidden in the base plate.

I retorfitted pieced of bamboo ply to the existing base plate. I marked out where I need to drill holes and where I need to cut faces.

I cut all the faces that would be visable in the final product and stuck them to the original base plate with a hot glue gun.

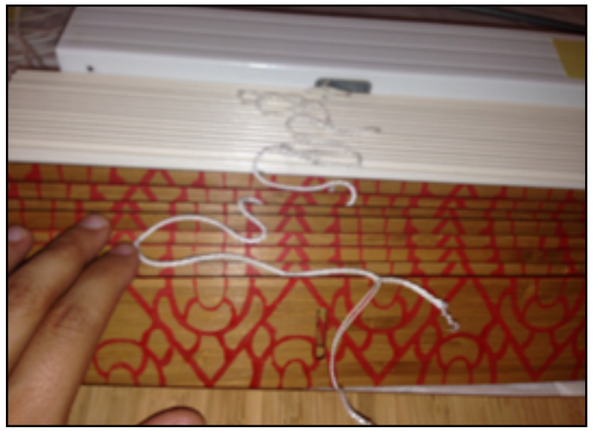
I tested the cables to see that they could be fed through the holes.

I then varnished the faces to give the base plate a nice finish aesthetically. The base plate and front plate now complemented eachother and act as a borders for the venetian blind slats, constraining the patterns.









Retrofitting the Slats.

Once both sides had been printed on, coated and fully dried, it came time for quality control and inspection.

I removed the slats that were furthers from perfect, and used the best of them in my final prototype, with about 5 extras.

I fed a slat in one at a time, ensuring that the patterns were always facing the correct way.

I had to be very careful with feeding the cabled through the slots, and had to restart several times to be sure that the slats and cables were in the correct places.

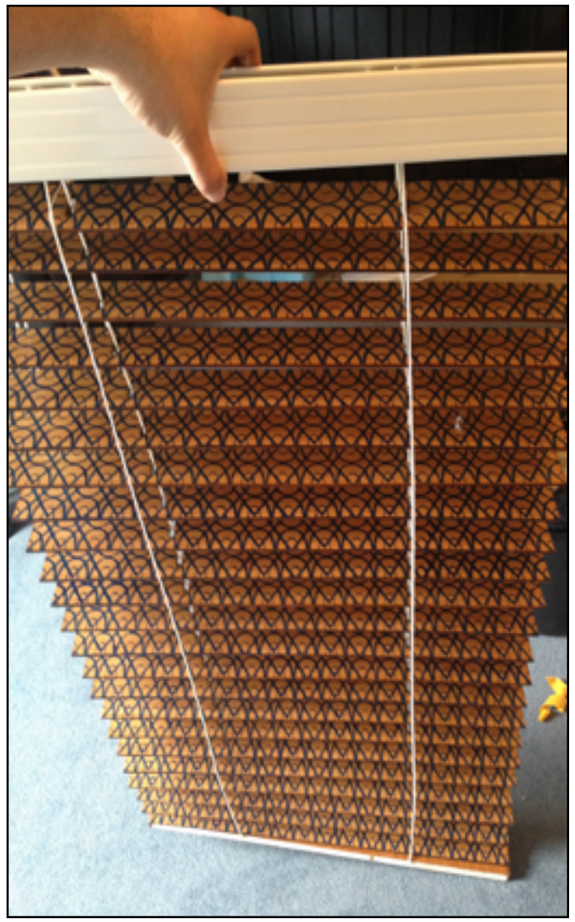
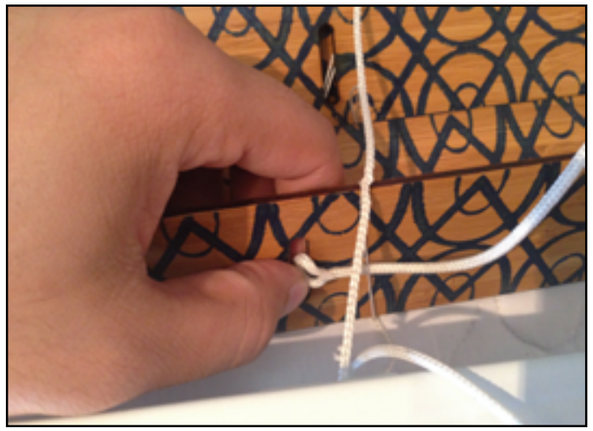
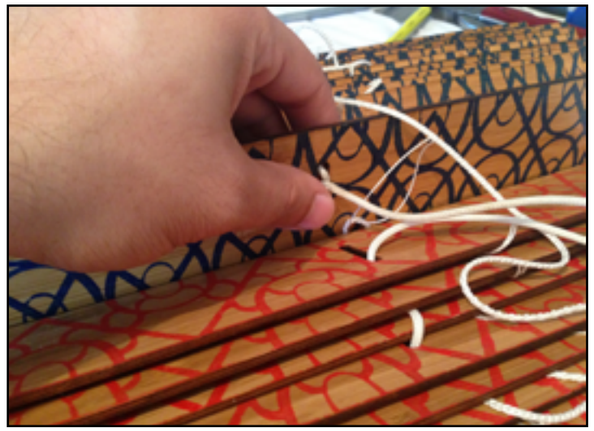
I scraped of paint drops with a metal ruler, then darkened the spot with varnish.

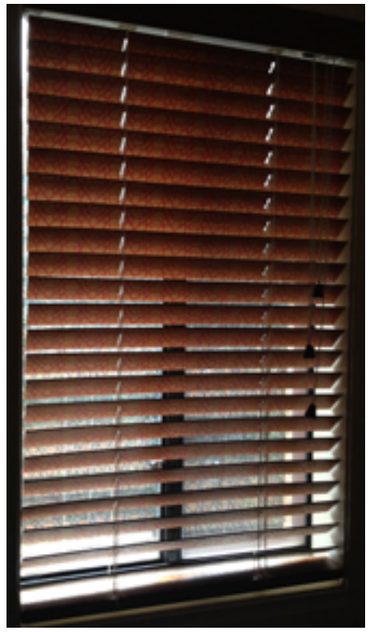
Retrofiting components

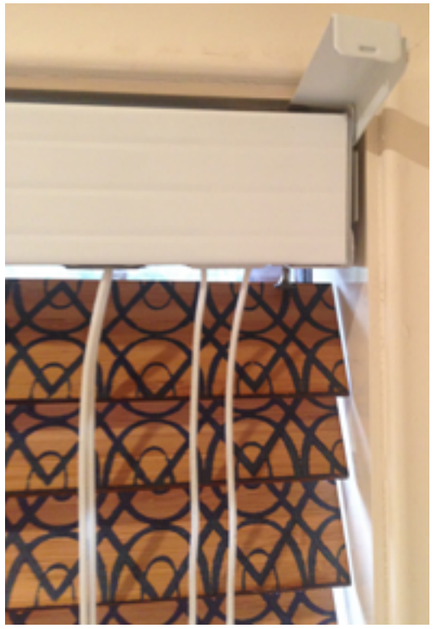




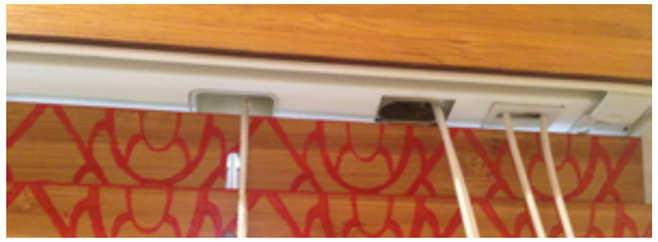





Fitting the system to the brackets in an appropriate context, and securing with screws. Function features were tested and evaluated.




Reflective Summary

I was trying to design a product which be have economically viable, environmentally responsible and socially beneficial toward Artisans from Gujarat. I established a market gap in venetian blinds, which are predominantly used in westernized countries. Existing products lack visual interest and aesthetic appeal. I plan on working with artisans, where they can apply their traditional techniques to a wider range of products that would effectively increase their income at fair trade rates, and untimely improve their living conditions.

I tested and prototyped various ways in which I could replicate and apply a traditional pattern onto a product targeted towards western consumers. I experimented with different materials and tested existing products to analyze how the systems function and become aware of competitor product standards. I decided to make my own custom printing blocks to create patterns that represent traditional artisan decorations. I used bamboo veneer plywood as the base material for my slats and main plates. I laser cut the slats and printed different patterns with different colours on each side of each slat. I then coated them all with UV stabilizing fixative spray, and retrofitted them to an existing system. The final result displayed an astonishing array of linear patterns, as the pattern on each slat unify together to make a beautiful feature. It was evident that a product such as the Sajana Blinds would beat existing competitor products if it functions just as well or better than them, as it defiantly beats them in aesthetics.

I used the assistance from the workshop technicians in ordering my material, having it laser cut and receiving advice on how to go about making my final product. Majority of the ideas and concepts were generated by myself, which were then developed through research, sketching and testing. Further refinement and modification towards the overall design and specific components were made frequently during the prototyping stage. Once parts were modeled and evaluated, it was common to become aware that I would need to make a change towards the component.

The overall final prototype effectively portrayed what the Sajana Blinds would look like if they were to be made as to my business plan. From prototyping I became very aware that a high level of precision is required when tying knots, thus this would ideally be done by machines or using high quality gauges. In my prototype, I used the existing metal mechanism housing, and became aware that this could easily be made from bamboo plywood as well, as well as the brackets. This would mean that over 90% of the product would be organic and biodegradable. Many components would be sourced from China, as this could potentially be sourced from India in the near future, as India is on the increase in the manufacturing industry. If the product was entirely organic, and all the components and materials were sourced from India that would be further beneficial as it would keen the money within the country, and prices could go down, which could lead to an increase in demand and supply.

For me the most important aspect of the prototype is that it functions just as well as competitor product, but beats them in aesthetics. It is a great feature to have one pattern displayed, and another completely different pattern telling a new story can be displayed simply by the pull of a string. The elaborate patterns and designs created from the Sajana Blinds truly enlighten a tradition by evoking viewers to become aware of how the product was made and decorated. This makes it prospective to be purchased by western consumers, and give some revenue directly to the artisans, and improve their lives in a socially responsible manner. Another significant element in this design is that it is environmentally friendly by using green materials, and low energy consumption machinery.

Previously I did not think that there were many complex components in venetian blinds, and I thought the mechanism would be able to be made from up-cycled components in Gujarat, however this assumption was incorrect and highly unlikely. Having experienced the making of the Sajana Blinds model through the prototyping process, I now feel that it would satisfy the triple bottom line, but there is still room for improvement. Most importantly I have learned that prototyping is a very useful tool to implement into the design process of any and all future projects that I am to work on. I have learned that prototyping enables me to test and refine the functionality of my deign, allowing me to test the performance of the materials I plan on using. Prototyping also help me understand and describe my product more effectively, and thus allows others to understand, visualize and physically get a feel of what my design concept is to be like.

Throughout the duration of this semester, I have significantly developed my skills in project management, ideating and prototyping. However, I have not sufficiently improved my skills in thorough research and market analysis. This means that I have identified areas to improve in, as well as areas that are useful and should continue to utilize evidently. Since I did not have much time to fully refine my design considerations, material and component selections I did not make the best choices. I made decisions which were best for my given timeframe and deadlines, however I am sure I could have made more resolved decision if I had more time to research. Hence if I was going to introduce this product to the market I will need to do more research towards the materials used, the life cycle analysis of the components used, and how I could best collaborate with artisans from Gujarat.