ITTO Project:
"PROMOTION OF SUSTAINABLE DOMESTIC CONSUMPTION OF WOOD PRODUCTS IN THAILAND"
(PD 926/22 Rev.1 (I))

WOOD PRODUCTS DESIGN

PISUT SIRIPANT

KASETSART UNIVERSITY
INTERNATIONAL TROPICAL TIMBER ORGANIZATION

JAPANGOV
MAFF
Ministry of Agriculture, Forestry and Fisheries

ITTO Project

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APRIL 2024

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PREFACE

The transition of Thailand toward a Bio-Circular-Green (BCG) economy places special emphasis on strengthening domestic markets for wood and wood-based products. Demand for furniture and interior materials is rising in parallel with urban housing development and government incentives, creating both opportunity and responsibility for designers, manufacturers, and policy makers. The International Tropical Timber Organization (ITTO) project *"Promotion of Sustainable Domestic Consumption of Wood Products in Thailand"* (PD 926/22 Rev.1 (I)) responds to this context by advancing innovative, climate-smart wood product design as a catalyst for sustainable growth.

This volume, Wood Products Design, synthesizes practical principles—function, safety, ergonomics, aesthetics, material efficiency, and end-of-life responsibility—with creative methods that draw inspiration from nature, geometry, the human form, and contemporary Thai culture. It aims to equip designers, entrepreneurs, community enterprises, and students with the knowledge and tools needed to turn locally grown timber into high-value products that compete in global markets while contributing to national objectives for green growth, carbon neutrality, and rural livelihoods.

The chapters that follow move from concept formation and prototyping to production, logistics, marketing, and life-cycle stewardship, reflecting the integrated supply-chain approach that underpins Thailand's current forestry and industrial strategies. By weaving together academic research, field experience, and stakeholder feedback gathered in the project's pilot provinces, the book aspires to guide future designers toward solutions that are economically viable, socially inclusive, and environmentally regenerative.

It is our hope that the insights shared here will inspire a new generation of Thai wood-product innovators and contribute to a resilient, design-led domestic wood economy for decades to come.

Pisut Siripant

April 2024

ACTKNOWLEGEMENT

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Finally, we thank every wood product designer, craftsman, and stakeholder who continues to champion sustainably sourced Thai timber. Your creativity and commitment are the driving force behind a vibrant, low-carbon, and culturally rich wood-products sector.

Pisut Siripant

April 2024

Wood Product Design and Development

The consumption of wood and wood products in Thailand’s domestic market is expected to increase, driven by ongoing housing development in major cities and government incentives for new home purchases. This trend highlights the need to strengthen the domestic wood and wood products industry to reduce the country's economic reliance on export markets. By focusing on the domestic market, Thailand can support government policies aimed at expanding green areas and promoting sustainable development, while also adding bio-economic value to emerging market segments.

To achieve these goals, it is essential to foster innovation in wood product design and promote positive attitudes towards community enterprises, wood products, and natural resource management. The aim is to encourage sustainable domestic wood consumption by developing innovative, market- oriented wood product designs. Additionally, improving production processes to reduce residual wood use and enhancing the capacity of stakeholders and the supply chain in pilot provinces are key to the industry’s long-term sustainability.

Thai designers are increasingly tasked with creating new products that meet consumer needs, but the design process is complex and influenced by the product’s intended use. Product development time varies significantly with complexity, and successful design requires careful planning- selecting suitable materials and methods that match desired features, style, and material properties, while showcasing the designer's creativity.

For example, designing a chair starts with selecting materials suited to its intended use. The designer then chooses fastening methods- like glue, nails, nuts, or joints, and calculate the proportions to ensure strength and durability. Color and aesthetic appeal are also key to making the chair both functional and visually attractive.

Design is the process of refining existing products or concepts to make them more suitable and innovative. For example, an outdated chair can be redesigned to enhance its aesthetics and uniqueness while maintaining or improving functionality. It involves arranging both 2D and 3D elements based on principles that balance utility and beauty—key traits of successful design. As a human-centered art form, design adds aesthetic value and practical benefits, meeting evolving needs and the desire for new, more convenient products.

In furniture design, the process involves analyzing, creating, and developing designs suitable for mass production, aiming to perfect shape and function before manufacturing. It also includes organizing materials, equipment, and machinery to produce affordable furniture for consumers (Khanthachoti, 1985). This is especially relevant in Thailand, where affordability and accessibility are crucial factors to the success of domestically produced wood products.

Product Design Principles

The meaning of design

The word ‘design’ can be defined as the ability to plan by selecting materials and methods that align with the characteristics, styles and properties of each material, guided by creativity. It involves creating something new with proper proportions, strength and color to ensure both beauty and durability. Before exploring product design, it is important to understand the fundamental meaning of design. In academic and professional contexts, the term "design" involves thoughtful planning, material selection, and methodical execution. It goes beyond aesthetics, requiring careful choice of materials and techniques that match the desired features, style, and properties of the final product.

In the Thai context, where cultural heritage and environmental sustainability are key to product development, design must reflect local traditions and ecological concerns. Creating new products require careful calculation of material proportions for strength, beauty, and durability. For instance, when using Thailand rich resources like teak wood, designers must consider its

strength, suitable colors to enhance its natural beauty, and durability in the country's varied climate conditions.

Moreover, in Thailand, where innovation drives both traditional crafts and modern industries, design plays a key role in bridging the gap between these two sectors. Designers must balance creativity with practicality to ensure their work is innovative, unique and functional, and sustainable. This is vital for promoting the domestic wood products market, where blending traditional craftsmanship with contemporary modern design adds value and appeals to local and global consumers.

In Thailand, design takes a holistic approach, blending cultural sensitivity, environmental sustainability, and innovation. By applying these principles, designers can create products that are visually appealing, practical, durable, and aligned with the nation’s broader goals of economic growth and sustainability.

Improving existing designs makes them more suitable and innovative. For example, a chair may become visually boring over time, so it is redesigned to be more attractive and unique, while maintaining or enhancing tis comfort and usability. When combining design elements, designers must balance utility and beauty- key aspects of good design. The thought process reflects a human need for new and more comfortable solutions.

Figure 1. Examples of chair designs

Source: https://i.pinimg.com/originals

https://chairblog.eu/wp-content

Product development is a multifaceted process involving the creation, refinement, or launch of new products to the market. It begins with ideation, based on market research, consumer feedback, and trends, followed by design, where ideas are transformed into viable products through careful planning, prototyping, and testing. After finalization of design, the process moves to production, where the product is manufactured at scale. This stage demands careful attention to material selection, process optimization, and quality control to meet both regulatory standards and consumer expectations.

Finally, the product is launched in the market, not just for sale but with strategic marketing to build awareness, generate interest, and stand out from competitors. Successful product development depends on how well it meets consumer needs, solves problems, or offers unique value in a crowded marketplace. Continuous feedback and iteration are vital throughout the process. Even after launch, companies collect user feedback to improve the product, add new features, or fix issues, helping maintain relevance and competitiveness in the market.

Ultimately, product development is about more than launching something new- it's about creating products that resonates with consumers, meet their needs, and provide real value to their lives. In a competitive market, strong product development is key to a strong brand presence and driving force for long-term success.

Industrial product design

Developing a creative thinking process helps plan and systematically combine elements to efficiently create or improve inventions. This includes utility- designs that are functional, beautiful, unique, durable, convenient, safe, cost-effective, easy to produce and maintain. Design must follow basic art principles such as harmony, balance, and unity. It can draw inspiration from nature, geometric shapes or human-made objects. Design plays a key role in transforming materials into attractive, high-quality products with distinctive features that meets international standards, added value, and potential for continuous development and competitiveness. In product design, applying design principles ensures products are visually appealing, have functional utility, culturally significant and valuable.

In the manufacturing era, products were released to the market based on form and utility, and if If it meets consumer needs, they sold easily due to less competition. Today, with increased competition and expanded markets, including exports to foreign countries, product design must consider consumer needs. To stay in the competitive market, designs must offer full utility, appealing shapes, attractive colors, and eye-catching aesthetics to the user.

Design Concept: Inspiration in Design

The design concept is a foundational approach that sparks creativity and guides the product design process. It can be shaped by ideas and sources, leading to distinctive, innovative designs that meet user needs. To achieve this, designers must skillfully choose forms and shapes that inspire diverse design concepts. Key sources of inspiration include:

1. Natural Inspiration

Using natural forms as a source of inspiration involves incorporating nature's unique shapes and patterns into product design. This creates products that are both visually appealing and functionally effective, with a sense of organic harmony to the design. Specific examples include:

1.1 Floral Inspiration

Elements like trees, leaves, flowers, and branches offer diverse shapes and structures for design inspiration. Designers can explore various forms such as tall or short trees, creeping vines, or various leaf shapes—square, round, lobed, or detailed- each reflecting the inherent beauty and diversity of nature.

Figure 2. Example of floral inspiration chairs

Source: https://i.pinimg.com

1.2 Fauna (animal form inspiration)

Wood design inspired by fauna draws on the diverse shapes and traits of terrestrial and aquatic animals, incorporating their physical attributes and symbolic meanings into the design of wood products. Forms of two- and four-legged terrestrial animals like birds, mammals, and reptiles, can be stylized into elegant, dynamic shapes that convey a sense of movement and vitality. These designs reflect the beauty and diversity of animal kingdom, adding life and harmony to the wood designs. This approach enables designers to create visually striking pieces with deeper cultural or symbolic meaning, deepening the viewer's connection to nature.

Figure 3. Example of fauna inspiration chairs

Source: https://i.pinimg.com

2. Human Form Inspiration

Human Form Inspiration, or Human-Inspired Aesthetic Design, uses the human body's structure, proportions, and movement as a foundation for creating products. This approach combines beauty and functionality, producing designs that are both practical and artistically engaging. By drawing inspiration from the shapes of children, adults, men, or woman, designers create forms that feel familiar and appealing. Body parts like hands, arms, feet, fingers, and facial features- such as the head, eyes, ears, nose, and mouth- offer rich inspiration for designs that are both intuitive and attractive.

Figure 4. Example of human form inspiration table and chairs

Source: https://i.pinimg.com

https://i3.wp.com/www.catdumb.com/wp

3. Man-made inspiration

Using man-made forms in design process involves drawing inspiration from various features of human-created design and shapes and their characteristics. This approach helps create products that are modern, creative, unique, and visually interesting. Items like chairs, trains, and airplanes. - with distinct names, shapes, and forms- serve as sources for innovative and identifiable designs.

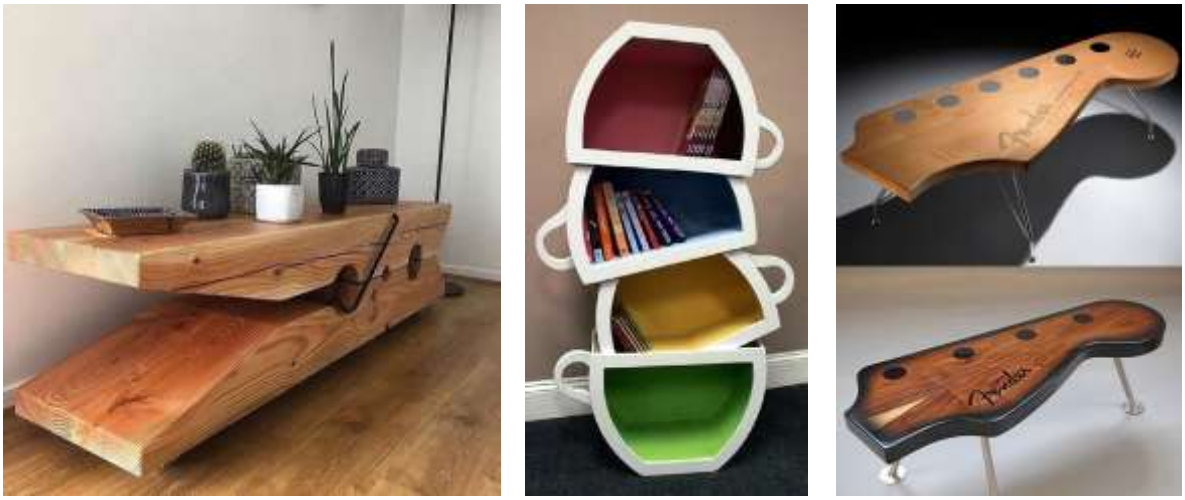

Figure 5. Example of man-made form inspiration table and sideboard

Source: https://i.pinimg.com

4. Geometric Form Inspiration

Using geometric shapes as a design concept involves drawing inspiration from their forms and characteristics in product design. This approach brings design made simple, orderly and a modern aesthetic feel. Commonly used and recognized shapes include circles, trapezoids, squares, cones, cylinders, and triangles.

Figure 6. Example of geometric form inspiration chairs

Source: https://i.pinimg.com

5. Free-form Inspiration

Using free-form shapes in design involves drawing inspiration from unconventional or irregular geometric forms. These shapes often add complexity, surprise, and variety, resulting in unique and creative designs. Each is one-of-a-kind and difficult to define, commonly seen in modern art and widely used across various fields.

Figure 7. Example of Free-form Inspiration chairs

Source: https://i.pinimg.com

Product Design Principles

Environmental design bridges product development and environmental management by considering a product's impact throughout its life cycle - from raw material extraction to waste disposal of products. These impacts include toxic emissions, non-renewable resource uses, and unnecessary energy consumption. Designers are responsible for creating products that meet consumer needs while considering various uses. Product design involves many factors that vary with the product's complexity. The product process may take long or short time, depending on the product type. For example, using natural materials may take longer time due to complex production process, while mass production with standard materials may be quicker (Kanthachote, 1985).

Design is a creative process that systematically brings elements together to create or improve inventions with efficiency in utility, beauty, uniqueness, durability, convenience, safety, economy, materials used, production techniques, and maintenance. It must follow basic art principles- harmony, balance, and unity- and may draw inspiration from nature, geometric shapes, and man-made forms. Design plays a key role in transforming materials into attractive high-quality products of international standard, adding value and enabling ongoing development and competitiveness in the product design process. It also preserves arts and culture, enhancing quality of life and supporting national development. Good product design relies on applying design principles to ensure products are functional, appealing and appropriate according to the design. The product design principles that designers should consider are as follows:

1. Function

Function is the most important principle in product design and must be considered first. Every product must serve its intended purpose efficiently and conveniently to be truly useful. For example, a worktable has more complex functions than a dining table, with drawers for storage, while a dining table doesn't require such features. Though a dining table can be used for work, it won't be as functional. Similarly, designing chairs are for sitting, but their design should suit specific activities. For example, a living room chair is made for comfort and socializing, a dining chair must match the table in size and style, and suitable for sitting and must support long periods of focused work. Using the wrong type of guest chair can lead to back pain, or neck pain, discomfort and inefficiency.

Figure 8. Example of functional designs

Source: https://i.pinimg.com

2. Safety

Design must ensure consumer safety of avoiding toxic substances that can harm life, prevent damage, and provide overall safety during use.

Figure 9. Example of Safety design

Source: https://i.pinimg.com

3. Strength in construction

A product must have structural strength, so designers should understand the properties of the material used and quantity requirements of the structure. For weight- bearing items like tables and chairs, knowledge of load-bearing principles is essential. While ensuring strength, designers must also, balance artistic beauty, as excessive structure can compromise aesthetics. Strength depends on shape design, selection of materials- and intended use- whether the product withstand weight or impact, and must be strong and durable. Testing during design is crucial. Additionally, the design should be environmentally friendly, suitable for the structure and cost-effective to reduce production expenses.

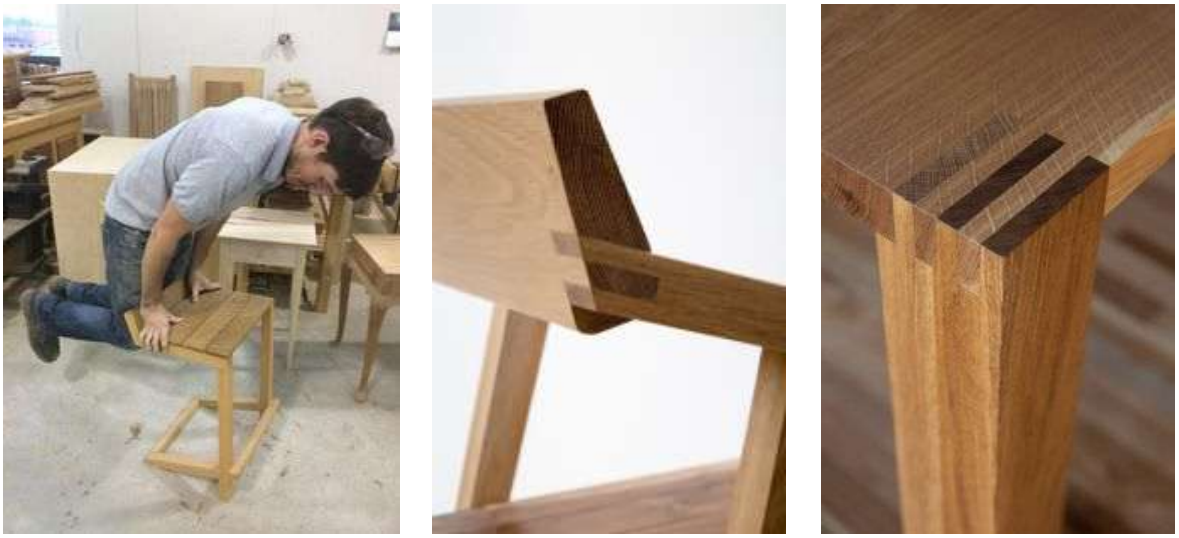

Figure 10. Example of strength in construction wood products

Source: https://i.pinimg.com

4. Ergonomic design

Ergonomics is a vital component of industrial design, aimed at enhancing user comfort and well-being. Ergonomic design requires deep understanding of human anatomy, including body proportions, sizes, and functional limits of various body parts across genders and ages. It relies on anthropometry for body measurements, physiology for functional capabilities and psychology for user interaction with products. Combining these fields helps product designers to meticulously determine dimensions, contours, and shapes—whether concave, convex, straight, or narrow—

ensuring products are ergonomically suit the human body and minimizes fatigue during prolonged use. For instance, a chair must offer proper size, comfort and softness, while a handle must fit the hand without causing strain. Since Western standards often cater to larger body types, they may not fit Asian users due to differences in body proportions. Therefore, product design must consider the specific body proportions of the target user group, including ethnic differences.

Figure 11 Example of ergonomic design of wood products

Source: https://www.yankodesign.com

5. Aesthetics or Sales Appeal

In product design, aesthetics are just as important as functional features, often influencing purchase decisions through visual appeal. Functional quality become evident over time with use, iwhile beauty-especially in items like souvenirs or decorative items- can be a key functional trait. This beauty stems from two things: form and color, but determining these in product design differs from pure artistic impression. Product design, as an industrial art, often reflects the designer's preferences rather than strict data and rules. Given the impact of form and color, studying color theory and design is essential to create harmony in industrial art.

Figure 12 . Example of aesthetics appeal products

Source: https://i.pinimg.com

6. Reasonable price (cost)

Products produced and sold must be based on researched consumer and market information. Designers need to identify the target group- their demographics, occupation, status, and product needs. Based on this, the product design and estimated price should suit the target audience. Achieving an appropriate price involves selecting the suitable materials and efficient production methods that is appropriate. If the cost exceeds the target price, components may be revised or developed, but the product's value must be maintained. This approach is known as cost reduction.

Figure 13 Example of reasonable price promotion

Source: https://cdn10.bigcommerce.com

Figure 14 Example of website promoting home decoration products

Source: http://credidescuentos.com.

7. Ease of Maintenance

Furniture should be designed for easy repair and maintenance. For example, wooden structures should be coated with glossy or matte finishes to protect against dirt and moisture that can damage the product.

Figure 15 Demonstration of accessible cabinet hinge repair – highlighting design for maintainability in wooden furniture

Source: https://carpenterdubai.com, https://melvillewoodworks.com

8. Materials

Designers should carefully plan the selection of materials based on suitability and reusability, considering where the product will be used- for example, materials suited for a beach resort. Each material's physical properties must match the product's needs, and non-toxic, high-quality raw materials should be chosen to avoid harmful substances like heavy metal-based paints that contain dissolved chlorine. Now a days, environmentally friendly raw materials are preferred, including recyclable materials and those that reduce energy use in the production process. Future disposal of expired raw materials should also be environmentally safe.

Figure 16 Organized selection of sustainable and reusable wood materials

Source: https://brisa.fi/media/catalog/category/woodcategory_1.jpg

9. Production process

Using clean energy- such as wind, solar, water, and plant-based sources- helps reduce pollution and supports controlled, low-emission processes. Efficient production also involves choosing appropriate machinery and equipment, minimizing production cycles to reduce waste, and using materials economically. This includes limiting loss of raw materials, reusing materials, and repairing existing machinery and equipment to maintain efficient production.

Figure 17 Precision craftsmanship and sustainable wood processing

Source: http://mobitec.be/media

Figure 18 Woodworking production facility or furniture manufacturing plant

Source: https://casafurniture.co/images/factory2@2x.jpg

https://d12swbtw719y4s.cloudfront.net/images/nry

10. Transportation

Designers must consider transportation cost-efficiency, including convenience, distance, space requirements, and the mode of transport- land, water or air. Packaging should protect the product fit the container space. For large items like tables, beds, cabinets or shelves, designers should plan transportation from the start for easily disassembled, compact packing, and fitting into standard boxes or crates. This reduces transportation costs and unnecessary packaging. Buyers can then transport and assemble the product easily on their own.

Figure 19 Transportation vehicles used for land transport

Source: http://www.myofficeliquidator.com

Figure 20 The delivery and moving process

Source: https://junkmailimages.blob.core

https://balkan2014floods.files.wordpress.com

Figure 21 A prime example of water transportation

Source: https://www.globalpost.ru

Design Considerations

Product designers should ground every decision in the relevant product standards, a clear understanding of the item's provenance, and credible insights into future market and technology trends. By aligning the design brief with these reference points, the team can ensure that the solution remains compliant, competitive, and forward-looking. Within this framework, two foundational questions structure the project: **What type of product is it—an entirely new creation or a modification of an existing one?** and **how, specifically, will the design be developed and improved?**

With those questions answered, the report will first identify the product's intended physical form—solid, liquid, or powder—and outline the core design features that shape consumer perceptions. It will summarize the measurable properties of the product, specify the materials chosen to meet performance standards, and map those choices against anticipated regulatory shifts and sustainability targets.

The next section will define the product's primary and secondary functions, state whether it is meant for immediate use or storage, and note the typical settings in which it will be deployed

(kitchen, yard, bedroom, or elsewhere). Any special operating conditions will be captured early so the design can accommodate them without sacrificing safety or durability.

A detailed user profile will follow. This profile will describe the intended audience (children or adults, women or men, professionals or hobbyists), clarify whether buyers and end-users are usually the same people, and document purchasing patterns—regular, occasional, or event-driven. Understanding these behaviors will help the design remain relevant as demographics and lifestyles evolve.

Market context will then be analyzed. Typical sales channels—street stalls, local retailers, or major shopping centers—and the number and strength of competitors will be assessed. This insight will inform whether the visual language should echo existing market leaders or differentiate itself to seize attention in a crowded marketplace. The section will also consider emerging retail formats, such as e-commerce and pop-up venues, to future-proof the design strategy.

Subsequent paragraphs will address user guidance and presentation. They will confirm whether the item will be sold individually or as part of a set, evaluate integration requirements among components, and assess available space for explanatory text or digital interaction (e.g., QR codes linking to extended instructions). Recommendations will balance eye-catching graphics with essential information, ensure the correct display of internal or external structures, and evoke the emotional response that strengthens brand affinity. Subtle techniques—adjusting colour palettes, proportions, or materials—may enhance aesthetics while avoiding user confusion or regulatory non-compliance.

The communications and after-sales plan will outline how the product will be promoted across traditional media, social platforms, and in-store displays. It will highlight residual benefits that endure after consumption, reinforcing customer loyalty and encouraging repeat purchases. Design features that anchor brand recall—logos, signature forms, or tactile cues—will be specified for consistency across future product iterations.

Finally, the report will catalogue all applicable legal and regulatory obligations, including material restrictions, safety labelling, environmental impact, and intellectual-property considerations. Cross-referencing these requirements with anticipated legislative trends will ensure that the product not only meets current standards but remains compliant as policies evolve—thereby safeguarding both the manufacturer's reputation and the customer's experience.

Implementation of Design

Research and data analysis are the primary methods that helps industrial designers to develop products that meet market needs. Translating research findings and market data into a viable product starts with assessing originality. The design team will review how far existing solutions have evolved and identify opportunities to push the concept further—whether by introducing new technology, refining a key feature, or elevating the overall aesthetic. A detailed comparison with current alternatives will highlight which functions perform well and which still need improvement, ensuring every enhancement directly supports the user's real-world tasks.

Ergonomics is the first filter for each proposed change. Dimensions, grip angles, weight distribution, and intuitive controls must all feel natural to the intended user. Safety follows immediately: hidden wiring, insulation that prevents electrical leakage, shatter-proof components, and rounded edges will be engineered into the product from the outset rather than added as afterthoughts. Cleanliness considerations—smooth, wipe-able surfaces, antimicrobial finishes, or easy-release parts—will further safeguard user wellbeing.

Space efficiency shapes the next set of decisions. Fold-flat frames, stackable modules, or collapsible elements can reduce footprint during storage and shipping. These practical choices are balanced by form and color, which together convey both brand character and functional clarity. The shape must be visually appealing yet purposeful, while the palette should resonate with consumer preferences and signal the product's use context (for example, cool tones for kitchen appliances or warm neutrals for living-space accessories).

Robust structural engineering underpins the outward design. Load paths, joint integrity, and service-life targets are calculated to match the intended duty cycle—be it occasional household use or continuous industrial deployment. Material selection then aligns performance with sustainability and cost: heat-resistant polymers for cookware, lightweight composites for portable

gear, or reclaimed wood for eco-conscious furnishings. The chosen production processes—whether injection mounding, CNC machining, or modular assembly—must suit the material and simplify quality control.

Attention to workmanship elevates the finished piece, especially when fine tolerances or artisanal detailing are required. Parallel work streams will define packaging that cushions the product from factory to end-user, while also providing an unpacking experience that reinforces perceived value. A comprehensive catalogue of models, sizes, and finishes supports both sales teams and future R&D.

Brand integration is critical: logos, signature forms, or proprietary textures will signal the manufacturer's identity at a glance, fostering brand loyalty and simplifying future line extensions. Throughout, target price points act as a design checkpoint—features that drive cost without adding proportional value are trimmed, while elements that deliver clear benefits are retained. Finally, durability benchmarks ensure the product performs reliably for its intended lifespan, protecting the customer's investment and the company reputation.

Creative Design Techniques of Alex F. Osbond

Figure 22 Examples of displays a modular furniture piece

Source: https://i.pinimg.com

Osbond is a personal creativity technique that involves experimenting with the following concepts:

1) **Put to other uses**: Put to other uses is a design concept that utilizes something different from what already exists.

Figure 23 Examples of displays a wooden cabinet or sideboard that exemplifies creative design techniques

Source: http://www.hotpod.net

https://i.pinimg.com

2) **Modification.** The modification is a design that has been changed and modified from the original. For example, color, shape, sound, movement, and usability.

Figure 24 Examples of displays two variations of a modern bar cabinet or display unit

Source: https://i.pinimg.com

3) **Can it be magnified?** Magnification is a design by adding new parts to the original. For example, adding more utility, increasing strength, height, length, and thickness.

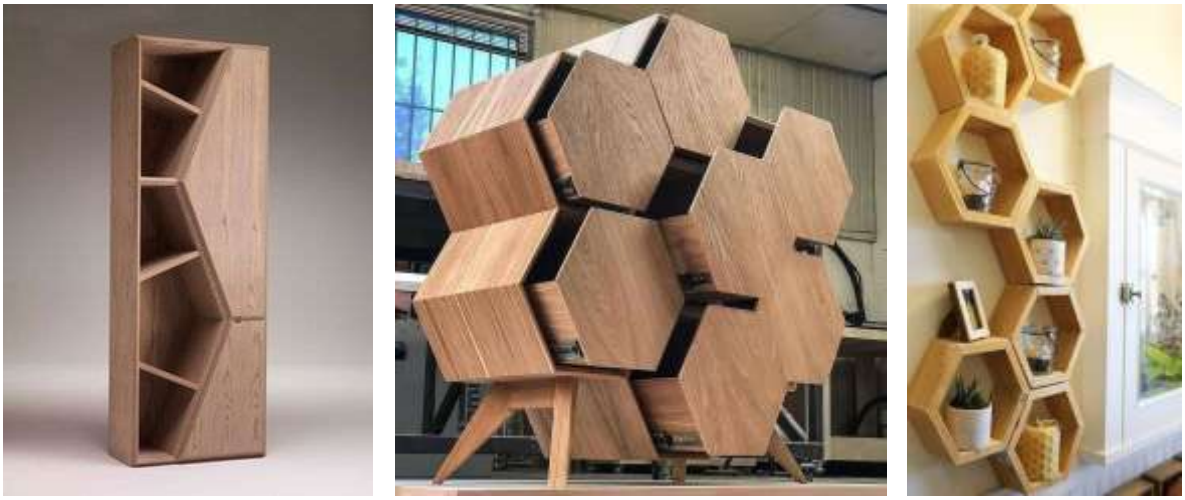

Figure 25 Examples of geometric wooden cabinet with integrated shelving and storage

Source: https://i.pinimg.com

Can it be minified? Minification is a design by reducing, cutting out, and miniaturizing the

original product. For example, reducing the original proportions, removing some unnecessary functions, and separating some parts.

Figure 26 Example of a set of hexagonal wall shelves, arranged in a honeycomb pattern

Source: https://i.pinimg.com

4) **A substitute** is a design by replacing or finding new things to replace the old ones. For example, using new production methods, new operating systems, new materials, and new energy sources, or changing some components.

Figure 27 Example of decorative key holders

Source: https://i.pinimg.com

5) **Rearrangement.** Rearrangement is a design that rearrange components different from the original. For example, switching some components, patterns that looks attractive and different from the original, including colors, rhythm, spaces, and other elements.

Figure 28 Examples of wall-mounted set of hexagonal shelves, arranged in a dynamic, interlocking honeycomb pattern

Source: https://i.pinimg.com

https://www.pinterest.com/kofo03

Reverse: In the design process, turning the front to the back, turning left to right, turning black to white, changing from positive to negative, or creating the opposite effect from what already exists shall help create new things looks better than before.

Figure 29 Examples of the tilted green chest of drawers and the transforming chair to bench

Source: https://www.ebaumsworld.com

https://www.designspiration.com/

Combination: Combining similar things together, with similar functions that is better than the original.

Figure 30 Examples of combined wardrobe and entryway organizer

Source: https://i.pinimg.com

The Project implementation of Wood Products Design and Innovation

As part of the project implementation, Dr. Pisut Siripant and project team visited Trang Province to conduct a preliminary survey and held stakeholder consultation meeting on the rubberwood business with local entrepreneurs (Figure 31 – 32)

Main Stakeholders in Trang Province:

Director of the Trang Provincial Office of Natural Resources and Environment, Mr. Charuay Inchan of Rubber Authority of Thailand, Representatives from 6 rubberwood industry businesses (4 sawmills and 2 wood product manufacturers).

Morning Session: Consultation Meeting Venue: Thumrin Thana Hotel, Trang Province

- Project Introduction: Prof. Yongyut Trisurat presented the project's objectives, outcomes, activities, and shared insights into rubber plantations, production sources, supply chains, and market trends at national and global levels.

- Overview of Trang's Rubber Industry presented by Mr. Warit Kittiakson (Director of the Natural Resources Division, Trang Office of Natural Resources and Environment), highlighted key issues:
  - Decline in rubber plantations due to higher income from durian farming
  - Rubber trees affected by leaf fall disease (Phytophthora)and declining yield
  - Trade and legal barriers such as high costs for FSC/PEFC certification
  - Rising transportation costs
  - Smallholder farmers face challenges in sustainable plantation management and access to international markets

Afternoon Session: Site Visits

- Interfurnitech Co., Ltd.
  - Purchase sawn rubberwood from ~60 local factories
  - Produces furniture for export (mainly to the U.S.)
  - Export volume dropped ~20% due to post-COVID-19
- PlanToys Co., Ltd.
  - Established in 1981, manufactures sustainable wooden toys for children of ages 0–5
  - ~80% of revenue from international markets (limited domestic market due to high prices)
  - Multiple international awards (e.g., Red Dot Award)
  - Revenue dropped from $14M pre-COVID to <$7M in 2021; currently recovered to ~$11M
  - Potential to expand market through partnerships with primary schools and the Ministry of Education (B2G model)

Key Findings from Field Visit

- Trang's industry has strong potential in both product design and modern manufacturing processes
- Clear trends toward developing and exporting quality wood products for domestic and international markets

Figure 31 Dr. Pisut Siripant, Prof. Yongyut Trisurat, and wood experts joined themeeting with the wood factory at Trang Province

Figure 32 The field visit, demonstrating the blend of design creativity and modern manufacturing in Trang's wood products industry

Furniture Design Contest 2023 (Value-Added Wood Furniture Design)

Led by **Dr. Pisut Siripant and team**, the contest aimed to promote sustainable domestic wood consumption. It focused on university students nationwide, encouraging innovative product design to modernize wooden products and reduce residual wood usage while meeting domestic market demands. See figure 33 – 34.

Objectives of the Contest:

1. Promote sustainable domestic wood and wood product consumption by fostering innovative, modern design and production processes that reduce residual wood usage **as** *"reduce residual wood usage" means cutting down the amount of leftover scrap—off-cuts, shavings, sawdust, and rejected pieces—that is generated as you turn raw timber into finished products.*
2. Commercialize winning entries to enhance stakeholder potential and strengthen the wood supply chain.

Exhibition & Awards:

- Winning designs were showcased at the Forestry Conference under the theme *"Thai Forests Towards a Green Economy"*.
- Prizes were awarded by Japan's forestry agency, ITTO and Thailand's Royal Forest Department.

Figure 33. The promotion and evaluation phases of a student furniture design competition focused on sustainable, value-added wood products

Figure 34 Exhibiting innovative wood products and design concepts, alongside recognizing the talents of young designers and participants

In collaboration with Japanese Forestry Agency and Royal Forest Department, Dr. Pisut Siripant and the project committee visited wood industries producing teakwood furniture and products. They also presented the winning designs from the 2023 contest to local communities and conducted knowledge-transfer activities.

Workshop on Promoting Wood and Wood Product Use

Location: Phrae Provincial Skill Development Center

Objectives:

1. To explain product design principles
2. To demonstrate engaging design techniques
3. To showcase product-making techniques
4. Hands-on training in assembly techniques

Workshop Highlights:

Topics: Modern design concepts tailored to user needs, production processes, and product proportions

Creative thinking techniques (e.g., Alex F. Osborn model) discussions, demonstrations, and practical training Participants: 40 attendees from community enterprises and wood businesses in Nan and Phrae provinces

Figure 35 Wood work training on wood residual utilization and design

Field Visit to Pong Subdistrict, Santi Suk District, Nan Province. As part of the initiative to promote sustainable domestic wood product consumption, Dr. Pisut Siripant and the project management team conducted a targeted site visit to a local teakwood community enterprise in Pong Sub-district, Santi Suk District in Nan Province. This visit was a crucial component of the project's outreach and capacity-building strategy (see Figures 35 – 36)

Figure 36 The successful community engagement event focused on empowering a local teakwood enterprise in Nan Province with modern tools and training

Figure 37 The visit at a facility showcasing high-quality, finished wood products, likely with an emphasis on forestry knowledge and sustainable practices

Key Activities and Their Purposes:

- Stakeholder Engagement and Needs Assessment
  - The team met with members of the teakwood community enterprise, including local craftsmen, entrepreneurs, and leaders.
  - Discussions were held to understand local challenges, production capabilities, and market access issues.
  - The aim was to build trust, identify opportunities for improvement, and align project support with the actual needs of the community.
- Knowledge Transfer on Product Design
  - Experts in design and furniture innovation shared insight into best practices in modern product design.
  - Topics covered included:
    - Ergonomic design principles
    - Aesthetic trends for domestic and export markets
    - Material-efficient cost-effective design to reduce residual wood usage while maintaining product quality and appeal
  - This knowledge helped equip local artisans with the creative thinking needed to upgrade their product designs.
- Production Process Training
  - The team provided guidance on improving manufacturing workflows.
  - Emphasis was placed on techniques to enhance precision, reduce waste, and increase productivity.
  - This included advice on wood treatment, cutting, finger-jointing, assembly, and finishing processes.
- Provision of Equipment and Tools
  - The project delivered woodworking machines and production tools suitable for small-scale furniture manufacturers.
  - These included:
    - Power saws and planers
    - Sanding machines

- Assembly jigs and hand tools

- The goal was to modernize the workshop, reduce labor, and enable production of higher-value products.

- Long-term Impact Goals:
  - Strengthen local capacity to produce competitive, high-quality furniture
  - Increase income-generation opportunities for rural communities
  - Encourage sustainable management of local teakwood resources
  - Foster local entrepreneurship in the value-added wood sector

Furniture Design Contest 2024 (2nd Round): Value-Added Wood Furniture Design

Following the success of the 2023 contest, **Dr. Pisut Siriphan and his project team** launched the **second edition** of the *"Value-Added Wood Furniture Design"* contest in 2024. This was conducted in **collaboration with the Royal Forest Department and key players in Thailand's forestry and wood product industries**, with a continued commitment to promote **sustainable domestic wood usage** (see Figures 39 – 40)

Key Characteristics of the 2024 Contest

- **Target Audience**: University students across the country, particularly from design, architecture, and engineering programs, as well as vocational and technical schools with woodworking facilities.
- **Material Focus**: Teak wood, known for its durability, aesthetics, and sustainability when managed responsibly.
- **Approach**: Unlike the previous edition, this round emphasized **hands-on design and prototyping**, requiring participants to demonstrate practical skills in joinery, assembly, and woodworking craftsmanship—not just digital or conceptual design.

Contest Objectives (Expanded):

- **Promote Innovative, Modern Wood Product Designs**:
  - Inspire new generation of designers to create products that are **aesthetically appealing**, **functionally relevant**, and **resource-efficient**.

- Encourage use of **design thinking** to solve real-world challenges in furniture production—such as minimizing waste, improving assembly efficiency, and visual appeal to wood products for modern consumers.
- Integrate traditional wood craftsmanship with **contemporary trends** in design to elevate the image of Thai wood products both locally and internationally.

- **Support Business Applications and Strengthen the Supply Chain:**
  - Transform winning designs into commercially viable products through partnerships with industry stakeholders, such as manufacturers, community enterprises, and exporters.
  - Equip stakeholders (e.g., small-scale producers, cooperatives, entrepreneurs) with access to new product designs that can be integrated into their products.
  - Strengthen the entire wood supply chain—from sustainable sourcing and processing to marketing and sales—by aligning design innovation with production capabilities and market demands.

- Additional Highlights:
  - **Judging Criteria** included innovation, functionality, sustainability, market potential, and craftsmanship.
  - **Workshops and Mentorships** were organized during the contest to provide students with real-time guidance from industry professionals.
  - **Prototyping Facilities** were made available in collaboration with woodworking training centers and universities.
  - **Winning Designs** will be showcased in national exhibitions and possibly introduced into **pilot production** by partnering factories or community enterprises.

Figure 38 The workshop focused on sustainable wood products or forestry, involving young wood-product designer students and project stakeholders

The implementation of the *Wood Products Design and Innovation* under the consultant, Dr. Pisut Siripant, the project had been structured around a series of strategic workshops and field surveys aimed at enhancing the capabilities of local wood enterprises in Thailand (Figure 39). The project team, comprising experts and consultants in wood processing and design, conducted these workshops in key provinces such as Nan and Trang. These regions were chosen due to their rich history of wood craftsmanship and their potential for integrating traditional knowledge with modern design methodologies.

The workshops focused on multiple aspects critical to the success of wood product innovation. A significant part of the training was dedicated to improving the technical know-how and skills of participants in wood processing like in drilling, planning, and sanding, which are essential for producing high-quality, durable products. In addition, the project introduced modern design principles that encourage creativity while protecting Thai cultural values. This approach ensured the designs were both visually appealing and aligned with market demands.

Moreover, the project workshops highlighted the importance of innovation and market relevance by connecting traditional crafts with modern industry practices to create globally competitive wood products. It also introduced new marketing strategies online platforms like Facebook and TikTok to help local enterprises expand their reach, attract modern consumers, and support the region's sustainable economic growth.

Overall, the project aimed to modernize Thailand's wood product industry blending cultural heritage with innovative design and sustainable practices. The successful workshops established a solid foundation for the sector's continued growth and development in the country.

Figure 39 The training workshop focused on practical woodworking skills, from marking and cutting to assembly, utilizing both hand tools and machinery

Figure 40 Demonstrating of woodworking capacity-building program or a community furniture production initiative

After the competition, the teams and the winning teams (1st , 2nd , 3rd place and honorable mention) visited Ban Sri Bunruang Community Enterprise, Nan Province (See Figure 31), to showcase their award-winning prototypes. They demonstrated how to design modern wooden furniture for limited spaces and helped analyze and improve the products from the community enterprises to make

them more modern. Figure 40 shows a holistic view of key considerations in Thai wood product design, integrating environmental, cultural, and innovative aspects. It reflects the goal of the project to modernize the wood product industry by combining traditional craftsmanship with contemporary design and sustainable practices. The workshops effectively implemented these principles, equipping local enterprises to create competitive, culturally meaningful, and sustainable wood products.

Workshop on Safety in Woodworking Machinery Operation

The project actively implements capacity-building initiatives to enhance safety standards within the woodworking industry. A core component of this effort is the comprehensive Workshop on Safety in Woodworking Machinery Operation, designed to equip participants with essential knowledge and practical skills for safe machinery use.

This workshop emphasizes the paramount importance of safety protocols in preventing accidents and fostering a secure working environment, thereby contributing to the overall sustainability and professionalism of the wood products sector. The program includes theoretical lectures and hands-on training, ensuring participants understand both the principles and practical application of safety measures in woodworking. This commitment to safety is crucial, as woodworking machinery inherently carries risks of injury if not operated correctly. By instilling a **"Safety First"** mindset, the project aims to reduce accidents, protect workers, and promote efficient, responsible production practices across Thailand's wood product industry. The workshop focus directly supports the project broader goal of promoting sustainable domestic consumption of wood products by ensuring that increased production is met with enhanced safety standards, benefiting both workers and the industry as a whole.

For the woodworking machinery operation, the workshop participants gained hands-on experience. A key activity in this segment was the production of teak wood storage baskets, allowing participants to apply their newly acquired knowledge in a practical setting. Participants were observed meticulously working with various woodworking machines. This included activities such as preparing and assembling wooden pieces, demonstrating attention to detail in their work.

The process involved tasks like gluing wood components together and using power tools such as nail guns for assembly, ensuring the secure construction of the storage baskets. Safety remained a paramount concern throughout this operational phase, with participants seen wearing appropriate personal protective equipment, including hard hats, as they engaged with the machinery and handled the wood. The focus on producing a tangible item like teak wood storage baskets not only reinforced technical skills but also provided participants with a practical outcome of their training (Figure 41).

Figure 41 Inaugural Address by Mr. Suchart Klayawongsa (left), the workshop participants and organizers of the training program (right)

The process of Woodworking Machinery Assembly

This was a crucial step in the project, with staff meticulously setting up the equipment provided by the SWU Project to the Department of Forest Products, Faculty of Forestry. This involved a detailed and hands-on approach to ensure proper functionality and integration of the new machinery. The assembly process required the use of various specialized tools, including wrenches and other metal components, which were carefully laid out on workbenches. Staff were observed engaged in the precise task of assembling machine parts, highlighting the attention to detail necessary for proper setup. In some instances, individuals closely examined machine components, underscoring the precision involved in getting the woodworking equipment ready for operation. The assembly was not just manual; there were instances where digital resources were utilized, with individuals referencing smartphones or laptops, suggesting the use of digital manuals or software installation as part of the setup. Ultimately, the various steps, from initial

unboxing and component identification to final physical assembly, were captured, demonstrating the comprehensive nature of bringing these new woodworking machines to operational readiness.

Dr. Pisut Siripant delivered a comprehensive and critical lecture on Safety in Woodworking Machinery Operation to the training participants. His presentation underscored the paramount importance of safety, emphasizing that the use of woodworking machinery inherently carries risks of injury, such as being cut by saw blades, struck by rebounding wood, or developing respiratory illnesses from wood dust. Therefore, he stressed that learning and adhering to safety principles are the most crucial aspects before operating any machinery.

The lecture detailed essential safety practices, covering a wide range of topics. he instructed participants on the proper use of protective equipment, including the mandatory wearing of safety glasses to prevent eye injuries from flying debris and dust masks when dust is prevalent. He also highlighted the necessity of hearing protection if noise levels exceed safe standards. Furthermore, the lecture covered critical pre-operation checks, such as ensuring all machine guards are correctly positioned and intact, verifying proper grounding of machinery, and confirming that all wrenches and tools are removed before starting operations. Participants were also advised to inspect workpieces for nails or other foreign objects before cutting and to ensure that machines have easily accessible on/off buttons (Figure 42).

Figure 42 Lecture on safety in woodworking machinery operation by Dr. Pisut Siripant

Beyond personal protective measures and pre-operation checks, his lecture delved into operational safety, emphasizing the importance of sharp and clean blades for efficient and safe cutting, proper adjustment of protective devices, and the necessity of shutting down machines before cleaning, adjusting, or repairing any parts. He also advised on using push sticks to safely feed materials, especially in narrow spaces, to prevent hands from coming too close to cutting edges. The lecture also covered workplace environment safety, stressing the importance of maintaining a clean and well-lit work area with non-slip flooring. Finally, he outlined strict prohibitions, including avoiding distractions, refraining from wearing loose clothing or jewelry that could get caught in machinery, never clearing dust with bare hands while the machine is running, and always shutting down the machine before attempting any adjustments or blade changes. He further illustrated the dire consequences of neglecting safety by presenting examples of accidents, such as workers being crushed by machinery or suffering severe injuries from machine contact, reinforcing the "SAFETY FIRST" message (Figure 43–45).

Figure 43 The training participants operated woodworking machinery operation to produce teak wood storage baskets

Figure 44 The workshop participants hand-on experience on the woodworking machinery assembly process

Figure 45 The workshop participants hand-on experience on the woodworking machinery assembly process (CONTD)

The culmination of the training program on woodworking machinery was marked by the **Certificate Presentation and Closing Ceremony**. This event celebrated the participants' successful completion of the workshop and reinforced the importance of the skills and knowledge they had acquired. As a representative of the organizing committee, Mr. Suchart Klayawongsa graciously presided over this significant occasion. He was seen presenting certificates to the training participants, a gesture that formally recognized their efforts and successful engagement throughout the program. The ceremony also included delivering the closing remarks, signaling the official end of the training program (Figure 46).

Figure 46 Certificate Presentation and Closing Ceremony

Summary

Product design in Thailand is guided by a holistic philosophy that balances cultural identity, environmental responsibility, and economic progress. Designers begin by framing each brief around national development goals and local values, ensuring that every product answer real functional needs while celebrating Thai heritage (Figure 47). Creativity and modern techniques are encouraged, but only when they coexist with eco-friendly materials and processes that advance the country's sustainability commitments.

Within this framework, design practice unfolds systematically. A rigorous planning phase defines objectives, constraints, and user requirements; only then are form, aesthetics, and material choices refined. Thai designers favor locally sourced woods such as teak or rubberwood, pairing them with finishes that highlight grain and withstand the country's heat, humidity, and monsoon cycles. Methodical execution—often supported by international quality standards—keeps production efficient, repeatable, and responsive to future market shifts.

Thai-specific considerations further shape each solution. Products must reflect cultural traditions, whether through familiar motifs, seating ergonomics suited to floor-level living, or joinery techniques perfected by master craftsmen. Designs are also adapted to tropical conditions: ventilation panels mitigate humidity, termite-resistant joinery extends service life, and weather-proof coatings preserve color and structure outdoors. These choices ensure that a product is both culturally resonant and physically durable.

Finally, successful Thai design links functionality to commercial value. By integrating brand cues—signature forms, tactile details, or iconic logos—into well-engineered, resource-efficient products, companies enhance the appeal and competitiveness of domestic wood goods at home and abroad. In short, Thai product design weaves tradition and innovation into sustainable, market-ready solutions that serve users today while safeguarding cultural and environmental assets for the future.

There can be concluded as following issues:

1) Integrating traditional Thai cultural elements with modern design techniques is essential for creating wood products from native tree species like Teak and other valuable timber such as para-rubber that appeal to both domestic and international markets.
2) Designs must focus on environmental sustainability through using eco-friendly materials and practices that contribute to sustainable economic growth in Thailand. Workshops addressed this by training participants on sustainable production techniques and selection of eco-friendly materials.
3) Products should meet modern aesthetic and functional demands while preserving Thai woodcraft and cultural heritage traditions. Workshops encouraged participants blending these traditions with modern designs, to create a distinct Thai identity for wood products.
4) Innovation and modern techniques including new design methodologies, modern tools, and marketing strategies helps local enterprises produce innovative, globally competitive products that retain cultural authenticity.
5) Workshops emphasized choosing materials suited to Thailand's diverse climate for durability and aesthetics, and applying methodical execution to ensure designs are visually appealing, functional and long-lasting.
6) Designs should reflect local traditions, ecological factors, and use of local materials like teak wood. Workshops provided hands-on training in design and production tailored to Thai market's specific needs.
7) In future outlook, elevate Design thinking and Innovation with Artificial Intelligence (AI) in wood products can be thought of.

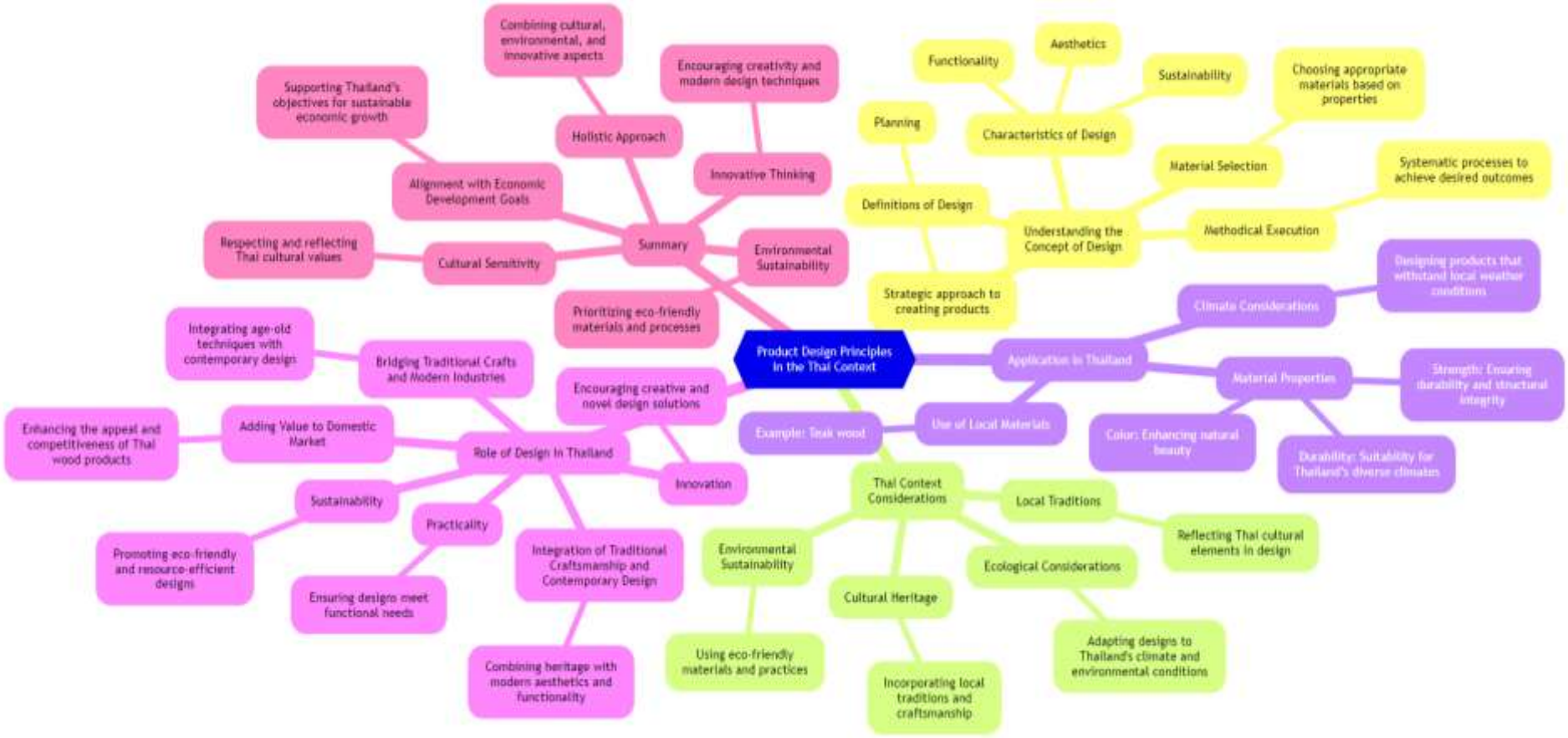

Figure 47 The Analysis of Wood Product Design in Thailand

References

Khanthachot, S. (1985). ***Furniture design***. O.S. Printing House Co., Ltd., Bangkok.

Kratuek, Y. (n.d.). ***Industrial furniture design***. Department of Industrial Promotion. Bang Pa-in Paper Mill Industry Co., Ltd., Bangkok.

Phichayapaiboon, W. (1984). ***Modern furniture design***. Chulalongkorn University, Bangkok.

Siripant, P. (2011). ***Environmental furniture design***. Kasetsart University, Bangkok.

Suksawang, S. (n.d.). ***SCAMPER: Tools/Techniques for Creativity and Innovation***. Retrieved April 25, 2024 from https://n9.cl/https__www_sasimasuk_com_1666

Yodbangtoey, M. (1995). ***Product design*** (Vol. 1). O.S. Printing House Co., Ltd., Bangkok.

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"PROMOTION OF SUSTAINABLE DOMESTIC CONSUMPTION
OF WOOD PRODUCTS IN THAILAND"
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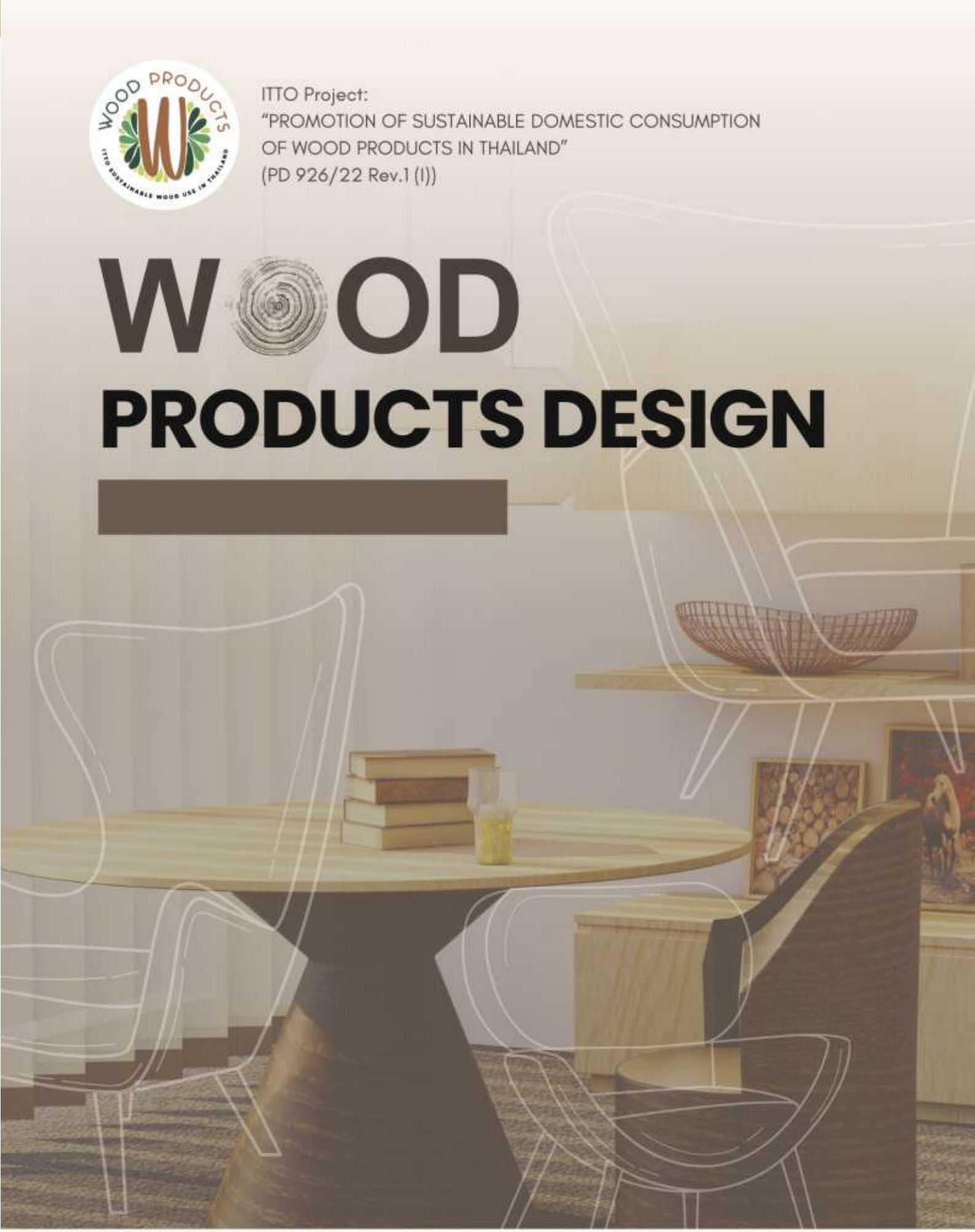
WOOD PRODUCTS DESIGN



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