

Metadata Elements for Children in Theory and Practice

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Abstract: This research aimed to investigate the status of children-specific metadata elements in theory (existing literature) and practice (metadata standards and children's digital libraries). Literature reviews as well as two cases, including children's online national libraries of Iran, and Singapore, are used to identify children-specific metadata elements and their application. The results revealed that descriptive metadata types had been mentioned more than analytical, social, and relational types; the DCMI metadata standard, besides LOM and ALTO metadata standards, can be used to develop an application profile for children's library catalogs. Two cases showed that they partially cover children-specific metadata elements, and neither has covered relational metadata elements. A deeper analysis of the children-specific metadata elements suggests that children's catalogs should be semantic and social. The results of this study can be insightful for children's book catalogers and children's book publishers (for marketing purposes).

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1.0 Introduction

Children are an important user group in libraries. Different types of libraries, including public libraries, children's libraries, and school libraries, are responsible for meeting children's information needs. The child user group has a heterogeneous nature, and different age groups (ages from 1 to 12 or 15) are regarded as children while they have different characteristics and information needs. For instance, Cerny, Markey, and Williams (2006, 6-8) have determined seven child groups based on their development status. These groups are infancy (ages 0-2), toddlers (ages 2-3), pre-school (ages 4-5), primary grades (K-2), middle grades (3-5), preadolescents grades (6-8), and adolescents grades (9-12). Generally, children start to read from primary grades, K-2, and this age group and forwards to 12 are regarded as the primary children group of libraries.

One of the most tragic news items in 2021 was the ending of the international children's digital library (ICDL). Fortunately, when writing this paper, it has returned as a simpler version with a limited number of books (www.childrenslibrary.org). ICDL, founded by the University of Maryland, is one of the first efforts to design a children-specific digital library and catalog, and it has international coverage of children's books. Children's information behavior is critical in designing children's (digital) libraries. Different aspects of children's library design, like physical library spaces (Hou 2019) and children's digital library interface (Druin et al. 2001; Wu, Tang and Tsai 2014), have been the subject of academic research. Information organization is one of the central services of libraries and provides a basic infrastructure for the motto 'right information to the right reader at the right time'. Information organization for children is an important issue both in research (Borgman et al.

1995; Busey and Doerr 1993; Farmer 2021; Svab and Zumer 2015) and in practice (Children's and Young Adults' (CYAC) at the Library of Congress) (Children's and Young Adults Cataloging Program n.d.).

Information organization has different strategies, including indexing, abstracting, descriptive and subject cataloging, and metadata creation; adding context to catalogs based on the preferences of the user group can make an information retrieval system efficient. Coyle (2016) argued that different methods used to add context to catalog data are facet extraction, data mining, and making first-class objects using linked data. Among these methods, facet extraction and allocation to information sources makes catalog data more useful and searchable (Coyle 2016). Adding more attributes extracted from information sources regarding user groups such as children, can help users search and find their desired information at the right time and leads to satisfaction. Translating attributes to a formal metadata language, in the form of tags and values, that becomes compatible with the other metadata standards is one of the critical issues in information organization. In the metadata field, metadata schemas or standards and application profiles are concepts that can help to solve this problem. An application profile is a collection of metadata elements extracted from different metadata schemas or standards to meet the needs of a specific user group (Zeng and Qin 2008). Application profiles can be helpful when there is no specific metadata standard for a specific use.

Using library catalogs for children remains challenging, especially since children have difficulty with multi-step processes, have less semantic and technical knowledge, and often search differently than adults. Appropriate catalogs for children should have clear and straightforward protocols, standardized visual guides, and flexible options for different manipulations. The content should be described accurately and in a way that communicates meaningfully with the children. Librarians should catalog children's content with regard to children as potential users and the integrated library management system's limitations. Children's feedback on this process can optimize results (Farmer 2020).

As Hutchinson, Baderson and Darwin (2006) imply, many search and review tools have problems for children. One of these problems is that they do not consider children's search and review skills, especially their problems with spelling, typing, and writing questions. On the other hand, they do not consider how searching with these tools is suitable for adults, not children. According to Reuter and Druin (2004), young children can search for hierarchy, but searching based on Boolean abilities is inappropriate. Therefore, information organizers should design library metadata for children to create less need for Boolean and keyword searches.

Given the heterogeneous nature of the children's user group, studies have revealed that they have different infor-

mation behavior in different age groups (Hirsh 1996). Abbas (2005) suggests that some problems in databases designed for children are related to metadata schema and controlled vocabularies used to describe children's materials. In many cases, metadata elements have not been chosen based on children's information behavior; controlled vocabularies are also less appropriate for this age group, making it difficult for children and their parents during information search (Abbas 2005). In response to this problem, some researchers have studied metadata elements and catalogs designed for children (Beak 2012; Beak 2014; Beak and Olson 2011a; Beak and Olson 2011b; Borgman, Hirsh, Walter and Gallagher 1995; Busey and Doerr 1993; Hirsh 1996; Hirsh 1999; Solomon 1994).

Children-specific metadata elements consist of a set of metadata elements that are used to describe children's library materials based on their information behavior. Some elements, such as publication date, might not be specific for children. Some might believe that with the application of recommendation systems in children's libraries, there is no more need for children-specific library catalogs and metadata.¹ However, the authors believe a recommendation system should have enough user search and preference data to work efficiently. Users provide these data at the early stages of a recommendation system development; therefore, the first groups of users should have access to appropriate metadata elements to make precise decisions on the book selection. On the other hand, a recommendation system proposes a set of results based on the user's personal information. Due to privacy concerns, some users might not agree to register in a library system.

The primary goal of this research is to study the status of the theory and practice in the field of children-specific metadata elements. The target age groups of the children in this study are primary grades and above. After this age, children usually learn to read and write and start to interact with an information system. The research tries to answer the following questions:

1. What specific metadata elements for children are proposed in the related literature?
2. What children-specific metadata elements are available in the existing metadata standards?
3. What children-specific metadata elements are applied in the digital libraries designed for children?

2.0 Literature review

In this section, studies related to children-specific catalogs were categorized into two groups: children or their parent information behavior, especially during book selection, and children-specific catalogs and metadata elements. It should be noted that today, digital information has led to changes

in library users' information behavior. Before emerging online catalogs, library users were using local or printed catalogs to locate their desired subjects or titles on the shelves; browsing printed books was the main task affecting their choice of specific materials. Now catalogs are expected to represent the content of library materials in a way that helps users choose their desired materials from various materials in the same subject in a library or online collection. Children across the globe are compelled to go online and use online resources, which affects their search abilities.

2.1 Children's or their parent's information-seeking behavior

Some research in the field of children and their parents' information-seeking behavior goes back to the 1990s when online catalogs and the internet were not widespread. Kragler and Nolly (1996) explored different criteria that primary school students consider when choosing their books from approximately 100 books in a reading room. These criteria included recommendations by peers, teachers, or friends, physical attributes such as book pictures, cover, size, subject, difficulty of words, author, characters, and relevance to television, films or movies. Hirsh (1999) studied elementary students' information-seeking behavior in various tasks on information retrieval systems focusing on science library catalogs. The results suggested that students consider different factors for selecting textual information sources. These factors are presented in Table 1.

Some researchers have studied the information-seeking behavior of children and discovered some important factors affecting children's information search. Beak and Olson (2011), through a meta-analysis of five studies on children's information-seeking behavior, identified various factors af-

fecting book selection among children. These factors are presented in Table 2.

Given children's cognitive processes during book selection, Beak (2014) has developed a child-driven metadata schema. The data for this research is gathered through a triangulated qualitative approach using questionnaires, interviews, paired think-aloud, and diaries. The resulting metadata schema includes almost 30 metadata elements about the different aspects of the children's storybooks.

Some parents prefer to choose books for their children, and Svab and Zumer (2015) studied how parents select picture books for children and which metadata elements are considered by them. Thirty-six parents of preschool children (1-6 years) were interviewed, and their behaviors were observed while choosing a Cinderella picture book from among six bibliographic records. They found that many parents did not use the library catalog for selecting books, and browsed to find their desired books. The parents preferred to have subjective judgment criteria regarding illustrations and content. When they were asked to use a catalog to select books, they selected a specific book considering the author, title, and publication year. After choosing books, it is interesting that 67% of them are dissatisfied with their selection due to the factors such as illustration type, font size, length, or level of text complexity. The researchers concluded that illustrations and book content are essential, and existing library catalogs are inappropriate for selecting books, especially picture books.

2.1 Catalogs and metadata elements for children

Studying children's use of catalogs can help librarians understand the appropriateness of metadata. Some studies have revealed that knowledge of children, rules of the online catalog

Factor	Description
Subject	This factor is related to the book's subject
Content novelty	This factor is related to the current information in a book that adds to children's knowledge.
Attractiveness	This factor is related to the level at which a book can arouse a sense of curiosity. This factor includes the appearance and content of the book.
Quality	This factor is related to the existence of valuable information in a book from children's points of view.
Peers' affection	This factor is related to the level of book attractiveness for friends or peers.
Ease of accessibility	This factor is related to book accessibility.
Time-related issues	This factor is related to the coverage of new and current information in a book.
Trustfulness	This factor is related to the coverage of unique and trustworthy information in a book.
Language	This factor is related to the readability and language of a book.
Pictures	This factor is related to attractiveness, quality, peer affection, relevancy to the subject, and validity of pictures.

Table 1. Factors affecting book selection among students.

Factor	Description
Physical attributes	This factor is related to the physical aspects of books, especially their covers, and includes cover pictures or color.
Difficulty level	This factor is related to aspects of a book's difficulty and includes vocabulary, book volume, page count, vocabulary count, and age range coverage.
Prior knowledge	This factor is related to the level of familiarity of children with books and includes characters' names, book series' titles, and films produced based on books.
Suggestions	This factor includes peers, teachers, friends, or parents' suggestions, awards that a book has received, reader ratings, and reviews by other readers.
Subjects	This factor includes subjects in children's lives, such as sports.
Relation with other media	This factor relates to the level of the relation of a book with television programs, movies, or other media formats.
Genera and framework	This factor relates to the story's time, place, and type of book, such as fiction, nonfiction, or conceptual.
Feelings	This factor relates to the feelings a book can convey, like worries, sadness, happiness, or fear.

Table 2. Factors affecting book selection among children.

(such as its syntax and query form), and skills needed for using it are three main factors of online catalog breakdowns (Solomon 1994; Borgman et al. 1995). Hirsh (1996) studied the effect of domain knowledge and other characteristics related to users and tasks on elementary schools' search success and search behavior. In this study, data were collected through interviews, observation of search behavior in an automated library catalog, online monitoring during search sessions, and card sorting (for pre and post-testing of children's understanding of science hierarchies). She found that children prefer to search on computerized information retrieval systems but have difficulties acquiring skills necessary for computer hardware, operation, and search. Information retrieval systems, especially command-based ones, provide challenges like typing, spacing, and punctuation, alphabetization for children. Children also have difficulties formulating search queries; their use of advanced search commands is limited, and they rely more on default functions. These difficulties suggest a need for designing information retrieval systems customized to children's needs, interests, and capabilities (Hirsh 1996). In addition to children's problems using computerized systems, some issues are related to the children-specific metadata elements. In this regard, Abbas (2005) has specified two main problems with age-specific metadata elements, including a lack of customization of metadata schemas for children and a lack of age-appropriate controlled vocabulary for metadata creation. She has reviewed some research on these two problems.

Beak and Olson (2011) compared Anglo-American Cataloging Rules (AACR2) with ICDL regarding children-specific metadata coverage. A crosswalk method is used in this study to compare two metadata schemas. They concluded that "ICDL's metadata schema tends to reflect more chil-

dren's unique information-seeking behavior for book choices than standard library cataloging does. Standard library cataloging tends to describe children's unique information-seeking behavior for book choices in a note area rather than describing in independent metadata elements".

Metadata elements related to ethnic or national diversity also have been investigated in the body of literature. Clarke and Schoonmaker (2020) considered what metadata elements for access points do not exist currently for diverse library resources regardless of a specific age group. This study identified related metadata elements by analyzing 13 metadata schemas. Then elements were semantically mapped using a metadata crosswalk to determine the intellectual and conceptual space of the elements. The results showed that metadata elements representing racial, ethnic, national, and cultural identities do not have appropriate coverage.

Wang et al. (2021) recorded children's picture book search strategies using a picture book search game. They designed a scenario to stimulate the children's search behavior, and a game was developed to imitate an actual search process. They could determine 29 influential metadata elements for searching picture books. They found that children first use the auditory elements they receive from adults to search; then add the visual elements they see in picture books.

3.0 Methodology

This research was carried out in three main steps. In the first step, based on reviewing the existing body of related literature, metadata elements necessary for children's catalogs or digital libraries are collected. In this step, "Children", "Kid", "Young adult", "student" along with "Metadata", "Cata-

log”, and “information organization” keywords were searched in Scopus and Google Scholar. In addition, a citation-based search was also performed to identify the most relevant literature. The fundamental papers on this topic were retrieved, and the metadata elements were extracted from each paper. In some of the papers, authors had determined the specifications of an appropriate catalog for children; in these cases, we tried to translate these specifications to appropriate metadata elements. Metadata elements have been categorized into four main categories, including:

- *Descriptive metadata elements.* This type of metadata element is objective and the result of a book’s description of the bibliographic, content, or structural aspects.
- *Analytical metadata elements.* This type of metadata element is the result of the analysis of the content of a book, such as subject (s), the difficulty level of the text, and the target age group.
- *Relational Metadata elements.* This type of metadata element is the result of connecting a book with other media, such as T.V. series or films.
- *Social metadata elements.* This type of metadata element is results from placing a book in a social context, such as awards, recommendations, likes or dislikes, or times read by others.

In the second step, existing general (DCMI), educational (IEEE-LOM), and structural (ALTO) metadata standards, using a metadata textbook (metadata, chapter2: current standards) and Library of Congress website (<https://www.loc.gov/librarians/standards>) were gathered and analyzed for their potential in creating an application profile for children’s libraries. The reason for choosing these three types of metadata is that metadata elements for children can be categorized into general, educational, and structural metadata

types. A well-known metadata standard in each type of metadata was identified and analyzed. The main goal of this step was to see to what extent children-specific metadata are covered in the existing metadata standards.

In the third and final step, observation was performed using a checklist containing children-specific metadata elements to see what metadata elements are covered in practice in online children’s libraries. Two digital library services designed for children, including the Iranian² and Singapore³ national library services for children and teens were chosen as cases for study. The reason for choosing these cases was the librarian’s participation in developing these projects and the support of national libraries from these projects.

In the Iranian Children National Library, related metadata elements will appear by clicking on each source (Figure 1). Metadata tags and values in this digital library are presented in Persian. Some metadata values are left with no values in many cases. Keyword search and browsing (by awarded books, recommended books, and authors) are possible ways for children to find their desired sources. In the collection development policy of this digital library, it has been declared that the main goal of collection development is selecting sources that are regarded as valuable based on various assessment systems. Recommendation of a book in academic research, award winner books in the national or international festivals, or books recommended by national authorities (like the National Children’s Book Council) are some of the reasons for placing a book in the collection (Iranian Children National Library n.d.).

Singapore’s National Library Board (NLB) provides part of its E-resources services on the Overdrive app (OverDrive will be discontinued in early 2023 and replaced by the Libby app). Part of this service is dedicated to children (Singapore National Library Board 2022). It is possible to search and browse (such as by subject, awards and best of, language, age



Figure 1. Metadata presentation in ICNL.

group) in this digital library. Metadata tags and values are presented in the English language. By clicking on every material metadata page appears (Figure 2) and different types of metadata are accessible through this page.

There are other national library services for children, including the Korean national library for children and young adults⁴ or Russian electronic children's digital library.⁵ However, as the authors were unfamiliar with the language of these two library catalogs they were removed from the cases. Random sample books were chosen by browsing each digital library. The reason for choosing ten random books was to be certain about the detail of the metadata elements used in each digital library. Some metadata elements were not present in some of the books; therefore, these random books were chosen from different subjects to make sure there were no new metadata elements; in other words, to reach a saturation level of the metadata elements, ten random books from different subjects were selected. Metadata elements of 10 books on different subjects in every digital library are observed and recorded in a checklist.

4.0 Findings

The results of this study are presented in three sections: children-specific metadata in literature, coverage of children-specific metadata in the metadata standards, and children-specific metadata in the two children's digital libraries.

4.1 Children-specific metadata in the literature

Analyzing the studies on metadata elements for children showed that a limited number of studies had paid attention

to this issue (five studies). Metadata elements (45 elements) for children extracted from the literature are presented in Table 3. Some metadata elements, such as cover color, page count, related media, recommended by, subject, and reading level, were mentioned more frequently in the literature than other metadata elements. Twenty-two metadata elements out of 45 (48.9%) metadata elements were mentioned only once in the literature. More than half of the identified metadata ($n=29$, 64.5%) are descriptive, followed by analytical ($n=10$, 22.5%), social ($n=5$, 11%), and relational ($n=1$, 2%).

4.2 Coverage of children-specific metadata in the metadata standards

Beak (2014) has developed a metadata schema for children called Child-Driven Metadata Schema (CDM). Reviewing the list of metadata elements in this schema reveals that the CDM mainly covers storybooks, and the horizon of children's literature is not limited to just stories. One possible way to develop a children-specific metadata schema might be connecting children-specific metadata elements to the existing metadata standards, especially those supported by authorities like the Library of Congress or IEEE. The list of metadata elements for children's catalogs extracted from literature and their similar elements in the existing metadata standards are presented in Table 4. Dublin Core (DCMI) metadata standard has the potential to cover many of the identified metadata for children. Although there are no specific metadata elements in DCMI, such as story aspects or character information, abstract metadata element in DCMI can be prepared in a structural way to cover this information.

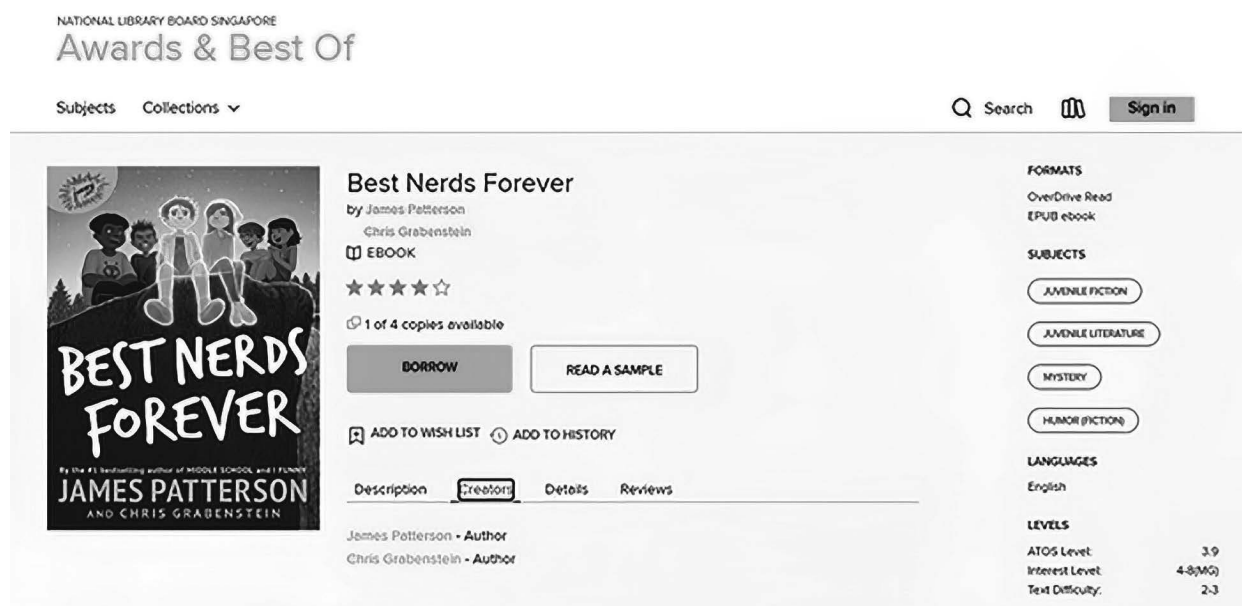


Figure 2. Metadata presentation on Singapore National Library Board.

Metadata elements	Metadata type	Source (s)
Cover color	Descriptive	Beak and Olson (2011); Beak (2014); Kragler and Nolly (1996)
Cover picture	Descriptive	Beak and Olson (2011); Kragler and Nolly (1996)
Page count	Descriptive	Beak and Olson (2011); Beak (2014); Svab and Zumer (2015)
Vocabulary count	Descriptive	Beak and Olson (2011); Svab and Zumer (2015)
Volume count	Descriptive	Beak and Olson (2011); Svab and Zumer (2015)
Age range	Analytical	Beak and Olson (2011); Beak (2014)
Character: name	Descriptive	Beak and Olson (2011); Beak (2014)
Book series name	Descriptive	Beak and Olson (2011); Beak (2014)
Related media	Relational	Beak and Olson (2011); Beak (2014); Kragler and Nolly (1996)
Recommended by	Social	Beak and Olson (2011); Beak (2014); Kragler and Nolly (1996)
Awards	Social	Beak and Olson (2011); Beak (2014)
Ratings	Social	Beak and Olson (2011); Hirsh (1999)
Reviews	Social	Beak and Olson (2011)
Subject (s)	Analytical	Beak and Olson (2011); Hirsh (1999); Beak (2014); Kragler and Nolly (1996)
Type (fiction, nonfiction and so on)	Descriptive	Beak and Olson (2011)
Related feelings (sadness, happiness, fear, and so on)	Analytical	Beak and Olson (2011)
Publisher	Descriptive	Beak and Olson (2011); Beak (2014); Svab and Zumer (2015)
Publication place	Descriptive	Beak and Olson (2011); Beak (2014)
Publication year	Descriptive	Hirsh (1999); Beak (2014)
Level of content novelty	Analytical	Hirsh (1999)
Level of attractiveness	Analytical	Hirsh (1999)
Like or dislike count	Social	Hirsh (1999)
Accessibility status	Descriptive	Hirsh (1999)
Level of trustfulness	Analytical	Hirsh (1999)
Language	Descriptive	Hirsh (1999); Beak (2014)
Picture qualities	Analytical	Hirsh (1999)
Storyline	Descriptive	Beak (2014)
Story setting: where	Descriptive	Beak (2014)
Table of content	Descriptive	Beak (2014)
Character: gender	Descriptive	Beak (2014); Kragler and Nolly (1996)
Character: origin	Descriptive	Beak (2014); Kragler and Nolly (1996)
Character: image	Descriptive	Beak (2014); Kragler and Nolly (1996)
Objects	Descriptive	Beak (2014)
Type (s) of illustrations	Descriptive	Beak (2014); Svab and Zumer (2015)
Book shape	Descriptive	Beak (2014)
Textured materials	Descriptive	Beak (2014)
Reading Level	Analytical	Beak (2014); Svab and Zumer (2015); Kragler and Nolly (1996)
Grade Level	Analytical	Beak (2014)
Creator (s)	Descriptive	Beak (2014); Kragler and Nolly (1996)
Level of engagement	Analytical	Beak (2014)
Title	Descriptive	Beak (2014)
Tone	Descriptive	Beak (2014)
Font size	Descriptive	Svab and Zumer (2015)
Sample page (s)	Descriptive	Svab and Zumer (2015)
Book size	Descriptive	Kragler and Nolly (1996)

Table 3. Children-specific metadata extracted from the literature.

Metadata categories	Metadata elements	Existing metadata element	Reference metadata schema
Descriptive	Person (s) with different roles such as author, illustrator, editor	Contributor or Creator	DCMI ⁶
	Title information	Title (Alternative Title)*	DCMI
	Content information, includes story aspects (when, where, line), table of content, character – related information including name, gender, and origin.	Coverage (Spatial), Description (Table Of Contents, abstract), Language)	DCMI
	Publication information including place of publication, publisher, edition, publication date, copyright date, publisher website	Publisher, Date (Available, Created, Copyrighted, Issued, Modified)	DCMI
	Identifiers	Identifier (Bibliographic Citation)	DCMI
	Physical information, including page number, size, book shape, cover color, format, objects on the front book cover, illustration (format)	Type, Format (Extent, Medium)	DCMI
		TextStyle, ParagraphStyle, Layout (page)	ALTO
Relational	Related resources such as movies or films	Conforms To, Has Part, Has version, Is Format Of, Is Part Of, Is Referenced By, Is Replaced By, Is Required By, Is Version Of, References, Replaces, Requires	DCMI
Analytical	Length, reading level, age range, grade level, subject (s)	Audience (Audience Education Level, Mediator), Subject	DCMI
		Learning Resource Type, Interactivity Level, Semantic Level, Intended End User Role, Context, Difficulty, Typical Learning Time	LOM
Social	Awards, engagement, recommendation	Not Found	Not Found

Table 4. Children-specific metadata coverage in metadata standards (*sub-elements are specified in parenthesis).

Searching and analyzing existing metadata schema yielded no results about social metadata elements. Some descriptive metadata elements, such as cover color, cover object, and book shape, are not covered in existing metadata standards.

4.3 Children-specific metadata in practice

4.3.1 Iranian Children National Library

The Iranian Children National Library (ICNL) website (Figure 3) started in 2018 with more than 23,000 books. This library's target user group is children in the 7-14 age

range. Books are thoroughly scanned in different subjects, and children can read them online. In addition to books, magazines, audiobooks, podcasts, and children's news items are presented on this site (Tehran Times 2020). At the time of writing this paper, there are 12,804 members, and the 12-14 age group has more members than others.

From different children-specific metadata element categories, ICNL covers descriptive, analytical, and recommendation categories. Details of metadata elements covered by ICNL are presented in Table 5; as it is evident in the table, a large number of the metadata elements in the ICNL have descriptive nature.



Figure 3. Iranian Children National Library home page.

Metadata categories	Elements covered by ICNL
Descriptive	Title, creators (author, illustrator, translator), the publication (publisher, publication year), content (language, abstract, keywords, genera, type of the book (e.g., fiction or nonfiction)), Color (book cover color), preview.
Social	Ranking (stars by readers), reader's notes or reviews, awards.
Analytical	Age range.

Table 5. Metadata categories and elements covered by ICNL.

Comparing metadata elements covered by ICDL (Beak and Olson 2011) and ICNL leads to the assumption that the ICDL project significantly impacts ICNL. ICNL has covered only essential bibliographic metadata elements and has not covered fully children-specific bibliographic information. There is a lack of Identifiers in descriptive metadata elements, recommendations in the social metadata, and poor coverage of analytical metadata elements. No attention has been paid to covering relational metadata elements in this project. Checking at least ten samples revealed that the abstract metadata element's value is empty or filled with short sentences about award or age range recommendations, and it seems there is no clear policy regarding some metadata elements' values.

4.3.2 Singapore National Library Board children's library on OverDrive

As part of the programs for children and teens, the National Library of Singapore has provided its E-resources service on OverDrive. This service (Figure 4) covers different E-re-

source collections for different age groups, such as baby board books, picture books, kids' magazines, junior simple books, award-winning children's collection, and kids' audio books. By registering in one of the libraries under the supervision of the national library board, children can access and use these electronic sources.

Metadata categories and elements covered by Singapore National Library Board children's library are presented in Table 6. Similar to ICNL, this library lacks metadata in the relational metadata category.

5.0 Discussion and conclusion

Charles Ammi Cutter proposed three functions for every catalog: first, a catalog should make a library user able to find required information with a known author, title, or subject; second, a catalog should make it possible to identify what information is available in relation to a specific author, subject, or information source type; finally, a catalog should assist in the choice of an information source (Kaplan 2016). Given these functions, it is evident that an ideal library catalog should include different types of metadata elements,

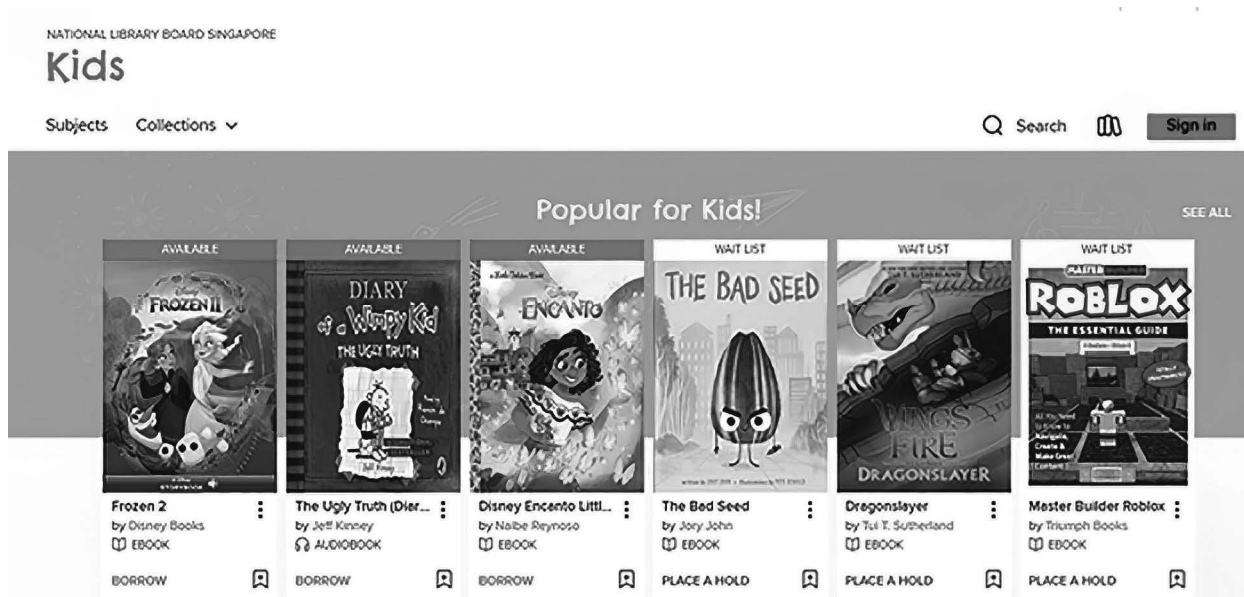


Figure 4. Home page of the Singapore National Library Board children's library on OverDrive.

Metadata categories	Elements covered by the library
Descriptive	Title, creators (author, illustrator), the publication (publisher, publication year), content (language, abstract, keywords, Genera, type of the book (e.g., fiction or nonfiction)). Color (E-book format), ISBN, preview
Social	Ranking (stars by users), reader's notes or reviews, awards, recommended by
Analytical	Age range, difficulty level (for English language books)

Table 6. Metadata categories and elements covered by Singapore National Library Board children's library.

like descriptive (to find), relational (to identify related information sources), and value-added metadata elements (to help in choosing an information source).

A digital library or catalog for children needs to consider two critical issues. The first is using metadata elements that can be helpful and interesting for the children's age group and their parents, and the second is related to metadata values. Regarding the metadata elements, different studies have suggested that children need more information to choose a book than adults do. These elements primarily are about the books' content, structure, recommendations, and the ideas of others (e.g., peers or teachers). This study merged the results of the previous studies to provide a clear picture of the metadata elements required in children's libraries. The results showed that descriptive metadata elements were mentioned more than other metadata in the literature. This result implies that children's book catalogers should spend more time and provide many access points to find a book; they should extract detailed information for describing books. In addition to descriptive metadata elements, catalogers should make relations among different in-

formation sources and help children identify the related information sources. Some metadata elements can add value to the catalog, and these types of metadata elements can help children or their parents to choose a book from different books on the same subject. Therefore, it is evident that cataloging books for children is expensive in terms of time, money, and human resources. In many cases, it needs a separate division in the libraries. It is not affordable for many libraries to invest in the catalog for children.

The results of this study revealed that there is no agreed metadata standard for children's information sources. Existing metadata standards do not fully cover appropriate metadata elements for the children, and DCMI, LOM, and ALTO metadata standards can be used to make an application profile for the description of library materials for children. Similarly, Beak and Olson (2011) compared two metadata schemas to decide which one is compatible with children's book choice characteristics. They found that metadata elements used in ICDL cover children's unique information behavior better than well-established standard library cataloging rules (AACR2+). Libraries or children's dig-

ital library developers have three options regarding child user groups. The first is to fully consider their information needs and use children-specific metadata elements, as suggested in Beak (2014) or ICDL metadata elements. The second option is partial coverage of the children-specific metadata using existing metadata standards, such as DCMI. The third option is cataloging for children like other library user groups.

Analysis of the existing digital library practices developed on the web for children showed that they have chosen the second option and have not fully covered the children-specific metadata elements. Analysis of the two national children's digital library cases revealed that they have not covered the essential children-related metadata. Some descriptive metadata types (such as story and character-related information, page count, cover color, or table of contents) and relational metadata are unavailable in these two cases. It is possible to place some of the descriptive and relational metadata elements in the abstract. Therefore, the abstract should be structured in a way that includes these metadata elements.

Additionally, it should be noted that traditional (physical) and digital library contexts can affect metadata elements. For example, some descriptive metadata elements, such as book shape, cover color, and font size, in the physical library context can be simply replaced by providing a preview of the book's cover and sample pages in the digital library context. Using the capacities provided by ontologies and linked data in semantic catalogs, it might be possible to connect various information items, like books and films. Using social library catalogs or social OPACs in digital libraries (Mendes, Quinonez and Skaggs 2009) makes it possible for peers, teachers, and librarians to share their feelings and ideas about books in the form of tags and comments. In summary, it can be said that children's catalogs should be information-rich, semantic, and social.

Metadata values in the form of a controlled vocabulary for children are one of the other challenges in cataloging for children (Abbas 2005). Previous research has shown that children has serious problems formulating queries (Solomon 1994; Borgman et al. 1995). Fails et al. (2019) have reviewed some possible solutions for helping children formulate queries. These solutions are mainly based on system interaction with children, such as query suggestion, spelling correction, or audio help. However, one possible way to overcome the query formulation problem is to provide different access points for resources and use various browsing methods, such as browsing by genera, type, title, or author. Hirsh (1996) found that children are more successful in simple-browse tasks. Creating different controlled vocabularies in the form of thesauri and authorities, especially those for describing the subjects of books, makes it possible to provide children with different paths to their desired information resources. Pavic and Cupar (2018) found that subjects suggested by students in Croatia do not match or only partially match the subjects

in catalogs. This example highlights that subject metadata values are incompatible with children's knowledge. Library catalogers need to design and maintain various controlled vocabularies for children. Some subscription-based catalogs for students have developed specific controlled vocabularies used in the existing metadata standards, such as MARC. The SCIS⁷ (Schools Catalogs Information Service) is one of these services supported by a team of experienced catalogers (<https://www.scisdata.com/about>).

Children's libraries must have clear policies for cataloging children's books. Using some bibliographic conceptual models like FRBR can be helpful because they can link information from different sources and solve one of the significant deficiencies of the existing flat metadata schemas. More research is needed on the conceptual models for children's library catalogs and the customized controlled vocabularies used in different platforms providing access to E-resources for children. As with Singapore National Library Board children's library, some other subscription-based platforms, such as Sora (<https://soraapp.com>), are available on OverDrive or similar apps, like Libby; it is worth researching the metadata elements used in these platforms for children's materials.

This study had a major limitation regarding the number of case studies. Language and free access limitations made the authors have just two case studies.

Notes

1. This was one of the reasons a reviewer raised for rejecting this paper in a journal
2. <https://icnl.nlai.ir/default.aspx>
3. <https://nlb.overdrive.com/library/kids/collection/98798>
4. <https://www.nlc.gov.kr/>
5. <https://rgdb.ru/>
6. Dublin Core metadata initiative
7. <https://www.scisdata.com/>

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