Information Management and Business Review (ISSN 2220-3796)
Vol. 17, No. 2, pp. 150-161, June 2025

Designing Bamboo-Based Products for Elderly Care: A Cross-Cultural Study Between Japan and Malaysia

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Abstract: Bamboo, a renewable and culturally significant material in both countries, Japan and Malaysia, presents vast potential for sustainable product design. As both Japan and Malaysia face the challenges of growing elderly populations, there is a need for products that promote independence, mobility, and a high quality of life for older adults. The study focuses on merging traditional bamboo craftsmanship with modern ergonomic needs, targeting key areas such as comfort, safety, and usability for aging populations. Therefore, this paper aims to explore the development of innovative bamboo-based products designed to enhance the well-being of the elderly, drawing on cultural and material synergies between Japan and Malaysia. The study has emphasized cross-cultural review on the bamboo-based industry in both countries, as well as presenting innovative bamboo-based products for the elderly. This research will provide practical solutions that address the global aging challenge and serve as a model for how traditional materials can be reimagined to meet contemporary societal needs, contributing to both the academic discourse on sustainable design and real-world applications for elderly care products. This study is significant to be aligned with Sustainable Development Goals (SDGs), particularly SDG 3 (Good Health and Well-being), SDG 9 (promotes inclusive and sustainable industrialization, fostering innovation, and building resilient infrastructure) and SDG 12 (Responsible Consumption and Production). By utilizing bamboo-based products, the research not only supports environmental sustainability but also fosters cultural exchange and innovation.

Keywords: *Bamboo Product Design, Aging Population, Cultural Heritage Integration, Sustainable Design*

1. Introduction

The global population indicates a rapid increase in the aging population, presenting both opportunities and challenges for societies worldwide. This demographic shift necessitates a focus on developing innovative solutions that cater to the specific needs and preferences of older adults, promoting their independence, well-being, and quality of life. Within this context, the design and development of products tailored for elderly care have gained significant importance, requiring a nuanced understanding of the diverse cultural contexts in which these products will be used. Notably, by 2025, approximately 60% of the world's elderly population will reside in Asia, underscoring the urgency of addressing the needs of older adults in this region (Mohammad & Abbas, 2012). Malaysia is expected to be an aging nation by 2035, where 15% of its population will be senior citizens. The demographic change is expected to have a considerable influence across multiple sectors, particularly in areas such as architectural design, infrastructure planning, and the construction labor force (Hamid et al., 2018), which must adapt to accommodate the specific needs of an aging society. In addition to these structural considerations, it is equally crucial to emphasize the role of product design tailored for the elderly, which prioritizes usability, accessibility, comfort, and safety to support independent living and improve the quality of life for senior citizens. Malaysia, like many other countries, is facing the challenge of an aging population, with the number of individuals aged 60 and over more than doubling between 1991 and 2010 (Tey et al., 2015). Japan, on the other hand, is already a super-aged society, with a significant proportion of its population aged 65 and over (Ramely et al., 2022). Given these demographic trends, there is a growing need to create age-friendly environments and support systems to enable older adults to age healthily and with dignity. Creating living spaces that let older adults stay in their homes as they age can boost their mental well-being, showing how important it is to think about how people and their environments connect when designing (Tan, 2022). With more and more people in Malaysia living in cities, we need to focus on supporting older adults' health and happiness by providing things like eco-friendly products and helpful infrastructure (Mansor & Harun, 2014).

In Japan, bamboo is becoming a big deal in building and interior design, helping the market grow. Its strength, flexibility, and good looks make it a popular choice for flooring, scaffolding, and stylish architectural touches.

Over the last five years, bamboo use in Japanese construction has jumped by about 25% each year (Credence Research, 2024). This rise reflects a broader movement among architects and designers to integrate bamboo into contemporary building designs that combine traditional Japanese aesthetics with modern sustainability principles. Notably, more than 60% of professionals in the Japanese construction industry have incorporated bamboo into at least one major project within the last year. The Japanese Ministry of Land, Infrastructure, Transport and Tourism has also observed a consistent growth in certifications for bamboo-based construction materials, indicating official recognition of its viability and performance standards. Concurrently, interior design trends are increasingly favoring natural materials, with bamboo being prominently used in both residential and commercial settings. Supporting this trend, data from the Japan Furniture Industry Association highlights a 30% rise in bamboo furniture sales over the past three years, underscoring its growing consumer appeal and market relevance (Credence Research, 2024).

From the Malaysian perspective, bamboo has been equally valued for its practicality and sustainability. The use of bamboo in traditional Malay houses and handicrafts highlights its versatility and eco-friendly nature. Bamboo's fast growth and renewable properties contribute to sustainable living, offering excellent raw material for products that are lightweight yet sturdy. In Malaysia, there are around 70 bamboo species, 45 of which are native and have seen a recent boost in exports (BERNAMA, 2022). Bamboo is deeply rooted in the traditional building culture of the indigenous communities, particularly in Sabah and Sarawak, where it serves as a primary construction material. The Temuan people use bamboo extensively in various aspects of their lives, ranging from cooking and medicine to musical instruments and weaponry (Neha & Aravendan, 2023). The versatility of bamboo is also evident in the construction of houses, rafts, and furniture, reflecting its importance in the Temuan community's daily life. Indigenous communities demonstrate a remarkable knowledge of bamboo, using its unique qualities to craft practical, culturally meaningful items. In Malaysia, there's a push to expand the market for bamboo products, especially in furniture, textiles, and construction. While bamboo has long been used for furniture and decor, its potential for creating modern, comfortable designs tailored to older adults hasn't been fully explored. More research is needed to see how bamboo can be shaped into products that improve the physical health and daily lives of the elderly.

Understanding the cultural significance of bamboo in Japan and Malaysia is key to designing products that connect with users and honor their traditions. Both countries value bamboo as a sustainable, natural material, which creates exciting possibilities for innovative designs aimed at older adults. Bamboo's lightweight yet sturdy nature makes it perfect for creating user-friendly products like ergonomic furniture, walking aids, or therapeutic tools for the elderly. Blending traditional bamboo aesthetics with modern designs can celebrate the cultural heritage of Japan and Malaysia while offering sustainable solutions that align with today's environmental goals (Manandhar, 2023). Bamboo's symbolic meaning in both cultures—representing strength, growth, and sustainability—combined with its practical benefits, makes it an ideal material for fostering collaboration between Japan and Malaysia. This study seeks to explore and evaluate bamboo-based products designed to meet the needs of older adults in both countries, tapping into these unique opportunities.

Globally, by 2050, the world's population of the elderly (aged 60 years and older) is expected to be around 2.1 billion. While the number of people aged 80 years or older is expected to triple between 2020 and 2050 to reach 426 million (WHO, 2024), this presents an urgent need for innovative solutions in healthcare, product design, and social services. Therefore, this study is highly relevant to achieve the Sustainable Development Goals (SDGs) particularly in terms of promoting sustainable development, ensuring healthy lives, and fostering inclusive communities specifically related to ensuring healthy lives and well-being of the elderly (SDG3), promotes inclusive and sustainable industrialization, fostering innovation, and building resilient infrastructure (SDG9) and focuses on ensuring sustainable consumption and production patterns (SDG12). This study also provides vast opportunities for researchers to provide cross-cultural collaboration between Japan and Malaysia, as well as facilitate both countries (Japan and Malaysia) to develop a holistic model of sustainable development that balances social, environmental, and economic dimensions, which will benefit in the long run.

Problem Statement

Despite the growing need for elderly care solutions and the abundance of bamboo resources, there is a notable lack of research on the cross-cultural design of bamboo-based products. While studies have explored cross-cultural collaborations in bamboo craft design, such as the Taiwanese-Nicaraguan initiative (Chang, 2024), these efforts primarily focus on craft production rather than addressing the specific needs of the elderly demographic. The lack of research on designing bamboo products with cultural sensitivity for elderly care is a significant gap, especially in places like Japan and Malaysia, where the number of older adults is growing. This gap makes it harder to create sustainable, culturally appropriate products that could truly enhance the lives of elderly people in these countries. Additionally, limited awareness of bamboo's potential and a lack of effective marketing are holding back its broader use and development (Emamverdian et al., 2020). There's a clear need to create innovative bamboo products designed specifically for the aging populations in Japan and Malaysia.

This study is driven by a mix of social, cultural, and environmental factors. By focusing on bamboo-based product design for older adults, the research aims to tackle global challenges while encouraging sustainable innovation. Both Japan and Malaysia are seeing their populations age rapidly, which means there's a growing need for products that cater to the unique needs of elderly individuals. Japan has one of the world's most aged populations, with nearly a third (around 29.1%) of its total population being 65 years or older. This equates to approximately 36.23 million people, and more than 1 in 10 are now aged 80 or older (Al Jazeera, 2024). The rapid increase in the elderly population is placing immense strain on Japan's economy, labor force, and social welfare systems. Projections indicate that this aging trend will continue, posing challenges for healthcare, pensions, and sustaining a productive workforce. According to the National Institute of Population and Social Security Research (IPSS), Japan's population aged 65 and over was 23.0% in 2010 and is projected to rise to 30.0% by 2025 (Inoue & Inoue, 2024), necessitating a focus on specialized services and products for the elderly.

Similarly, Malaysia is undergoing a demographic transition, with the percentage of its population aged 60 and above increasing from 6.2% in 2000 to 11.1% in 2020, and projected to reach 15.3% by 2030 (Abdullah, 2024). In Malaysia, the aging population is increasing at a fast pace, though it is still at an earlier stage compared to Japan. Malaysia became classified as an "aging society" in 2020, when the proportion of people aged 65 and above reached 7%. By 2044, this demographic will make up 14% of the total population, turning Malaysia into an "aged society." By 2056, Malaysia is expected to be a "super-aged society," with over 20% of the population above 65 years old. The rapid aging of populations in Japan and Malaysia is creating challenges like limited job opportunities, strained healthcare systems, and concerns about financial security for older adults. With fewer young people entering the workforce and slower population growth, economic growth could slow down significantly by 2050 (World Bank Group, 2025).

As the number of elderly people grows, there's an increasing demand for products that make life more comfortable, safe, and manageable for older adults. In Japan and Malaysia, older individuals often face difficulties with mobility, accessing healthcare, and feeling included in society. This highlights the need for products designed with accessibility, ease of use, and comfort in mind. Creating such products is vital to improving the quality of life for older adults, helping them stay independent and supporting their overall well-being. Issues like reduced mobility, health concerns, and safety risks call for ergonomic, user-friendly, and comfortable solutions. This study is driven by the chance to design products that enhance the lives of elderly individuals, ensuring they feel safe, independent, and cared for. By blending traditional craftsmanship with modern design, this project celebrates the cultural heritage and expertise of both Japan and Malaysia. This collaboration can inspire similar efforts elsewhere, showing how shared values and resources can tackle common challenges.

This research on bamboo-based products for the elderly offers a compelling example of cross-cultural innovation, blending traditional materials with modern needs. It not only addresses the practical and ergonomic needs of aging populations in Japan and Malaysia but also taps into cultural values and sustainability to tackle global issues. Using bamboo as a core material supports the global shift toward eco-friendly solutions. Bamboo grows quickly, is renewable, and absorbs a lot of carbon, making it a greener alternative to materials like plastic or metal. For centuries, bamboo has been used in traditional construction, and today it's found in high-quality structures like schools, villas, hotels, and public spaces (Bredenoord, 2024). By showing how a time-tested material can meet contemporary needs, this research promotes environmental responsibility and

supports the growth of sustainable industries. It could inspire other countries facing similar aging trends to explore sustainable materials for products designed for older adults. The study also aims to contribute to global conversations about aging by creating a research model that weaves together cultural relevance, sustainability, and modern design. This project sets a strong example for other nations dealing with aging populations.

2. Literature Review

Bamboo's cultural importance and practical qualities in Malaysia

Bamboo holds a special spot in Malaysia's heart, woven deeply into daily life, traditions, and the environment. It's been a cornerstone for Malays, indigenous groups, and other communities, shaping everything from traditional homes to handicrafts and even food. Its eco-friendly nature and versatility make it a go-to material for both old-school and modern uses. In traditional Malay and indigenous architecture, bamboo's lightweight yet sturdy qualities shine. Rural folks rely on it to build homes, bridges, and even boats. Research from Noor Hanita Majid and Mohd Afiq Rosali (2025) highlights how indigenous communities in Peninsular Malaysia use bamboo for homes that stay cool and airy in the tropical heat. Over in Sabah and Sarawak, it's a key material for longhouses, where entire communities live together.

Beyond construction, bamboo sparks creativity in Malaysian handicrafts and art. Malay artisans weave it into stunning baskets, mats, and household items that are as practical as they are meaningful, carrying cultural and economic weight. Indigenous groups like the Iban and Kadazandusun craft bamboo into beautiful, functional pieces too. It even finds its way into music, shaping instruments like the Angklung, a traditional percussion piece, and the Seruling, a soulful bamboo flute (Rahim & Idrus, 2018). And let's not forget its role in Malaysian cuisine, where bamboo adds a unique touch to dishes. Bamboo shoots, also known as "rebung," are commonly used in recipes such as "Masak Lemak Rebung", which is a coconut milk-based meal with turmeric and chili. Bamboo is also utilized as a cooking vessel, as seen in "Lemang", a popular meal prepared with sticky rice and coconut milk and cooked within a bamboo stalk over an open fire (Mohd Nazri Abdul Raji, 2017). The natural qualities of bamboo add a distinct flavor to various recipes. Beyond eating, bamboo has spiritual and ceremonial significance in Malaysian culture. The Dayak population of Sarawak celebrates the Gawai Festival, which includes bamboo in its rituals and traditional dances. Some indigenous communities employ bamboo in wedding rituals and healing procedures, believing it has protective and purifying characteristics.

Research by Mabin Ab Aziz (2022) revealed that bamboo's environmental benefits and sustainability have led to its increased use in modern applications. Bamboo, a quick renewable resource, is being promoted as an environmentally friendly alternative to lumber in construction, furniture manufacturing, and even textiles. Because of its ability to absorb huge volumes of CO2, the Malaysian government and environmental organizations promote the use of bamboo in reforestation programs and carbon offset initiatives. In terms of material science, bamboo has outstanding physical qualities that make it highly practical (Pimid & Thevan, 2024). It has a high strength-to-weight ratio, which means its tensile strength is comparable to steel. Its innate flexibility lets it bend without breaking, which is especially useful for building in earthquake-prone areas. Furthermore, bamboo's hollow form makes it light and easy to transport.

Bamboo's applications, environmental benefits, and sustainable use in Malaysia

Environmental Benefits

Bamboo is an environmentally favorable resource because of its rapid growth and renewable nature (Mabin Ab Aziz, 2022). Unlike hardwood trees, which take decades to mature, certain bamboo species reach full growth in just 3-5 years, giving them a more sustainable alternative to timber. This rapid regeneration helps to reduce deforestation while maintaining a steady supply of basic materials. Bamboo also plays an important role in carbon sequestration by absorbing significant amounts of CO2 and releasing more oxygen, which helps to mitigate climate change.

The plant's vast root system helps to conserve soil by avoiding erosion and stabilizing riverbanks, which is especially useful in Malaysia's mountainous regions. Its capacity to survive with little water and no chemical fertilizers makes it a good candidate for water conservation. Bamboo also promotes biodiversity since its forests provide natural homes for a variety of wildlife species, sustaining ecosystem balance while avoiding

habitat degradation.

Sustainable Use
Malaysia is progressively incorporating bamboo into eco-friendly construction and green building initiatives (Hashim & Tay, 2023). The material is being touted as a sustainable alternative to cement and steel, for product design and with potential use in prefabricated homes and eco-resorts. Bamboo farming is supported by government policies as well as NGOs' activities to encourage reforestation efforts and long-term economic development. Farmers are encouraged to plant bamboo as a cash crop, reducing reliance on existing timber companies and establishing new revenue streams. According to Kaur and PerminderJit (2022), bamboo's sustainability is further enhanced by its integration into the circular economy. Waste from bamboo-based companies is recycled into biochar, compost, and even animal feed, resulting in little resource waste. Bamboo is finding new applications in high-tech fields such as biodegradable polymers, carbon fiber composites, and water filtration systems, thanks to research and innovation. Universities and research institutions continue to look for ways to improve bamboo's durability and efficiency.

Notably, bamboo's environmental benefits and sustainable applications make it an important resource for Malaysia's future. Its quick growth, carbon sequestration capabilities, and little environmental effect all contribute to ecological protection. With proper management, technical developments, and regulatory backing, bamboo has the potential to play an important part in Malaysia's transformation to a greener, more sustainable economy.

Bamboo-based Industry in Japan

Cultural significance and material properties of bamboo in Japan
Bamboo (take, 竹) has a strong cultural and spiritual importance in Japan, representing strength, flexibility, and tenacity (Pincus, 2023). Its ability to bend without breaking exemplifies the Japanese philosophy of adjusting to adversities while retaining inner strength. Because of this, bamboo is frequently associated with perseverance and endurance, making it a significant emblem in Japanese art, literature, and daily life. According to Japanese folklore, bamboo has protective properties that ward off evil spirits and offer good fortune. Many Shinto shrines and Buddhist temples employ bamboo fences and decorations to create a sacred and purifying environment. Bamboo is used in Kadomatsu, a traditional New Year's decoration set at doors to provide prosperity and good luck for the following year (Bess & Wein, 2001). Bamboo is fundamental to many Japanese festivals and customs. During the Tanabata Festival, people write their wishes on colorful paper strips and hang them from bamboo branches, thinking that their dreams will come true. Another event, Kagami Biraki, includes cracking open a cask of sake housed in bamboo pots to represent new beginnings and good fortune.

Bamboo has long been used in Japanese product arts and crafts as well as household tools. Traditional tea ceremonies frequently include bamboo equipment such as tea scoops (chashaku) and whisks (chasen), which highlight the material's elegance and simplicity (Sun & Liu, 2022). Bamboo was also revered by Samurai fighters, who used it to make practice swords (shinai) and arrow shafts because of its resilience and flexibility. Moreover, bamboo is one of the fundamental components in Japanese gardens, contributing to the visual and spiritual balance of the areas. It is utilized for fences, paths, and water features like shishi-odoshi, which produces a rhythmic sound that adds to the serene ambiance of Zen gardens. The abundance of bamboo in these gardens demonstrates the Japanese respect for nature's balance and tranquility. According to Bess and Wein (2001), bamboo is widely used in Japanese culinary traditions, particularly in the form of young shoots (takenoko), which are a seasonal delicacy included in dishes such as miso soup and rice. Bamboo containers, chopsticks, and steamers are commonly used in Japanese cooking, demonstrating their versatility and eco-friendliness. These behaviors demonstrate how bamboo is completely integrated into both everyday living and cultural ceremonies.

Bamboo's elasticity and shock-absorbing properties make it perfect for construction, particularly in Japan's earthquake-prone areas. It can survive severe winds and seismic movements without breaking, which is why it has long been employed in traditional Japanese homes and modern eco-friendly buildings. Another prominent feature of bamboo is its natural antibacterial and water-resistant properties (Iroegbu & Ray, 2021). It includes antimicrobial chemicals that inhibit bacterial growth, making it acceptable for use in cookware,

fabrics, and flooring. Its biodegradability and renewability add to its reputation as a sustainable and environmentally beneficial material. Apparently, bamboo is an important aspect of Japanese culture, representing strength, purity, and harmony with nature. It is a valued and sustainable resource in Japan, with applications ranging from spiritual traditions, festivals, and cuisine to outstanding material capabilities utilized in construction and crafts. As the country adopts eco-friendly methods, bamboo remains a fundamental material that ties the past and the future, showing Japan's strong regard for the environment and culture.

Bamboo's applications, environmental benefits, and sustainable use in Japan

Environmental Benefits

Bamboo brings a wealth of environmental perks, cementing its role as a key player in Japan's push for sustainability. Its fast growth makes it a fantastic eco-friendly substitute for traditional timber (Akwada & Akinlabi, 2016). Even more impressive is bamboo's knack for soaking up large amounts of CO2 while releasing more oxygen than many trees, which makes it a powerful ally in the fight against greenhouse gas emissions. As Japan strives for carbon neutrality, planting more bamboo could be a game-changer in tackling climate change (Sokolowski & Kurokawa, 2024). Bamboo's sprawling root system does wonders for holding soil in place, curbing erosion, and protecting riverbanks, which is crucial in a country prone to heavy rains and typhoons that often destabilize the land.

Bamboo farming also shines for its minimal water needs. Unlike thirsty commercial crops, bamboo thrives with little irrigation and enriches the soil with organic matter, cutting down on chemical fertilizers. This makes it a stellar choice for sustainable farming and restoring degraded land in Japan. Plus, bamboo forests are havens for wildlife, supporting a variety of birds, insects, and small animals. Traditional bamboo groves across Japan nurture local ecosystems by offering food and shelter, helping maintain nature's balance while boosting conservation efforts. Expanding and preserving these forests is a win for both ecology and sustainability.

Sustainable Use

According to Akwada and Akinlabi (2016), Japan is wholeheartedly embracing bamboo as an eco-friendly resource, driven by government policies, private companies, and ongoing research. A key focus is sustainable construction, where bamboo's popularity is soaring as a greener alternative to steel and concrete. Its impressive strength, flexibility, and lightweight nature make it ideal for building structures that can withstand earthquakes—a must in Japan's quake-prone environment. On top of that, bamboo farming is gaining traction as a profitable venture, encouraging farmers to cultivate it as a cash crop and move away from industries that harm forests. Agroforestry efforts encourage responsible bamboo harvesting, which keeps bamboo forests productive while maintaining ecological balance. Furthermore, selective cutting and managed growth management serve to prevent bamboo overgrowth, which can occasionally affect native ecosystems.

In addition, bamboo is playing an increasingly important role in Japan's circular economy. Waste from bamboo-related businesses, such as building, furniture manufacturing, and paper production, is recycled into valuable goods such as biochar, compost, and biodegradable plastics (Iroegbu & Ray, 2021). This strategy reduces waste while maximizing bamboo's potential as a renewable resource. It appears that bamboo is important in Japan's attempts to conserve the environment and promote sustainability. Its quick growth, carbon absorption, soil protection, and biodiversity support make it a sustainable resource. At the same time, sustainable bamboo cultivation, environmentally friendly building, and creative bamboo-based goods help to reduce Japan's ecological footprint. With continuous investment in research, responsible harvesting practices, and government initiatives, bamboo has the potential to be a cornerstone of Japan's green future.

Cross-Cultural Comparison of Bamboo in Malaysia and Japan

Bamboo also has ritualistic significance in several Malaysian cultural rites, representing strength, unity, and persistence (Noor & Khoo, 2012). Bamboo is significant in both Malaysian and Japanese cultures, but its applications, symbolism, and long-term use vary depending on historical, environmental, and sociological circumstances. While both countries regard bamboo as an important resource for construction, crafts, and environmental conservation, their cultural interpretations and traditional applications reflect distinct aspects of their separate heritages. In Malaysia, bamboo is profoundly ingrained in traditional cultures and rural livelihoods (Mohd Zaihidee Arshad et al., 2014). In Malaysia, bamboo is deeply woven into the fabric of local

life, especially among indigenous groups like the Orang Asli. For generations, communities have relied on it to build homes, craft intricate handicrafts, and create musical instruments like the angklung and seruling. Even bamboo shoots, known as rebung, are a cherished ingredient in local dishes. Beyond its practical uses, bamboo holds a special place in cultural rituals, symbolizing strength, unity, and resilience, making it far more than just a plant—it's a way of life.

In Japan, bamboo carries a profound spiritual and artistic significance, as noted by Koji Matsunobu (2007). It embodies strength, purity, and flexibility, playing a central role in Shinto and Buddhist ceremonies. You'll often see bamboo fences or decorations at temples and shrines, believed to ward off evil spirits. Its elegance shines in Japanese garden designs, tea ceremonies (where it's crafted into tools like chasen and chashaku), and even martial arts with shinai practice swords. Bamboo's mystique also weaves through folklore, like The Tale of the Bamboo Cutter, a story that highlights its poetic and magical allure.

From an environmental standpoint, both Malaysia and Japan champion bamboo as a green, sustainable resource. In Malaysia, it's being promoted as an alternative to timber to combat deforestation, while in Japan, bamboo aids in reforestation and captures carbon. Both nations are also exploring innovative bamboo-based products, from biodegradable packaging and textiles to eco-friendly construction materials, to support sustainability efforts. Despite their unique cultural and ecological approaches, Malaysia and Japan share a deep respect for bamboo's economic, artistic, and environmental value. By sharing knowledge and practices, they can further develop bamboo industries, ensuring this remarkable plant continues to thrive for future generations.

3. Designing Bamboo Products for Malaysia and Japan's Elderly

Bamboo's incredible versatility makes it a cherished part of both Malaysian and Japanese cultures, with each country weaving it into their traditions in unique ways, especially when designing products for older adults. Exploring these approaches not only fosters cross-cultural understanding but also reveals how bamboo can enhance seniors' lives in meaningful ways. In Malaysia, bamboo furniture for the elderly is designed with both style and comfort in mind. Hamid et al. (2020) introduced the concept of "ergoaesthetic" design, which blends ergonomic support with visual appeal to create furniture that uplifts seniors' living spaces and supports their physical well-being. This approach carefully considers aesthetics, comfort, cultural values, and user behavior at every step. However, despite bamboo's clear benefits, it hasn't been widely embraced in Malaysian furniture production. Ratnasingam et al. (2020) point out that public unawareness of bamboo's advantages and reluctance from wood-based industries are holding things back. By raising awareness and promoting bamboo's potential, Malaysia could create more senior-friendly bamboo products that make a real difference.

In Japan, bamboo craftsmanship is steeped in tradition, blending practicality with minimalist elegance. Take bamboo walking canes, for example—they're lightweight yet sturdy, providing reliable support for seniors while reflecting cultural significance. Artisans at places like Oomiya Takezai Kogei have long crafted these items, prioritizing simplicity, natural beauty, and functionality. This philosophy resonates with older adults, offering products that are easy to use, visually pleasing, and deeply rooted in Japan's cultural heritage. By celebrating bamboo's unique qualities, Japan creates items that not only meet practical needs but also bring a sense of tradition and beauty to seniors' lives.

An Example of Bamboo-based Products

	Bamboo Rocking Chair A bamboo rocking chair, crafted with ergo-aesthetic principles, offers seniors both comfort and support. The natural flexibility of bamboo allows for a gentle, soothing rocking motion that can feel calming and rejuvenating. This chair beautifully marries Japan's appreciation for simple, natural materials with Malaysia's focus on ergonomic design, creating a piece that's both functional and inviting.
	Walking canes made of bamboo Elderly people can rely on bamboo walking canes for dependable support because they are strong and lightweight. Because of their innate flexibility, they can absorb shocks and lessen joint strain when moving.
	Scratchers for Bamboo Backs Bamboo back scratchers, which are ergonomically built with a gentle curve, improve comfort and independence by enabling elders to reach itchy regions without straining. Several businesses that specialize in bamboo products sell these objects, which are frequently found in traditional Japanese homes.
	Foot Massagers Made of Bamboo These massagers, which are made from smooth bamboo rods, encourage circulation and ease foot strain, helping older people relax and take better care of their feet. In Japan's health and wellness scene, bamboo foot massagers are a popular choice, offering a simple yet effective way to relax and soothe tired feet, though specific makers aren't mentioned in the sources provided.

	Bath Chairs Made of Bamboo Bamboo bath chairs, durable and naturally water-resistant, provide a safe and stable seating option for the bathroom, helping to prevent slips and falls during bathing. These chairs beautifully blend Japan's deep appreciation for bamboo craftsmanship with practical design, combining functionality with the warm, natural charm of the material.
	Tea Sets Made of Bamboo Bamboo tea sets, light and easy to handle, let seniors savor their tea rituals with comfort and charm. Rooted in Japan's rich tradition of bamboo tableware, these sets are lovingly crafted by artisans who keep this timeless art alive.

Looking at bamboo-based products designed for seniors in Japan and Malaysia reveals how deeply culture shapes design choices. By embracing these perspectives, designers can create items that not only meet the practical needs of older adults but also reflect the beauty and values of each culture, fostering collaboration and mutual understanding across borders.

4. Proposed Bamboo-Based Product for the Elderly

When creating bamboo products for older adults, we need to think about sustainability, comfort, cultural fit, and ease of use. These ideas can either improve existing products or introduce entirely new ones. The Smart Bamboo Walking Stick is a standout example of a fresh, innovative design for seniors. It blends modern technology with bamboo's natural strengths to enhance mobility and safety for older users.

The Smart Bamboo Walking Stick is lightweight yet strong, thanks to bamboo's durability, making it easy for seniors to carry and use. Its ergonomic handle is designed to fit comfortably in the hand, reducing strain and ensuring a secure grip even after long periods of use. Built-in LED lights help light up dark areas, making it safer for seniors to move around and lowering the risk of trips or falls. The stick also includes fall detection sensors that can sense sudden movements and instantly alert caregivers or emergency services if something goes wrong. Plus, a GPS tracker can be added to let family members or caregivers keep an eye on the user's location, offering extra peace of mind. By combining traditional bamboo craftsmanship with cutting-edge technology, this smart walking stick promotes safety, independence, and eco-friendliness for seniors.

5. Conclusion

In wrapping up, bamboo holds a special place in Malaysia's heart, weaving together its cultural, economic, and environmental fabric. From its use in traditional architecture, crafts, food, and product design to its role in time-

honored customs, bamboo's versatility shines through. It's a vital resource that bridges Malaysia's rich heritage with modern innovation, thanks to sustainable practices and new technologies. Collaborating on cross-cultural designs can also spark global connections and inspire creative exchanges. As Wan (n.d.) points out, design has a universal charm that brings people together, no matter where they're from. To top it all off, the Smart Bamboo Walking Stick is a game-changer for seniors, blending cutting-edge tech with classic bamboo craftsmanship to boost mobility and safety. With features like fall detection sensors, GPS tracking, a comfy ergonomic grip, a sturdy bamboo frame, and built-in LED lights, this design thoughtfully meets the practical and safety needs of older adults. Beyond its practical use, the walking stick encourages sustainability and cultural significance because bamboo is a readily available and environmentally friendly material. This innovation gives family members and caregivers peace of mind in addition to enabling seniors to walk freely. Smart assistive devices like this walking stick will be essential to ensuring that the elderly live safer, more comfortable, and more dignified lives as the world's population ages.

References

Abbas, M. Y., & Saruwono, M. (2012). Our 'Golden' citizens with 'Golden' facilities? *Procedia - Social and Behavioral Sciences, 49*, 127. https://doi.org/10.1016/j.sbspro.2012.07.012

Abdullah, J. M., Ismail, A., & Yusoff, M. S. B. (2024). Healthy ageing in Malaysia by 2030: Needs, challenges and future directions. *Malaysian Journal of Medical Sciences, 31*(4), 1–13. https://doi.org/10.21315/mjms2024.31.4.1

Ab Aziz, M. A. B. (2022). *Application of bamboo as a sustainable building material for reducing carbon footprint in Malaysia* [Doctoral dissertation, Universiti Teknologi Malaysia].

Akwada, D. R., & Akinlabi, E. T. (2016, July). Economic, social and environmental assessment of bamboo for infrastructure development. In *International Conference on Infrastructure Development in Africa* (pp. 1–15).

Al Jazeera. (2024, September 16). Japan's elderly population rises to a record 36.25 million. *Al Jazeera and News Agencies*. https://www.aljazeera.com/economy/2024/9/16/japans-elderly-population-rises-to-record-36-25-million

Arshad, M. Z., Il, I. M., & Ibrahim, A. H. (2014). Sarawak bamboo craft: Symbolism and phenomenon. In *SHS Web of Conferences* (Vol. 5, p. 00002). EDP Sciences.

Azeez, M. A., & Orege, J. I. (2018). Bamboo, its chemical modification and products. In *InTech eBooks*. https://doi.org/10.5772/intechopen.76359

BERNAMA. (2022, October 2). Coordinate bamboo industry management to boost commercial potential. https://www.bernama.com/en/news.php?id=2122007

Bess, N. M., & Wein, B. (2001). *Bamboo in Japan*. Kodansha International.

Bredenoord, J. (2024). Bamboo is a sustainable building material for innovative, low-cost housing construction. *Sustainability, 16*(6), 2347. https://doi.org/10.3390/su16062347

Brunner, K., Ada-Katrin, B., & Händler-Schuster, D. (2021). Exploring health-related needs of elderly people (70+) at home: A qualitative study from Switzerland. *Journal of Primary Care & Community Health, 12*. https://doi.org/10.1177/21501327211055635

Chang, H. Y. (2024). Cross-cultural bamboo craft design collaboration: An interview review of Taiwanese design assistants and Nicaraguan craftsmen. In Tsai, T. W., Chen, K., Yamanaka, T., Koyama, S., Schütte, S., & Mohd Lokman, A. (Eds.), *Kansei Engineering and Emotion Research,* 2314, 204–216. Springer. https://doi.org/10.1007/978-981-97-9910-7_18

Credence Research. (2024). *Japan bamboo market 2024–2032*. https://www.credenceresearch.com/report/japan-bamboo-market

Emamverdian, A., Ding, Y., Ranaei, F., & Ahmad, Z. (2020). Application of bamboo plants in nine aspects. *The Scientific World Journal,* 7284203. https://doi.org/10.1155/2020/7284203

Hamid, A. G. A., Abd Rahman, K. A. A., & Zainal Abidin, M. E. (2020). Ergo-aesthetic concept design approach among bamboo furniture manufacturers in Malaysia. *International Journal of Advanced Research in Engineering and Technology, 11*(9), 167–176.

Hamid, A. R. A., Muhamad, N., Zakaria, R., Aminuddin, E., Alwee, A. A., & Tok, A. (2018). The challenges of the ageing population on the Malaysian construction industry. *Journal of Physics: Conference Series, 1049*, 012034. https://doi.org/10.1088/1742-6596/1049/1/012034

HASHI Consulting. (2019). *Innovation in super-aging Japan*.

https://www.academia.edu/44355900/ERGO_AESTHETIC_CONCEPT_DESIGN_APPROACH_AMONG_BAMBOO_FURNITURE_MANUFACTURERS_IN_MALAYSIA

Hashim, N., & Tay, P. Y. (2023). The Influence of Sustainable Building Materials in Malaysia. *MAJ-Malaysia Architectural Journal*, *5*(1), 63-74.

Inoue, T., & Inoue, N. (2024). The future process of Japan's population aging: A cluster analysis using small area population projection data. *Population Research and Policy Review, 43*, 58. https://doi.org/10.1007/s11113-024-09903-5

Iroegbu, A. O. C., & Ray, S. S. (2021). Bamboos: From bioresource to sustainable materials and chemicals. *Sustainability, 13*(21), 12200.

Kaur, P. J., Yadav, P., Gupta, M., Khandegar, V., & Jain, A. (2022). Bamboo as a source for value-added products: Paving the way to global circular economy. *BioResources, 17*(3), 3676–3696.

Matsunobu, K. (2007). *Spiritual arts and education of "less is more": Japanese perspectives, Western possibilities*. *Journal of the Canadian Association for Curriculum Studies, 5*(1), 103–119. https://doi.org/10.25071/1916-4467.17028ResearchGate+4

Majid, N. H. A., & Rosali, M. A. (2025). Discovering the wisdom of the Orang Asli traditional dwellings: Typologies formation through physical characteristics. *Engineering Proceedings, 84*(1), 48.

Mansor, M., & Harun, N. Z. (2014). Health issues and awareness, and the significance of green space for health promotion in Malaysia. *Procedia - Social and Behavioral Sciences, 153*, 209–220. https://doi.org/10.1016/j.sbspro.2014.10.055

Matsunobu, K. (2007). Japanese spirituality and music practice: Art as self-cultivation. In *International Handbook of Research in Arts Education* (pp. 1425–1442). Springer.

Mohammad, N. M. N., & Abbas, M. Y. (2012). Elderly environment in Malaysia: Impact of multiple built environment characteristics. *Procedia - Social and Behavioral Sciences, 49*, 120–126. https://doi.org/10.1016/j.sbspro.2012.07.011

Mohd Nazri Abdul Raji, et al. (2017). Past and present practices of the Malay food heritage and culture in Malaysia. *Journal of Ethnic Foods, 4*(4), 221–231.

Mohd Zaihidee Arshad, Izani Mat Il M. Hum & Abd. Halim Ibrahim. (2014). *Sarawak bamboo craft: Symbolism and phenomenon*. SHS Web of Conferences, 5, 00002. https://doi.org/10.1051/shsconf/20140500002

Neha, P., & Aravendan, M. (2023). A review on sustainable product design, marketing strategies and conscious consumption of bamboo lifestyle products. *Intelligent Information Management, 15*(3), 67–83. https://doi.org/10.4236/iim.2023.153005

Noor, F., & Khoo, E. (2012). *Spirit of wood: The art of Malay woodcarving*. Tuttle Publishing.

Noor, S., Isa, F. M., & Muhammad, N. M. N. (2021). Silent scream of Malaysian elderly: A case study in Noble Care ageing centres. *Research on Ageing and Social Policy*. https://doi.org/10.17583/rasp.2021.6388

Oentoro, K., & Wiyatiningsih, W. (2021). Bamboo furniture design development using newspaper as an environmentally friendly product in Sleman Regency. *Advances in Social Science, Education and Humanities Research, 608*, 89–93. https://doi.org/10.2991/assehr.k.211228.017

Petermans, A., & Cleempoel, K. V. (2010). Designing a retail store environment for the mature market: A European perspective. *Journal of Interior Design, 35*(2), 21–36. https://doi.org/10.1111/j.1939-1668.2009.01036.x

Pimid, M., & Thevan, K. (2024, December). Expert panel opinions on carbon sequestration through bamboo utilisation in Malaysia: Rehabilitation of tin mines. In *IOP Conference Series: Earth and Environmental Science,* 1426(1), 012012. IOP Publishing.

Pincus, L. (2023). *Authenticating culture in imperial Japan: Kuki Shuzo and the rise of national aesthetics* (Vol. 5). University of California Press.

Ramely, A., Ahmad, Y., & Harith, N. H. M. (2022). The effects of Malaysian older people's participation and engagement in the local labour market. *Malaysian Journal of Social Sciences and Humanities (MJSSH), 7*(7). https://doi.org/10.47405/mjssh.v7i7.1685

Ratnasingam, J., Ioras, F., & Wenming, L. (2020). Bamboo furniture: The sustainable future for the Malaysian furniture industry. *UTHM News*. https://news.uthm.edu.my/en/2024/09/bamboo-furniture-the-sustainable-future-for-malaysian-furniture-industry/

Rahim, W. R. W. A., & Idrus, R. M. (2019). Importance and uses of forest products, bamboo and rattan: Their value to the socioeconomics of local communities. *International Journal of Academic Research in Business and Social Sciences, 8*(12), 1484–1497.

Siti, S. B. S., Abdul, H. P. S., Wan, W., & Jawai, M. (2013). Bamboo-based biocomposites: Material, design and

applications. *InTech eBooks*. https://doi.org/10.5772/56057

Sokołowski, M. M., & Kurokawa, S. (2021). The bamboo that bends is stronger than the oak that resists: Active energy consumers in Japan. In *Routledge Handbook of Consumer Protection and Behaviour in Energy Markets* (pp. 356–367). Routledge.

Stanley, S., & Sebastine, A. J. (2023). Work-life balance, social support, and burnout: A quantitative study of social workers. *Journal of Social Work, 23*(6), 1135–1150. https://doi.org/10.1177/14680173231197930

Sun, Y., & Liu, X. (2022). How design technology improves the sustainability of intangible cultural heritage products: A practical study on bamboo basketry craft. *Sustainability, 14*(19), 12058.

Tan, T. H. (2022). Perceived environmental attributes: Their impact on older adults' mental health in Malaysia. *International Journal of Environmental Research and Public Health, 19*(6), 3595. https://doi.org/10.3390/ijerph19063595

Tey, N. P., Siraj, S. B., Kamaruzzaman, S. B., Chin, A. V., Tan, M. P., Sinnappan, G. S., & Müller, A. M. (2015). Aging in multi-ethnic Malaysia. *The Gerontologist, 56*(4), 603–609. https://doi.org/10.1093/geront/gnv153

Vedel, I., Kaur, N., Hong, Q. N., Sherif, R. E., Khanassov, V., Godard-Sebillotte, C., Sourial, N., Yang, X. Q., & Pluye, P. (2018). Why and how to use mixed methods in primary health care research. *Family Practice, 36*(3), 365–368. https://doi.org/10.1093/fampra/cmy127

Wan, W. (n.d.). Exploring cross-cultural connections through traditional design. *Japan Insights*. https://www.japan-insights.jp/stories/stories07.html

WHO. (2024). Ageing and health. Fact Sheets. World Health Organization. https://www.who.int/news-room/fact-sheets/detail/ageing-and-health#:~:text=At%20this%20time%20the%20share, 2050%20to%20reach%20426%20million.

Woo, J., Mok, K., Chu, W. L., Lo, R. C., & Ko, R. C. (2024). Implementing aging in place in Hong Kong: Meeting the needs and aspirations of older adults and their caregivers living in private housing. *International Journal of Environmental Research and Public Health, 21*(3), 348. https://doi.org/10.3390/ijerph21030348

World Bank Group. (2025). Global Economy Set for Weakest Run Since 2008 Outside of Recessions. PRESS RELEASE NO: 2025/075/DEC. https://www.worldbank.org/en/news/press-release/2025/06/10/global-economic-prospects-june-2025-press-release#:~:text=Finally %2C%20to%20accelerate%20economic%20growth,conflicts%2C%20emergency%20relief%20and %20support.&text=Regional%20Outlooks:,For%20more%2C%20see%20regional%20overview.

Yadav, M., & Mathur, A. (2021). Bamboo as a sustainable material in the construction industry: An overview. *Materials Today: Proceedings, 43*, 2872–2876. https://doi.org/10.1016/j.matpr.2021.01.125

Yang, S., Nie, H., & Fang, H. (2017). Study on the characteristics of Japanese bamboo product design. *Advances in Intelligent Systems and Computing, 586*, 464–471.

Yi, C., & Feng, X. (2021). Home interactive elderly care two-way video healthcare system design. *Journal of Healthcare Engineering,* 6693617. https://doi.org/10.1155/2021/6693617