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The Use of Color as Classification Notation: One way Cataloguers can make a Difference

Abstract

Classification is about relationships, not just finding the proper notation or category. It provides a logical order of subjects and subtopics from broad to narrow, which can be converted into a linear layout of library contents. With technological advancements, classification systems, as well as their notation, must develop. This study looks at the conventional properties of notation, the classificatory needs it must serve, and their prospective applications to classification notation in order to investigate the feasibility of employing color as classificatory notation.

Keywords: Classification Notation, Cataloguers, Color Coding, Facet Analysis, Organization of Knowledge

Introduction

Each cataloger or librarian's major aim is to organize library resources to meet users' information-seeking needs, such as searching, identifying, selecting, and receiving the essential information resources from users in a timely manner. Any restriction of access, whether intentional or unintentional, will limit the ability of libraries to fully fulfill their primary function of meeting the library and information needs of the communities they serve. When information resources are not accessible, they are useless. The notions of cataloging and classification encompass this essential role. As a result, cataloging is an important process that allows people to access all of the library's acquired information resources, as it allows them to find information that is relevant to their personal and professional development (L., Young, & Joudrey, 2020).

It also gives access points to information resources so that users can find the information or resources they require. In libraries, on the other hand, classification systems

typically serve two purposes(Avraam, 2017). For starters, they make subject access easier by allowing users to see what works or papers the library possesses on a particular subject. They also provide a known location where the information source can be found (e.g. where it is shelved). In accordance with the subject headings, the cataloger provides a classification, or call number. Some of the popular classification systems according to (Hanson, 2013) are the Library of Congress Classification (LCC), the Dewey Decimal Classification (DDC) the Bliss Bibliographic Classification (BC), the Universal Decimal Classification (UDC), Cutter Expansive Classification, and the Colon Classification (CC); LCC & DDC being the most popular ones.

Because of the flaws in these categorization schemes and the unique nature of some libraries, they (libraries) developed their own system that involves color coding or the use of color as a classification symbol(Cabonero & Dolendo, 2013a). This is to ensure that they provide services to all types of users, whether they are familiar with the schemes or not, and regardless of their educational levels or qualifications. Any restriction on access, whether intentional or unintentional, will limit the libraries' ability to fully fulfill their primary role of meeting the library and information needs of the communities they serve(Horvart, 2010). Against this backdrop, this study will examine the use of color as classification notation: one way the cataloguers can make a difference.

Concept of Classification Notations

Classification traditionally provides formal, orderly access to the shelves; it is also a mechanism by which to collocate materials in the catalog. It's what makes browsing possible. Invariably, classification is the process of arranging, grouping, coding, and organizing books and other library materials (e.g. serials, sound recordings, moving images, cartographic materials, manuscripts, computer files, e-resources etc.) on shelves or entries of a catalog,

bibliography, and index according to their subject in a systematic, logical, and helpful order by way of assigning them call numbers using a library classification system, so that users can find them as quickly and easily as possible(Luther, 2010). The call number serves a dual purpose: it determines the place of a book on the shelf and collocates books on the same topic next to each other.

A call number consists of a class number that identifies the class, a book number that identifies the author, and a collection number that identifies the collection to which it belongs(Ankeny, 2013). Ordinary classification is concerned with the systematic ordering of concepts and objects. However, we are concerned with papers in library classification, and the goal is to arrange them in the most useful and lasting order possible. Bibliographic classification systems, like knowledge classification systems, group entities that are linked and comparable together in a hierarchical tree-like structure (assuming non-faceted system; a faceted classification system allows the assignment of multiple classifications to an object, enabling the classifications to be ordered in multiple ways)(Janis & Daniel, 2020).

It necessitates a detailed classification structure in which information is split into broad categories, which are then further subdivided into subjects or main classes. Main classes are subdivided into sub-classes, which are further subdivided into divisions and subdivisions, and so on. In this approach, classification progresses from general to specific, classifying and categorizing concepts into logically hierarchical groupings based on the similarities and differences between them(Cabonero & Dolendo, 2013b). Indentions in the categorization schedules show different levels of hierarchy. A system of digits or letters, or a combination of both, is used to represent each subject, classes, sub-classes, and divisions. It is this notation that helps in the arrangement of documents on the shelves(Lin, Fortuna, Kulkarni, Stone, & J., 2013).

The organization of documentary materials can be made more rational by using classification. The use of classification allows library customers to search the shelves for materials as well as more things on the same or related subjects, as well as to learn what papers the library has on a given subject(Aida, 2011). One of the two approaches for facilitating subject access to library items is the use of library classification systems. Thesauri and subject headings lists are examples of alphabetical indexing languages(Garg, Padalkar, & Mueller, 2011). Subject headings allow access to documents using vocabulary terms, whereas classification arranges information and library assets into a systematic order based on their subject content. Multiple terms can be assigned to the same document in thesaurus or topic headings, but each document can only be placed in one class in classification(Einakian & Newman, 2010).

So, utilizing a library categorization method, a classification number assigned to a document provides a specific placement for an item on the shelves. The DDC classification system is the most extensively used categorization system in the world(Clarke, 2013). LCC is highly enumerative, listing all past, present, and possible future subjects, and its notation is extremely friendly and extendable(Bianco & Citrolo, 2013a). The LCC is also the most often updated classification system. LCC's Classification Web database is updated daily, with new additions and revisions suggested by catalogers and accepted by the LCC editorial team. In the United States, academic libraries generally use Library of Congress Classification and public and school libraries prefer to use the Dewey decimal classification. Major libraries now use web versions of LCC and DDC to classify their materials(Garg et al., 2011). The electronic version of LCC is available online as Classification Web (<http://classificationweb.net>) and an electronic version of DDC is available online as WebDewey (<http://dewey.org/webdewey>).

A library classification system is a method of coding and organizing library materials (books, serials, audiovisual materials, computer files, maps, manuscripts, and realia) by subject and assigning a call number to each one (Bianco & Citrolo, 2013a). Bibliographic classification systems are similar to biological classification systems in that they group similar entities together in a hierarchical tree structure (assuming none-faceted system). In most libraries, classification systems serve two purposes (Lin et al., 2013). For starters, they make subject access easier by allowing users to see what works or documents the library has on a particular subject. They also provide a known location where the information source can be found (e.g. where it is shelved).

Some classification systems are better suited to assisting subject access than shelf location. For example, UDC, which has a sophisticated notation that includes plus and colons, is more difficult to use for shelf design but more expressive than DDC when it comes to expressing relationships between subjects (Caborero & Dolendo, 2013b). If the user does not know the citation order, similarly faceted classification techniques are more difficult to utilize for shelf layout. Some libraries may utilize classification systems only for one function or the other, depending on the size of their collection. In extreme situations, a public library with a modest collection may rely solely on a classification system for resource location, rather than a complex subject classification system (A. U. Libraries, 2013). Instead, all resources could be grouped into a few broad categories (Travel, Crime, Magazines etc). This classifying approach is known as "mark and park."

In terms of functionality, classification systems are often described as

- enumerative: produce an alphabetical list of subject headings, assign numbers to each heading in alphabetical order
- hierarchical: divides subjects hierarchically, from most general to most specific

- faceted or analytico-synthetic: divides subjects into mutually exclusive orthogonal facets

There are few completely enumerative systems or faceted systems, most systems are a blend but favoring one type or the other. The most common classification systems, LCC and DDC, are essentially enumerative, though with some hierarchical and faceted elements (more so for DDC), especially at the broadest and most general level. The first true faceted system was the Colon classification of S. R. Ranganathan.

Comparing Classification Systems

As a result of differences in Notation, history, use of enumeration, hierarchy, facets, classification systems can differ in the following ways(Janis & Daniel, 2020):

- Type of Notation - Notation can be pure (consisting of only numerals for example) or mixed (consisting of both alphabets and numerals or other symbols).
- Expressiveness - This is the degree in which the notation can express relationship between concepts or structure.
- Whether they support mnemonics - For example the number 44 in DDC notation usually means it concerns some aspect of France. For example 598.0944 concerns "Birds in France." The 09 signifies country code, and 44 represent France.
- Hospitality - The degree in which the system is able to accommodate new subjects
- Brevity - Length of the notation to express the same concept
- Speed of updates and degree of support - The best classification systems are constantly being reviewed and improved.
- Consistency
- Simplicity

The **Library of Congress Classification (LCC)** is a library classification system created by the US government. Most research and academic libraries in the United States and numerous other nations use it; nevertheless, most public and minor academic libraries still use the Dewey Decimal Classification (DDC)(Ankeny, 2013). It should not be confused with the Library of Congress Control Number or the Library of Congress Subject Headings. Before taking over as Librarian of Congress, Herbert Putnam established the classification with the help of Charles Ammi Cutter in 1897. It was created for use by the Library of Congress and was influenced by Cutter Expansive Classification, DDC. It is basically enumerative in nature, despite the fact that it divides subjects into broad groups. It is a guide to the books that are really in the library, not a world categorization(Cabonero & Dolendo, 2013a). The National Library of Medicine (NLM) uses the unused letters W and QS-QZ in its classification system. Some libraries employ NLM instead of LCC because of LCC's R. (Medicine)

The system

Letter Subject area

- A General Works
- B Philosophy, Psychology, and Religion
- C Auxiliary Sciences of History
- D General and Old World History
- E History of America
- F History of the United States and British, Dutch, French, and Latin America
- G Geography, Anthropology, and Recreation
- H Social Sciences

J	Political Science
K	Law
L	Education
M	Music
N	Fine Arts
P	Language and Literature
Q	Science
R	Medicine
S	Agriculture
T	Technology
U	Military Science
V	Naval Science
Z	Bibliography, Library Science, and General Information Resources

The **Dewey decimal classification** (DDC, often known as the Dewey Decimal System) is a proprietary library classification system created by Melvil Dewey in 1876, and has undergone 22 major changes since then, the most recent in 2004(Hanson, 2013). The DDC tries to categorize all knowledge into ten categories. The ten main classifications are then subdivided further. Each primary class is divided into ten divisions, with ten sections in each division. As a result, the system can be broken down into ten primary categories, 100 divisions, and 1,000 sections(Horvart, 2010). DDC has the advantage of being both entirely numerical and indefinitely hierarchical because it uses decimals for its categories.

It also uses elements from different parts of the structure to construct a number representing the subject content (often combining two subject elements with linking numbers

and geographical and temporal elements) and form of an item, rather than relying on a list containing each class and its meaning(Bothmann, 2011). The more expressive but more sophisticated Universal Decimal Classification, which combines the fundamental Dewey numbers with selectable punctuation marks, is based on DDC's numbers (comma, colon, parentheses etc.). Apart from its regular revisions, DDC's greatest advantage over its main competitor—the Library of Congress Classification system—is its simplicity(Medicine, 2012). It is often easier to use for most users because to the use of pure notation, a mnemonics system, and a hierarchical decimal place structure. DDC and UDC are also more versatile than the Library of Congress Classification because they utilize aspects (through auxiliary tables), whereas the Library of Congress Classification is almost entirely enumerative(Ankeny, 2013).

On the other hand, unlike the Library of Congress Classification, which has 21 classes at the top level, DDC's decimal approach makes it more difficult to introduce new subjects. Another consequence is that DDC notations might be significantly lengthier than equivalent classes in other classification systems. Another drawback of DDC is that it was created in the nineteenth century by essentially one individual and was based on a top-down approach to classifying all human knowledge, making it difficult to adapt to changing fields of knowledge(P. S. U. Libraries, 2013). The Library of Congress Classification system, on the other hand, was built primarily around the concept of literary warrant; classes were added (by particular specialists in each field) only when they were needed for works owned by the Library of Congress.

As a result, while the Library of Congress Classification system was able to incorporate changes and additions of new branches of knowledge, particularly in the fields of engineering and computer science (the Library of Congress Classification's greater hospitality

was also a factor), DDC has been criticized for falling short in those areas. As a result, the DDC is not used by most large academic libraries in the United States since the classification of works in those fields is insufficiently specific(Bianco & Citrolo, 2013a). Because each area is developed by an expert according to cataloging demands, there is little consistency in the Library of Congress Classification system. Because of the structure of the system, it is also highly US-centric (much more so than DDC), and it has been translated into significantly fewer languages than DDC and UDC.

The system is organized into 10 primary classes or categories, each of which is divided into ten secondary classes or subcategories, each of which has ten subdivisions. See List of Dewey Decimal Classes for a more comprehensive list(Aida, 2011).

- 000 – [Computer science](#), [information](#), and general works
- 100 – [Philosophy](#) and [psychology](#)
- 200 – [Religion](#)
- 300 – [Social sciences](#)
- 400 – Language
- 500 – Science
- 600 – [Technology](#)
- 700 – Arts and recreation
- 800 – Literature
- 900 – [History](#) and geography

The Use of color as Classification Notation

Aristotle was one of the first to try to describe how colors are made up and how they relate to one another. Color may be a useful notational method to represent relationships

among ideas in a classification scheme because of this early understanding of these links. Leonardo da Vinci was the first color theorist to describe the concept of "basic" colors and assign a value to them (Clarke, 2013). This leads to the concept of color order, which also has to do with classification in terms of filiation order and grouping themes and/or materials in a single-dimensional line. A. H. Munsell desired a "logical technique to define color" that relied on objective numbers rather than "misleading" descriptors (Bianco & Citrolo, 2013a). He defined hue, value (light or dark), and chroma (saturation or brightness) as the three dimensions of color, and assigned a notational system to pigment mixtures that represented each of the three dimensions.

The Munsell notation is made up of alphanumeric hue, value, and chroma designations. This standardization enabled artists to establish color components without having to experiment and to provide precise color requirements, which prompted industry standardization (Einakian & Newman, 2010). The quantification and standardization of color may lend itself to this formal aim because one of the purposes of classification notation is to explicitly and uniquely describe a particular idea. Wilhelm Ostwald improved on the three-dimensional color model by transforming the classic spherical method into a triangle-based cone. These ideas all describe color's qualities, how it functions, and how it is seen. Color as a notational device—generally referred to as a "code" in the field—to identify personalities and attributes comes closest in psychological investigations. "A person may be a 'red,' a 'blue,' and so on (Garg et al., 2011). The colors are only tags that might easily be substituted with a numerical or other tag code, such as a, b, c, or 1, 2, 3. Given the possibilities provided by color theory, it is absolutely possible that color may transition from requiring its own notation to serving as a notation for other classification systems.

To begin with, color is limitless. The range of colours, tints, and saturations is indefinitely divisible, while being discretely split for perceptual convenience. A notational system capable of limitless expansion is required for an endless universe of subjects(Lin et al., 2013). Ranganathan's computations for pure bases of Indo-Arabic numerals and Roman alphabetical characters, as well as the improved capacity given by a combined basis of the two, were discussed earlier in this article. The base of pure numerals was nine; the mixed base of alphanumeric digits was thirty-three. In comparison, a pure basis of hexadecimal colors as modeled on the web is over sixteen million, even if infinite division is not conceivable due to human perception(Cabonero & Dolendo, 2013b). Given that a notational system's capacity is essentially determined by the size of its base, color provides for significantly more capacity than any of the present digits used in bibliographic classification. If more capacity is required, colors could be repeated in a manner similar to Colon Classification's rounds of aspects.

Aside from psychological and emotional meanings, color can allow for just as much, if not more, expressiveness than alphanumeric digits. Hues can be given to basic subjects in the same manner as the Colon Classification assigns roman capitals(Bianco & Citrolo, 2013b). By modulating the saturation or tint of a basic topic or aspect, color can express hierarchy within that subject or facet: possibly the broader the subject, the higher up the chain, the deeper the tint; while the larger the subject intention, the whiter the saturation. Such expressiveness can also support hospitality in the same way, accounting for interpolation and extrapolation and displaying it through infinite gradations of hue(Borland & Huber, 2011a). Support for expressing relationships between subjects can be accommodated by color through the blending or mixing of hues. Color blending is an easy way to depict subject relationships like lamination and loose assemblage. In the case of Ranganathan's "agriculture in Java," if agriculture was represented by a pure hue of red and Java was

represented by a shade of reddish purple formed by the combination of the two, "agriculture in Java" might be represented by a shade of reddish purple formed by the combination of the two.

The use of additional color dimensions may even enable the depiction of phase relationships such as bias, influence, comparison, and difference. Because of the wide range of hues, tints, and saturations available, as well as the ability to blend colors, distinct colors can be used as notation, removing the difficulties of synonym and homonym and allowing for easily recognizable numerals (Borland & Huber, 2011b). Blending and combinations are inherently more compact than traditional notational bases for all but the shortest class numbers. A single color digit could provide immersive expressivity while remaining more concise than a multi-digit alphanumeric equivalent. Color has a significant impact on our life. Color is a source of joy for everyone. Colors may alter one's attitude, lessen or enhance tensions, elicit excitement, and even provide relief to a tired person (Borland & Huber, 2011a). Colors are divided into three categories: primary, secondary, and tertiary. The primary colors are red, yellow and blue. The Secondary colors are green, Orange and purple. And the tertiary colors are yellow-orange, red-orange, red-purple, blue-purple, blue-green and yellow-green. Color coding separates the tools used in one type of task or location from another.

Ways Cataloguers can make a Difference

While the theoretical exploration of color as a classification notation portrays it as superior to traditional bases and digits, is this really the case in real-world applications? Application of color notation to traditional physical bibliographic materials can present useful opportunities and this is where cataloguers come in. The Openbare Bibliotheek Amsterdam (Amsterdam Public Library), for example, uses color to successfully organize its public DVD

collection by title and genre(A. U. Libraries, 2013). While not strictly categorization, the replacement of old DVD inserts with new ones that are color-coded according to genre now allows for physical browsing on two dimensions rather than the single dimension provided by traditional classification.

Other libraries in the Netherlands have introduced a locally created classification scheme that uses color in conjunction with symbols and phrases, and patron satisfaction has risen as a result(Cabonero & Dolendo, 2013b). While these examples do not yet fully use all of the potential benefits that color attributes might provide, they are a start. Using a classification system based purely on color has the potential to alienate a sizable segment of library users. The limitations of human perception definitely play a role in the use of color as a notational technique, and color alone is unlikely to be sufficient for a universal population to perform the job of notation(Avraam, 2017). Perception concerns, as well as the topic of metadata and other items to be classified, generate wider questions.

Is notation intended to be used in backend architecture by librarians and personnel in the physical world and machines in the digital world? Is notation actually a tool for end users, assisting them in navigating a universe of information and subjects by explicitly defining and notating them? How crucial is categorization presentation in a world increasingly dominated by computers? Is 746.920942 more beneficial to end users, or would they prefer if the machine translated the notation into understandable and parsable words for them, such as "fashion design in Britain"? Even if color does not address the problems or encapsulate the desired attributes of notation, it is time for catalogers to look into new options and see how they could work in the digital age.

As new technologies emerge, classification should no longer be constrained by outdated standards and tools. While classification notation was laboriously handwritten or

typed on cards in the early twentieth century, and books were manually labeled and shelved, libraries no longer follow such models(Luther, 2010). The method is no longer constrained by a librarian's ability to write on a card swiftly or legibly, or by the alphanumeric characters that appear on a typewriter. Advances in printing and computers brought up new worlds of possibilities for notation, both for physical materials and for mechanized and automated standard implementation(Hanson, 2013). These twenty-first-century technologies are ripe for investigation, and librarians must investigate possible improvements and new ideas and technologies that may provide opportunities for notational systems that achieve hospitality, uniqueness, and both brevity and expressiveness without sacrificing one for the other.

Recommendations

Technological advancements and the shift to digital formats and resources may provide future tools and capacities for harnessing the theoretical potential of color for classification notation, particularly when combined with other notation such as alphanumeric characters.

- Working with computer scientists could lead to new ways to investigate the use of color in digital interfaces.
- As some libraries shift away from classic classification systems like DDC and LCC in favor of new, regionally devised schemes, an examination of how and whether they include color into their schemes could provide further instances for study.
- Studies of librarians' and users' impressions of color classification notation are crucial to determining whether the system is still effective and relevant today.

Conclusion

A successful theoretical paradigm for bibliographic notation could be color. Large capacity, filiation order, brevity, hospitality, and expressiveness are all desirable attributes and characteristics of notation. A multi-dimensional notation system would make sense in a multi-dimensional universe of themes.

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