
Bamboo play: Eco-friendly game design

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ABSTRACT

This study aims to explore in depth the process of creating games that serve as a tribute to the quality of regional craftsmanship while simultaneously promoting play that is environmentally conscientious. It carefully evaluates the suitability of using bamboo and other environmentally friendly materials to create games that are exceptional in terms of their longevity, safety, and visual appeal. Stressing the amazing qualities of bamboo, like its quick growth and flexibility, the study reveals a game that has been meticulously constructed through the design process. This research intends to promote a culture of sustainable development and improve the bamboo craft community by including craftspeople at every level, from design conception to production. It imagines a time when games are used to promote positive social and environmental change in addition to providing entertainment. This research paves the way for a more promising, socially conscious, and economically active future by supporting local artistic talent and advancing economic development.

Keywords - Socially responsible game design, Sustainable material, Bamboo product design, Eco-friendly play, Environmental concern, Local craftsmanship promotion, Bamboo packaging.

1. Introduction

1.1 Sustainability

The concept of sustainability is the utilisation of resources to fulfil current demands without endangering the capacity of generations to come to fulfil their own needs. It involves taking decisions and acting in a way that takes the long-term impact on the economy, society, and environment into account. To ensure a healthy and sustainable future for all, it basically comes down to living and working in a way that preserves balance and harmony with the earth and its resources. (Mollenkamp & Daniel, 2023)

Let's delve into the "Reduce, Reuse, Recycle." (Earthreminder, 2020) (homework.study, 2024)

Reduce: To use less is to do this. Watch how much you consume. For instance, choose things with minimal packaging, use as little water as necessary, and try to use less electricity. You may lessen waste production and contribute to resource conservation by lowering.

Reuse: Look for ways to repurpose items rather than discarding them after only one usage. As an illustration, you can reuse a cardboard box for storage or use a water bottle several times. Reusing things lowers the demand for new creations, saving resources and energy.

Recycle: Recycling is the process of creating new goods from discarded materials. Many materials, including paper, glass, plastic, and metal, can be recycled. Recycling helps create new items without consuming any resources.

1.2 Game design

A child's growth is greatly aided by games, which not only offer enjoyment but also help to develop social, motor, and cognitive abilities. A significant aspect that affects a child's experience and learning is the design of the games. Furthermore, because of environmental concerns, the significance of sustainability in game design has grown in recent years. (Denis A. Coelho, 2013) Development of Children and game design plays an important role in children's cognitive development and is enhanced by games that promote creativity, critical thinking, and problem-solving. Also in physical development, Playthings that require physical exercise, such as sports equipment, puzzles, and building blocks, improve motor skills and coordination. Playthings that encourage social interaction, cooperation, and communication skills include cooperative play sets and board games (Mary Barreto, 2013). Game design plays a crucial role in children's development and environmental sustainability. Firstly, ensuring age-appropriate design is vital for safety and effective learning, aligning toys with the child's developmental stage. Secondly, games should be engaging and interactive to captivate children's interest and foster curiosity, enhancing their learning experience. Lastly, designing sustainable games with eco-friendly materials like biodegradable substances, recycled plastic, or sustainable wood reduces environmental impact, promoting a healthier planet for future generations. By integrating these principles into toy design, manufacturers can contribute positively to children's growth while minimising ecological harm (Muturi & Maureen, 2023). Creating durable and long-lasting games not only promotes extended playtime but also fosters a sustainable consumer culture by reducing the need for frequent replacements. Sustainable packaging practices, such as minimising plastic usage and opting for recyclable materials, contribute to waste reduction associated with game packaging. Moreover, incorporating educational content that promotes environmental consciousness and sustainability education helps nurture a generation of environmentally aware individuals who are poised to become future environmentalists. These practices collectively support the goal of fostering a more environmentally conscious society through game design and consumption.

1.3 Tic-Tac-Toe

Noughts and crosses, or X's and O's, is another name for the straightforward strategic game tic tac toe, which has its origins in antiquity. A variation of the game was played as early as 1300 BCE in ancient Egypt, where its origins can be found. A board game that looked like tic tac toe was found by archaeologists on the roof of the Temple of Seti I in Egypt. Over the ages, the game changed and emerged in many forms in many cultures. A grid and stones were used in a game called "Terni lapilli," which was played by the ancient Romans. Tic-tac-toe and a game known as "Nine men's Morris" were played in mediaeval England. But the tic tac toe game as we know it today actually originated in the 19th century. During this time, the game gained popularity in the US and was frequently played on paper or chalkboards. The sound of the X's and O's being placed on the board gave rise to the game's moniker, tic-tac-toe. The game tic tac toe gained popularity and accessibility, and it was frequently utilised as a basic teaching aid for pattern detection and strategy. Because of its simplicity, both adults

and kids like doing it as a pastime. Tic tac toe was one of the first games to be developed for early computers when computers first came out in the 20th century and made their way into electronic versions. Even though it's so basic, tic tac toe is nevertheless a beloved game that people play all around the world. (Aurosi, 2019), (Kanungo, 2022).

1.4 Game design from sustainable materials

Games crafted from sustainable materials, particularly bamboo, offer a commendable step towards eco-conscious play. Bamboo's remarkable attributes, including rapid growth, renewability, and inherent strength, make it an ideal choice for toy manufacturing. Embracing bamboo reduces dependence on conventional plastics, contributing significantly to environmental preservation (Erenjoy, 2023).

1.5 Bamboo of Northeast India

With an annual production of 3.23 million tons, India is the second-richest nation in the world in terms of bamboo genetic resources, after China. Our forest of bamboo is cultivated over an area of over fourteen million hectares. The fastest growing plant is the bamboo, which is a member of the grass family Poaceae (Gramineae) and is also known as the poor man's timber. The bamboos, which are found all over our country, are important forest species. It oversees the rural economic development contribution in our nation. The vast array of bamboo resources found in the North-Eastern regions of India is essential to the food and nutritional security of the tribal area. The North-East states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, and the Western Ghats are home to around 50% of the world's bamboo species (Bamboo the 'Green Gold' of North East, 2021).

2. Review of Literature

In India, bamboo has a lot of potential for usage as a feedstock for bioenergy production if it is gathered, maintained, and thoughtfully prepared. Bamboo can be found everywhere, is well-liked by the community, grows quickly, is adaptable, stores and sequesters carbon quickly, can be grown in degraded soil, and provides superior fuel qualities for traditional bioenergy production (Rashmi Rathour, et al., 2022). The decline in the bamboo industry has resulted in a large number of bamboo technical talents moving to other industries, which has led to the departure of traditional bamboo craftsmen. According to (Yanmin & Shuisheng, 2015), traditional bamboo craftsmanship is in danger of disappearing. The dearth of bamboo craftsmanship abilities, and the prevalent absence of inventiveness in traditional craftsmanship, among other issues. Influence of innovation education on bamboo product innovation index. He thought that innovative skills were a must for craftspeople. The design of contemporary bamboo products can inherit, understand, and apply bamboo culture through an awareness of the culture or from the perspective of regional culture, explore the ontological value of bamboo culture, and foster innovative vitality, according to (Xudong & Aihua, 2009); (Xiaolu, Xinzhu, & Xueting, 2019).

A wide range of factors influence a product's ability to be designed from bamboo. bamboo culture, encompassing both material and spiritual aspects; bamboo materials, encompassing physical and ecological attributes; and bamboo craftsmanship, encompassing handicrafts. Mechanical technology, technology, and these three areas are the unique components that set them apart from other material

goods. various bamboo kinds will have various materials. Bamboo product design and material selection are influenced by various factors such as physical structure, toughness, growing year, and so forth. In (Zongdeng & Hongying, 2017)The information currently accessible regarding the processing method indicates that, in addition to standard processing and forming procedures like sawing, profiling, planning, weaving, etc., there are also reconstituted bamboo forming procedures and bamboo-wood composite laminated wood forming procedures. (Xiaokai,, 2009)

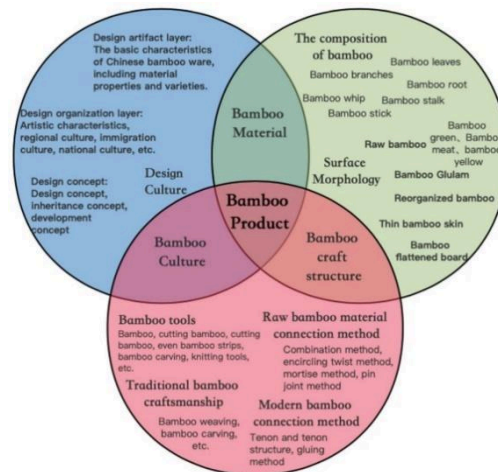


Figure 1 - Bamboo products in modern life
Source: (Xue, Khairul, Noor, & Noor, 2022)

As shown in fig. 1.,in addition to meeting people's wants for bamboo products in modern life, the study focuses on user needs and assists the bamboo industry in defining the market positioning of products. In addition to elevating bamboo goods' design value, it also plays a part in advancing the incorporation of sustainable design and development principles. (Xue, Khairul, Noor, & Noor, 2022)

In terms of genetic resources pertaining to bamboo, India ranks second globally (Depuydt, et al., 2018).India is the country that produces about 25% of the bamboo worldwide. plants, found in nearly all provinces. In India, the Northeast and Western Ghats are the most popular places for bamboo cultivation. Bamboo is produced at a rate of about 4.6 million tone's (Mt) per year, averaging 0.33 t, and varying from 0.2 to 0.4 t ha⁻¹. Thirteen percent of the nation's total forest sector is made up of bamboo. The predicted area of the nation that can produce bamboo is 160,037 km². There has been a 3229 km² rise in the area used for bamboo production, as per the India State of Forest Report (ISFR) 2017 (Sirsat, Raut, & Raut, 2021). Maharashtra has 11,465 km² of land suitable for growing bamboo, according to the Forest Survey of India (FSI) report, with the Vidarbha region providing more than 90% of the world's bamboo biomass (Rane, Narkhede, Dalvi, & Dalvi, 2018). Despite controlling 31.1% of the world's total bamboo producing territory, India accounts for only 4.5% of the projected \$12,000 million worldwide bamboo sector (Dabas & Kumar, 2018).

According to some academics, craftsmen's outdated technology and way of thinking are the primary obstacles preventing the growth of bamboo products (Min Jun & Yue, 2016). (Brata, 2009)used the

example of bamboo handicrafts to highlight the need of education and to examine the industry from the viewpoint of artisans. Though the coverage is limited and more of a formality, many professionals, academics, and the government have started to pay attention to the preservation and transmission of traditional craftsmanship in recent times. One of the key reasons for this is that, from a design standpoint, the research intervention is rather inadequate. (Xiaolu, Xinzhu, & Xueting, 2019)

3. Research Design Methodology

3.1 Design Process

The method used to create this product was called the Double Diamond design process. Discover, define, develop, and deliver are its four stages. During the discovery phase, designers investigate and comprehend the issue area, obtaining knowledge and understanding to guide their strategy. After that, they synthesis the data to describe the problem statement precisely, frame the challenge, and comprehend user demands during the defined phase. During the development phase, designers explore different options and use ideation and prototyping to generate prospective solutions. Ultimately, during the delivery phase, designers turn concepts into workable solutions, honing and reworking prototypes to get them ready for launch. To effectively address design difficulties and produce significant solutions, this technique balances divergent and convergent thinking.

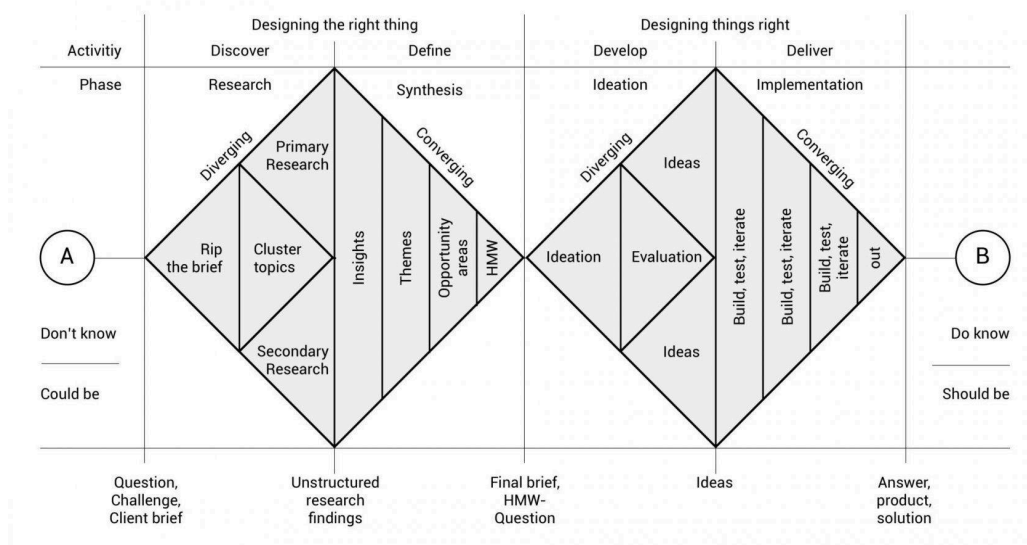


Fig. 2. Double diamond design process (Nessler, 2016)

Source: <https://medium.com/digital-experience-design/how-to-apply-a-design-thinking-hcd-ux-or-any-creative-process-from-scratch-b8786efbf812>

3.2 Discover

From secondary research it was found that, the potential of bamboo as a sustainable resource for robust, secure, and aesthetically pleasing games and the process of making games combines local artistry with environmentally responsible concepts. By putting an emphasis on social responsibility and creativity, the project aims to rethink games as catalysts for societal and environmental improvement. Meanwhile, encouraging bamboo crafts goes beyond just producing games; it also

gives regional craftspeople access to markets. communities can attain sustainable growth while safeguarding their natural resources and cultural legacy.



Fig.3. Man with bamboo on a tree (Source: *shutterstock.com*)

As shown in fig.3, A man is using a long bamboo pole and rope to climb a tall palm tree in the picture's rural environment. This scenario perfectly captures the creativity and fortitude that are characteristic of rural areas, where people creatively approach daily tasks by employing traditional ways. Man's ascension, set against a background of verdant foliage, represents the enduring bond between humans and the environment and draws attention to the harmony and symbiosis inherent in customary activities. Viewers are encouraged to appreciate the strength and simplicity of rural life through this image, where obstacles are overcome with creativity and tenacity.

3.3 Define

Drawing inspiration from the picture, drew a representation of a product intended for tourists and kids. This creative product uses bamboo packaging, which is consistent with environmentally friendly methods. A portable game of tic tac toe is contained inside a scroll. The wooden game pieces give the experience a more organic feel. Families looking for interactive entertainment on the road as well as environmental enthusiasts will like this combination of vintage games and eco-friendly packaging. It's an enjoyable and sustainable combination that appeals to a wide range of customers and enhances the travel experience. This innovative product can also serve as a souvenir for tourists. As visitors engage with the game, they not only enjoy a fun activity but also take home a meaningful keepsake from their journey. This dual-purpose nature enhances its value as both a travel accessory and a memento of the unique experiences found in Northeast India.

3.4 Develop

3.5 Product sketches



Fig. 4 Overall product
Source: Author

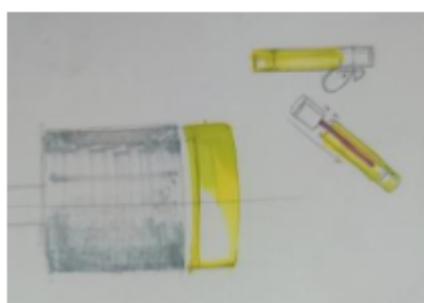


Fig.5 Sketch 1
Source: Author



Fig. 6 Sketch 2
Source: Author



Fig. 7 Sketch 3
Source: Author

As shown in fig.5, fig.6, fig.7 bamboo game products, intricate designs that highlight key apertures and provide plenty of space for branding to improve the overall viewing experience. These illustrations show the structural layout as well as the positioning of different components and optimal impact and visibility. maximise both practicality and visual appeal by carefully organising the positioning of apertures and branding areas in the designs, resulting in an eye-catching product presentation that appeals users.

3.6 Making Process



Fig. 8. Making appropriate length
Source: Author



Fig. 9. Opening clamp
Source: Author

As shown in fig.8 and fig. 9, various stages are involved in making this product. First, bamboo gets cut to the appropriate lengths, widths, and diameters; different species are selected according to how well they work for uses. For shaping and manufacturing the bamboo pieces, tools including hand saws, chisels, hammers, and bamboo carving knives are necessary. When making bamboo games, exact measurements are essential to guarantee that the bamboo is of the right height to fit scroll. This can be done with rulers or tape measures. All things considered, producing exquisite and useful products from bamboo demands expertise, perseverance, and attention to detail.

3.7 Deliver



Fig. 10. Top opening
Source: Author



Fig. 11. Game pieces
Source: Author



Fig. 12 Tic-Tac-Toe scroll
Source: Author



Fig. 13 Final Product
Source: Author

As shown in fig.10, fig.11, fig.12 and fig.13, the game developed is meant for both tourists and kids. It adheres to environmental principles by including new features, such as bamboo packaging. A scroll holding a portable game of tic tac toe is enclosed in it, providing entertainment for on-the-go. The wooden components in the game add to the overall natural feel of the encounter. This combination of a classic game with eco-friendly packaging appeals to families looking for engaging travel entertainment as well as eco-conscious individuals. It targets a broad audience and improves the travel experience in a way that strikes a balance between sustainability and fun.



Fig. 14. Taking out scroll
Source: Author



Fig. 15. Dividing pieces
Source: Author



Fig. 16. Scroll set up
Source: Author



Fig. 17. Enjoying and playing
Source: Author



Fig. 18. Pack up
Source: Author

It is imperative to undertake product testing as shown in fig.14, fig.15, fig.16, fig.17 and fig. 18 with a varied user base to ensure its feasibility and appeal. The game's potential success is underscored by the positive feedback provided by testers, who considered it to be engaging, environmentally conscientious, and acceptable as a travel souvenir. Such projects are a good fit given the rising need for environmentally friendly travel gear. Eco-friendly goods, such as the one developed, can promote positive environmental effects and consumer happiness by embracing sustainable techniques and incorporating user feedback.

3.7 Branding and Identity



Fig. 19. Specific area for logo
Source: Author



Fig. 20. Package branding.
Source: Author

As shown in fig.19 and fig.20 Presenting Bamboox, a distinctive blend of contemporary entertainment and old-world craftsmanship. Our creation blends the classic game of Tic Tac Toe with the organic elegance of bamboo. The Tic Tac Toe 'O' and 'X' are subtly incorporated into the logo, which represents this harmony. Bamboox is more than simply a game; it's a representation of strategy, community, and environmentally friendly living. Bamboox embodies an eco-friendly approach to gaming and high standards of quality and environmental consciousness and embracing heritage while reinventing leisure with Bamboox.

4. Conclusion

Designing a Tic Tac Toe game using bamboo and other sustainable materials offers several benefits including, environmental impacts like utilising bamboo as a fast-growing and renewable resource which reduces the product's(game) environmental footprint and contributes to sustainability. Promotion of eco-friendly Practices by creating a game that emphasises eco-friendly materials, we raise awareness about the importance of sustainability in everyday products (Krawczuk, 2013).The aspect of educational Value incorporating sustainable materials into the game design provides an opportunity to educate players, especially children, about the significance of eco-conscious choices and the benefits of utilising renewable resources (Zhang, Wang, & Tang, 2023). Innovation and creativity in the use of bamboo and sustainable materials showcases innovative design possibilities and demonstrates that eco-friendly products can be both functional and aesthetically pleasing. This research project sets a precedent for integrating sustainable materials into various other game designs and consumer products, fostering a culture of sustainability in the gaming industry and beyond.

The SWOT analysis has been done for the bamboo product/game development as per following,

Strength: Bamboo is a renewable resource, environmentally friendly and sustainable. It is known for its strength and durability, ensuring the product lasts longer. Bamboo is biodegradable and can be easily shaped and moulded into various toy designs, offering versatility in product. Weaknesses: Initial production costs for bamboo products might be higher compared to conventional materials. Sourcing bamboo might be challenging, leading to potential supply chain constraints. Some users might perceive

bamboo toys as less valuable compared to other materials. Opportunity: With increasing awareness about environmental issues, there's a growing market for sustainable products like bamboo. Continuous innovation in bamboo processing techniques and design can lead to unique and appealing offerings like home decor items, furniture, games, souvenirs. Collaborating with environmental organisations or retailers focused on sustainable products can help expand market reach. Threat: The market for sustainable games/products is becoming more competitive, with other materials and brands for consumer attention. Also, misconceptions or biases about bamboo products may pose a threat to market adoption and sales. Changes in environmental regulations or standards could impact the production and sale of bamboo products.

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