





Japanese design concepts and traditional joints for modern furniture

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ABSTRACT: Japanese culture presents refinement, simplicity, aesthetics, and balance. It shows how nature and aesthetics can be integrated into the living space. The architecture of the Japanese house is characterized by sliding doors and partitions that can be removed to create large, open, and flexible spaces. Traditional furniture has a simple beauty and functionality that fits perfectly with Japanese life and philosophy. Japanese wood products are uniquely crafted without nails or screws, relying on precise joinery for durability. Such a technique yields very durable and aesthetically pleasing furniture pieces. Japanese wood techniques, employing the art of Japanese woodworking, offer training in the wood workshop, teaching patience and respect for nature. This study reviews and highlights Japanese design concepts along with a selection of traditional jointing techniques for furniture. Based on them, a modern table inspired by the Torii Gate was designed. Therefore, modern furniture inspired by such concepts can stand the test of time.

Keywords: Design, Furniture, Japanese joints

Modern mobilyalar için Japon tasarım konseptleri ve geleneksel birleştirmeler

ÖZ: Japon kültürü incelik, sadelik, estetik ve denge sunar. Doğanın ve estetiğin yaşam alanına nasıl entegre edilebileceğini gösterir. Japon evinin mimarisi, büyük, açık ve esnek alanlar yaratmak için çıkarılabilen sürgülü kapılar ve bölmelerle karakterize edilir. Geleneksel mobilyalar, Japon yaşamı ve felsefesiyle mükemmel bir şekilde uyuşan basit bir güzelliğe ve işlevselliğe sahiptir. Japon ahşap ürünlerinin tasarımında çivi veya vida kullanılmadığı bilinen bir gerçektir ve bu da onları hassas bağlantılara sahip olmaları nedeniyle çok benzersiz kılar. Böyle bir teknik, çok dayanıklı ve estetik mobilya parçalarıyla sonuçlanır. Japon ahşap işçiliği sanatını kullanan Japon ahşap teknikleri, ahşap atölyesinde eğitim sunarak sabrı ve doğaya saygıyı öğretir. Bu çalışma, Japon tasarım konseptlerini ve mobilyalar için geleneksel birleştirme tekniklerinden bazılarını inceler ve vurgular. Bunlara dayanarak, Torii Kapısı'ndan esinlenen modern bir masa tasarlanmıştır. Dolayısıyla bu konseptlerden ilham alan modern mobilyalar zamana meydan okuyabiliyor.

Anahtar kelimeler: Tasarım, Mobilya, Japon bağlantıları

1 Introduction

Interior design, specifically Japanese furniture, has become a source of inspiration for designers all around the world. Japanese culture is known for its refinement, simplicity, aesthetics, and balance. Japanese-inspired interior design integrates nature and aesthetics into living spaces. The basic elements of Japanese interior design are: simplicity, the use of nature as a source of inspiration, the colour palette, the architecture and flow of the space, and traditional furniture items by using specific traditional techniques (Fujita, 2003). When all of these come together, an environment where balance and harmony prevail emerges. This study reviews and highlights Japanese design concepts along with a selection of traditional jointing techniques for furniture. Based on them, a modern table inspired by the Torii Gate was designed.

2 General Concepts of Japanese Design

2.1 Simplicity and minimalism

Simplicity is one of the most important characteristics in creating a piece of furniture, and that principle is reflected in every aspect of the design (Hirano, 1991; Breyer, 2020). The furniture is reduced to its essence with clear shapes and simple lines making the space clean and uncluttered. This approach enables energy to flow freely, creating a calm and peaceful environment (Juniper, 2003).

Simplicity is also highlighted in the choice of colour palettes used in Japanese design, such as shades of white, gray, and natural wood tones, generally neutral hues. These colours create an ideal background for positioning furniture within a room. Such a space becomes an “open cavity” that invites contemplation and relaxation (Nitschke, 1993).

2.2 Integration of nature

The Japanese have a deep connection with nature, which strongly informs their design philosophy (Engel, 1985). Natural elements such as stone, wood, and bamboo are generously integrated into built spaces. Wood is frequently used to create a warm and welcoming environment in Japanese-style interiors. Furniture items like low tables (*chabudai*) and backless chairs (*zaisu*) contribute to this natural ambiance. They are typically dark-coloured, made from wood or bamboo, and feature a low profile and flexible character to ensure they can be easily moved, especially important in spaces with sliding walls (*fusuma*).

The concept of *shinrin-yoku*—or “forest bathing”—is a modern interpretation of this ancient connection to nature, emphasizing the psychological and physiological benefits of immersing oneself in natural surroundings (Li, 2018). Similarly, *tsubo-niwa* or Japanese courtyard gardens are small green spaces often found within homes that bring nature indoors. These gardens promote relaxation and reinforce the connection between inhabitants and the natural world (Keane, 1996).




2.3 Japanese colour palette

The colours used in Japanese design are inspired by the natural environment of Japan. For example, gray and black highlight the rocks and stones, white and beige highlight the snow and cherry blossoms, shades of green represent the luxuriant vegetation of Japan, and blue highlights the ocean and clear sky (Young, 2008). These colours combine perfectly to create a calm, balanced image, adding depth and texture to spaces and furniture.

Natural lighting plays an important role in the design, thanks to large windows and shoji paper panels, which allow natural light to enter the room, thus giving a bright and airy space.

Artificial lighting uses lamps with warm and diffused light, with a minimalist design or suspended, made from natural materials such as wood or paper (Jodidio, 2005). Indirect lighting through cornices suits Japanese design through the modest light and the atmosphere it gives to the space. This type of lighting helps small rooms and is the right choice to maintain the minimalist and simplistic style. Table 1 displays examples related to these three concepts.

Table 1. General concepts of Japanese design (Spanu, 2024)

| No. | Definition | Example |
|-----|---------------------------------|--|
| 1 | Simplicity and minimalism |  |
| 2 | Integration of nature |  |
| 3 | Colour palette |  |

2.4 The architecture and flow of space

The architecture of the Japanese house is characterized by sliding doors and partitions that can be removed to create large, open, and flexible spaces (Jodidio, 2005). This design encourages connections between different areas of the house, especially with the surrounding terraces and gardens.

The living room is inspired by the rooms specific to the tea ceremony with very low furniture pieces. The dining table is used while kneeling or on cushions, and the armchairs

and sofas must be at floor level. A mattress filled with rice threads called *Tatami* is used for the floor, which is placed across the entire surface of the room.

The Japanese bedroom must be strictly functional, the furniture pieces must not be cramped, and therefore the bed must be very low, or even a mattress is set directly on the floor. The colours must be among the simplest, cream, black, and brown, both for the walls and accessories.

The kitchen is planned to be always kept clean. Wooden or stone furniture, with imperfections, creates an exemplary space, one of the strengths of Japanese design, thanks to the *wabi-sabi* technique, a concept that brings to mind the beauty that is found in imperfection (Juniper, 2003).

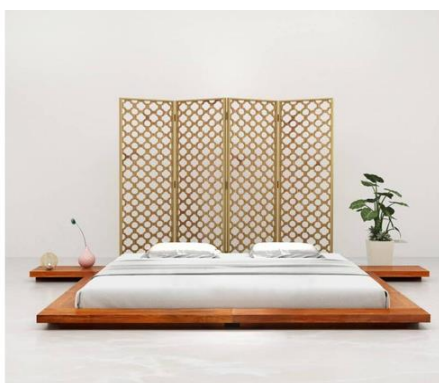
The bathroom is a space where you can disconnect at any time of the day. Japanese Ofuro bathtubs are specific to Japanese culture and Zen philosophy and are used for relaxation sessions. Stone and wood elements with diffused lamps or natural light are used for the walls in the bathrooms.

The hallway of the Japanese house is considered an important space because it is a space for receiving guests, and therefore, they show their respect for their fellow humans through elegance and refinement. Low cabinets for shoes or wooden chests of drawers can be placed in this space to support the green plants.

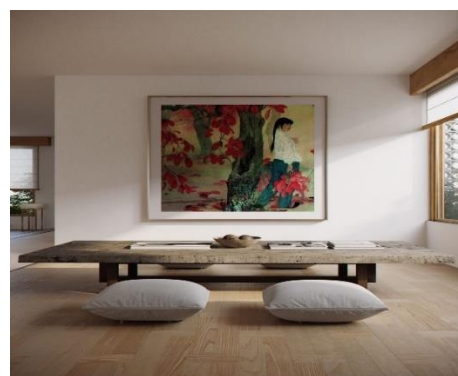
2.5 Specific traditional Japanese furniture

Traditional furniture has a simple beauty and functionality that fits perfectly with Japanese life and philosophy (Yoshida, 2009). Cabinets and storage furniture are generally built without handles to maintain this minimalist character. An important element in furniture design is the *Futon* bed, which consists of a quilted mattress (*shikibuton*) and a sheet (*kakebuton*) that serves as a blanket. This combination is placed directly on the *Tatami*. The frame of the bed in Fig.1a is made of acacia wood which gives it stability and robustness.

Each stage of construction is done with skill, and each bed becomes unique in its way. Another element of furniture design is the *chabudai* or low Japanese tables (Fig.1b). These are perfect for serving tea and traditional food. Examples of modern Japanese interior design are presented in Table 2.




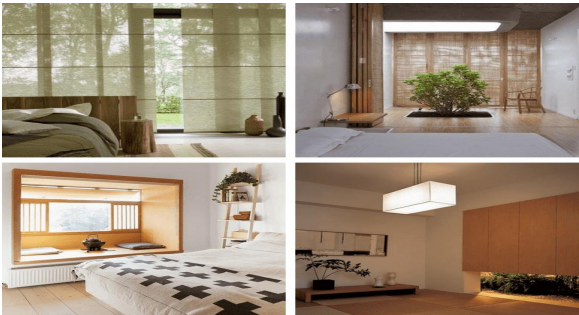

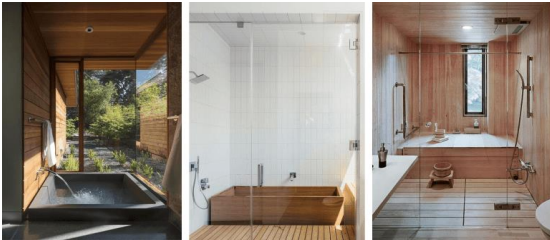

a. Futon bed



b. Low table-Chabudai

Figure 1. Specific Japanese furniture (Spanu, 2024)

Table 2. Examples of modern Japanese interior design (Spanu, 2024)

| No. | Description | Example (room and furniture) |
|-----|-------------|--|
| 1 | Living room |  |
| 2 | Bedroom |  |
| 3 | Kitchen |  |
| 4 | Bathroom |  |
| 5 | Hall |  |

2.6 Modern trends in furniture design and examples of successful projects

Japanese culture is based on simplicity and minimalism, so furniture should be as simple as possible. A spacious and airy room with furniture within the strictest limits is much more beautiful and welcoming than one loaded with furniture items (Adriasola et al., 2016; Jodidio, 2005). Aligned with the modern trends felt nowadays in design, the contemporary Japanese style can be highlighted by the following elements (Spanu, 2024):

- **Sophisticated minimalism** is a major furniture design style that emphasizes quality and durability with the slogan “less is more” (Juniper, 2003).

- **Japandi style** represents a cultural fusion of two different interior design styles. This style is distinguished by combining the traditional Japanese style with the minimalist and soothing Scandinavian design. Japandi style became popular in 2017, when it was intended to express minimalist technique and aesthetics in a complementary way.

- **Neo Art-Deco** represents a contemporary style in vogue and is also called the return to glamour. It is a trend that emphasizes details such as wallpaper, stucco in a room, so that the opulent furniture stands out.

- **Biophilic design** is a style that brings nature into people's homes and can contribute to creating a cleaner and more relaxing environment.

- **Eclectic style** (the new normal) is a style that breaks with the concept that everything has to fit together perfectly, so it is a mix of styles, textures, and colours that can create a unique and welcoming space with a lot of personality (Juniper, 2003). It offers the freedom to combine old with modern elements, synthetic materials with natural or bright colours with neutrals.

- **Inclusive design** is a growing trend to meet the needs of all residents including those with disabilities. Characteristic elements are ramps, handles, or adaptable furniture that make the surrounding space more functional.

Traditional Japanese carpentry works on the principle of respecting nature. Out of the world-renowned furniture creators, we can name George Nakashima and Hisao Hanafusa.

George Nakashima used to say that a tree is our most intimate contact with nature. His entire philosophy and work were based on this concept. He believed that a tree should be cut down when it reaches maturity, because then, like man, it will die and return to the ground. Thus, cutting it down and using it to make useful objects in the house gives it the chance to live another life. He worked wood in a special style, different from other woodworkers. He preferred the part where the tree trunk forked, because that's where the wood had the most beautiful pattern (Nakashima, 1981).

Tabletops made from a single slice of wood were brought into Nakashima's furniture design, and the use of wooden bow ties to bridge cracks or weak spots between them became his signature (Fig. 2a). Nakashima designed a lot of furniture, but he never signed it. He created works for famous people, and his pieces are housed in famous museums in the US and Japan.

Hisao Hanafusa is a carpenter who uses traditional techniques, saying that you have to work with nature to achieve your goals. This statement helps him preserve the natural shapes of wood without interfering with them. He develops the idea of using wood from the base of the tree upwards, thus preserving the order of nature. The creative process begins with the tree, which is cut and sliced into planks that are left to dry for up to 10-20 years, after which he chooses the plank and nature tells him what to do with it. Therefore, you look for a project that fits the nature (Fig. 2b).



a. Table created by George Nakashima
(URL 1, 2025)



b. Table created by Hisao Hanafusa
(URL 2, 2025)

Figure 2. Different designs for modern furniture

3 Japanese wood jointing and the SOA table design

3.1 Brief history of the wooden Japanese joints

Japanese joinery is a traditional woodworking technique that has been used for centuries in Japan (Brown, 2011). It is known for its intricate craftsmanship and precision, resulting in strong and durable wooden joints and structures (Engel, 1985). *Kabuse-meji-tsugi* represents the art of Japanese joinery. In this technique, the craftsman considers the functional along with the aesthetic line, but the wood species to be used are granted with respect, and wood colour, pattern, and texture are relevant for the designed work (Takenaka, 2006). This attention to detail ensures that the joint not only serves its purpose but also enhances the overall beauty of the structure. In addition, *kabuse-meji-tsugi* is not limited to just straight joints; curved and angled joints can be obtained as well. Such structures are found in various architectural elements such as roofs, beams, furniture, or door frames (Yoshida, 2009).

The origins of Japanese carpentry go back to the Asuka and Nara periods (VI-VIII centuries) when Japan was heavily influenced by the Chinese culture (Ito, 1998). Continuing during the Heian period (IX-XII centuries), the art of Japanese joinery flourished and new techniques appeared (Fujita, 2003).

Later on, Japanese carpentry underwent further advancements during the Kamakura period (XII-XIV centuries). Zen Buddhism greatly influenced the philosophy behind carpentry, emphasizing its simplicity and harmony with nature.

No nails, screws or glue are used for traditional Japanese woodworking, neither modern power tools. Such joints provide an exceptional durability to the resulting structures. In the case of constructions, the resistance to earthquakes is due to the absence of iron nails, which allows the joint to flex and support seismic forces. The craftsmen use a range of tools, all well-sharpened and accurate. Even though power tools are increasingly used instead, hand tools remain essential to achieve intricate joints in their project (Brown, 2011; Izuhara, 2020).

3.2 Specific Japanese wood jointing techniques

Japanese wood joining techniques for furniture are known for their refinement and accuracy, allowing the creation of durable and aesthetic furniture pieces without the use of nails or screws (Sato and Nakahara, 1995; Yoshida, 2009). Here are some of the most commonly used Japanese jointing techniques in wooden furniture construction:

- **Kumiko**

Kumiko is a traditional Japanese method of joining wood, primarily used to create decorative patterns in wooden frames, such as *shoji* screens and other architectural elements (Seike, 1977). The history of this technique spans several centuries and reflects the craftsmanship and attention to detail characteristic of Japanese carpenters.

Kumiko originated in the Asuka period (538-710 AD), but became truly sophisticated during the Edo period (1603-1868). During this period, carpenters developed a wide range of intricate patterns reflecting Japan's cultural and aesthetic influences. The technique has been refined over the years, and craftsmen have passed down their knowledge from generation to generation.

Kumiko involves the accurate cutting and joining of small pieces of wood to create geometric patterns. It does not use nails or glue, but relies on precise joints that fit together perfectly. Some of the most common patterns include *asanoha* (hemp leaf) and *yosegi* (complex geometric patterns) (Fig.3a).

Kumiko is not only a decorative technique but also a symbol of traditional Japanese values such as simplicity, functionality, and respect for nature. Each pattern has its meaning, and the craftsmen place great emphasis on balance and proportion in their designs (Sato and Nakahara, 1995; Yoshida, 2009).

- **Ari-Gata**

Ari-gata, also known as dovetail jointing, is one of the oldest and most appreciated wood jointing techniques in the Japanese tradition. This joint is known for its durability and strength, and is frequently used in the construction of wooden furniture and structures (Sato and Nakahara, 1995; Yoshida, 2009). The history of *Ari-gata* stretches back centuries with origins in the Yamato period (250-710 AD). The technique evolved as Japanese carpenters perfected woodworking methods influenced by the need to create strong structures without the use of nails or other metal materials which were rare and expensive.

The *Ari-gata* joint is characterized by its trapezoidal shape which resembles the tail of a dove (Fig. 3b). This special shape provides a robust connection that is resistant to separation forces, making it ideal for drawer corners and other joints that require high strength (Seike, 1977; Yoshida, 2009).

The *Ari-gata* technique is mainly used in furniture construction, such as drawers, boxes, and other furniture items that require strong corner joints. In addition to functionality, this technique also adds aesthetic value, showing the craftsmanship of the carpenter and respect for Japanese tradition.

- **Hozo**

The *Hozo* technique, also known as mortise and tenon, is one of the oldest and most widely used woodworking techniques in the world. In Japan, the technique was perfected and became an essential element in the construction of buildings and furniture, reflecting the craftsmanship and attention to detail of Japanese carpenters (Sato and Nakahara, 1995).

The *Hozo* technique has ancient origins, having been used for thousands of years in various cultures to create durable and sturdy structures. In Japan, the technique was adopted and adapted to suit the specific aesthetic and functional requirements of Japanese architecture and carpentry. The first uses of the *Hozo* technique in Japan can be traced back to the Yayoi period (300 BC - 300 AD) when Japanese carpenters began to develop advanced methods of woodworking. During the Nara period (710-794) and Heian period (794-1185), the use of the *Hozo* joint became more sophisticated as Japanese carpenters began to build temples and other complex structures (Seike, 1977; Yoshida, 2009). During the Edo period (1603-1868),

the *Hozo* technique reached a level of extraordinary refinement with Japanese carpenters developing numerous variations of the joint to suit different architectural and furniture applications. *Hozo* is widely used in the construction of traditional Japanese buildings such as temples, pagodas, and houses. It is also essential in the making of traditional Japanese furniture such as tables, chairs, and cabinets (Fig.3c).

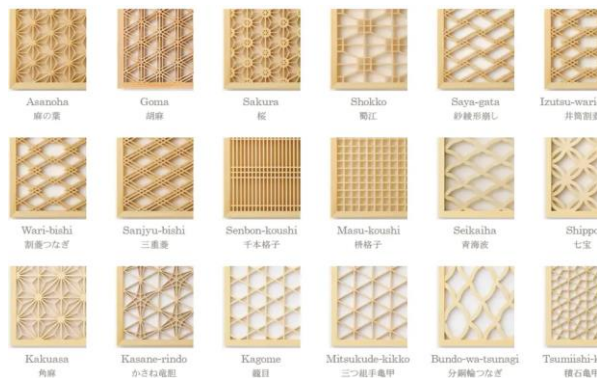
• *Kanawa-Tsugi*

Kanawa-tsugi is a traditional Japanese method of wood joining used in construction and carpentry. This technique involves connecting two pieces of wood, usually at right angles, using a special type of mortise (Seike, 1977; Yoshida, 2009).

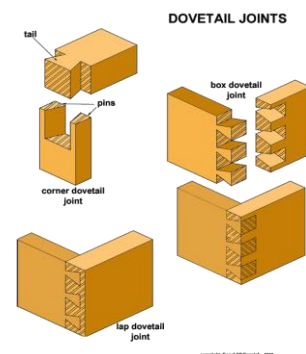
It is a joint used to extend the length of a piece of wood. The pieces of wood are cut and joined in a way that evenly distributes the tension, creating a strong joint, and it is often used in the construction of long furniture frames such as tables and benches (Fig.3d).

Kanawa refers to a key-shaped piece of wood while *tsugi* means joint. In this technique, a piece of wood is cut and shaped to fit where the two main wooden pieces meet. This involves an intricate cut to fit perfectly into the space between the two pieces of wood, thus ensuring a strong and stable connection (Sato and Nakahara, 1995).

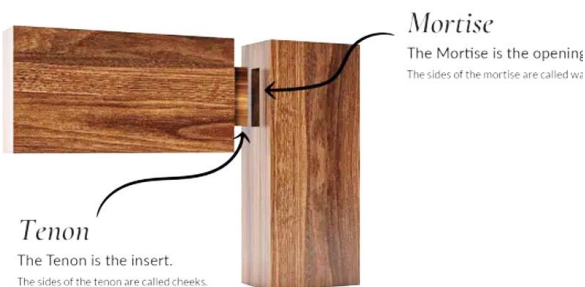
Kanawa-tsugi is valued for its simplicity, but also for its strength. This technique was developed over time in Japan and is still used today in many traditional and modern construction projects. Using this technique requires skill and precision, but the results can be impressive from an aesthetic and functional point of view.



a. Kumiko

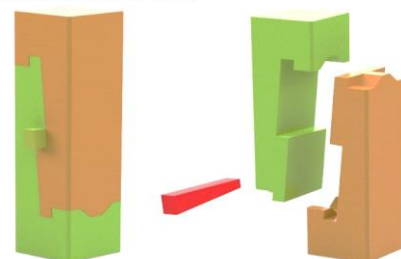


b. Ari-Gata



c. Hozo

Japanese Joinery Kanawa Tsugi



d. Kanawa Tsugi

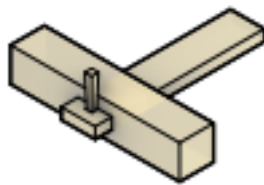
Figure 3. Examples of Japanese jointing techniques (Spanu, 2024)

3.3 The SOA table design

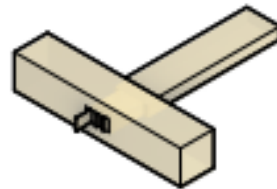
The table is a Japanese concept inspired by the Japanese Torii Gate, which marks the entrance into a sacred place of a Shinto shrine in Japan.

The table is made of oak wood (*Quercus robur* L.) by using two types of Japanese joints, such as *Wari-kusabi* and *Hana-Sen* (Fig. 4 a-b). The *Hana-Sen* (draw pin joint) relies on a piercing locking pin while the *Wari-kusabi* (split wedge joint) uses a set of wedges pushed into corresponding slots at the end of the male component, effectively locking the assembly (Wall, 2021; Spanu, 2024). Two variants of the table in 3D modelling are presented in Fig.5.

The table is built starting from the legs up, towards the tabletop, it contains no screws. It was designed to be delivered in pieces and assembled according to a sketch attached to the project. The table is a prototype; it has a size of 900 * 500 mm and a height of 450 mm. Semi-professional tools have been used in a private workshop to produce it: a roughing machine, circular table saw, band saw, hand circular saw, mortising machine, and chisels. The sequences of processing are presented in Table 3. A manual sander was used for sanding, and Rubiomonocoat black oil was applied to obtain the final finishing (Fig. 6).



a. *Hana-Sen*



b. *Wari-Kusabi*

Fig. 4. Typical joints used for the SOA table (Wall, 2021; Spanu, 2024)



a. Natural finishing



b. Black finishing

Figure 5. 3D modelling of the SOA table (Spanu, 2024)

Table 3. Sequences of the processing in the workshop (Spanu, 2024)

| | | |
|---|--|---|
|  |  |  |
| 1. Planing | 2. Circular saw | 3. Panel consolidation |
|  |  |  |
| 4. Oblique cutting | 5. Mortising | 6. Band saw |
|  |  |  |
| 7. Sanding | 8. Manual cutting | 9. Elements |
|  |  | |
| 10. Front view of the table | 11. Side view of the table | |



a. SOA table (Spanu, 2024)



b. Torii Gate (URL 3, 2025)

Figure 6. Final product inspired by the Torii Gate

4 Conclusions

The research results are presented below in bulleted form.

- Sustainability is deeply rooted in the ethos of Japanese woodworking. Traditional wood-working craftsmen use local wood species such as Hinoki (Japanese cypress), Sugi (Japanese cedar), and Kiri (Paulownia) which have good workability and beauty. Therefore, the local ecosystems are well-supported by such a practice.
- The sustainability of Japanese woodworking resonates strongly with the contemporary global emphasis on environmental practices.
- The art of Japanese woodworking is a tradition where respect for material, precision of technique, and elegance come together and transcend borders, cultivating a connection with nature and heritage. It offers lessons in the wood workshop; it teaches patience and respect in the natural world.
- As a result, modern furniture can be based on such concepts and stand the test of time.

Author Contributions

Oprea-Adrian Spanu: Conceptualization, Project administration, Resources, Writing – original draft, **Emilia-Adela Salca Manea:** Supervision, Validation, Visualization, Writing – review & editing.

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Conflict of interest statement

The authors declare no conflict of interest.

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