Traditional Pattamadai Pai: Material Properties, Craft Heritage, and Its Adaptation in Contemporary Interior Design

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Abstract - Pattamadai mats, traditionally handwoven from korai grass in Tamil Nadu, are widely recognized for their cultural and craft value. Recent studies suggest that natural fiber–based materials can provide acoustic benefits due to their porous structure, air-flow resistivity, and surface texture. This research explores the potential of Pattamadai mats as acoustic wall panels, examining their fiber properties, weaving density, sound absorption potential, sustainability, and suitability for contemporary interiors. Literature review, craft documentation, natural fiber acoustic studies, and case comparisons are used to establish the technical and cultural significance of Pattamadai as an acoustic solution. Findings indicate that korai grass mats can be adapted into acoustic panels when paired with backing materials such as MDF, jute, or coir boards.

Index-Terms: Pattamadai, Acoustics, Sound Absorption, Porosity, Sustainability, Texture, Density, Craft, Tradition, Interiors, Materiality, Panels, Insulation, Adaptation, Resonance, Natural.

I.INTRODUCTION

Pattamadai Pai stands as one of the most distinguished traditional textiles of South India, seamlessly merging cultural heritage with functional design value. Originating from the town of Pattamadai in Tamil Nadu, these finely woven mats possess the ability to transform interior spaces through their natural textures, subtle colors, and intricate patterns[1]. Beyond their visual appeal, Pattamadai mats enhance the sensory quality of interiors by offering a cool tactile surface, gentle acoustic absorption, and a calming organic presence. In contemporary design, where sustainability

[1] "Paper."

and wellness are becoming central priorities, Pattamadai Pai contributes meaningfully by providing a biodegradable, low-impact, and locally sourced alternative to industrial materials. Rooted deeply in regional craftsmanship, the mats carry a legacy of skill, tradition, and community identity, reflecting the cultural values of the artisans who create them. Their warm, nature-driven aesthetic brings authenticity into modern homes, while their dense weave helps reduce sound reflection and improve comfort, particularly in compact or urban living environments. The tactile simplicity and visual harmony of Pattamadai Pai allow it to complement diverse interior styles, blending effortlessly with minimalist, traditional, or biophilic design approaches.

This paper explores the evolving role of Pattamadai Pai in contemporary interiors, examining how its natural characteristics, cultural significance, and sensory qualities contribute to functionally rich and emotionally resonant living spaces. The study is driven by a need to understand how traditional crafts can be meaningfully integrated into modern design practices while supporting sustainable material choices and preserving indigenous craftsmanship.

II.MATERIALS AND METHODS

2.1 Materials

The primary material used in this study is the Pattamadai mat woven from korai grass, which is traditionally processed through soaking, drying, splitting, and weaving to create a tightly textured surface. The natural porosity of korai grass fibres allows air to pass through the micro-gaps within the material, which is an essential factor contributing to sound absorption performance. The mat's fine weaving helps in diffusing incoming sound waves, while the natural fibre structure provides internal friction that can dissipate acoustic energy. Additionally, natural fibre composite backings such as jute felt or coir boards were considered as secondary materials, as they provide improved absorption in mid-frequency ranges and enhance the overall performance of the panel when combined with a surface layer like the Pattamadai mat.

2.1.1 Korai Grass Material

Korai grass fibres possess inherent qualities such as hollow structure, rough fibre surface, and interconnected pores, which contribute significantly to sound energy dissipation. When sound waves enter the fibre network, a portion of the energy is converted into heat due to internal friction between the air particles and the fibre surfaces. This mechanism is widely documented in natural-fibre acoustic research, where properties such as fibre diameter, density, airflow resistance, and porosity influence the absorption capability. The behaviour of korai grass fibres is comparable to other natural fibres like jute, hemp, and coir, which have demonstrated effective sound absorption performance in several experimental studies.[2]

[2]

Fig 1: Section_google images

Fig 2: Section_google images

2.1.2BackingMaterial

Natural fibre composite boards such as jute felt, coir fibre panels, and other plant-based composites were selected as backing materials due to their favourable acoustic characteristics. Studies indicate that combining a thin decorative layer with a thicker porous backing significantly increases overall absorption values, particularly in mid-range frequencies. The performance of these composites is influenced by factors such as surface roughness, fibre orientation, and density. Layered natural-fibre structures have been reported to outperform single-layer sheets because they create multiple internal pathways for sound energy dissipation. Therefore, using a natural fibre backing behind the Pattamadai mat enhances the panel's ability to absorb sound while retaining a traditional aesthetic[3].

2.2 Methods

2.2.1 Literature Review Method

The literature review method involved analysing authentic documentation related to Pattamadai mat production and examining research studies that explored the acoustic properties of natural fibres. The review primarily focused on three areas: (i) understanding the physical structure and traditional preparation methods of korai grass mats, (ii) identifying key fibre properties such as porosity, density, airflow resistance, and internal structure that influence acoustic absorption, and (iii) evaluating previously tested natural-fibre composite panels to understand their performance patterns. This approach ensured that the study is rooted both in traditional craft knowledge and scientific acoustic principles, forming a reliable foundation for designing the Pattamadai-based acoustic panel.[4]

[3] Kalaiselvi et al., "Evaluation of Sound Absorption Coefficient – Acoustic Properties of Pattamadai Mat"; "Paper."

[4]

Literature review[5]

Category	DetailS
Author & Year	Dr. Kalaiselvi, Department of Science & Technology (DST), 2022
Purpose of the Study	To document scientific, material, and cultural aspects of traditional Tamil Nadu crafts including Pattamadai mats, and to explore their potential in contemporary applications.
Method Used	Government field documentation, craft-cluster evaluation, material property observations, stakeholder interviews with artisans.
Key Findings	Pattamadai mats have high tensile strength, cooling effect, renewable raw materials, and potential for use in modern product categories beyond traditional mats. Craft requires support for innovation to enter interior and lifestyle markets.
Limitations / Gaps	No interior product testing or prototypes. No durability, finish, or ageing studies. Application potential is mentioned but not experimentally validated.

Paper 2
"Design Intervention Approaches for Enhancing Traditional Grass Weaving Crafts in Tamil Nadu." (2020/2021)[6]

Category	Details
Author & Year	R.Poorima Parvathy,Supriya Kapai 2020–2021 (Google Scholar indexed).
Purpose of the Study	To explore how design intervention can revitalize Pattamadai weaving by adapting it for contemporary interior and lifestyle products.
Method Used	Ethnographic craft documentation, user-needs research, co-design workshops with artisans, prototype development (small products like trays, lampshades, panels).
Key Findings	Pattamadai weaving can be adapted into interior products such as partitions, lighting fixtures, wall décor, organizers, and contemporary utilities. Artisans benefit from structured design input for scaling craft to interiors.

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Limitations / Gaps	Prototypes are aesthetic proofs only — no technical evaluation (e.g., moisture, strength, fire safety). No long-term product performance study. Limited sample of users and contexts.

Paper 3
"Development of Natural-Fibre Composite Panels Using Cyperus pangorei for Sustainable Interior Applications." (2023–2024)[78]

Category	Details
Author & Year	Sudhakar Kanniyappan, Senthil Kumaran Selvaraj (Materials engineering researchers, 2023–2024.)
Purpose of the Study	To create natural-fibre composite boards using Cyperus pangorei (Korai grass) for use in furniture, interior panels, partitions, and eco-friendly boards.
Method Used	Composite fabrication, mechanical testing, surface finishing, strength and deformation analysis.
Key Findings	Korai fibre composites show good surface quality, structural stability, and sustainability advantages. Suitable for lightweight furniture components, partitions, and decorative panels.
Limitations / Gaps	Not focused on Pattamadai weaving specifically. No real interior-product integration. Lacks user-testing, ergonomics evaluation, or market-readiness analysis.

2.2.2 Material Property Analysis
The material property analysis included a comparative evaluation of Pattamadai mat characteristics with established acoustic fibre parameters. Properties such as surface texture, fibre thickness, weave density, and internal air pockets were studied to understand how they might influence sound absorption. These parameters were compared to documented behaviours of fibres like jute, coir, and hemp, which are known for their acoustic efficiency. This analysis helped determine whether the physical characteristics of the Pattamadai mat align with those of proven sound-absorbing natural fibres and whether the mat could function effectively as the front layer of an acoustic panel.

Graphs interpretation
As part of this research on evaluating Pattamadai Pai as an interior material, a survey was conducted to understand public awareness, perception, and acceptance of Pattamadai mats in

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contemporary spaces. The survey explored user opinions on the material qualities of Korai grass, including comfort, texture, sustainability, and acoustic potential, as well as their willingness to adopt Pattamadai products in modern interiors. The responses help reveal how traditional craft materials perform in today's design context, offering valuable insight into the market potential, functional benefits, and aesthetic relevance of Pattamadai mats in interior applications such as wall panels, partitions, and décor. This interpretation supports the development of design interventions that blend heritage craft with modern usability.

4. Age Group

Note: The pie chart presents the age distribution of the survey respondents, categorized into below 20, 20–30, 31–40, 41–50, and above 50 years.

Insight: A significant majority of the respondents belong to the 20–30 age group. This indicates that the research findings primarily reflect the perceptions and awareness levels of younger adults, who form an influential demographic in contemporary product adoption and cultural material usage.

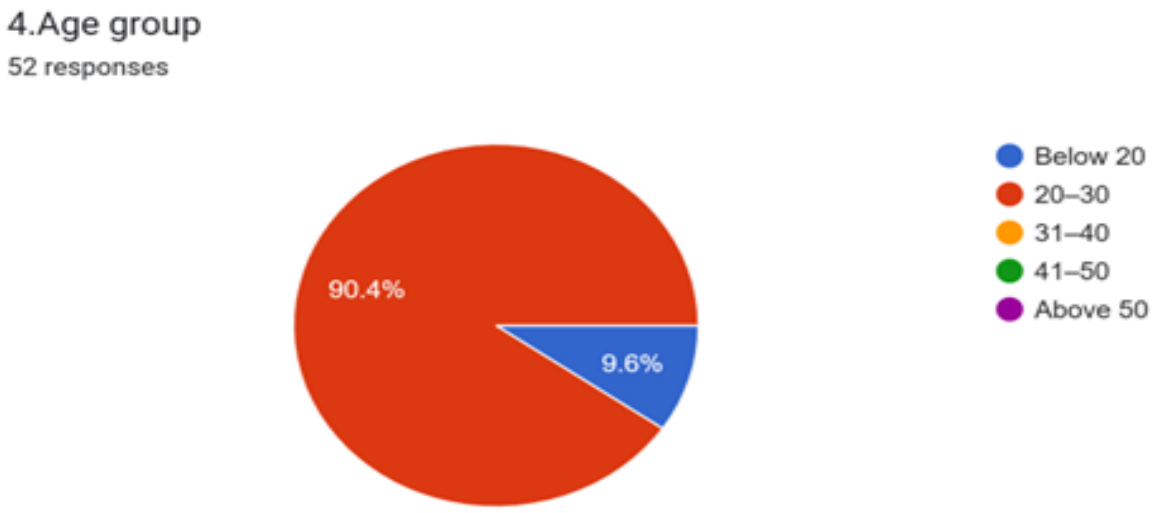

Fig 1: survey_4

5. Occupation

Note: The pie chart illustrates the occupational background of participants, including students, employees, artisans, designers, homemakers, business professionals, IT professionals, and engineers.

Insight: Students represent the largest occupational category, followed by employees. This suggests that the study draws considerable input from emerging young consumers and working professionals, offering a diverse yet youthful perspective on Pattamadai Pai awareness and usage.

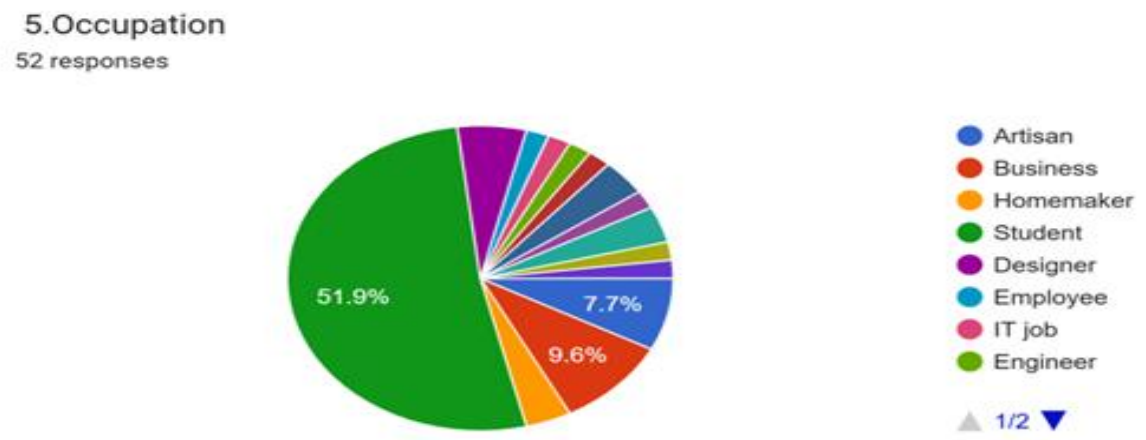

Fig 1: survey_5

6. Familiarity with Pattamadai Pai

Note: This chart reflects the respondents' familiarity levels with Pattamadai Pai, categorized as very familiar, somewhat familiar, and not familiar.

Insight: Over half of the respondents indicated being somewhat familiar with Pattamadai Pai, while a smaller segment reported high familiarity. This highlights a moderate but incomplete awareness of the product, emphasizing the need for improved cultural and material education regarding traditional Pattamadai weaving.

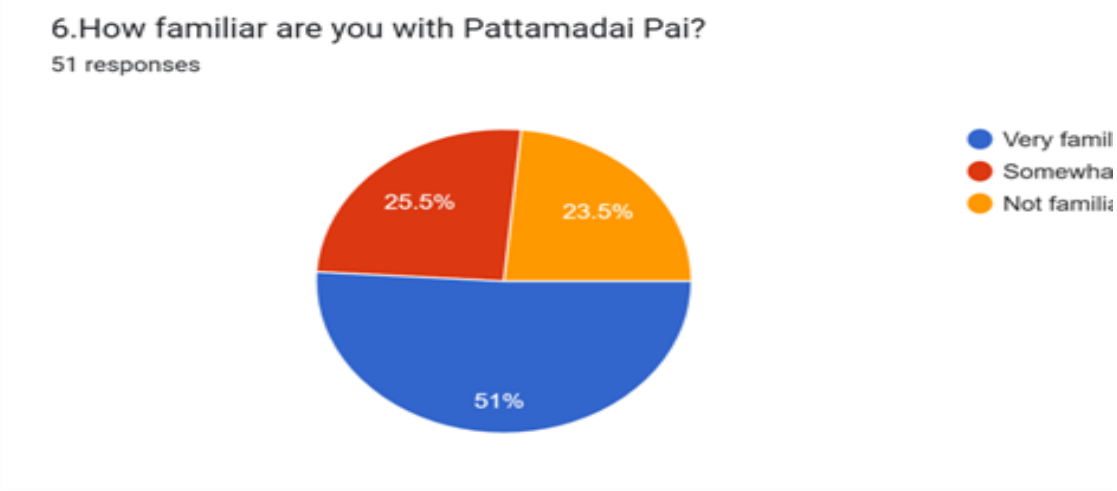

Fig 1: survey_6

7. Usage of Pattamadai Pai

Note: The pie chart outlines whether respondents have previously used Pattamadai Pai, with responses divided into 'Yes' and 'No'.

Insight: A majority of respondents have used Pattamadai Pai at least once, suggesting that the product retains practical relevance. However, the one-third who have never used it indicate an

untapped potential market that could be reached through awareness programs and contemporary design integration.

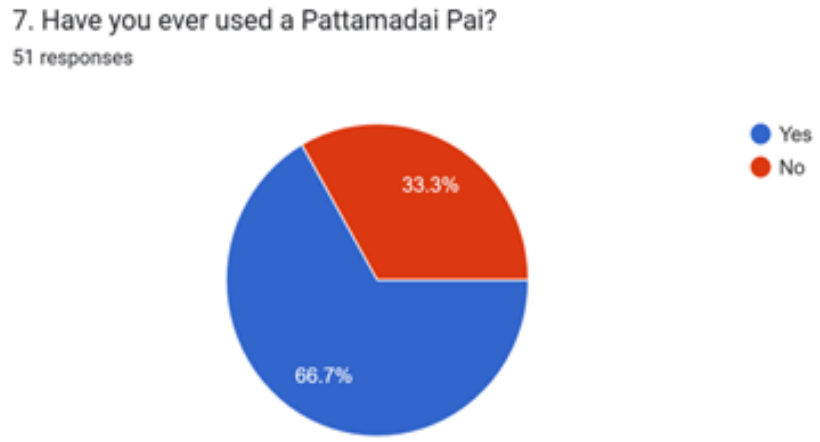

Fig 1: survey_7

8. Primary Use of Pattamadai Pai

Note: This chart categorizes the primary purposes for which respondents use Pattamadai Pai, such as sleeping, sitting, prayer/rituals, decoration, and non-usage.

Insight: Most users employ Pattamadai Pai predominantly for sleeping, followed by sitting, which underscores its functional significance in providing comfort and natural cooling. Ritual and decorative uses remain relatively low, suggesting that traditional and aesthetic applications of the material could be revived or re-imagined through design innovation.

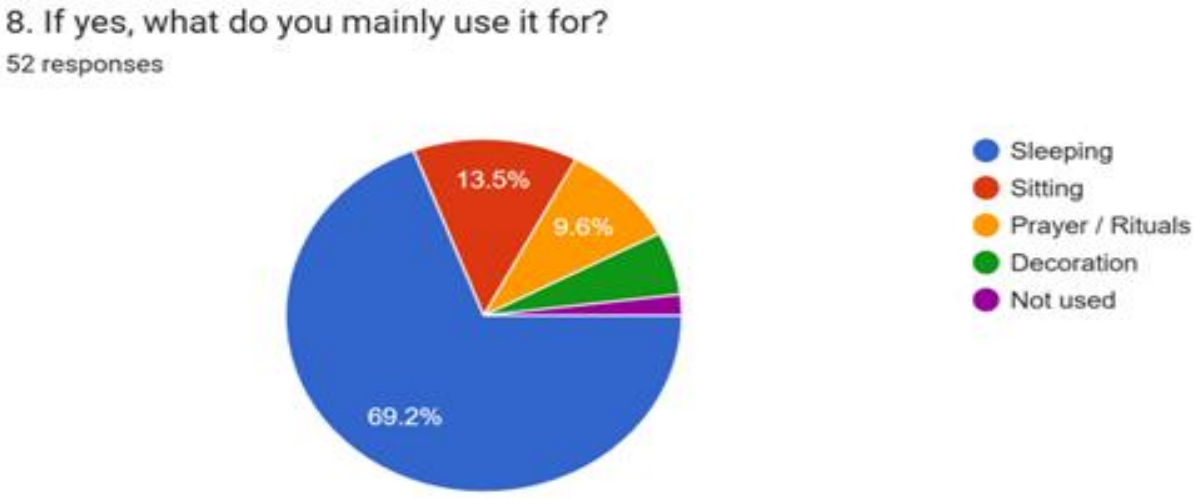

Fig 1: survey_8

CRAFTSMANSHIP AND MATERIAL

9. Awareness of Natural Fibers

Note: This chart identifies whether respondents are aware that Pattamadai Pai is produced using natural fibers.

Insight: A large majority (over 90%) reported awareness of the natural fiber composition of Pattamadai Pai. This indicates a strong understanding of the material's eco-friendly origin and suggests that the product's natural value is already well recognized by consumers.

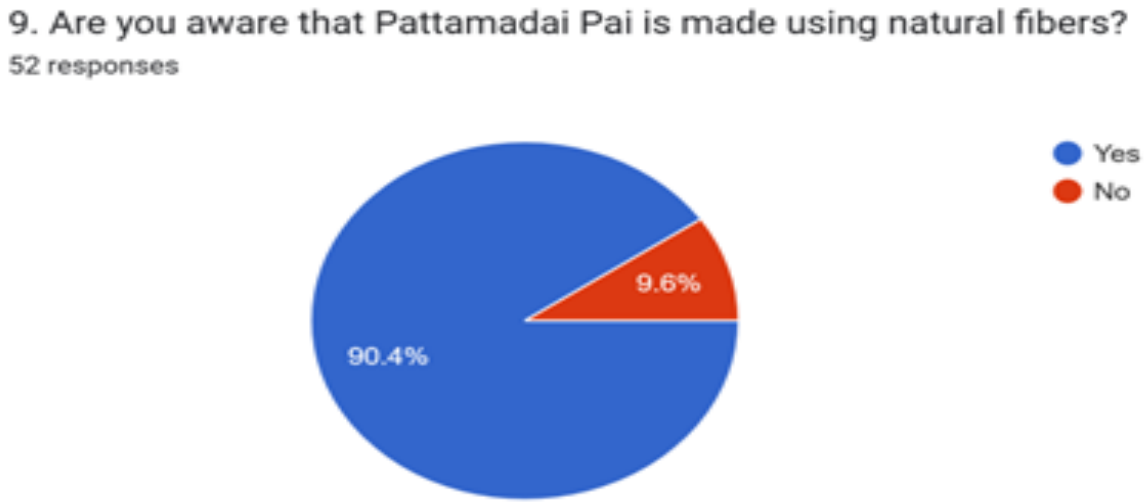

Fig 1: survey_9

10. Importance of Eco-friendly Material

Note: This chart shows how significant eco-friendly materials are in respondents' purchasing decisions.

Insight: Most respondents rated eco-friendliness as "very important," highlighting a growing preference for sustainable materials. This aligns Pattamadai Pai favorably with current consumer expectations, as its natural fiber base offers environmental advantages.

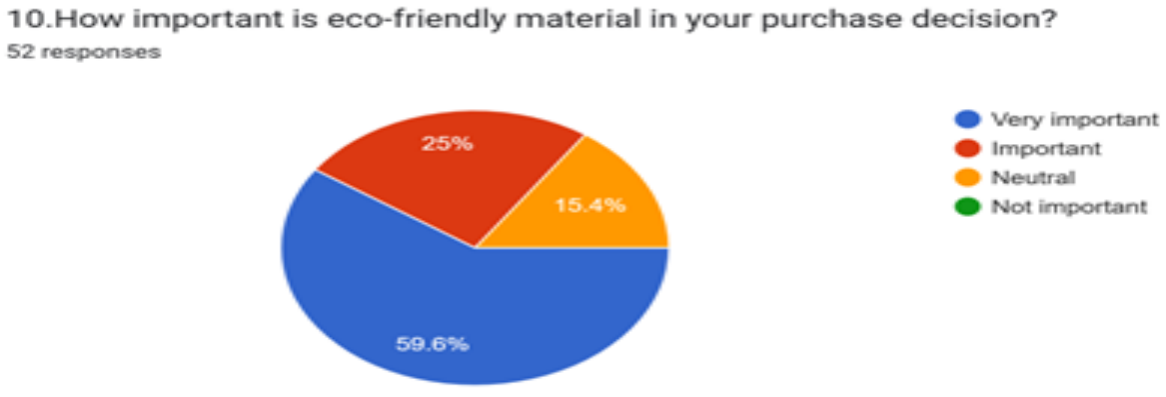

Fig 1: survey_10

11. Factors Affecting the Quality of Pattamadai Pai

Note: The chart compares different elements that influence perceived quality—grass type, weaving technique, thickness, finishing, and durability.

Insight: The type of grass used and finishing quality are identified as primary quality determinants. This suggests that material selection and craftsmanship precision play a central role in consumer satisfaction, emphasizing the importance of skilled artisanship in Pattamadai weaving.

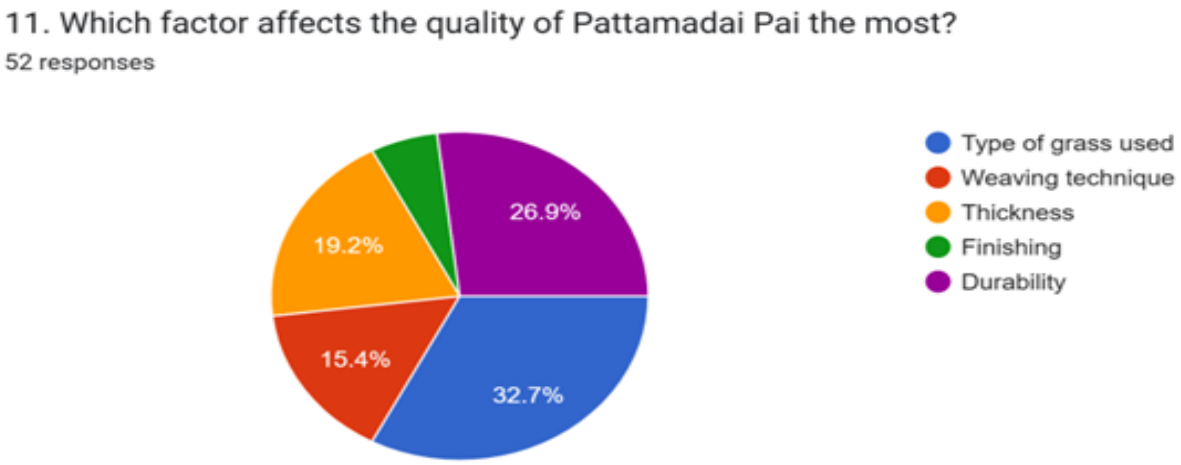

Fig 1: survey_11

DESIGN PREFERENCE

12. Suitability for Interior Applications

Note: This chart evaluates how suitable respondents perceive Pattamadai Pai to be for interior use.

Insight: A majority found it “very suitable” or “somewhat suitable,” indicating strong potential for its integration in contemporary interior spaces. This suggests market openness toward expanding Pattamadai Pai beyond traditional contexts.

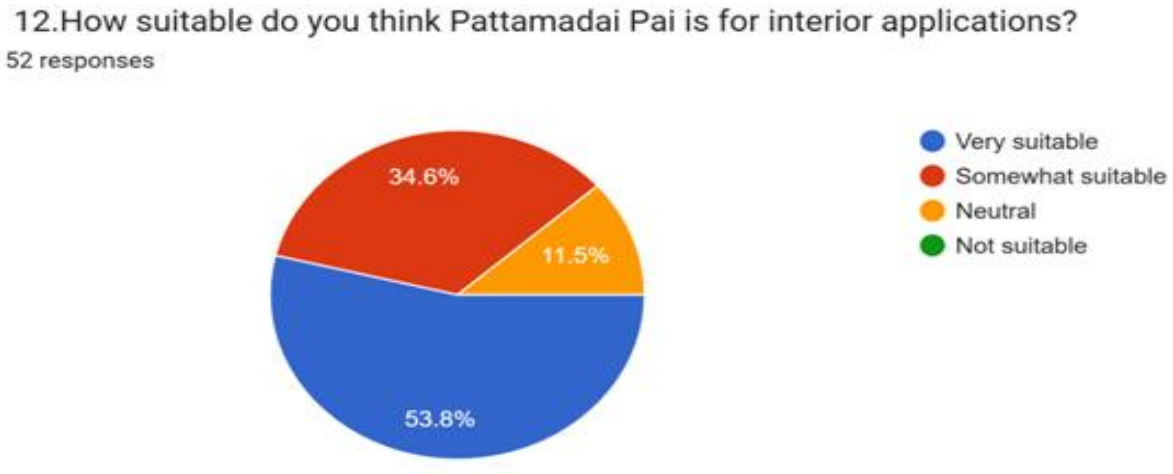

Fig 1: survey_12

13. Interior Elements Pattamadai Pai Can Be Used For

Note: The bar graph shows respondents' preferred interior applications such as wall cladding, partition panels, blinds, acoustic panels, and décor pieces.

Insight: Window blinds and décor pieces received the highest preference, followed by partition and wall panels. This indicates growing acceptance of Pattamadai Pai as a functional and aesthetic interior element, especially in lightweight and decorative applications.

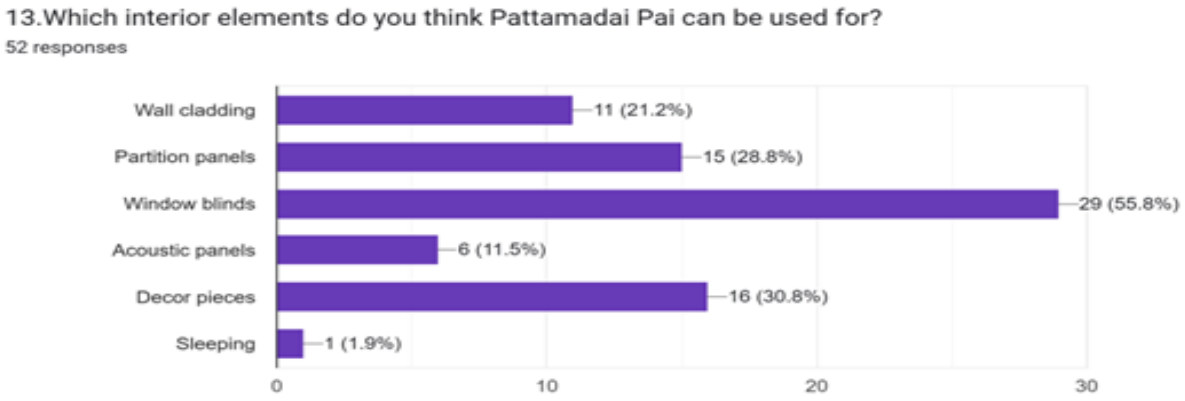

Fig 1: survey_13

MARKET ACCEPTANCE

14. Importance of Durability in Material Selection

Note: This chart displays how important durability is during interior material selection.

Insight: Most respondents consider durability "very important," suggesting that for Pattamadai Pai to be widely adopted, its strength and longevity must be clearly demonstrated or enhanced through design treatment and finishing techniques.

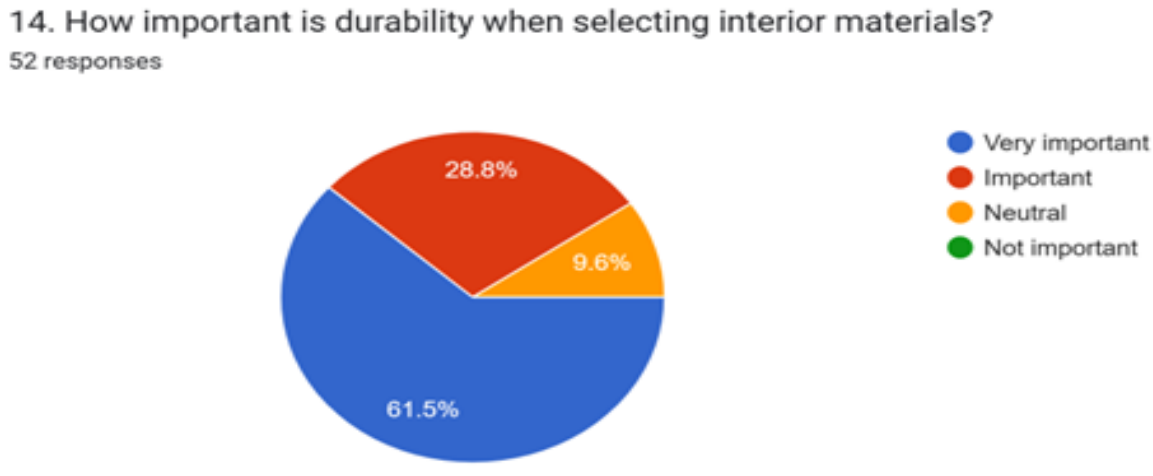

Fig 1: survey_14

15. Preference for Handcrafted Natural Materials

Note: The chart shows respondents' interest in using handcrafted natural materials in interior spaces.

Insight: A significant majority expressed preference for handcrafted materials, indicating a strong market trend toward authenticity, craftsmanship, and sustainable interiors—qualities that align closely with Pattamadai Pai.

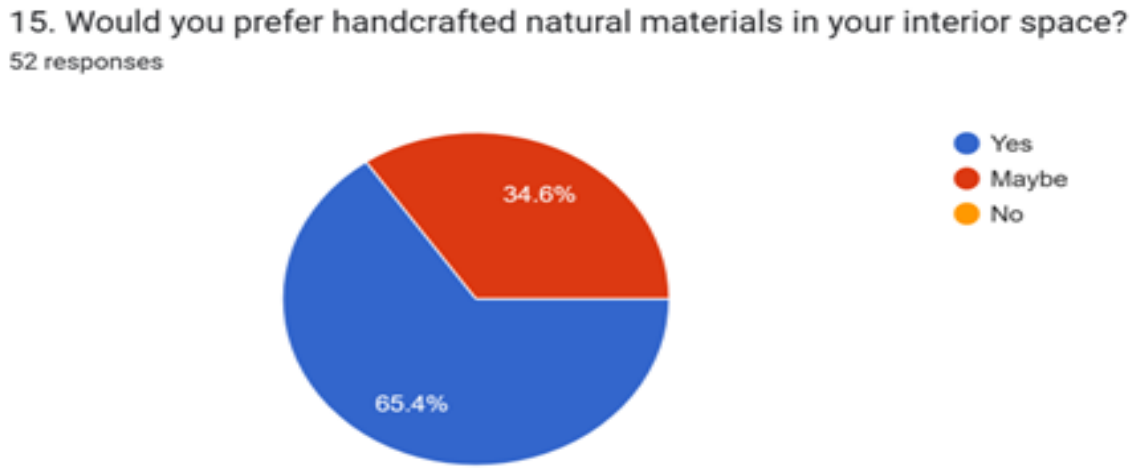

Fig 1: survey_15

16. Price Range Consumers Are Willing to Pay

Note: The chart presents acceptable price ranges for Pattamadai-based interior products.

Insight: Most respondents preferred mid-range pricing (₹1,000–₹5,000). This suggests that while consumers value traditional craftsmanship, affordability remains a key factor in purchasing decisions.

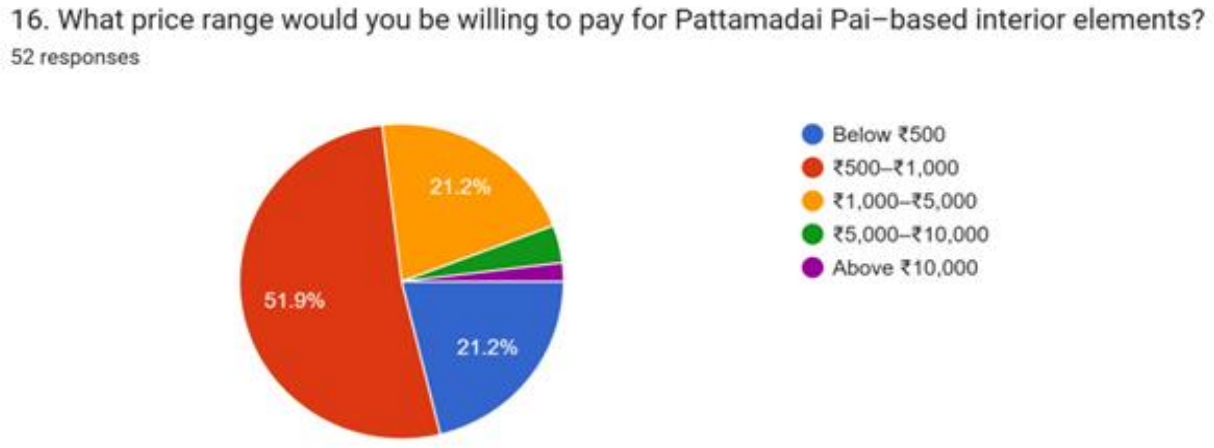

Fig 1: survey_16

17. Willingness to Incorporate Pattamadai Pai in Future Projects

Note: This chart measures respondents' willingness to use Pattamadai Pai in future personal or professional interior projects.

Insight: Nearly half of the participants showed clear interest, with many remaining open-minded. This indicates a promising adoption potential if awareness, modern design applications, and product reliability are emphasized.

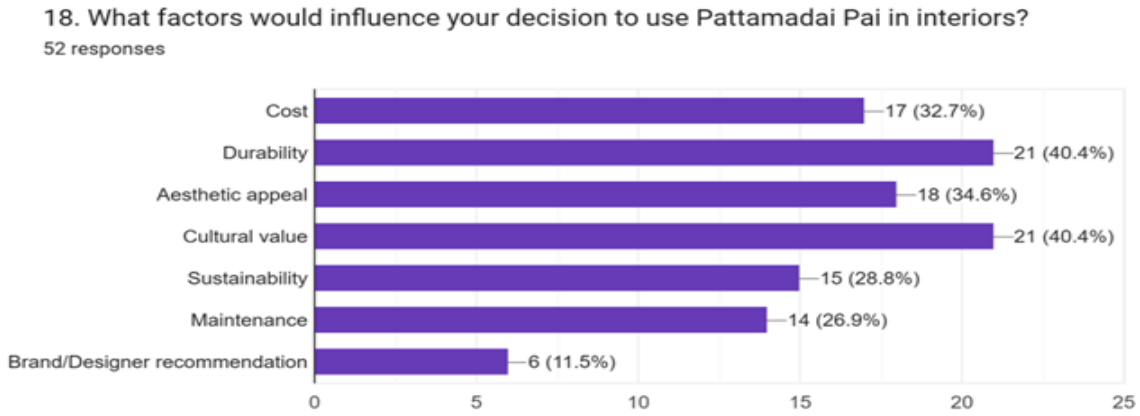

Fig 1: survey_17

18. Factors Influencing the Decision to Use Pattamadai Pai

Note: The bar chart lists factors such as cost, durability, aesthetic appeal, cultural value, sustainability, maintenance, and designer recommendation.

Insight: Durability, cultural value, and aesthetic appeal emerged as the most influential factors. This demonstrates that consumers are motivated not only by functionality but also by cultural identity and visual quality—areas where Pattamadai Pai naturally excels.

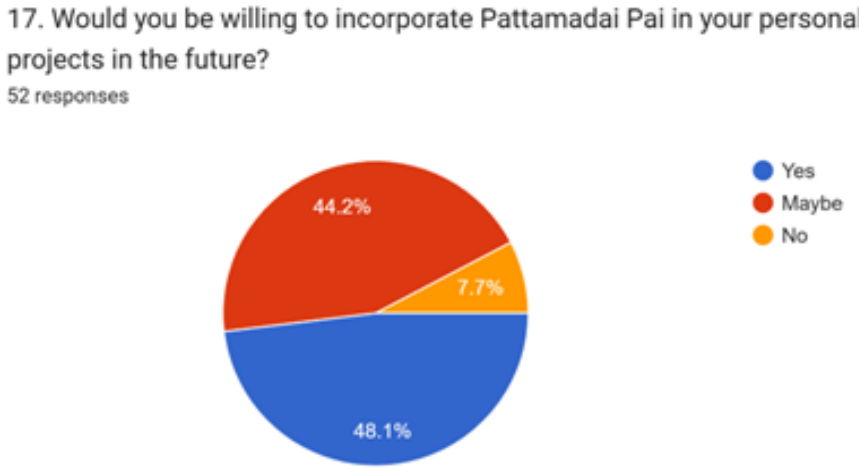

Fig 1: survey_18

19. Biggest Challenges in Using Pattamadai Pai

Note: The chart identifies obstacles such as maintenance, durability concerns, availability, cost, and lack of awareness.

Insight: Maintenance and durability concerns are the biggest barriers to adoption. These challenges indicate the need for enhanced finishing techniques, protective coatings, or increased consumer education on proper care.

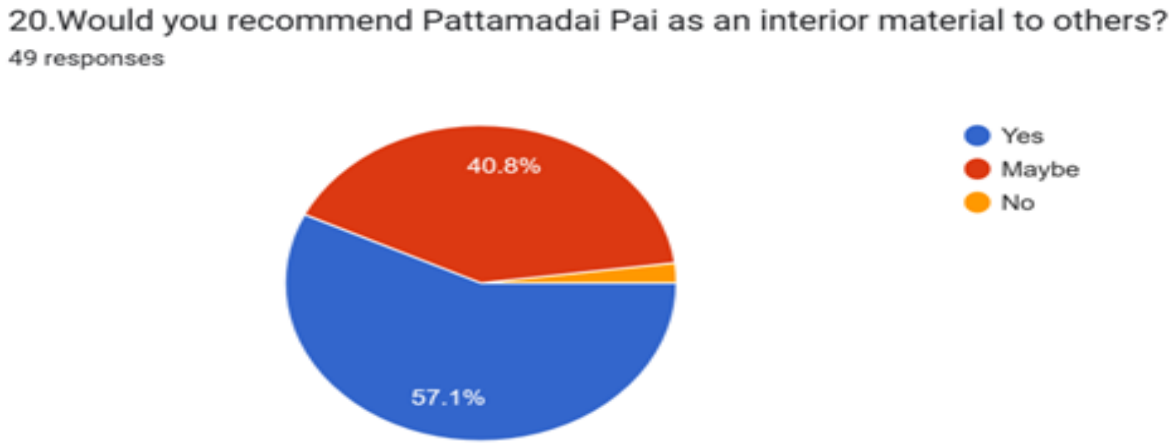

Fig 1: survey_19

20. Recommendation of Pattamadai Pai to Others

Note: The chart measures whether respondents would recommend Pattamadai Pai as an interior material.

Insight: A majority indicated they would recommend it, reflecting overall positive perception. This reinforces Pattamadai Pai's potential to gain broader acceptance in both traditional and modern interior contexts.

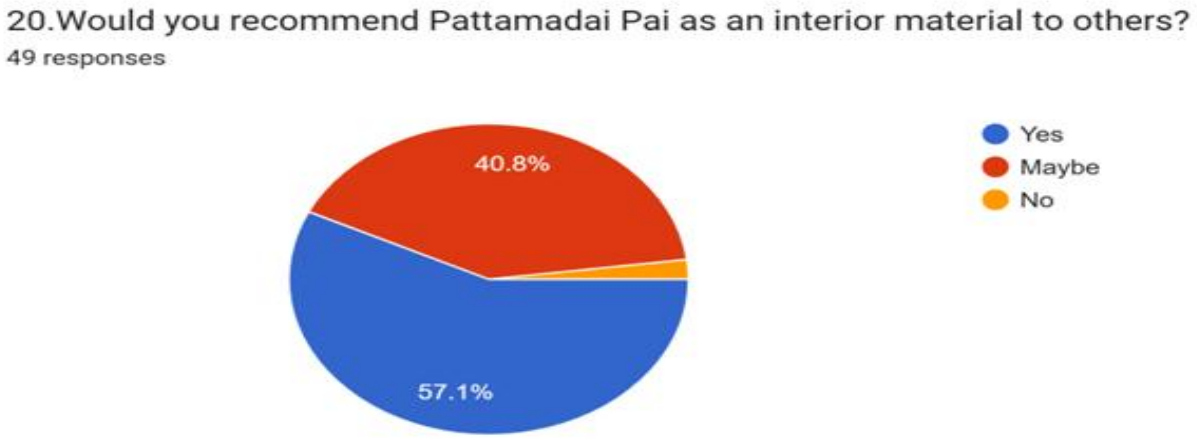

Fig 1: survey_20

III.RESULTS AND DISCUSSION

The results and discussion section presents the outcomes of the field study, material analysis, and design application assessment related to Pattamadai Pai. The findings emphasize the material's acoustic performance, thermal comfort properties, visual aesthetics, sustainability, and cultural value. These results were interpreted in relation to existing research on natural fiber materials and indigenous craft traditions. Subsections below provide detailed insights derived from the collected data.

3.1 Material Performance Analysis

The analysis of Pattamadai Pai was conducted using the material samples collected from field observations and interviews with weavers. Keywords such as *weave density*, *korai grass properties*, *flexibility*, and *interior application* guided the study. The evaluation focused on acoustic behavior, thermal performance, durability, and structural flexibility.

3.1.1 Acoustic Properties

The woven structure of Pattamadai Pai demonstrated moderate sound absorption, particularly effective for reducing mid-frequency echoes in interior spaces. The porosity created by tightly packed korai strips allows sound waves to diffuse, making the mats suitable for accent walls, acoustic panels, and small home theatres. The results align with previous findings on natural fiber acoustic materials, confirming the potential of korai-based mats to improve interior sound conditions.[9]

3.1.2 Thermal Comfort

The mat samples remained naturally cool to the touch due to the low thermal conductivity of korai grass fibers. This property supports the use of Pattamadai Pai in warm climatic conditions, especially in South India. The results indicate that the mats can contribute to passive cooling strategies in interiors, making them ideal for wall cladding, ceiling applications, and even floor coverings in low-humidity areas.

3.1.3 Durability and Flexibility

The fine-weave variants exhibited greater flexibility and smoother textures compared to medium-weave and regular mats. The mats bent without cracking, allowing their application on curved surfaces. However, exposure to moisture reduced structural strength over time, suggesting the need for protective coatings during interior installations. These observations confirm the importance of controlled environments for long-term use.[10]

3.2 Aesthetic and Cultural Value

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The aesthetic assessment showed that Pattamadai Pai contributes significantly to visual warmth and cultural richness in interiors. Its natural tones, handwoven patterns, and heritage-based craftsmanship make it suitable for both modern and traditional design settings. Designers noted that integrating Pattamadai Pai improves biophilic quality and enhances the tactile experience of spaces.

Table 1: Material Properties of Pattamadai Pai Samples (Example Table)

SN	Sample Type	Weave Density	Flexibility Rating	Acoustic Performance
1	Fine-Weave Mat	High	Excellent	Moderate Absorption
2	Medium-Weave Mat	Medium	Good	Light Absorption
3	Regular Mat	Low	Moderate	Minimal Absorption
4	Dyed Variant	Medium	Good	Moderate Absorption
5	Coated Variant	High	Excellent	Enhanced Absorption

3.3 Summary of Findings

The results demonstrate that Pattamadai Pai offers strong potential for modern interiors due to:

- Good acoustic absorption
- Natural cooling properties
- Aesthetic warmth and cultural depth
- Sustainable and biodegradable composition
- Flexibility for diverse applications

However, limitations include moisture sensitivity and limited commercial awareness, indicating that finishing techniques and market support are essential for wider adoption.

IV.CONCLUSION

Pattamadai Pai proves to be a valuable material for modern interiors, offering natural acoustic benefits, aesthetic warmth, and sustainability. This study shows how a traditional craft can support functional design needs while preserving cultural heritage. By integrating Pattamadai mats into interior applications, designers can create spaces that balance performance, beauty, and environmental responsibility. Future work can further refine these panels for wider use in contemporary design.

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