Furniture and decorative items informed by craft and technology

Sua Kah Yong, James
School of Art, Design and Media

Dr Chalit Kongsuwan
School of Art, Design and Media

Abstract **–** A piece of furniture aids in our everyday life. Traditional woodworking crafts and furniture have become obsolete since the Industrial Revolution due to the breakthrough of technology. This modern production minimises manufacturing costs and maximises time efficiency. However, the overwhelmingness of mass production has recently caused the degradations of both the maker's skill and the taste of consumers as well as environmental deterioration. Arts and Crafts movements such as the Japanese *Mingei* were established to resurrect conventional craftsmen and to preserve vernacular heritages and handcrafted practices.

Keywords **–** furniture design, woodworking, handcrafted, machine-made, oriental nostalgic form

1 INTRODUCTION

To set the context of this research paper, the key terms, 'handcrafted' and 'machine-made' in furniture design, will be clarified in sections 1.1 and 1.2.

A brief introduction of the issue of furniture design in the present-day will be covered in section 1.3.

1.1 HANDCRAFTED FURNITURE

Handcraft is a traditional method that is use to produce fine furniture. The hand tools involved are primitive and down to earth, without the use of machinery and electricity. (refer to Figure 1)

Figure 1: Traditional Woodworking Hand Tools
(Wood Choppin' Time, 2016)

Besides hand tools, the joineries (refer to Figure 2) involved in securing the wood pieces not only serves as visual delight but demonstrates the understanding of woodworking techniques and the properties of various wood species.

Figure 2: Bridle Joints
(Montalvo, 2015)

1.2 MACHINE-MADE FURNITURE

Furniture design had later began to necessitate with machineries during the Industrial Revolution, to cater for mass production and increase in precision during construction.

Figure 3: Table Saw - Rip Cut
(Wood Magazine, 2010)

As technology advanced rapidly into the digital age, people have began to rely digital technologies like 3D printers and CNC (Computer Numerical Control) machines (refer to Figure 4) for furniture construction.

Figure 4: CNC Machine
(Wood Carver 3D, 2014)

Furniture has slowly come into being fully constructed with machines and as machine-made furniture only requires the skill of computer softwares and digital programs, this may lead to the loss of traditonal woodworking techniques and knowledges.

1.3 ISSUE OF FURNITURE DESIGN IN THE PRESENT-DAY

Maintaining the tradition of handcraft has become a challenge because of the requirement of time and labour intensiveness. Nowadays, young designers have been dictated by the digital technologies. This dictation has resulted in the lack of product's authenticity and originality. In order to seek the balance between tradition and progression, we should look bake to the past to anticipate future. Consequently, it would be beneficial to recover the equilibrium between crafts and technology with the regard of locality and culture.

2 AIMS / OBJECTIVES

The research aims to invite viewers and users to appreciate the synchronisation between handmade and mechanical production. By synchronising the vitality of natural materials and conventional joineries with the rapid pace of modern technology, the power of opposing elements is proposed to reunite and elicit the spirit of place (native materials or species), people (handcraftsmanship) and product (inheritable quality and uniqueness).

3 LITERATURE REVIEW / BACKGROUND OF RESEARCH

Prior to this research, there were already art movements formed against the machinery productions and advocated a return to handcrafted productions.

Section 3.1 investigates the Eastern *Mingei* movement with Western *Art and Crafts* movement and their reactions towards machine production.

While section 3.2 serves to review selected artisans and their masterpieces informed by craft and technology

3.1 THE ART MOVEMENTS

3.1.1 The *Mingei* Movement

Yanagi Sōetsu was the leader of Japanese *Mingei* movement, which literally illustrates the "art of the people". Craftworks of *Mingei* could be mass-produced by the hands of ordinary people thus being affordable and functional, and portrayed the characteristics of their region.

Yanagi appreciated the origin of beauty in ordinary craftworks made by unknown people. He realized that good craftworks should be pragmatic and down-to-earth. The idea is that anonymous ordinary craftworks are free of ego and sensible. Craftworks were made to serve its function rather than to satisfy the desire of the famous or the rich. This reflects the key value of the traditional culture of Japan – Harmony.

In view of the humble goods created in the *Mingei* movement, Yanagi and his followers acknowledged that true beauty could only be found in traditional handcrafts as they display a spirit of selfless innocence and harmony.

As a modern craft movement, it upheld the finest craftsmen who in turn aided in preserve and raise the standards of traditional crafts as being threatened during the Industrial Revolution. By understanding the traditional values of Japanese crafts, one could further relate to quality and form of Japanese craftworks, even the ordinary ones.

Interestingly, the concept of the *Mingei* movement resembles similar qualities with the *Art and Crafts* movement led by William Morris in the late 19th century. Both demonstrated in the beliefs of handcrafted object and simplicity of form.

3.1.2 The *Art and Crafts* Movement

Led by William Morris, the *Art and Crafts* movement was a reaction against historicism and machinery mass production during the Industrial Revolution in the 19th century. Machine production was regarded as degradations to both the creator and consumer as it was a threat to creativity and individuality respectively.

Apart from manufacturing, Morris rejected the decorative profusion of Historicism where the forms of the furniture were excessively decorated and ornamented. According to Morris, there were issues in ornamentation and utility, taste and function. Decoration should enhance objects' forms and functions rather than disguise them. Hence, there was a preference for simpler and more organic forms of nature.

However, *Art and Crafts* movement was focusing on unique and quality handcrafted goods that are mainly

dedicated for the rich while the *Mingei* movement emphasized on mass produced goods by hands of the ordinary people thus being both affordable and functional.

Both *Art and Crafts* and *Mingei* movement prized handcrafts. Good design and craftsmanship could reform society and improve the quality of life of the maker and consumer. The characteristics of both movements highlighted on simpler and organic forms of nature, truth to material and vernacular design which are notions to retain the traditional and natural qualities of handcrafts.

3.2 THE ARTISANS

Following on, there are numerous outstanding artisans worldwide and many were well-recognized with different approaches in woodworking and their unique philosophies towards furniture design and construction.

3.2.1 Isamu Noguchi

Isamu Noguchi began to design his first piece of furniture in 1939 which was the *Table for A. Conger Goodyear* (refer to Figure 5) commissioned by the President of the Museum of Modern Art in New York, Anson Conger Goodyear, hence was named after him. This table is one of a kind, with dynamic abstract features sculpted by rosewood base and an organic-shaped glass top balances upon three points.

Figure 5: Isamu Noguchi, *Table for A. Conger Goodyear* (1939) produced by Isamu Noguchi, made of rosewood and glass, dim: 73 x 210.8 x 87.3 cm

Later in 1945, Noguchi designed his second furniture, the *Noguchi Coffee Table* (refer to Figure 6), which was an evolution of the *Table for A. Conger Goodyear*. This time was for Herman Miller; The Noguchi Coffee Table was designed for mass production that differs from the previous table being a one-off furniture. The top glass now has a more equilateral triangular shape and the base now consists two identical pieces that could be milled simultaneously yet also maintain a stable and self supporting base by connecting the edge the two pieces with a pin inside. The innovative translation of forms not only expedites the process of mass production but also retain the concept of fluidity and language of the initial dynamic expression.

Figure 6: Isamu Noguchi, *Noguchi Coffee Table* (1944) produced by Herman Miller, made of solid wood with lacquer finish glass, dim: 40 x 126.5 x 91 cm

Lastly, the *Noguchi Rudder Table* (refer to Figure 7), which the iconic shape of the tabletop coincides with the renowned *Noguchi Coffee Table*. This table featured an unequal form composed of mixture materials yet the notion was simply intriguing. In a quick look, the table looks as if it was balancing off solely on the solid wooden leg, while the other two metal legs were seen to be disappearing, transmitting an effect of airiness.

Figure 7: Isamu Noguchi, *Noguchi Rudder Table* (1949) produced by Herman Miller, made of veneer over plywood and chromed steel, dim: 40 x 127 x 91.5 cm

Noguchi's tables possess the awareness to modern technology playing with features of airiness and symmetry aiding the process of mass production. Yet they maintained the essence of pragmatic functionality of handcrafted with the simplicity of shapes and notion of traditional craft techniques.

3.2.2 Sori Yanagi

Being the son of Sōetsu Yanagi, Sori Yanagi was nonetheless influenced by the *Mingei* movement. By merging the essence of modern simplicity and the awareness tradition practicality, his works had reached a balance between the recognition of handcrafts with the advantages of industrial production.

In view of his renowned *Butterfly Stool* (refer to Figure 8), the construction reflects on the characteristics of modern design and technology. The parts simply consist of two symmetrical pieces of molded plywood, two screws and a threaded brass rod, which inevitably aids in mass production and also indicates the portability of modern furniture.

Figure 8: Sori Yanagi, *Butterfly Stool* (1954) produced by Tendo Mokko, made of moulded plywood with a lacquer finish and brass fittings, dim: 39 x 42 x 31 cm

Giving it a close look, the play of symmetry is at its best where the veneers are placed carefully for a mirror effect. Moreover, the point contact of the stool to the ground is only at the four rounded edges of the stool, illustrating the lightness of the butterfly apart from the visual delighting shape of the butterfly wings that derives its name.

The curvature of the stool not only resembles the butterfly but also evenly distributed the weight and strengthens the overall structure capacity of the wood. In the traditional Japanese context, it also portrays a reminiscent of the Shinto shrines particularly the slightly curved top, which also serves as seating surface that conforms to the human body.

His *Elephant Stool* (refer to Figure 9), constructed at the same year 1954, inheres few similar qualities with additional traits of stackability and the resemblance of the nostalgic elephant's trunk.

Figure 9: Sori Yanagi, *Elephant Stool* (1954) produced by Kotobuki Company, made of Fiberglass-reinforced plastic, dim: 37 x 51.5 x 46.5 cm

Both *Butterfly Stool* and *Elephant Stool* demonstrates the quality of lightness and evoke nostalgic senses with oriental features. The concept of past, present and future defines the elements of the traditional, modern and timeless design respectively. Harmonization is the crucial key.

3.2.3 George Nakashima

George Nakashima was a renowned American woodworker for his involvements in various associations and being recognized by both the America and Japan government for his unique woodworking approach.

Nakashima's signature was the butterfly joints that connects cracked or ragged wood slabs with smooth treated surfaces, which retain the natural quality of the soul of the wood, at the same time functions as a piece of modern furniture. This technique can be seems in his *Minguren I Table* (refer to Figure 10), which are all one of kind.

Figure 10: George Nakashima, *Minguren I Table* (1965) produced by George Nakashima, made of English oak, dim: 45.5 x 84 x 84 cm

Nakashima's most iconic work would be his *Conoid Chair* (refer to Figure 11). It portrays modern qualities as a cantilevered chair, without being four-legged and the smart and sleek bridle joints supporting the overall structural capacity of the chair.

Figure 11: George Nakashima, *Conoid Chair* (1980) produced by George Nakashima, made of English walnut, dim: 84.5 x 57 x 67.5 cm

As mentioned, Nakashima's design possessed the soul of the tree, he treated wood as slabs rather than only using the heartwood of the tree, and saw beauty as a whole. Retaining the sapwood, cambium, buck and even the pith, he sliced the logs in slabs, amended the rotted or cracked areas with butterfly joints and used bridle joints for the legs, creating a piece of art furniture that is one of a kind yet communicate and relate to the modern era.

Nakashima's philosophy could be viewed as a furtherance of the *Art and Crafts* movement that reacted to the poor quality and design of machine-made furniture. Hence in the late 20th century, a group of American designers began to create works that restored the historic craft methods and rejected mass production. This was the *American Studio Craft* movement and Nakashima was a prominent member of the group. Occurred after the first world war where financial prosperity allowed the rejection of mass production and setting up for an one of kind production.

Rejuvenating wood in simple joinery techniques is a remarkable approach by Nakashima. Understanding the materials and seeing its beauty as whole, even the bark and the pith of a tree can be visual delights.

4 METHODOLOGY

Japan has a rich combination of skilful craftsmen, conventional joineries and modern technologies. Hence, inspirations were drawn from attributes of Japanese designs such as Sori Yanagi's *Butterfly Stool* and *Shinto Shrines*. These exotic reference is blended with the archetypal forms of the endemic Singaporean Stag Beetles (Dorcus Reichei), hence the name *Beetle Stool*. The resultant of the furniture design is intended to suggest a harmonious pace between traditional heirlooms and technological advances. (refer to Figures 12, 13,14)

Figure 12: Dorcus Reichei (2008)

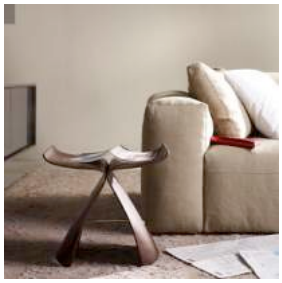

Figure 13: Sori Yanagi, *Butterfly Stool*

Figure 14: Itsukushima Shinto Shrine

4.1 SELECTED CRAFT MATERIAL – WOOD

Wood has been of the first materials worked by early humans alongside with stone, clay and even animal parts due to its availability and the lack of technology. Since then, fine traditional woodworking had slowly evolved with the increasing knowledge in the aspects of wood.

From growing condition of its tree to how it is being cut down and joined, the traditional material of wood may not look as simple as it seems. The tree consists of various parts notably the burl, bark, pith, cambium, sapwood and lastly the heartwood (refer to Figure 15) that is the only part commonly used to produce lumbers. Other parts are rarely and only used for their visual delights such as Cherry and Walnut. After being cut, the lumbers are stacked and require a period of kiln drying to evaporate moisture content before it can be used.

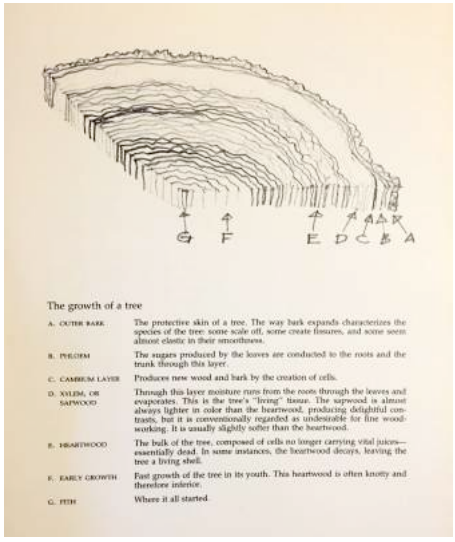

Figure 15: George Nakashima - *The Soul of a Tree* (George, 1981)

Other than being sawn as lumber, wood can come in slices as veneers, which could easily form curves via bent lamination. There are various methods of sawing and slicing wood to achieve different appearance of the wood – 'figure' (refer to Figure 16).

Figure 16: Book-Matched Veneers (Morgan, 2015)

Moving on to the joinery of wood, which too, involves understandings of the wood properties. Wood is made out of grains and the formations of grains react conditions such as moisture and temperature that would lead to expansion and contraction. A typical piece of lumber consists of face, edge and end grains. To maintain the structural capacity of the wood, end grains require joinery due to its bad gluing surface, while face and edge grains could be glued without joinery.
Fine furniture makers avoid using screws and nails as they are regarded as machinery parts that degrade the both the creator and the wood itself, being a threat to creativity and individuality. Hence, not only joineries are used for joints, they and as appreciations and details to the eye such as dovetail joints (refer to Figure 17).

Figure 17: Dovetail Joints (George, 1981)

Despite having traditional hand tools, modern technology have developed power tools for fine woodworkers to craft with absolute precision and level surfaces. As power tools aided in production fine furniture, technology had progressed into the digital age where computer numerical control (CNC) machine are used to craft all if not majority of the furniture parts. Furthermore, the assembly via wood joineries is replaced screws and brackets. All these technologies have greatly degraded fine craftsmanship and may one day leads to obsolescence.

Finding the balance by filling the gap between traditional handcraft and modern technology would fulfill part of the thesis. As wood has its limits and constraints, fine furniture should embrace its properties with joineries and shapes informed by cultural influences. There is so much knowledge involves in the aspects of wood, indeed a gifted material from nature.

4.2 DESIGN DEVELOPMENTS

The form of the *Beetle Stool* came about by the virtue of the semblance of Stag beetles with the Shinto shrines for their iconic horns and jaws serves as a nostalgic feature towards the Japanese culture. Together with the aesthetics inspiration of *Butterfly Stool* by Sori Yanagi.

4.2.1 First Phase (refer to Figure 18)

The joineries were emphasized in which how the overall structure were being constructed. The gaps held together via butterfly joint that connects down to the legs simulating the continuity between traditional craft joints and buoyancy of technology

Furthermore, the exposed splined miter joints, tusk tenon joint (with wedges) and butterfly joints were served as detailed decorations and visual delights that add on to the functionality of the piece of fine furniture

Lastly, the extended joineries divide voids and gaps transmitting an effect of airiness, notwithstanding hefty perceptions of a stool.

Figure 18: First Design

4.2.2 Second Phase (refer to Figure 19)

The stool was redesigned starting with the legs. With individual legs, every angle stimulates an inviting aesthetics rather than the hefty frame in the initial version. The legs were developed in which bridle joint were explored in various asymmetrical positions, creating the inward back legs that simulating the elongated insect's leg with angled tips.

The seating is then form along the contours of the legs, creating a seamless petal/trapezium shape. In addition with the gentle inwards slope seating that conforms to the human body. The split was added not only to reveal the bridle joints but also retaining the integrity of the wood grain generating the continuity between the echo of traditional craft and buoyancy of technology. The backrest serves as continuity between the split and also uphold the reminiscent of both Stag beetles and Shinto Shrine.

Figure 19: Second Designs

4.2.3 Third Phase (refer to Figure 20)

The legs were further refined to emphasize the lightness on the seating. The back legs are now extended to form the back of the chair stimulating continuity. The seating was modified too to achieve a more harmonious aesthetics, in turn complementing the each and every component. A furthered design was developed too with a strong beetle aura simulated by the bulky yet airy form.

Figure 20: Third Designs

4.2.4 Final Phase (Refer to Figure 21)

The final concept possesses the following attributes:

- As symbolic as sculpture; As functional as furniture
- Tapering legs show a floating quality of insect's legs, making the stool visually and physically much lighter
- Recalling the upward curve of Shinto Shrines evoke oriental nostalgic form
- Resemblance of beetle's legs and jaws suggested endemic species of Singapore
- Split seating generating ventilation and saving the cost of timber
- Symmetrical and demountable qualities (flat-pack) aid in thrifty production and transportation

Figure 21: Final Design

Figure 22: Design Progress

5 RESULTS

The resultant of the *Beetle Stool* will be fabricated using facilities available in School of Art, Design and Media. This will ensure whether the design of the *Beetle Stool* is feasible in real life context and further modifications to enhance its intrinsic values.

The followings are the components of the *Beetle Stool* (refer to Figure 23).

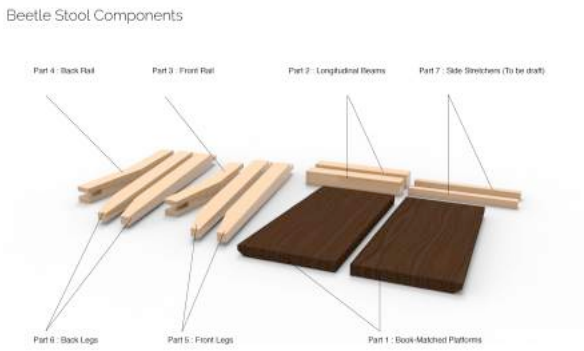

Figure 23: *Beetle Stool's* Components

In order to for the *Beetle Stool* to be able for flat packing, the MINIFIX 15 connectors were being used (refer to Figure 24).

Figure 24: MINIFIX 15 Connectors

5.1 FURNITURE CONSTRUCTION

In order to achieve accuracy and optimum proportion, a 1:1 mock up was recommended using Medium Density Fibreboard (MDF) for cost efficiency. This will provide aesthetics and functionality of the stool and enables testing of the design to acquire feedbacks from users.

5.1.1 Construction of 1:1 Mock Up

After gluing the MDFs to achieve a thickness of 36mm, various strip components of were cut with the aid of acrylic templates (refer to Figure 25).

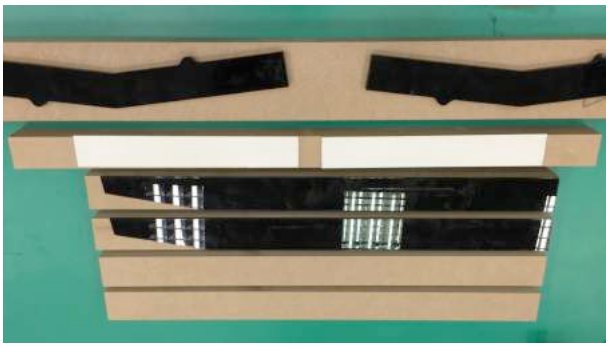

Figure 25: Acrylic Templates

In order to achieve the accurate dimensions and angles, jigs were build out with the remaining MDFs (refer to Figure 26 & 27).

Figure 26 & 27: Jigs

The following are the components before joining with bridle joints (refer to Figure 28).

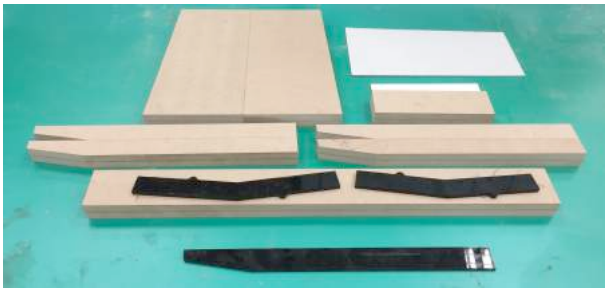

Figure 28: Milled Components

After using the bandsaw and an intensive amount of sanding, the bridle joints were able to fit although there were still gaps in between (refer to Figure 29 & 30).

Figure 29 & 30: Bridle Joints

Followed by the tapering that occurs at the legs and the seating platforms (refer to Figure 31 & 32) to achieve buoyancy and floating qualities in respect to the beetle's legs and upward curves of shinto shrines.

Figure 31 & 32: Tapering of Components

Before the final assembling, the mock up consisted of some imperfections and glue lines, hence spray painting was an option to conceal them and make it more presentable. Although it is not the intended finishes, it is the form and proportion that matters at this stage. Spray painting MDF was not a easy task as MDF would absorb moisture instantly creating rough and blotchy textures. Hence, various coats of primer and putty were used to prevent the absorption. Lastly, coats of matt black were sprayed for that neutral one-color prototype look (refer to Figure 33 & 34).

Figure 33 & 34: Priming & Spray Painting

The final assembly involved the MINIFIX 15 connectors and dowels for extra structural capacity (refer to Figure 35).

Figure 35: Final Assembly

Lastly, a final coat of spray paint was applied to conceal minor scratches (refer to Figure 36).

Figure 36: Final Mock Up

Some feedbacks gathered in result of the Mock Up were to include side stretchers (increase stability), slight taper of the gap in between the platforms and tapering of the front and back of both platforms (refer to Figure 37).

Figure 37: Final Refined Design

5.1.2 Construction of Final Prototype

After having experimenting with the Mock Up, the construction of the Final Prototype went on smoother. After the legs have been milled, the tapering jig was made for precise measurements to achieve the correct tilt. (refer to Figure 38).

Figure 38: Tapering Jig

Using the wide belt sander, the tapering of the legs were able to be achieved with the jig (refer to Figure 39).

Figure 39: Tapering of Legs

The other parts of the taper required the tables with the readymade jigs from the Mock Up to be used (refer to Figure 40 & 41).

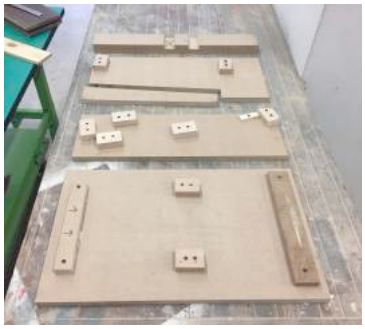

Figure 40: Jigs to be used

Figure 41: Tapering in Progress

The book-matched platforms were challenging due to its compound angles hence various jigs and markings were essential for precise sawing. Also with the aid of the tilting saw (refer to Figure 42 & 43).

Figure 42 & 43: Tapering of Book-Matched Platforms

The dark Teak wood book-matched platform were then sand thoroughly before staining it. Being a dark wood and even sanding, it absorbs the dark stain very well (refer to Figure 44 & 45).

Figure 44 & 45: Sanding and Staining the Platforms

Next, the front and back rails, longitudinal beams and side stretchers were then milled to the precise dimensions (refer to Figure 46 & 47).


Figure 46 & 47: Rails, Beams & Side Stretchers

This time round, the bridle joints were cut and cleaned up with chisel for precise joining (refer to Figure 48).

Figure 48: Chiseling for Bridle Joints

After gluing the bridle joints, a thorough sanding was done before assembly of all the parts (refer to Figure 49 & 50).


Figure 49 & 50: Sanding of Components

As this was the construction of the final prototype, the position of the MINFIX joinery was tested on leftover maple wood before actuating on the actual piece (refer to Figure 51).

Figure 51: Testing of MINIFIX 15 Connectors

Proceeding on to the assembly, everything turned out fine and structurally functional (refer to Figure 52, 53 & 54)

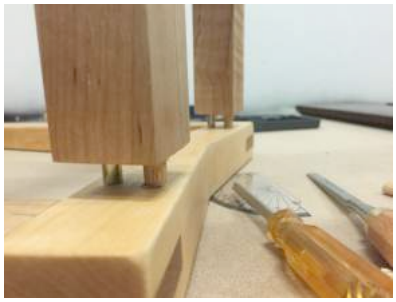

Figure 52: Assembling of MINIFIX 15 Connectors

Figure 52 & 53: Assembling of Side Stretchers

Figure 54: Assembling of Final Prototype

For the final finishing, after applying danish oil with lint free cloth and wiping off after a couple of minutes, it was left a day for drying. With three coats of danish oil applied, steel wool and beeswax was as the final top coating for the smooth finishing (refer to Figure 55 & 56).


Figure 55 & 56: Finishing of Final Prototype

After the finishing have dried, the final prototype was completed and proceeded on for photographing (refer to Figure 57 & 58).

Figure 57: *Beetle Stool* (Photograph 1)

Figure 58: *Beetle Stool* (Photograph 2)

5.2 DESIGN FEEDBACKS

Due to human errors, there are slight gaps in between the platforms and the rail, hence the extension of the internal longitudinal beams would extend the gaps, making it intentional, enhancing the features and correcting the human errors (refer to Figure 59).

Figure 59: Refined Design from Feedbacks

6 CONCLUSION

To conclude, the *Beetle Stool* harmonizes the synchronisation between handmade and mechanical production through its conventional joineries and modern machineries respectively. By evoking nostalgic senses through the harmony of attributes with the regard of locality and culture, the *Beetle Stool* suggests a harmonious pace of traditional heirlooms as technological advances. With the relation of opposing elements proposed to reunite and elicit the spirit of place (native materials or species), people (handcraftsmanship) and product (inheritable quality and uniqueness), the *Beetle Stool* is bear upon as a result of furniture design informed by craft and technology.

ACKNOWLEDGEMENT

The researcher of this project would like to extend his acknowledgement and gratitude to Dr Chalit Kongsuwan from School of Art, Design and Media. We wish to acknowledge the funding support for this project from Nanyang Technological University under the Undergraduate Research Experience on CAmpus (URECA) programme.

REFERENCES

Renwick Gallery. (1972) *Woodworks: Furniture Objects by Five Contemporary Craftsmen*. Minnesota Museum of Art, USA.

Wald, George. (1981) *The Making of an Object. George Nakashima: 1905 - The Soul of a Tree*. Kodansha International Ltd, Japan.

The Seibu Museum of Art. (1986*) Space of Akari and Stone. The Meaning of Akari*. p. 95. Fai Nippon Printing Co Ltd, Tokyo.

Ostergard, Derek E. (1989) *Catalogue. George Nakashima: Full Circle*. Weidenfeld & Nicolson, New York.

Aston, Dore. (1992). *Early Wander-Years . Noguchi East and West*. p. 106- 107. Alfred A. Knopf, Inc, New York.

Hiesinger, Kathryn B. and Fischer, Felice. (1994) *The 1950s, Japanese Design: A Survey Since 1950.* p. 50 - 73. Harry N. Adams Incorporated, New York.

Nagare, Masayuki. (1994) *Masayuki Nagare: The Life of a Samurai ArFst.* Weatherhill Inc., New York.

Hunter, Sam. (2000) *Bryan Ohno Gallery. Isamu Noguchi*. University of Washington Press, Washington.

McLeod, Mary. (2003) *Fortuitous Encounters – Charlotte Perriand in Japan, 1940-41*. Charlotte Perriand: An Art of Living. p. 90 - 113. Harry N. Adams Incorporated, New York.

Sato, Shozo. (2008) *Ikebana: The Art of Arranging Flowers.* Tulle Publishing, USA

Dorcus Reichei (2008) [Image] Retrieved from https://www.flickr.com/photos/invertsfromhell/sets/72157633040331924

Basil & Elise Goulandris Foundation. (2010) *The Intercultural Dialectics of Seeing. Noguchi Between East and West*. p. 13. Umberto Allemandi & C, Venice

Wood Magazine. (2010) *Tool Review: General-purpose Tablesaw Blades*. [Image] Retrieved from http://my.woodmagazine.com/woodworking-tools/reviews/table-saws/general-purpose-tablesaw-blades/

Elle, S. (2013) *Isamu Noguchi. A brief life history of the artist and designer Isamu Noguchi*. Retrieved from https://www.youtube.com/watch?v=Rf4hT8dCSeM

Mitchell, Albie. (2013) *Noguchi Coffee Table. Collab*. Retrieved from http://thecollab.us/noguchi-coffee-table/

Vitra. (2013) *Isamu Noguchi. Living*. Retrieved from http://www.vitra.com/en-un/corporation/designer/details/ isamu-noguchi

Wood Carver 3D. (2014) [Image] Retrieved from https://www.youtube.com/watch?v=elRfTgngPhc

Akari. (2014) *Light Sculptures by Isamu Noguchi*. Retrieved from hlp://www.akari-ozeki.com/

Morgan, Bob (2015) *Book-matched Veneers*. [Image] Retrieved from http://www.veneer-factory-outlet.com/2-ply-book-matched-crotch-mahogany-veneer-faces-with-2-leaves-3-64-thick/

Montalvo, Catriona. (2015) *Bridle Joints.* [Image] Retrieved from https://blog.handkrafted.com/what-is-fine-furniture/

Herman Miller. (2015) *Isamu Noguchi. Designers*. Retrieved from http://www.hermanmiller.com/designers/noguchi.html

The Noguchi Museum. (2015) Retrieved from http://www.noguchi.org

Wood Choppin Time. *Traditional woodworking hand tools.* [Image] Retrieved from http://www.woodchoppintime.com/what-is-fine-furniture/

Stonebutterfly, Sori Yanagi. [Image] Retrieved from http://www.stonebutterfly.co.uk/sor-yanagi-butterfly-stool-walnut

Itsukushima Shinto Shrine. [Image] Retrieved from http://m.flikie.com/33579038/itsukushima-shinto-shrine-.html?skey=dusk