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Research on Information Visualization Communication Design of Traditional Xuan Paper Making Techniques in the New Media Context

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Abstract: Traditional Xuan paper-making is a knowledge-intensive craft in which materials, tools, procedures, manual judgment, and cultural meanings are closely intertwined. In current communication practice, however, this knowledge is often presented as isolated photographs, exhibition texts, or short process clips. Such forms are useful for documentation but do not always help non- specialist audiences understand how the parts of the craft relate to one another. This paper discusses how information visualization can support the communication of Xuan paper-making in a new-media environment. The analysis focuses on information hierarchy, visual translation, temporal narrative, and media adaptation. On this basis, a communication framework is proposed that combines layered information, motion-based explanation, scenario-specific output, and lightweight interaction. The aim is not to replace the craft with digital effects, but to make its internal structure easier to perceive while retaining the authenticity of the process. The study offers a design-oriented reference for the contemporary communication of traditional craft-based intangible cultural heritage.

Keywords: New media; Xuan paper-making techniques; Information visualization; Intangible cultural heritage; Communication design

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1. Introduction

Xuan paper is widely associated with Chinese painting and calligraphy, yet the paper itself is also the product of a complex traditional craft. Its production brings together plant materials, water, tools, repeated manual operations, and judgments developed through long-term practice. Studies of Xuan paper have addressed cultural value, industrial development, craft protection, and digital communication, providing a useful basis for understanding its contemporary transmission [1–5].

The difficulty lies less in the absence of content than in the way that content is organized for public viewing. Museum displays, documentary images, illustrated texts, and short videos can each show part of the process, but they often separate one operation from the larger system to which it belongs. A viewer may remember the visual impact of sheet formation or drying without understanding the sequence of preparation that precedes it, the role of tools and materials, or the judgment required from the craftsperson. In mobile media, where attention is distributed across short and rapidly changing units of content, this fragmentation becomes more obvious.

Information visualization provides a way to address this problem at the level of information structure. Rather than treating visualization as decoration, this paper uses it as a method for sorting, relating, and presenting craft knowledge. The discussion is based on the communication characteristics of traditional Xuan paper-making and considers how visual coding, motion, interface structure, and interaction can be used without weakening the accuracy of the craft itself.

2. Communication challenges of Xuan paper-making in the new media context

2.1. Complex craft knowledge in fragmented media

Xuan paper-making is a chain of connected operations rather than a single demonstrative technique. Raw-material preparation, pulping, sheet formation, pressing, drying, and subsequent handling each have their own objects, tools, actions, and timing. When the process is explained mainly through continuous prose, a non-specialist reader has to reconstruct these relationships independently. On short-video platforms, the opposite problem appears: content is often reduced to visually distinctive moments because those moments are easier to capture and circulate.

This preference for visually striking procedures is understandable, but it can obscure less visible forms of knowledge. Preparation, sequence, material condition, and tacit judgment are not always dramatic on screen, even though they are essential to the craft. The communication problem is therefore not simply that information is insufficient. More often, the information lacks an explicit structure that allows viewers to see how one stage depends on another.

2.2. Static presentation and the reading habits of new-media audiences

Text panels, photographs, and documentary films remain valuable forms of cultural documentation. Their limitation appears when the same material is transferred directly to a mobile environment without being reorganized. A long caption that works in an exhibition does not necessarily work on a phone screen, and a complete process video does not automatically reveal the logic of the process. Existing studies on Xuan paper communication have similarly called for more diversified digital forms and greater audience participation [2–3, 6].

For this reason, new-media communication should be understood as more than a change of carrier. The important question is how information is re-edited for a specific mode of viewing. A mobile page can reveal content in stages; motion graphics can clarify an action that is difficult to explain in words; a digital exhibition can link an object to additional layers of explanation. In each case, the design task is to reconstruct the relationship between content, sequence, and medium.

2.3. From one-way explanation to active understanding

Traditional heritage communication often places the institution, curator, or inheritor in the position of speaker

and the public in the position of receiver. Social media changes this relation. Users comment, save, forward, compare, and sometimes remake what they encounter. This does not mean that craft knowledge should be simplified into entertainment. It does mean that communication can give viewers more opportunities to make choices and test their understanding.

For younger audiences who do not regularly use Xuan paper in painting or calligraphy, historical importance alone may not be enough to establish a connection. A clearer route is to make the internal logic of the craft visible and to let users participate in small acts of recognition: identifying materials, arranging stages, comparing states, or exploring why a particular operation is necessary. Such participation can reduce the psychological distance between specialist knowledge and everyday experience [7–8].

3. Information structure and visual translation

3.1. Building an information architecture before designing graphics

The first step in information visualization is not choosing colors or icons, but deciding what information belongs together. For Xuan paper-making, the material can be organized into five closely related groups: materials, tools, procedures, people, and culture. Materials describe the physical basis of production; tools identify the implements used at specific stages; procedures show sequence and transformation; people introduce skill and experience; and cultural information explains the relationship between Xuan paper, regional knowledge, calligraphy, painting, and traditional aesthetics.

These groups should not be displayed as separate inventories. Their value lies in the links between them. A material enters a particular process, a tool enables a particular action, and the action may require judgment that cannot be fully reduced to a fixed rule. Visualizing these links turns a list of operations into a knowledge network. For a general audience, this network provides a map of the craft before detailed information is introduced.

3.2. Translating craft forms into a visual system

Xuan paper-making already contains a distinctive visual vocabulary. Plant forms, pulp fibers, water traces, tool silhouettes, paper edges, and surface textures can all be used as sources for visual translation. Previous design research has shown that Xuan paper's material and craft characteristics can support contemporary visual and cultural applications [9–10].

The important point is to extract rather than imitate. A tool icon, for example, can be simplified according to the shape needed for recognition; a set of process symbols can share a common line weight; texture can be used as a secondary cue rather than as decoration. When visual elements have a stable relationship to information categories, viewers are able to recognize repeated meanings across pages and platforms. Consistency then becomes part of the communication function.

3.3. Using time as part of the visual explanation

Craft knowledge is temporal. Materials change state, actions occur in sequence, and certain outcomes depend on timing. A static flowchart can show order, but motion can show transition. In a mobile interface, vertical scrolling can follow the production sequence, while small animations can explain how a movement changes material from one stage to the next. For procedures such as sheet formation, the visual emphasis may be placed on the relationship among the mould, water, and pulp rather than on a decorative reconstruction of the

workshop.

This approach allows the design to remain explanatory. Motion is used when it clarifies change; static diagrams remain appropriate when they communicate comparison or classification more directly. The decision should follow the content rather than the desire to make every element move.

4. Information visualization strategies for new-media communication

4.1. Layered information for different levels of reading

A single interface does not need to present every piece of craft knowledge at once. A more effective structure can distinguish between core, extended, and specialist information. Core information answers basic questions about what Xuan paper is and how it is made. Extended information introduces tools, materials, and key operations. Specialist information can then provide cultural background, terminology, and more detailed process knowledge.

This layered structure is especially useful on mobile devices. A viewer who wants a quick overview can remain at the first level, while another viewer can open additional information through scrolling, tapping, or expandable sections. The same system therefore accommodates different levels of prior knowledge without reducing the craft to a simplified summary.

4.2. Motion for explaining process rather than adding spectacle

Dynamic visualization is most useful when it explains an action that is difficult to understand from a still image. Key-frame animation, path movement, magnification, and state change can be used selectively. During sheet formation, for example, a simplified animation can show the direction of movement and the distribution of pulp. The purpose is not to create a technically exact simulation, but to help the viewer understand what changes during the operation.

On short-video platforms, this principle can be extended into a series of compact knowledge units. Each unit can focus on one question while sharing the same symbols, typography, and motion rules. Fragmented viewing is then no longer treated as an obstacle alone; it becomes a condition that the visual system can work with.

4.3. Adapting one knowledge system to different media scenarios

New media is an environment composed of different platforms rather than a single channel. Short videos favor concise movement and strong visual focus; mobile webpages can sustain longer sequential reading; digital exhibitions allow information to be connected with objects and space. The same content should therefore be reformatted rather than duplicated unchanged.

Augmented reality is one possible extension, particularly when digital information needs to be linked to a physical object or exhibit. Studies of AR-based Xuan paper communication suggest that such technology can expand the experiential dimension of craft presentation [2]. Yet technology should remain subordinate to the communication task. If a static diagram explains a relationship more clearly than an interactive effect, the simpler form is the better design choice.

4.4. Lightweight interaction as a way to reinforce understanding

Interaction is most effective when the action corresponds to the knowledge being learned. Users might

arrange process stages, match tools with operations, distinguish material states, or open a detail only when it becomes relevant. These small interactions ask the viewer to make a judgment instead of merely receiving information.

The result can also support secondary communication. A completed sequence, comparison, or personalized path may be converted into a shareable visual card or short summary. In this way, the design connects viewing, understanding, and sharing without requiring the craft itself to be turned into entertainment.

5. A practical design path for Xuan paper information visualization

A practical workflow can begin with the materials already used in craft documentation: process records, photographs, terminology, tool information, and cultural explanation. These materials are first classified and connected according to the production sequence. The next step is to identify which relationships need visual explanation and which can remain textual. Only after this information architecture is established should icons, diagrams, typography, texture, and motion be developed.

For a mobile interface, the production process can be presented as a vertical narrative. Each section introduces one stage with a concise visual explanation, while details about tools, materials, and cultural meanings can be opened separately. For short-video communication, representative procedures can be edited as a serial format with a stable opening, icon system, and graphic language. A digital exhibition can use the same information system at a larger scale and connect physical exhibits with layered digital explanation.

This cross-media approach is useful because it does not require a separate visual identity for every platform. The information model and visual rules remain consistent, while the amount of content, rhythm, and mode of interaction are adjusted to the viewing situation. Such consistency also helps avoid the common problem of cultural communication being reduced to unrelated promotional fragments.

There is, however, a clear boundary to this form of redesign. Graphic simplification must not alter the actual sequence or meaning of the craft, and motion design should not invent procedures that do not exist. Information visualization should lower the cost of understanding while preserving the reliability of the knowledge being communicated. This balance between clarity and authenticity is central to the design of traditional craft information.

6. Discussion and evaluation considerations

A communication system for traditional craft should be evaluated by more than visual attractiveness or the number of interactions it offers. For Xuan paper-making, the more relevant questions are whether viewers can recognize the order of the process, understand why a material or tool appears at a particular stage, and distinguish factual craft knowledge from decorative interpretation. These criteria shift evaluation from surface appeal to communicative clarity.

Media context also changes what counts as effective visualization. On a mobile screen, legibility, reading rhythm, and the number of operations required from the user are practical concerns. In an exhibition, scale, viewing distance, and the relationship between digital content and physical objects become more important. A visual system therefore needs a stable information logic, but its presentation should remain flexible enough to respond to different situations rather than forcing one interface onto every platform.

Cultural accuracy is another boundary. Simplification is unavoidable when complex craft knowledge is translated into icons, diagrams, or motion, yet simplification should not alter the sequence of production or imply technical relationships that do not exist. When uncertainty remains, explanatory text or source notes are preferable to an invented visual answer. This principle is especially important for intangible cultural heritage, where communication design participates in shaping how non-specialist audiences understand the craft.

The framework proposed here is conceptual and design-oriented. It has not yet been tested through a completed interactive prototype or a large-scale audience experiment. A subsequent stage of the study can therefore develop representative mobile and exhibition prototypes and compare user comprehension, navigation efficiency, and perceived cultural clarity. Such evaluation would help determine which visualization methods genuinely improve understanding and which merely increase visual complexity.

7. Conclusion

The communication problem facing traditional Xuan paper-making is not solved simply by placing more images or videos online. The craft contains a dense network of materials, actions, tools, experience, and cultural meanings, while many new-media formats encourage brief and fragmented viewing. Information visualization is valuable because it can mediate between these two conditions: it reorganizes complex knowledge and gives audiences a clearer route into the craft.

The strategies discussed in this paper-layered information, selective motion, scenario-based adaptation, and lightweight interaction — are intended as parts of one communication system rather than independent effects. Their purpose is to make relationships visible, support different depths of reading, and create opportunities for active understanding. For Xuan paper-making and similar forms of traditional craftsmanship, the most important principle is that digital expression should remain accountable to the craft itself. New media can change how the knowledge is encountered, but the credibility of that knowledge must remain the basis of design.

Disclosure statement

The authors declare no conflict of interest.

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