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Information Visualization for Hainan Li Pottery: An Intangible Cultural Heritage Perspective

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Abstract: Hainan Li pottery is a traditional pottery-making practice of the Li ethnic group in Hainan and contains information related to craft history, daily life, and cultural memory. At present, its communication mainly relies on object display, textual explanation, cultural experience activities, and tourism promotion. However, existing approaches often focus on individual objects and lack systematic presentation of historical development, production procedures, vessel types, decorative motifs, and cultural relationships. This study applies information visualization design to reorganize and represent the cultural information of Hainan Li pottery. Through literature review, exhibition observation, and visual material analysis, relevant information was classified into five aspects: historical development, cultural relationships, vessel types, production processes, and decorative motifs. Based on this classification, the Tao Qi Li Feng information visualization series was developed through visual elements, diagrams, and graphic structures. The study explores a design approach for transforming fragmented intangible cultural heritage information into a visual system. It provides a reference for the contemporary communication of Hainan Li pottery and other forms of traditional craftsmanship.

Keywords: Hainan Li Pottery; Intangible Cultural Heritage; Information Visualization; Visual Communication; Traditional Craftsmanship; Cultural Transmission.

1. Introduction

The safeguarding and contemporary communication of intangible cultural heritage (ICH) have attracted increasing attention in recent years. The traditional pottery-making techniques of the Li ethnic group in Hainan were included in China's first national list of intangible cultural heritage in 2006. These techniques preserve knowledge related to local materials, daily use, aesthetic practices, and collective memory. Unlike standardized ceramic production, Hainan Li pottery is mainly produced through hand forming, coil building, motif engraving, and open firing. These procedures are closely connected with local materials, manual experience, and traditional production practices. At present, Hainan Li pottery is mainly presented through museum exhibitions, intangible cultural heritage displays, educational activities, and cultural tourism projects. These forms of communication have increased public awareness, but the related information is usually presented separately. Historical development is often introduced through brief descriptions, while the sequence of pottery-making procedures and the connections between vessel forms and daily functions are not fully shown. Decorative motifs are also frequently displayed as visual elements, with limited explanation of their cultural meanings. As a result, audiences may recognize the external appearance of Li pottery but have limited understanding of its historical background, production procedures, and cultural context. Previous studies have examined the application of Li pottery in contemporary design, including packaging innovation, but fewer studies have addressed the organization and visual presentation of its historical information, craft techniques, vessel forms, decorative motifs, and cultural relationships as an integrated content structure [1]. For Hainan, this issue also concerns how local cultural knowledge enters design education and the cultural-tourism and digital communication settings associated with the Hainan Free Trade Port and the International Design Island [15,16]. Based on this situation, this study applies information visualization to organize the cultural information of Hainan Li pottery and explore ways to present the relationships among different cultural elements through visual design.

2. Current Communication Practices and Visualization Needs of Hainan Li Pottery

2.1. Cultural Information Embedded in Hainan Li Pottery

Hainan Li pottery is a traditional pottery-making practice of the Li ethnic group in Hainan and represents one of the minority handicrafts that retain early morphological features in China [2]. Its history can be traced back to the Neolithic Age [3], and Li pottery was included in the first national list of intangible cultural heritage in 2006. In terms of information organization, the study of Li pottery involves several aspects, including historical development, vessel types, production techniques, decorative patterns, and cultural relationships, rather than only focusing on individual ceramic objects. Historically, Li pottery developed from daily-use utensils into an important part of intangible cultural heritage. Different vessel types, such as pottery pots, jars, steamers, and basins, were closely related to cooking, storage, and other daily activities. The production process includes clay preparation, hand shaping, coil building, pattern engraving, drying, and open firing, which together form the basic procedure of pottery making. The decorative patterns of Li pottery include geometric, animal, plant, and mythological motifs. These patterns are not only visual elements but also reflect the Li people's understanding of nature, daily experience, and

aesthetic preferences. In the process of information visualization design, these materials can be organized according to different characteristics, such as historical sequence, production procedures, vessel classification, and cultural connections. These categories provide the basis for constructing timelines, process diagrams, classification charts, and relationship maps for the visual presentation of Hainan Li pottery.

2.2. Current Communication Practices

At present, the communication of Hainan Li pottery-making techniques involves government departments, news media, intangible cultural heritage platforms, museums, and educational activities. Government departments, media platforms, and intangible cultural heritage institutions promote public awareness of Li pottery through reports and related activities. Museums mainly present Li pottery knowledge through physical displays, graphic explanations, and on-site interpretation. Research and educational activities provide opportunities for audiences to experience pottery-making techniques and understand the production process [4]. In recent years, with the development of rural revitalization and cultural tourism integration, Hainan Li pottery has also become part of regional cultural tourism development [5].

Previous studies on the development of traditional Li pottery craftsmanship indicate that its inheritance and communication still face challenges in terms of transmission environment, industrial resources, and public dissemination. The current communication of Li pottery lacks systematic information organization. Museum exhibitions need to consider not only visual presentation but also the interpretation of cultural knowledge and educational functions [7]. Although the experience of making pottery is popular among the public, most classes do not explain the links among the stages of clay preparation, coil construction, pattern design and firing. Short videos and tourism promotion can show the regional features and handmade characteristics of Li pottery, but they usually offer little explanation of related cultural elements, such as women's pottery-making traditions, material knowledge and ethnic memory. Most of the cultural and creative works are in pottery form, and the meaning of the patterns, how they are used in daily life, and relevant historical information have not been fully disclosed. The above cases show that to promote the spread of the culture of Hainan Li pottery, historical records, craft processes and other cultural information should be organized.

2.3. Key Communication Problems

Based on the above materials, the main communication problems of Hainan Li pottery can be divided into five categories.

First, the history of Li pottery has not been introduced adequately. Most of the current displays are physical objects with short text descriptions. Li pottery is a national intangible cultural heritage, but how it transitioned from being used daily to being a cultural resource is not well known.

Second, the production process is not clearly conveyed in existing forms of presentation. Li pottery making has many steps and requires a long period of practice. However, many displays focus on the finished works or individual production stages, and the connections among material preparation, manual techniques, tools and firing methods are not always clear. Therefore, it is difficult for the public to know how the raw materials are transformed into finished pottery.

Third, the relationships between vessel forms and practical functions need to be clarified. Most of the current exhibitions of pottery objects only show their external characteristics and do not elaborate on how they are actually used in daily life. Therefore, although the audience can distinguish between the shapes of the vessels, they are unable to learn about the role of these objects in the daily life of the Li people through these objects.

Fourth, the cultural meanings of decorative motifs are not sufficiently explained in current presentations. Li pottery has many patterns related to culture and traditional knowledge. However, in cultural tourism promotion and cultural product design, these motifs are often adopted mainly as ethnic visual elements. Their origins, structures, and cultural connotations are not always clear. Therefore, although the audience can see the visual shape of the pattern, they are unable to grasp the culture it represents [8].

Fifth, the wider cultural significance of Li pottery has not been fully communicated. Knowledge of women's pottery-making culture and history, material usage, practical experience, and ethnic memory are difficult to convey through simple text and object displays alone. Therefore, a more structured approach is needed to show the relationship between pottery objects and their cultural background.

3. The Role of Information Visualization in Communicating Hainan Li Pottery

3.1. Structuring Cultural Information for Heritage Transmission

Hainan Li pottery has many kinds of cultural information, such as its history, craftsmanship, shapes of vessels, decorative patterns and cultural associations. These contents are usually recorded separately in the existing materials, and it is difficult for the audience to know how they are connected. This paper uses information visualization to organize and present this material. Timelines can be used to present historical information; process diagrams can organize production steps; and visual links can show the connections among different elements of culture. This organization presents Li pottery-making knowledge not as isolated skills and objects, but as an interconnected system of historical development, techniques, and culture.

3.2. Facilitating Public Understanding and Communication

Information visualization combines text, diagrams, and symbols to make the relationships within complex cultural material easier to follow [10]. For Li pottery, the aim is not simply to identify the appearance of a vessel. An effective presentation should also show where its material comes from, how it was made and used, and how it relates to local customs. The Tao Qi Li Feng series was developed from the regional-culture project framework used in the Information Design course. Documentary records and museum materials were checked before the content was classified and arranged. Students therefore worked with information hierarchy, visual translation, and cultural interpretation at the same time. This case connects professional design training with Hainan's regional cultural resources and responds to the talent-development direction of the International Design Island [16], while avoiding the use of Li motifs as decorative signs

detached from their original context.

3.3. Extending Visual Translation Approaches to Traditional Craftsmanship

From the perspective of design research, information visualization organizes and presents traditional craft knowledge in a visual form. Li pottery has the following contents: history, production process, vessel shapes, decorative patterns and cultural customs. During the design stage, these types of information are collected, organized, and translated into visual forms. In this way, traditional craftsmanship can be presented through diagrams, graphic symbols, and visual relationships rather than through text alone [11]. Information visualization can therefore support the contemporary presentation of regional culture and intangible cultural heritage.

4. Information Visualization Design Strategy

4.1. Design Process

4.1.1. Information Collection and Selection

The study collected relevant materials through literature review, exhibition observation, image collection, and analysis of existing visual resources. The collected materials mainly included documents from China's national intangible cultural heritage records, academic studies on Hainan Li pottery, local cultural materials, and related heritage protection documents. Exhibition information was obtained from relevant displays at the China (Hainan) Museum of the South China Sea and the Hainan Provincial Museum of Ethnology. Visual materials were also collected from the Sanya transmission center for traditional Li pottery-making techniques and other publicly available records. During the process of material selection, attention was given to the reliability, representativeness, and visual applicability of the information. The selected materials were required to have documentary or material support and reflect the main characteristics of Hainan Li pottery. Meanwhile, information that could be transformed into visual forms, such as timelines, process structures, classification relationships, graphic symbols, and cultural connections, was further extracted. Based on the above division, the collected materials were organized into five categories: historical development, cultural connotations, types of vessels, production process and decorative patterns.

4.1.2. Building the Information Hierarchy

An information hierarchy was established to organize the collected cultural materials of Hainan Li pottery. The five levels of organization for the information are: thematic category, primary information, secondary information, tertiary information and mode of representation (Figure 1). The topic category indicates the main content of that part. The basic information is the main content in each category, and the additional information shows how these contents are connected. Tertiary information offers particular descriptions and other details. The mode of presentation refers to how to show various kinds of information visually, and in this way, the gathered materials at different levels and in relation to each other have been organized. This organization of information lays the foundation for subsequent graphic extraction, color selection, and layout arrangement.

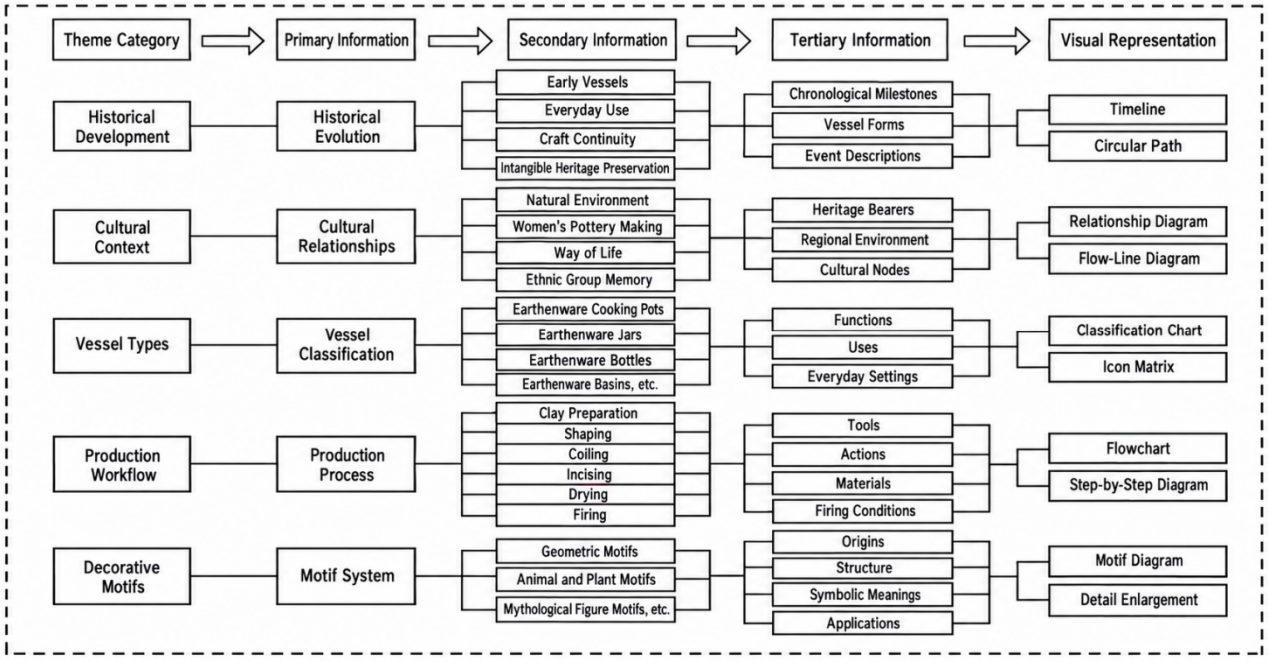


Fig 1. Hierarchical Structure of Information on Hainan Li Pottery

4.1.3. Visual Translation and Reading Path

Visual translation in this paper is the organization of cultural information into visual forms that can be recognized and understood by the audience. According to the chosen materials, the four sources of visual elements are vessel shape, craft process, decorative pattern and cultural environment. Based on the visual characteristics of Li pottery, open-firing traces, nature, materials used in pottery production, etc., the colors of this work were chosen. Together, the above sources provided the graphics and colors for the visualization series (Table 1 and 2). Vessel-form elements help to organize objects; craft elements organize procedural nodes; decorative motifs are redrawn as graphic symbols and explained in terms of their meanings; and cultural elements build relationships among people, places, daily life and craft traditions. The same color scheme was used for the page backgrounds, icons,

relationship lines, and key information. Based on the sequence of element extraction, visual translation, color coordination and layout organization (Fig. 2), all dimensions of the information on Hainan Li pottery have been arranged into graphic-textual structures with clear visual hierarchy and reading paths.

Table 1. Extracted Cultural and Visual Elements of Hainan Li Pottery

No.	Vessel 01	Vessel 02	Vessel 03	Vessel 04	Vessel 05	Vessel 06	Vessel 07	Vessel 08
Name	Pottery Jar	Cooking Pot	Pottery Pot	Storage Jar	Pottery Bowl	Rice Steamer	Liquor Steaming Vessel	Large Pottery Vat
Sample Image								
Extracted Graphic								
No.	Process 01	Process 02	Process 03	Process 04	Process 05	Process 06	Process 07	Process 08
Name	Crushing Clay	Mixing Clay with Water	Coil Building	Forming Vessel Body	Refining Vessel Form	Forming the Rim	Open Firing on Level Ground	Bark Quenching
Sample Image								
Extracted Graphic								
No.	Motif 01	Motif 02	Motif 03	Motif 04	Motif 05	Motif 06		
Name	Dali Shen Motif	Gan Gong Bird Motif	Geometric Motif	Double-Deer Motif	Fish Motif	Frog Motif		
Sample Image								
Extracted Graphic								
No.	Culture 01	Culture 02	Culture 03					
Name	Heritage Bearer	Women's Pottery Making	Heritage Transmission Center					
Sample Image								
Extracted Graphic								

Table 2. Color Sources for the Information Visualization of Hainan Li Pottery

Color Source	Extracted Area	Color Characteristics	Design Application
Open Firing		Earthy yellow, deep fired brown	Process nodes; local emphasis
Li Pottery Objects		Clay orange, ochre brown	Vessel icons; principal pottery forms
Natural Environment		Light gray-green, olive green	Cultural relationship lines; auxiliary icons
Pottery-Making Materials		Light beige, dry-earth yellow	Backgrounds; information sections
Details of Li Pottery Motifs		Ochre orange, light wood-beige	Motif reconstruction; explanatory backgrounds

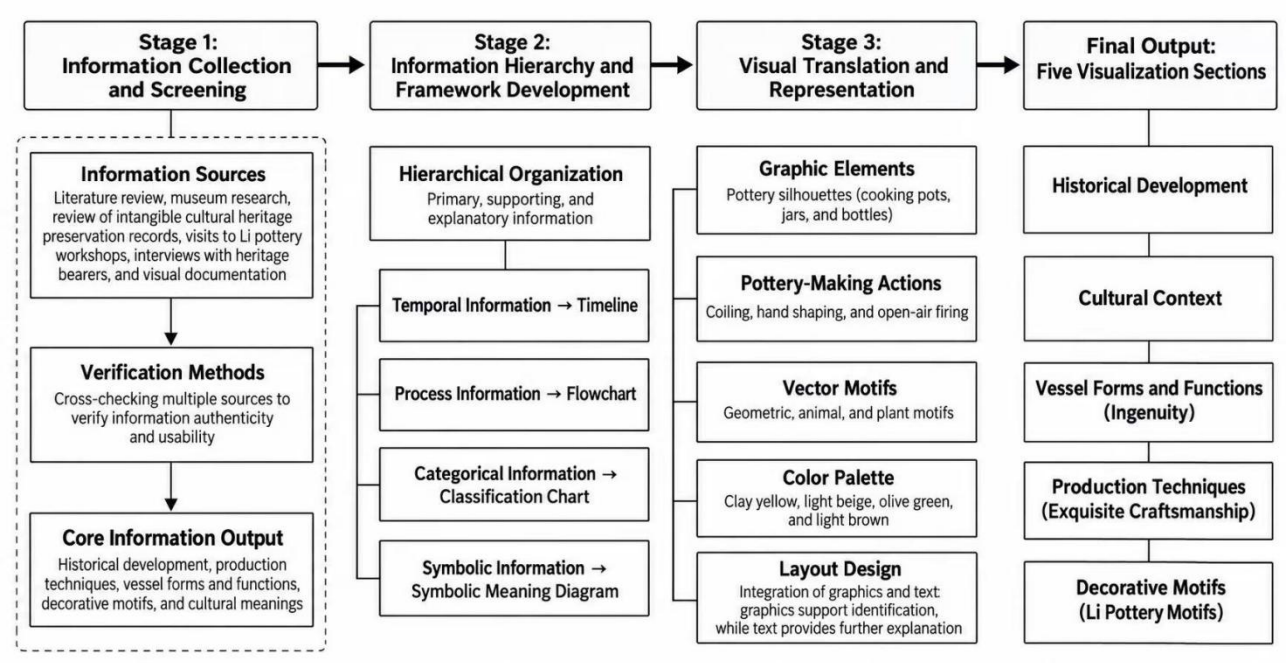


Fig 2. Information Visualization Design Framework for Hainan Li Pottery

4.2. Design Principles

4.2.1. Intuitiveness

Information visualization needs to correspond to audience cognition and visual reading habits so that information hierarchy can be optimized and core content recognized efficiently [13]. Because Hainan Li pottery contains multiple dimensions of information, presentation through long textual descriptions or isolated physical objects can increase cognitive difficulty. Accordingly, production procedures are represented through process diagrams rather than lengthy descriptions; historical development is organized through timelines rather than disconnected dates; and relationships between vessel types and their functions are established through classification diagrams. The principle of intuitiveness therefore concerns not decorative simplification but the conversion of complex information into structures that can be read and compared efficiently.

4.2.2. Accuracy

Visual translation should be based on reliable cultural evidence and avoid inaccurate interpretation of cultural symbols. Historical information, production techniques, vessel functions, and decorative motifs are closely related to their specific cultural contexts. Therefore, the visualization process refers to documentary records, material observations, and information from heritage practitioners to ensure the accuracy of the content. The interpretation of decorative motifs is based on relevant Li cultural traditions, natural environments, and folk knowledge when supported by available materials. The representation of pottery-making processes follows the documented production procedures. Accuracy provides the foundation for effective cultural communication through visualization.

4.2.3. Aesthetic Coherence

Although information visualization mainly focuses on information communication, aesthetic perception is also considered in the design process [14]. Hainan Li pottery presents material features formed by clay, handmade production, and firing techniques. Based on the above attributes, the design language of the visual system was developed in relation to the material qualities of Li pottery. Light natural colors were used for the background, and simplified drawings were employed to depict representative vessel forms, firing marks, and Li pottery motifs. Decorative elements unrelated to Li pottery were avoided in order to maintain information clarity and preserve its cultural characteristics.

5. The Tao Qi Li Feng Information Visualization Series

5.1. Thematic Planning and Overall Visual System

The five contents of the Tao Qi Li Feng series are the history of Hainan Li pottery, its culture, vessel types, production process and decorative patterns. The title links objects with knowledge about their production and use. "Qi" refers to a change in perception of pottery, and "Li Feng" refers to the area and craft culture of the Li people. Light beige is the main background color, and pottery colors in the series include yellow, olive green and light brown. The colors are drawn from the pottery surface, firing traces and the surrounding nature. Vessel illustrations, craft scenes and motif graphics are based on the visual materials introduced in Chapter 4. Use the same colors for the background, icons, connection lines and information labels in all five areas. The five sections share a consistent visual style but use different structures according to their content; for example, there is a timeline of the development of history, a network of cultural relations, a classification diagram of vessel types, a sequence of production processes, and a layered arrangement of decorative patterns.

5.2. Historical Development: From Heritage Labels to Continuous Narrative

The historical-development visualization organizes the development of Li pottery according to its daily life, craft inheritance and recognition as intangible cultural heritage

(Fig. 3). These subjects make up the main nodes of the timeline and the information on early pottery forms. Explanatory text and simplified vessel silhouettes were added to the nodes, which were connected along a circular path to show changes over time. This arrangement presents pottery not only as an element of everyday life but also as a carrier of cultural knowledge. Chronological information shows the order of events, and vessel graphics help people connect with material culture. Therefore, The composition places heritage recognition within the broader history of pottery making and use.

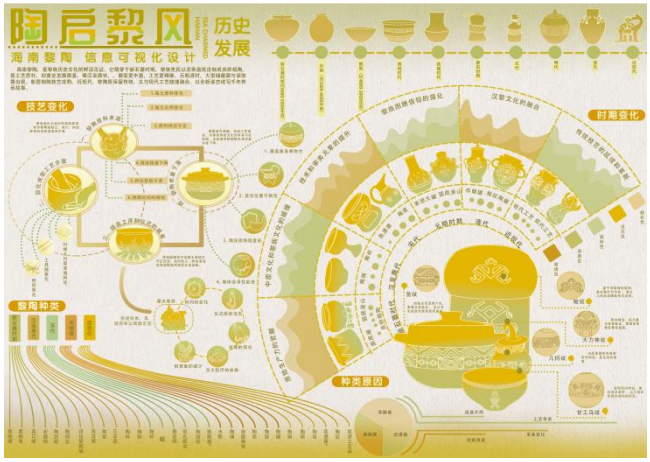


Fig 3. Tao Qi Li Feng: Historical Development Visualization

5.3. Cultural Relationships: From Object Recognition to Relational Understanding

The composition of cultural relations includes the environment, people, practices and uses of Li pottery (Fig. 4). Its nodes are regional resources, production methods, bearers of heritage, vessel functions and cultural concepts. Connecting lines show the relationships among these categories, and the network has character illustrations and context graphics. These show the places where pottery is made and used, as well as the culture of women's pottery-making and daily life. The illustrations offer a familiar environment for the cultural categories, and the network shows connections that are not obvious in a list of individual vessels. Clay and the natural world are included along with craft knowledge and daily life. Their placement in the same work shows that pottery-making is based on the material and social conditions of that time.

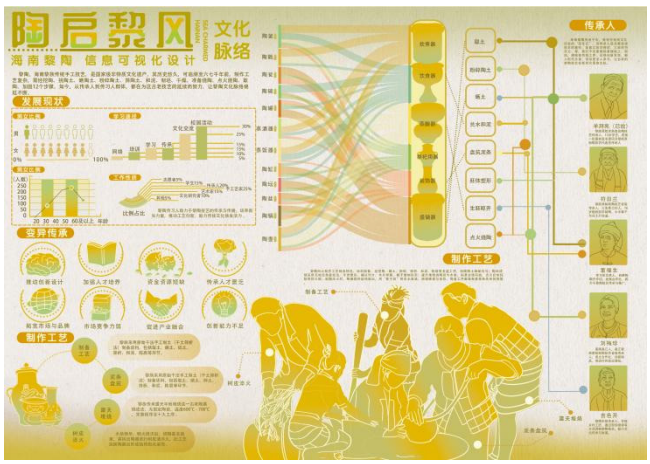


Fig 4. Tao Qi Li Feng: Cultural Relationships Visualization

5.4. Vessel Types: From Formal Difference to Functional Relationships

The vessel graphics retained the distinctive structural features needed to differentiate one vessel type from another. Representative jars, pots and steamers were chosen from the collected visual materials and simplified to form the vessel-type composition (Fig. 5). The vessels were analyzed in terms of the rim, body, and base, and the classification diagram links these formal features with their functions and everyday uses. The vessel graphics present formal differences, while the accompanying information explains their functions. This layout provides a basis for comparison without losing the structural characteristics of the selected vessels.

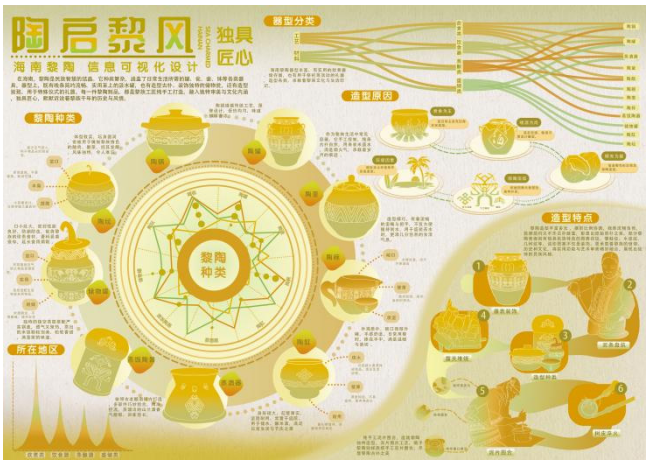


Fig 5. Tao Qi Li Feng: Vessel-Type Visualization

5.5. Production Process: From Experiential Craft Knowledge to Procedural Interpretation

The production process includes clay preparation, shaping, decoration, drying, and firing. Process nodes determine the order of the main operations, such as shaping, coil building, decoration, drying and open firing (Fig. 6). At different stages, pictures of the potters and brief descriptions are added to show different stages of the production process. Illustrations show hand operations; nodes connect them sequentially, and some icons represent materials, tools, firing conditions, etc. Together with the corresponding steps, these components show the resources required for each operation. The sequence provides an overview of production while allowing individual stages to be examined separately. The visualization presents the documented operations but does not substitute for direct experience of the craft.

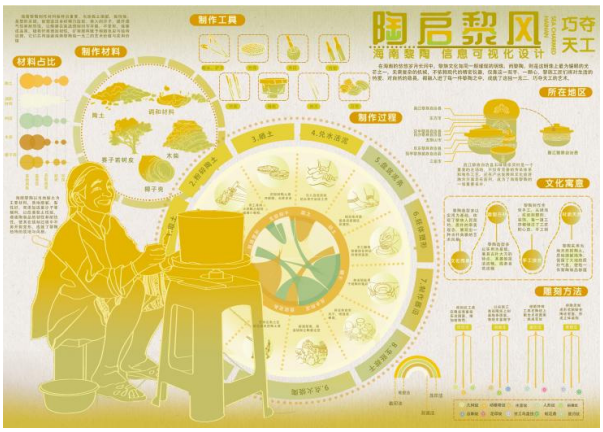


Fig 6. Tao Qi Li Feng: Pottery-Making Process Visualization

5.6. Decorative Motifs: From Surface Patterns to Cultural Symbols

The decorative-motif visualization examines individual patterns, combinations, and their use on pottery (Fig. 7). The selected motifs were redrawn in vector format, and enlarged details were used to show their formal features. Textual descriptions were added to provide cultural explanations. On the right, examples of fish, frog, and geometric motifs are arranged radially. The center links individual motifs with combined decorative patterns used on pottery. The composition presents the motifs at different scales: enlarged graphics show individual details, while the central arrangement demonstrates how motifs form larger decorative structures. Accompanying text distinguishes between visual description and cultural interpretation. The graphics show the forms of the selected motifs, while their meanings are explained with reference to supporting cultural materials.

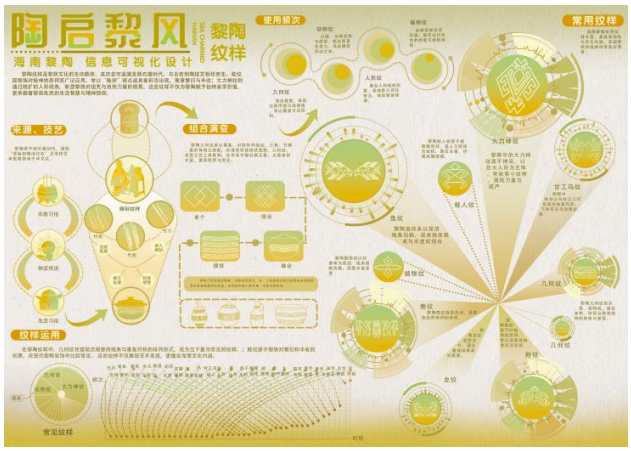


Fig 7. Tao Qi Li Feng: Decorative-Motif Visualization

The five visualizations were planned as a related series rather than as separate posters. The historical timeline provides a sequence for exhibition captions or a series of digital posts; the production-process diagram can be reorganized as a storyboard for a short video; and the vessel, motif, and cultural-relation diagrams support comparison and discussion in class. When the same content is transferred from one medium to another, the visual hierarchy, scale, and reading order may change, but the documentary source and cultural explanation of each item should remain traceable. This approach connects a Hainan cultural subject with the cultural-tourism creative design and digital creative design sectors identified in the Hainan International Design Island Industrial Development Plan [16].

6. Summary

Hainan Li pottery is an important form of traditional pottery-making among the Li ethnic group, carrying knowledge of everyday utensils, manual practice, and ethnic culture. To address the fragmented presentation of its historical development, production process, vessel functions, decorative motifs, and cultural meanings, this study applies information visualization methods to organize and visually translate relevant materials. The resulting series presents the history, craftsmanship, vessel forms, motifs, and cultural relationships of Hainan Li pottery through structured visual pathways, allowing previously scattered intangible cultural heritage information to be understood as a connected system.

This study presents one design outcome developed from the regional-culture project framework used in the Information Design course. The resulting series should be regarded as a design prototype; without audience testing, it cannot yet demonstrate that public understanding has improved. Its present contribution is to reorganize Li pottery knowledge into a visual resource for heritage education, design teaching, and digital communication. In the context of the Hainan Free Trade Port and the International Design Island, the case provides a specific example of how local cultural knowledge can enter contemporary design training and communication beyond its original setting [15,16]. Further classroom observation and audience research may examine how the material is adapted for different users and whether viewers correctly understand the relationships among vessels, techniques, and cultural meanings.

Acknowledgments

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