Design of metadata scheme for traditional Chinese clothing patterns for cultural digitization

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Abstract: *In view of the problem that the current digital collection and description of Chinese traditional costume pattern metadata lack an in-depth exploration and expression of cultural connotations, a practical analysis method is adopted. This method considers the needs at three levels: external attributes, content attributes, and specific applications of traditional costume pattern data, in order to achieve international common use. Based on the DC metadata, we conducted an in-depth analysis of the cultural connotations of traditional clothing patterns and expanded the elements accordingly. We designed a traditional clothing pattern metadata scheme covering three categories of elements: general, management, and cultural. The cow head pattern found in the traditional clothing of China's Wa ethnic group was used as an example to illustrate the process. This solution can describe, display, and manage the attributes of traditional clothing pattern image resources in a more comprehensive manner and promote the sharing and application of these resources, based on cultural digital expression.*

Keywords: *Traditional clothing; Patterns; Metadata; Cultural digitization*

1. Introduction

Chinese traditional clothing is a material carrier of traditional Chinese culture and a symbol of civilization. It is also an integral element of people's lives. Its emergence and evolution are closely intertwined with politics, economy, geography, ethnicity, religious beliefs, and living customs. As a significant carrier of China's traditional culture, clothing patterns represent the most concentrated expression of clothing culture. These patterns, imbued with specific meanings and artistic characteristics on traditional clothing, carry the profound accumulation of traditional culture and unique aesthetics. After extensive historical development, they have evolved into decorative graphics and patterns with unique traditional characteristics. Different historical periods, regions, and ethnic groups hold varying perspectives on patterns. The choice of colors and styles also makes traditional clothing and its patterns highly recognizable. To apply traditional clothing patterns to various fields such as clothing design and education, it is essential to describe the rich cultural connotations and meanings inherent in traditional clothing patterns and explore their aesthetic perspectives and emotional foundations. This understanding of the culture and art of traditional clothing patterns can then be used for reference and educational applications.

When traditional clothing pattern images are indexed, stored, and displayed in a digital resource library according to a specific metadata scheme, users can more effectively achieve retrieval, understanding, management, and use of pattern image resources. In terms of metadata scheme design, expanding the semantics of traditional clothing pattern resources, especially the exploration of cultural connotations, can promote the more effective dissemination and application of traditional clothing patterns in design, education, and other fields. However, the current metadata scheme framework, structure, and categories of traditional clothing patterns still lack the collection and description of cultural attributes, and no unified norms and standards have been formed. Based on this, it is necessary to reconstruct a set of metadata for traditional clothing patterns for cultural digitization. This plan aims to promote a more comprehensive presentation of traditional clothing patterns.

2. Literature review

Metadata is a specification used to describe and index the external and content attributes of resources in various digital resource libraries. The standard definition of metadata is a method for describing and indexing the attribute information of a specific resource object. It is a collection of data with multiple

functional description items, serving as organizational data for the expression and dissemination of resource object knowledge. The determination of metadata standards is a crucial indicator and foundational element for the standardized construction of digital resource databases [1].

The existing resource metadata standards applied in various fields target the singular needs of specialized resources and organizational groups. There is no universal method or metadata standard for resources with complex object attribute information, such as traditional clothing pattern resources, that allows for uniform organization and description. Currently, the metadata standards with significant global influence and suitability for general use of traditional clothing and pattern resources include: VRA (Visual Resources Association), suitable for the description of three-dimensional physical resources such as buildings, cultural relics, and folk culture; DC (Dublin Core), appropriate for general network resource description; and CDWA (Categories for the Description of Works of Art), suitable for the description of artworks and digital image resources[2].

After recognizing the uniqueness of traditional cultural resources and traditional clothing resources, some scholars in China have attempted to design and apply metadata solutions for traditional cultural resource metadata based on the aforementioned three metadata standards. Zhou (2018) explored the cultural connotation deeply based on the internationally accepted DC metadata and expanded the basic elements to construct a set of national costume metadata based on cultural ontology and digital color description[2]. Fan et al. (2022) combined the case of digital cultural resources in Hubei Province and conducted metadata-based description and application research on digital cultural resources by analyzing the metadata attributes of cultural resources[3]. Ye et al. (2023) proposed a metadata construction plan for traditional clothing by extending the DC core elements, based on the 15 core elements of the DC metadata standard, and combined with the characteristics of clothing products and the application specifications of the clothing industry[4].

The metadata scheme in the above studies is not tailored to the unique characteristics of traditional clothing patterns, especially in terms of the digital description of cultural connotations. It is not comprehensive and flexible enough for direct reuse. Therefore, this article begins with the basic attributes of traditional clothing patterns, supplements the cultural attributes of pattern resources, and forms a metadata scheme for Chinese traditional clothing patterns oriented toward cultural digitization.

3. Method

3.1 Traditional Clothing Pattern Metadata Scheme Design Process

A complete resource metadata scheme includes three aspects: semantics, structure, and expression form [5]. The design of the traditional clothing pattern metadata scheme encompasses these three aspects. The design method for the traditional clothing pattern metadata description scheme is generally oriented based on the object attribute characteristics and application purposes of traditional clothing patterns. It takes into account the metadata standards in related fields that have been widely used both internationally and domestically, and refers to the practical applications of relevant resource libraries and platforms. Accordingly, the existing elements in these metadata standards are utilized to design and reconstruct a metadata description scheme that meets the needs of the traditional clothing pattern library, as shown in Figure 1.
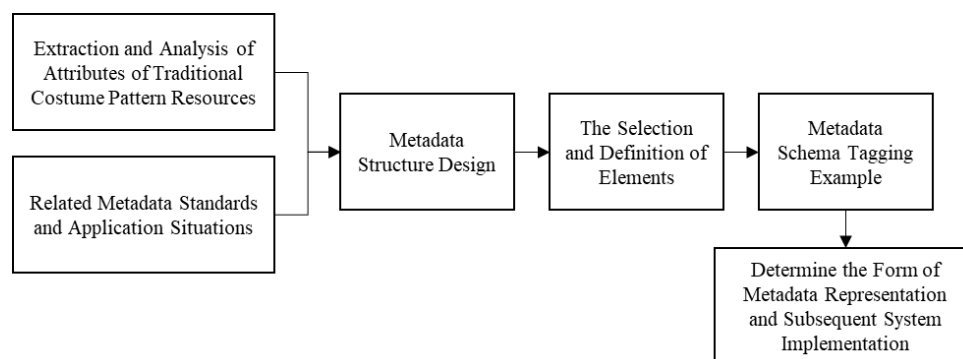

Figure 1: Design Flowchart of Traditional Clothing Pattern Metadata Description Scheme

3.2 Metadata Structure Design

Metadata consists of a collection of multiple elements, and the relationship between each element forms the metadata structure. Different metadata standards often have varying structures. The more notable structures include the flat structure of DC and the hierarchical tree structure of IEEE LOM [6]. The metadata structure is influenced by the attribute characteristics of the resource objects to be indexed, as well as by the application purpose and requirements of the metadata scheme. The attributes of traditional clothing pattern resources discussed in this article are characterized by their complexity and multiple categories. The application requirements and purpose of the metadata scheme are to describe patterns more effectively and to facilitate the display and understanding of the patterns' multi-category attributes, which aids in expressing pattern knowledge. Based on these considerations, a hierarchical tree structure among traditional clothing patterns and elements is deemed more appropriate.

The metadata of traditional clothing patterns has a hierarchical tree structure, divided into "root node," "branch node," and "leaf node." The top level is the root node, representing the traditional clothing pattern metadata. This metadata collection contains many sub-elements, and these child elements can also contain their own child elements. Among these child elements, those that contain further child elements are branch nodes, and those that do not contain child elements are leaf nodes, as shown in Figure 2.
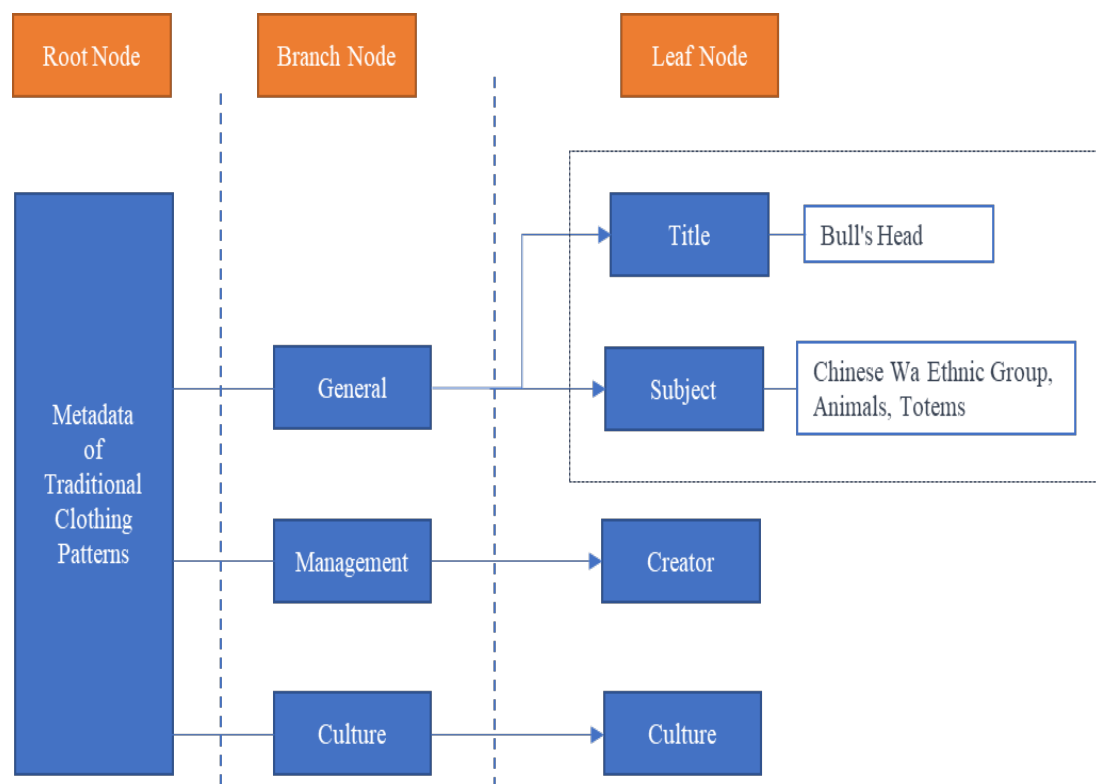

Figure 2: Traditional clothing pattern metadata structure design diagram

The root node of traditional clothing pattern metadata is divided into two types of data elements: branch node elements and leaf node elements. Branch node elements, such as general and cultural, are divisions and descriptions of attribute categories of pattern resource objects. They represent a collection of leaf node elements without specific values or sizes and are used in the front-end pattern description and knowledge expression on the pattern learning platform. They do not allocate fields and space in the database table. Leaf node elements, such as title and theme, describe a single attribute of the pattern resource object. They are individual data elements, belong to a certain branch node element, represent a specific type of attribute of the pattern, and have specific restrictions on data type and value size. The structure of traditional clothing pattern metadata reflects its element expansion mechanism. If an element is introduced to describe a certain attribute characteristic of clothing patterns, it needs to be classified and attributed to a specific branch node. To add a category description to the clothing pattern metadata, a leaf node for this type of attribute description should be added to the branch node.

3.3 Selection and Definition of Elements

The most challenging aspect in designing a traditional clothing pattern metadata description scheme is determining which elements are needed and the semantics and attributes of each element description. First of all, the selection and definition of elements are inseparable from the resource analysis of traditional clothing patterns. The purpose of resource analysis is to extract attributes of collected traditional clothing pattern physical objects, especially representative objects, based on the attribute content and description of the patterns themselves, their management, and application requirements. These elements describing traditional clothing patterns are extracted from existing pattern culture research documents, pattern design application research documents, similar resource library resource description elements, and one's own understanding of patterns. They are not comprehensive and standardized enough and need to be standardized in accordance with relevant metadata standards.

Considering the standardization and effectiveness of the metadata description scheme, the selection and definition process of traditional clothing pattern metadata elements does not recreate all elements. Except for some elements that describe the unique attributes of traditional clothing patterns, most metadata element selections and definitions need to adopt standardized elements and definitions already existing in public standards. This ensures the semantic compatibility and understandability of each traditional clothing pattern metadata entity. Therefore, the selection and definition of elements involve selecting standard elements that can be directly cited in metadata standards released in the resource category field covered by traditional clothing patterns to replace the elements listed in the resource analysis, or to further extend the elements in the published metadata standards. These are integrated into the concepts and definitions of existing elements, and corresponding mapping relationships are established between the elements. Finally, all elements are categorized and attributed according to their characteristics, and structural relationships are established.

Based on the above design process and methods, the author divided the traditional clothing pattern metadata into three categories: general, management, and culture, with a total of 17 elements. Among them, general and management elements mainly refer to relevant standards of network resources and image resources and reuse 10 elements including "Title, Description, Subject, Identifier, Creator, Contributor, Rights, Date, Type, Format" from the core elements of DC metadata[7].

The value of traditional clothing patterns lies in their unique cultural connotations and artistic characteristics. In the expression and dissemination of pattern knowledge, the cultural and artistic characteristics behind the patterns must be supplemented by appropriate text descriptions to better transform them into knowledge. Therefore, cultural category elements are the focus of selection and definition in this article. Cultural elements include "7 elements: Resource, Costume, Relation, Nationality, Classification, Culture, and Coverage," which are specifically defined as follows:

(1) Resource, definition: the source of traditional clothing pattern. The sources of patterns in this article are divided into two categories: photography and collection. For photography, it is the specific shooting location and venue, and for collection, it is the link address and literature description of available patterns. Examples: "Photography/Wengding Village, Cangyuan County", "Collection/Jiayou Photography Network www.photofans.cn/picid=xx".

(2) Costume, definition: a reference description of clothing extracted or derived from traditional clothing patterns. Clothing patterns originate from clothing, and they should also be compared with corresponding clothing in resource platform displays, showing the viewer the application part of the pattern in the clothing, the application effect, and the original design intention of the pattern. Elements can be described by providing links to pictures of patterned clothing, enabling learners to consciously view the source clothing of the pattern.

(3) Relation, definition: a description of the relationship between patterns. Many large patterns in traditional clothing also contain small graphics and pattern elements. When these patterns are stored and displayed separately, these elements are involved. The most important relationships among them are "contains" and "is contained in", which describe the interrelationship between patterns. This correlation is also an important reference in pattern learning. Example: "Hani-020-03 is included in the Hani-020/pattern link".

(4) Nationality, definition: a description of the nation to which the pattern and patterned clothing belong. The ethnic attributes in traditional clothing patterns are an important explanation of the cultural information in the patterns and are key information for understanding in design learning and educational applications. Examples: "Han", "Wa".

(5) Classification, definition: the classification results of different morphological and content characteristics of traditional clothing patterns. Different from the "Resource Type (Type)" element previously mentioned, pattern type emphasizes the artificial classification of patterns according to different pattern contents. The purpose of describing the classification results is to summarize and express the content characteristics of traditional clothing patterns. It is a brief summary of the cultural and artistic characteristics of patterns to facilitate learners' understanding and retrieval. Examples: "Animal print", "Myths and legends".

(6) Culture, definition: a detailed description of the cultural background and artistic characteristics of traditional clothing patterns. The creation and development process of patterns on traditional clothing is part of pattern culture. In the process of pattern display, the abstract formation process of patterns needs to be expressed in words. These descriptions are key experiences for learning and reference and are also important for other learning groups to understand traditional culture and art. The element description content includes, but is not limited to, the formation process of the pattern, the symbolic meaning of the pattern, etc. Example: "The spiral pattern is a pattern that the Hani people like very much. It has an auspicious symbolic meaning of the endless existence of all things and expresses the Hani people's desire for children and grandchildren to multiply and live endlessly."

(7) Coverage, definition: a description of the usage situation of traditional clothing patterns in time and space. The existence and development of traditional clothing patterns have their own unique time and space axes. This element describes this aspect. The element modifiers include time, place, and occasion of use. The annotator needs to have an in-depth understanding of the pattern. Example: "Wu Ba, time: modern times; place and occasion: worn by the deceased and mourning women of Yuanyang Hani, Honghe River."

4. Result: Example of Traditional Clothing Pattern Metadata Scheme Description

To illustrate the metadata scheme of traditional clothing patterns as a whole, this article selects the common pattern "cow head" on traditional men's clothing of the Wa ethnic group in China as the object for example description. Table 1 is the metadata description of Figure 3.

Figure 3: Chinese Wa Traditional Men's Clothing with Cow Head Pattern

Table 1: Example of Metadata Description of the Cow Head Pattern on Traditional Men's Clothing of the Wa Ethnic Group in China

Branch Node/ Category	Leaf Node / Element	Describe	Reference Standard
Universal	Title	bull head	Reuse DC elements
	Description	An important totem pattern of the Wa ethnic group, abstracted from a cow's head, with red and yellow colors. It is commonly seen in Wa men's clothing and backpacks.	Reuse DC elements
	Subject	Bull head, Wa people, totem	Reuse DC elements
Manage	Identifier	The database assigns a 32 -bit random code	Reuse DC elements
	Creator	Goofy shot	Reuse DC elements
	Contributor	goofy drawing	Reuse DC elements
	Date	2023 _	Reuse DC elements
	Type	vector redraw image	Reuse DC elements
	Format	AI/PNG format pictures	Reuse DC elements
	Rights	This picture was drawn by Gao Fei personally and can be disseminated and shared publicly.	Reuse DC elements
Culture	Resource	Taken in Wengding Village, Cangyuan County, Lincang City, Yunnan Province	Extended DC elements
	Costume	Wa men's tops, URL	The cultural attributes and characteristics of traditional clothing patterns
	Relation	No primitive association exists	Extended DC elements
	Nationality	China's Wa ethnic group	The cultural attributes and characteristics of traditional clothing patterns
	Classification	animal patterns, myths and legends	The cultural attributes and characteristics of traditional clothing patterns
	Culture	The cow is the totem of the Wa people and the god who protects them. In the hearts of the Wa people, the cow symbolizes luck and nobility. There are many legends about cows among the people of the Wa people. The cow is an animal and image that the Wa people love very much, so the Wa people often The clothing is decorated with a cow head pattern.	The cultural attributes and characteristics of traditional clothing patterns
	Coverage	Modern / Chinese Wa men's daily clothing	Extended DC elements

5. Discussion

This paper fully considers the principle that the traditional clothing pattern metadata scheme has a clear structure, and the element collection is easy to understand and can express the unique cultural connotation of traditional clothing patterns. Based on the 10 core elements of DC metadata, 7 elements are extended and expanded to form a comprehensive Chinese traditional clothing pattern metadata scheme with 17 elements in three categories: general description elements, management description elements and cultural description elements. According to this metadata scheme, especially the selection

and definition of cultural description elements in the scheme, the regional space, history, and ethnicity behind the clothing patterns can be described, which is conducive to the preservation of national clothing patterns based on cultural digitization. and sharing, providing reference for traditional cultural dissemination, art design and educational applications.

6. Conclusion

Developing a Chinese traditional clothing pattern metadata scheme for cultural digitization and applying it to the indexing of pattern image databases clearly expresses the cultural significance of traditional clothing patterns. This forms the basis for the dissemination and sharing of pattern image resources on the Internet. The traditional clothing pattern metadata description scheme presented in this article describes the external attributes and content attributes of traditional clothing pattern image resources from three aspects: general description elements, management elements, and cultural elements. This ensures complete and clear semantics for the annotation of traditional clothing patterns. The scheme can meet the management needs and user requirements of common traditional clothing pattern image databases, achieving the goal of enriching the semantics of traditional clothing pattern resources.

The traditional clothing pattern metadata description scheme introduced in this paper also requires further improvement. At present, the expansion and selection of elements are based on the specific analysis of small samples of traditional clothing pattern resources. In the future, it is necessary to correct and improve these description elements through multi-sample feedback from experts and users, thereby promoting the formation of traditional clothing pattern metadata standards. Additionally, when formulating metadata standards, there are many practical challenges in how to supplement the collection of existing cultural category elements of traditional clothing patterns and how to enhance the understandability, memorability, and experienceability of these cultural category elements.

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