# OPAC development as the genre transition process, PART 1: OPAC generations historical development

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The purpose is to present library OPAC as a communication genre in its mutability. The paper is based on the idea of OPAC development as a transition to subsequent OPAC generations. Every generation, in the light of genre theory, can be treated as a subgenre with its own communication purpose. As such, it is subject to transformations caused by information technology development. OPAC development is described as an electronic genre transition process, which allows for distinguishing eight OPAC subgenre generations. They were distinguished based on socio-historical development of the genre system and were described according to Shepherd and Watters[1] genre development model. These subgenres are then subjected to genres analysis revealing their basic characteristics (purpose, form and functionality). The paper is divided into two parts. Part 1 describes text genre theory and OPAC generations historical development as communication genre. Part 2 is dedicated to OPAC genre analysis.

**Keywords:** OPAC generations; OPAC development;Communication genres; Genre analysis

## Introduction

The library catalog, nowadays functioning almost solely in the form of computer database is very often the subject of research and scientific publications. It is known as OPAC, although the form of the database is not enough for a catalog to be called the OPAC. Library of Congress defined OPAC as "an access tool and resource guide to the collection of a library or libraries, which contains interrelated sets of bibliographic data in machine-readable form and which can be searched interactively on a terminal by users"[2].

One of the new research directions is treating the library catalog as a textual tool of knowledge organization (KO), which is understood here in the narrower meaning of the term, as presented by Hjørland[3]. As Andersen writes[4], libraries and their catalogs are communication genres that have been developed historically to support writing and documenting activities. In library, understood as communication hub, the organization and search of texts takes place, which activities are as complicated as other activities related to writing and reading. This means that KO practices interact and affect writing practices, in which different actors use writing to negotiate information-seeking tasks.

In this article we will focus on the historical aspect of the development of OPAC as a communication genre. The historical perspective on library communication practices that Andersen mentioned in the above citation is often under-exposed in library and information science literature. KO includes rhetorical choices of both information users and information organizers (librarians) and the choices are constrained by previous communication practices in earlier versions of library information retrieval (IR) systems. There are questions such as: how did the various text forms of the OPAC interface and catalog record come into use in subsequent OPAC generations/stages? How have the practices of creating and transmitting these forms developed? Have the reasons for these forms changed with the development of information technologies and how? And also, what was the effect of these long communication practices and what was constrained by them?

It seems that the answers to these questions are important because they allow the development of our knowledge of an important element of scientific communication. It is important to obtain a historical perspective on how specific social practices of the KO have influenced communication practices since the 1970s (time of appearance of computer systems in libraries). Many theories of effective KO activities in OPAC are based on relational or transactional models that rarely take into account historical factors at all levels of communication processes in OPAC[5]. To properly understand these processes, researchers must

be able to take into account the emergence of policies derived from historical, recursive information retrieval practices.

The huge global reach of these historical practices requires researchers to work out ways of communication development in specific periods. The question arises about the type of this communication which is implemented in libraries. Is it scientific (users point of view) or professional (information professionals) communication? Or maybe, due to the tools used, it is technical communication? In historical research of actual communication practices, the use of such wide disciplinary categories may mask the complexity of historical communication processes. To avoid this problem, Zachry[6] advises to use a research approach using elements of genre theory, especially in its North American variant, to explain the historical development of communication practices over time. This approach takes from the theory of genres a special emphasis on constructing patterns of communication practices (information behaviors) implemented by people in KO processes. In this way subsequent OPAC generations can be understood as evolution of the IR tool in response to changed library patrons' information needs. In the paper genre analysis methodology will be used to describe OPAC cybergenre transitions in subsequent generations.

Specifically, this approach takes from the theory of genres a focus on the genre knowledge of specialists in the field of KO, who were key people involved in OPAC development. The knowledge was expressed in their statements, published in major books and journals in the field of library and information science. These statements, from 1986-2019, relate to previous practices and typical OPAC narrative forms, enabling research explaining the emergence, reproduction and disappearance of communication practices based on this tool over the past almost 40 years. Based on this material and analysis of the OPAC genre, a description was also made of its purposes, forms and functionalities, and how these features change over time. This allowed us to answer further questions such as: how emergence over time of subsequent OPAC subgenres reflects changes in communicative purposes of discourse community of their users? How does the analysis of the OPAC genre about its form and functionality contribute in explanation of OPAC development as cybergenre?

The rest of the first part of the paper is organized as follows. The next two sections are explanation of the genre theory and transition process from traditional to electronic genres (cybergenres). Then the OPAC historical development is presented based on professional and scientific literature review, resulted in the distinction of eight OPAC generations. The paper is finished with a summary section.

## Text genre theory

As Auken[7] writes, in the 1980s has happened the so-called "rhetorical turn in studies of genres". It meant a change in the meaning of the basic, distinctive characteristics of the genre; form of utterance was replaced in this role by its social function (communicative purpose). This means moving away from the understanding of the genre as primarily the content and form included in the utterance to understanding it as a social function of information encoded in this utterance. In this way, to the two characteristics of the genres (the form and content, together constituting the utterance), a third – the function or the purpose of action supported by the genre was added. The adoption of pragmatic point of view related to communication behaviors accompanying every human activity, resulted in treating genres as a class of communication practices[8-12].

Carolyn Miller, one of the main promoters of changes in rhetorical studies of genres, has moved it from focusing on the utterances into the direction of greater sensitivity towards their functions. Therefore, she defined a genre as "typical actions based on recurrent rhetorical situations"[11]. For her, the notion of genre is essentially a means of the situation and the motives, the intention and the effect. Motive at the level of the genre becomes a conventional social purpose within the recurrent situation. This means genres are treated as communication activities carried out between the author (creator), his/her utterance and the reader (recipient) in a shared space of meaning and action[13]. In this way, a genre is a rhetorical means for mediating private intentions and social exigence; it is achieved by combining the private with the public and the unique with the recurrent. It is worth noting that genres understood in this way are usually related to the so-called every day *de facto* (factual) genres, like the letter of recommendation, the user manual, the progress report[11] or the blog[14].

Several years after Miller, John Swales[12] further developed her genre definition and meaning. Swales defines genre as a social and communicative event. In his opinion, a genre comprises a class of

communicative events, the members of which share some set of communicative purposes. Communicative purpose is a privileged criterion defining the genre. These purposes are recognized by the expert members of the discourse community, and thereby constitute the rationale for the genre. This rationale shapes the schematic structure of the discourse and influences (mainly constraints) the choices of content and style.

Swales' approach to genre is basically functional, and genres are envisaged as social or communicative events. Furthermore, the relationship between the purpose accomplished by a genre and the structure of the genre is such that "the communicative purpose of a genre shapes the genre and provides it with an internal structure ─a schematic structure"[15]. By this definition of genre, Swales tries to establish a relationship between the purpose accomplished by a genre which is shaping it, and the structure of the genre.

Misha Vaughan and Andrew Dillon[16] provide a definition, which is an extension of Miller's definition. According to them, the genre is a class of communication events, which are characterized by having a common set of conventions and rules aimed at facilitating interaction of communicating parties by creating and handling (e.g. modification) expectations in the community of creators (authors) and recipients (readers) of information. This definition indicates that the level of uniformity of genre concept in the users' community can be studied from both – the point of view of the users of its physical manifestation, and from the point of view of the interpretation of its social, historical, and cultural roles. However, apart from socio-cultural aspects of the use of text genres, there are also cognitive factors, the result of which are not only the communication purposes of the community of discourse, but also the cognitive strategies used by community members to achieve considered objectives of the communication[17].

## Genre transition over time and new cybergenres

Genres are not immutable constructs; on the contrary, they are a very dynamic phenomenon. Inherent within the concept of genre itself is the implication that communicative practices exist in historical patterns, same as responses to situations. The reason for this is that genre is a kind of mental schemata, and hence genres change with every new lived experience of their users. They constitute products of knowledge of conventions[18]. Each new text, created within a genre convention enhances or

remodels the genre in some respects, according to the personal knowledge of the information creator. Also, each reader in the transaction of reading transforms their social comprehension (understanding). Genre does not exist without its history, and the history grows with each new text referring to the rules of the genre[10]. Within all genres, intertexts link individual communicative practice to prior practices. On the other hand, genres must form relatively permanent structures towards their usefulness in the act of communication[9]. Some cultural aspects, like particular language use, also influence genre diversity[19]; e.g. German catalog record is somewhat other genre than the English one.

Special interest was paid to transition from traditional (printed) to electronic genres. The latter are sometimes called *cybergenres*. The term cybergenre was used for the first time by Michael Shepherd and Carolyn Watters. These authors also presented a 4-tier model of cybergenres evolution[20]. They divided cybergenres into two groups of subgenres, extant and novel. Extant genres are directly derived from existing genres in other media, which have been transferred to digital media. Existence of novel genres is only associated with digital media. Each of these was subdivided into the other two types of genres (see Tab. 1). It is also stated that the new functionality achieved by the genre in a new medium is the result of evolutionary change; functionality refers to the capabilities afforded by a new (electronic) medium[21]. It can be defined in terms of browsing, searching, email facility, discussion, interaction, online ordering, online enquiring, collaborative computing etc. Genres at the lowest level of the model are treated as successive stages of the evolution of higher-level genres.

## Historical transitions of the OPAC cybergenres

Analysis of the OPAC as communication genre will be presented in part 2 of the paper. This section is

| Table 1 — Cybergenre evolution[20] | | |
|---|---|
| Genre level | Subgenres |
| Extant genres | **Replicated genres**: exact reproduction of the genre in the new medium; similar content and form, minor changes to functionality |
| | **Variant genres**: increase of functionality, small changes in content and form |
| Novel genres | **Emergent genres**: treated as a new, significant increase in functionality, new content and form |
| | **Spontaneous genres**: no predecessor in another medium: new form and functionality |

preparation of the necessary basis for these considerations, presenting the features and functions of OPACs in their historical development. These considerations are based on literature research.

Historically, the library catalog genre consists of various subgenres, functioning at different times and technologies available at that time, starting from book catalogs, through card, microfilm, and microfiche catalogs. The second half of the twentieth century brought very important technological changes in library catalogs through the use of computer technology. The use of computers in libraries began in the mid-1960s[22]. They were used to assist with the production of catalogs that were based on 80-column punched cards with the resulting catalog being printed on to paper. These catalogs were not OPACs; the computer systems of that time worked in batch mode.

Don Swanson[23], in his article that appeared just before the implementation of the first computer systems in libraries, described a hypothetical genre of a computer catalog (called "console") that holistically connects these three elements into a single user access point to library. An important part of it was the librarian, who was supposed to answer questions that went beyond the capabilities of the catalog. This catalog, placed in the library, was supposed to provide immediate, direct information services. It was supposed to direct the user to full texts access, which would allow finding specific pages and even paragraphs of both: original works as well as reviews and critical studies[24]. These ideas can be seen as instantiation of Vannevar Bush's[25] about twenty years earlier idea of Memex.

The OPAC genre has appeared in the early 1970s, but the first solutions had very limited functionality and played complement role to the circulation module, which was the beginning of the currently functioning ILS. Modern OPACs have been used since the 1980s; the term 'OPAC' appeared in 1981[26]. Until recently, their creators tried to reproduce card catalog transactions in them, which was the result of a lack of understanding of new opportunities offered by transactions in the electronic environment. In contrast to the previously used analog technologies, where the information retrieval involved practically only reading transactions, the OPAC performs a richer writing/reading transactions, which significantly affects the user interface genre design.

The development of OPAC genres, as well as the evolution of ILS, of which OPAC is a part, is associated with the development of information technology (IT), affecting the functionality of the genre. OPAC is not a homogeneous genre; it embraces many subgenres, which are called generations. Many authors[27-30] divide the historical development of this genre into subsequent generations, with different genre rules applied, especially their functionalities and communicative purposes supported. Thus, the genre of a library catalog is not a constant construct; on the contrary – it undergoes continuous, though usually evolutionary changes over time. That means the communication genre analysis may allow a description of the variability of this genre.

Authors writing about OPAC generations usually refer to works of Charles Hildreth, who as one of the first divided the OPAC development on several generations. In his paper, published in 1987[27], he wrote about two generations and the need for next OPAC generation. He called it $E^3$OPAC – the enhanced, expanded, and extended OPAC, writing about theoretical system of fundamentally different KO, even changing its ontological status[31].

The idea of "next OPAC generation" was then repeated by many authors, concerning different emerging IT. Usually the concept appeared, when the authors came to the conclusion that the OPAC of current generation was no longer working appropriately, especially from its users' point of view[32]. This meant that new communication purposes had emerged forcing modification of the existing OPAC genre towards creating a new one. Eight genres can be distinguished based on the genre knowledge of these authors represented in their publications describing the OPAC evolution in subsequent subgenres.

The evolution of the OPAC subgenres, reflected in changes in the applied genre properties (purpose, form, functionality) are presented below. Only part of the genre groups and their transactions[33] are included in the following OPAC genre historical analysis and resulting generations' list. First of all, the genres of catalog record, system interface and user's request were considered as the most typical ones for OPAC genre. They are all strongly related to each other, which makes their description difficult. Other genre groups that function in the OPAC "background", in the sense that they are usually invisible to the library patrons, have been omitted. All dates concerning the appearance of subsequent OPAC generations are indicative and concern developed Western countries.

**First OPAC generation (I)**. OPACs of the first generation, created at the turn of the 1970s and 1980s[34] were mainly used to search for previously known items according to a limited number of basic metadata attributes, such as author, title, and call number or possibly subject headings (as a phrase). There were no authority files. Options of search transaction were limited to entering strict search phrase, as it required character-by-character matching between user query and the OPAC record[2]. The search transactions were single – they were not modifiable based on previous search results[27]. The OPAC system was directed by commands entered from the keyboard.

The first generation OPACs were usually based on unique, customized solutions implemented in libraries for their own use. The first commercial suppliers of ILS with OPAC as its integral part appeared after 1978[35]. Two directions of development prevailed. The creators of the first OPACs tried to make them functionally and even visually card catalogs alike. Imitating the navigational structure of card catalogs was not a simple task. Attempts to accomplish it have sometimes had interesting results, like uniform titles application[36], which was employed many years later in FRBR (see generation VII, below). The solutions known from interfaces used in database systems, mainly the most popular, like Dialog and BRS were also replicated.

**The second generation (II)**, which appeared at the end of the 1980s, was based on solutions offered by commercial suppliers, providing integrated systems (ILS) for library management. The combination of search model known from the card catalog and the functionality of bibliographic databases was still popular[37]. Possibility to search by subject headings (with controlled vocabulary) or keywords from titles and other fields was added, as well as new mechanisms for request construction, like the use of Boolean expressions[5, 38]. This last innovation allowed for advanced search by combinations of attributes of different kinds, like keywords with classification symbols, which is also the result of the new option of limiting the search to selected fields of the record.

Some of the catalogs offered the function of selecting the record display mode (e.g. short, medium, full), and user interface support level (e.g. a differently designed dialog for a novice or experienced user, more error messages). Browsing facilities were added as well. Catalogs have become available via telnet. OPAC has been connected to the circulation module, which gave the opportunity for new transactions, e.g. enabled users get to know the availability status of retrieved documents.

The disadvantages were frequent search errors, poor user assistance in problem solving, problems with using retrieval language vocabularies, and poor organization of large response sets. OPAC was confined to one form of documents – monographs[39]. The second generation is characterized by an increase in support of the user's action of information retrieval, but still poor functionality of OPAC[40].

Hildreth[31] summarized the features of the IInd generation OPAC as:
- subject access,
- keyword access,
- boolean searching,
- index term browsing,
- shelf list review
- full standard bibliographic records,
- multiple display formats,
- two or more dialog modes,
- interactive search refinement,
- search results display or print manipulation,
- help facility, context-sensitive
- informative error messages
- action and "how to" option prompts
- search term approximate match routines.

All the improvements have greatly affected the cataloging process[41].

**The third generation (III)** of OPAC, in operation since 1996, was supposed to prevent problems typical for earlier generations by the use of new interface techniques and search tools. New, controlled and uncontrolled OPAC record access points as well as spelling control of the user request were added. Searched results begun to be ranked by relevance.

OPAC contained metadata not only about books but also other communication genres, like journals, audiovisual and electronic documents. Circulation module was significantly developed for functionalities like orders and loan control, specific data on localization and a list of copies owned by library. The user interface was based on menu system leading to data displayed in windows and graphic form (icons). Differentiation for transactions of searches a known item and a subject was the base for differentiation of user's dialog design. The model for ILS and its OPAC was increasingly client-server architecture and the catalog was accessible remotely on the Internet[34]. At the same time, users lost direct librarian support.

Hildreth[31] described new III$^{rd}$ generation functionalities (in addition to that of II$^{nd}$ generation) as:

- natural language query expressions,
- automatic term conversion/matching aids,
- non-Boolean retrieval techniques, e.g. best-match retrieval,
- ranked retrieval output,
- relevance feedback methods
- intelligent navigation aids,
- integration of keyword, controlled vocabulary, and classification-based search approaches,
- expanded coverage and scope,
- extended access range via linkages and networks.
  Tedd[22] has added several functionalities, as:
- acceptance of search expressions in ordinary language, with facilities for using a dictionary to provide for abbreviations, synonyms or spelling variants,
- context-dependent automatic help,
- using terms from relevant records retrieved to enhance the search strategy.

Hildreth, in his papers from the 1990s proposed some improvements he named next generation, like extended OPAC[37] or WebPAC[38]. Guha and Saraf[42] suggested the new Web-based OPAC generation emerged during the late 1990s. Web OPAC as the next generation was pointed by Behesthi[34] as well, who proposed some features of **fourth generation (IV) OPAC.**

The fourth generation is characterized by the use of many tools typical for the Web, such as the graphical user interface (GUI)[43], sharing resources using the Z39.50 protocol (transaction of the so-called integrated search)[44], using hypertext (links) and the ability to process metadata in various formats (for example, MARC and Dublin Core) imported from various sources.

The help functions could be implemented in the form of a chat. Metadata records contained links to multimedia and full texts objects. Links to external databases were used. Cover images, abstracts, tables of contents complemented typical catalog records. Users had the possibility to use interface options, like simple and complex search. Design of OPAC interfaces was influenced by technological changes caused by microcomputers and emergence of Internet.

Babu and O'Brien[45], in addition to features of previous generations, summarized the features of Web OPACs as:

- graphical user interface (GUI),
- availability of hypertext links through bibliographic records,
- emulation of search engines in terms of appearance and search features,
- availability of full-text,
- one interface to search all electronic information.
  Husain and Ansari[46] have added:
- links to circulation files, reference help etc.
- information about community events.

Despite all these innovations, OPACs of the generation were designed to meet the goals described by Cutter yet. Just like in card catalogs, the main attributes for information retrieval were tittle, author, and subject headings. OPAC was designed for users who know these metadata elements before starting the search transaction. The presentation format of the metadata record still resembled a catalog card.

After 2000 new functionalities of OPAC were the reason for the next OPAC generation, or the next generation catalog (NGC) descriptions. It was understood differently depending on technological possibilities. For example, Antelman, Lynema and Pace[47] proposed abandoning Boolean algebra to query formulation in favor of partial-match techniques, like probabilistic and vector-based techniques, used in ILS like Okapi or Endeca.

The so-called OPAC 2.0 is treated as the **next (V) generation OPAC**. Some authors, like Wilson[48] and Mercun with Žumer[49] or Jetty, Jain and Hopkinson[50] understood OPAC 2.0 as a place of collaboration and participation and indicated as important improvement in OPAC development. It is an extension of Web 2.0 enabling integration of the library OPAC with CMS (Content Management System), which significantly increases the user's interface transaction capabilities; it allows users to add their own tags, scores and opinions on materials in library collections, export records in the selected description style[51]. This term has been used since 2005.

Data input by one user are accessible and retrievable for all other users; this is why OPAC 2.0 is often called a social application. However, the similarities often remain superficial. OPAC functionality is supplemented with the possibility of Web 2.0 services, like user participation, feedback, social networks etc. In addition, users can customize the interface of the catalog, save search results, order and prolong items and pay fees. RSS provides information about new acquisitions. All the features

mentioned are an attempt to adapt the rules of the OPAC genre to the rules known to the users from other Web applications. It is a constant tendency noticeable in the previous and subsequent stages of the OPAC genre development. On the other hand, the most important feature of ILS that can be called 'discoverability' is designed differently in OPAC than in social systems such as e.g. LibraryThing or LinkedIn (e.g. dissimilarities in the recommender systems, search criteria, and algorithms).

The newer proposals for OPAC 2.0 and generally library 2.0 go beyond the usual use of Web 2.0 services. A new perspective on OPAC functionalities is proposed by limiting barriers to access to information, taking into account usability and interoperability, ensuring the flexibility of ILS and their OPAC. Metadata come from many sources and relate to various document genres, including the electronic ones. The most important element of the library system is the user and their information needs met by transactions with OPAC.

The Web-scale discovery (WSD) systems begun to be treated as the **next (VI) OPAC generation** at the turn of the first and second decades of the 21$^{st}$ century[52, 53]. The discovery system allows managing the library resources in the unified way regardless of the resource format and location, and its architecture is no longer service oriented[54]. It is the new interface often independent of the underlying ILS, providing additional functionality[55]. Such a system is a part of the library next generation OPAC, which possesses some additional features, like faceted navigation and relevance-ranked search results[24, 30]. Library catalog began to be treated as identifiable web-based orientation service of search and discovery[56].

WSD System, provided by many library software providers since 2009, is a dedicated discovery layer that provides access to many (preferably all) electronic library resources (to their metadata and/or full-texts) through a single interface and single, integrated index[57]. Search results provide direct, full-text access to documents in electronic form if accessible by the library. OPAC's search interface and transactions realized with its use resembles those carried out by search engines (simple keyword search box)[58]. Also metadata display is maximally simplified[59]. Its development is a manifestation of the desire to centralize transactions of retrieval and circulation by OPAC genre[24], what is perceived as effective by users[60].

Search results include metadata from OPAC and databases purchased by library, repositories and digital libraries and other available sources, paid and open, and interfaces with OpenURL resolvers such as SFX[61]. It means that book and journal metadata is displayed in one list with book chapter and journal content metadata. Weights are assigned to search results based on metadata of different document genres, to determine their relevance. New browsing capabilities are added, like faceted navigation[62]. Yang and Hofmann[53] summarized the features as:

- single point of entry for all library resources,
- state-of-the-art web interface,
- enriched content,
- faceted navigation,
- simple keyword search box with a link to advanced search on every page,
- relevancy ranking,
- spell checking,
- recommendations/related materials,
- user contribution (e.g. tagging, ratings and reviews)
- RSS feeds,
- integration with social networking sites
- persistent links.

It is easy to see that some features have been taken over from previous generations, mostly the V$^{th}$ one[63].

The designers of these systems meet the users' information goals, their genre features are self-service (in the direction of self-sufficiency), ensuring satisfaction, and interface imitated internet sites like Google and Amazon[64]. These goals are achieved by modifying the OPAC features, its interface, search options, and modes of displaying results (e.g., tag cloud). As a result, the OPAC user activity is also changed; it is called information discovery rather than information retrieval. Information discovery is more like information browsing or navigating, as for the Internet resources. This often means using the same communication genres (like e.g. interfaces) in similar KO activities offered by libraries and websites mentioned and alike. These trends are continued in the next generations of OPAC.

Parallel to the previous two generations there were also library catalogs built on the principles of the **FRBR model (VII)** and its derivatives, mainly FRBR-LRM and BIBFRAME replacing the ideas of AACR2[65]. The new cataloging rules (record creation), mainly RDA, are adapted to these models. Naun[36] considered that after OPAC 2.0 catalog based on

FRBR and RDA rules need to be treated as next OPAC generation. It most important purpose is a better presentation of bibliographic relations and stronger support for user tasks, mainly access, by improvement of the user interactions with metadata. The other purpose is simplification of the standard and its adaptation to the rules prevailing in the global information ecosystem[66].

Changes must also affect ILS, their algorithms and user interfaces to ensure users can achieve the goals of their interactions with bibliographic information and ILS as a whole. Due to the proper structuration of metadata record, allowing demonstration of the relationships between bibliographic items, it is possible to return to transactions available in former catalogs in book form. Relations indicate the connections between the work and its expressions and manifestations on the one hand and between related works on the other. For this reason, the model is most useful for works with extensive relationships, many editions, translations, derivatives, etc. This is in contrast to the previous approach of cataloging based mainly on the manifestation[67]. This means that computer technology has brought back the best solutions (interfaces and metadata structures) from previously used communication technologies in libraries.

A lot of researches have been carried out indicating the benefits of taking hierarchy of bibliographic items into account, like allowing enhanced search, easier browsing and advanced navigation, especially in a networked environment[68-71]. The implementation of FRBR supports also the creation of not only simple bibliographic structures, but also more complex structures, such as existing in music works, serials and electronic resources[72].

**OPAC in cloud computing**, especially linked data technology(also known as Linked Open Data, LOD), is treated as the last **"next catalog generation" (VIII)** to date. This technology includes a set of good practices and rules for interlinking machine-readable data sets using URIs and the RDF metadata schema to display, disseminate and merge data in a Web environment. Although this technology was created for all information processing applications, it is very interesting for library metadata. Library LOD is any library data describing resources or supporting their discoverability and expressed in LOD standards[73]. Here standards of VIIth generation, like BIBFRAME and RDA are in use.

Simply moving the catalog to the cloud already causes significant changes in transactions carried out with it, especially from the librarian point of view. The latest solutions related to the Semantic Web not only provide the transfer of communication genres to the cloud, but more importantly, causes the conversion of their content to the RDF syntax with unique identification of metadata elements, which can help integrate library resources with other resources on the Web[74]. This applies not only to metadata records, but also to all vocabulary genres (including ontologies) that play a new, even more important role. The result is a change in metadata genre functionality. The before closed record, constituting a functional whole, becomes self-functioning metadata subgenres set with its own meaning and combined with relationships going far beyond what OPAC has allowed before.

For the first time, the dichotomy between such genres as metadata record and controlled vocabulary (access points)[75] and even between information and metadata genres has been eliminated. Such a catalog for the first time allows OPAC to completely move away beyond the closed environment of the library KO and become involved in the activities of KO in an open Web environment. This means that metadata is not only computer-processed but also computer-interpreted[76]. The role of metadata discovery and dissemination is growing at the expense of traditional information retrieval. This direction brings the metadata closer to big data solutions[77].

This brief summary of the historical development of OPAC as the subsequent generations of this genre, which may be considered its subgenres, indicates that in working OPACs features of many generations are usually combined. The evolution of OPAC consists between others in choosing good ideas of past generations and keeping them in next generations combined with new functionalities. The same mechanism will probably work in the same way in the future. This is why the list presented above is not closed. But such a chronological enumeration is only the beginning of the analysis. There are some important questions not answered yet, like: What has forced such a development directions but not another? What is the main feature determining the distinction of subsequent OPAC generations (subgenres)? Are technological reasons or users' needs more important in this respect? To find the answers to these questions we will use the genre analysis methodology, with results described in part 2 of the paper.

## Conclusions to Part 1

The above presentation of OPAC cybergenres, in the historical development and in the process of its emancipation from a strict institutional framework to global network environment, may serve as an example of the application of the genre theory in the study of detailed solutions in the field of KO. This research approach brings many benefits compared to more traditional methods. In particular, its advantages are visible in two aspects. Firstly, the use of genre knowledge allows integration of perspectives related to the determinants affecting the KO and the effects of the use of genres in these processes (such as the parent genre – OPAC with the primary communication purpose, and its subgenres – individual OPAC generations distinguished for having separate specific purposes). Secondly, it allows the separation of the OPAC physical carrier and software platform from its genre features.

The historical development of OPAC is an example of digital genres transition from very poor electronic copy of its analog predecessor to turning OPAC into universal library itself[78]. Next step was connecting local KO centers into one universally connected system. The last step (as for today) is including the system to the universe of information of every kind and purposes existing in electronic form outside the library world. This way OPAC, as every library catalog, is part of social processes of KO held in information users discourse community and helps to shape it[79].

The second part of the paper will describe library OPAC understood as electronic communication genre. Then it will discuss results of OPAC subgenres analysis in their historical development of form, content and communicative purposes as three distinctive genre features.

## References

1   Shepherd M and Watters C, The evolution of cybergenres. *In Proc. of the 31st Annual Hawaii Intern. Conference on System Sciences (HICSS'98)*, (IEEE Press; Los Alamos), 1998, p. 97-109.

2   Xie I, Interactive information retrieval in digital environments, (IGI Publ.; Hersley, New York), 2008.

3   Hjørland B, What is knowledge organization (KO)?,*Knowledge Organization*,35 (2/3) (2008) 86-101.

4   Andersen J, The concept of genre in information studies, *Annual Review of Information Science and Technology*, 42 (1) (2008) 339-367.

5   Borgman Ch, Why are online catalogs still hard to use?,*Journal of the American Society for Information Science*, 47 (3) (1996) 493-503.

6   Zachry M, Communicative practices in the workplace: a historical examination of genre development, *Journal of Technical Writing and Communication*, 30 (1) (2000) 57-79.

7   Auken S, Utterance and function in genre studies: a literary perspective. In: Andersen J, (ed.) *Genre theory in information studies*, (Emerald Group Publ.; Bingley), 2015, 155-178.

8   Bhatia V, Critical genre analysis. Investigating interdiscursive performance in professional practice, (Routledge; London, New York), 2017.

9   Bakhtin M, Speech genres and other late essays, (Univ. of Texas Press; Austin), 1986.

10   Bazerman Ch, Systems of genres and the enactment of social intentions. In: A. Freedman A, and Medway P (eds.) *Genre and the new rhetoric*, (Burgess Science Press; Basingstoke), 1994, 79-101.

11   Miller C, Genre as social action, *Quarterly Journal of Speech*, 70 (2) (1984) 151-167.

12   Swales J, Genre analysis: English in academic and research settings, (Cambridge Univ. Press; New York), 1990.

13   Andersen J, What genre theory does. In: Andersen J, (ed.) *Genre theory in information studies*, (Emerald Group Publishing Ltd; Bingley), 2015, p. 1-12.

14   Kjellberg S, Researchers' blogging practices in two epistemic cultures: the scholarly blog as a situated genre, *Human IT*, 12 (3) (2014) 36-77.

15   Askehave I and Swales J, Genre identification and communicative purpose: a problem and a possible solution, *Applied Linguistics,* 22 (2) (2001) 195-212.

16   Vaughan M and Dillon A, Why structure and genre matter for users of digital information: a longitudinal experiment with readers of a web-based newspaper, *Intern. Journal of Human-Computer Studies*, 64 (6) (2006) 502-526.

17   Bhatia V, Genre analysis today, *Revue belge de philologie et d'historie,* 75 (3) (1997) 629-652.

18   Bhatia V, The power and politics of genre, *World Englishes,* 16 (3) (1997) 359-371.

19   Wierzbicka A, Genry mowy. In: Dobrzyńska T and Janus E, (eds.) *Tekst i zdanie: zbiór studiów*, (Zakład Narodowy im. Ossolińskich; Wrocław), 1983, p. 125-137.

20   Shepherd M, Watters C and Kennedy A, Cybergenre: automatic identification of home pages on the Web, *Journal of Web Engineering*, 3 (3/4) (2004) 236-251.

21   Shepherd M and Watters C, The evolution of cybergenres. *In Proc. of the 31st Annual Hawaii Intern. Conference on System Sciences (HICSS'98)*, (IEEE Press; Los Alamos), 1998, p. 97-109.

22   Tedd L, OPACs through the ages, *Library Review,* 43 (4) (1994) 27-37.

23   Swanson D, Dialogues with a catalogue, *The Library Quarterly*, 34 (1) (1964) 113-125.

24   Barton J and Mak L, Old hopes, new possibilities: next-generation catalogues and the centralization of access, *Library Trends*, 61 (1) (2012) 83-106.

25   Bush V, As we may think, *The Atlantic Monthly*, 176 (1) (1945) 101-108.

26   Caplan P, On discovery tools, OPACs and the motion of library language, *Library Hi Tech*, 30 (1) (2012) 108-115.

27   Hildreth Ch, Beyond Boolean. Design the next generation of online catalogs, *Library Trends*, 35 (4) (1987) 647-667.

28   Taylor A, *The organization of information*, (Libraries Unlimited; Westport, CN), 2003.

29   Nahotko M, Komunikacja naukowa w środowisku cyfrowym: globalna biblioteka cyfrowa w informatycznej infrastrukturze nauki, (Wydaw. Stow. Bibliotekarzy Polskich; Warszawa), 2010.

30   Owen W and Michalak S, Engine of innovation: building the high performance catalog, *Information Technology and Libraries*, 34 (2) (2015) 5-18.

31   Hildreth Ch, Advancing toward the E³OPAC: The imperative and the path. In: Pulis N, (ed.) *Think tank on the present and future of the online catalog: Proceedings of ALA Midwinter Meeting,* (American Library Assoc.; Chicago), 1991, p. 17-38.

32   Wisniewski J, Web scale discovery: The furure's so bright, I gotta wear shades, *Online*, 34 (4) (2010) 55-57.

33   Nahotko M, Genre groups in knowledge organization, *Cataloging & Classification Quarterly*, 54 (8) (2016) 553-582.

34   Beheshti J, The evolving OPAC, *Cataloging & Classification Quarterly*, 24 (1/2) (1997) 163-185.

35   Hippel E, Democratizing innovation, (The MIT Press; Cambridge, MA), 2005.

36   Naun Ch, Next generation OPACs: a cataloging viewpoint, *Cataloging & Classification Quarterly*, 48 (4) (2010) 330-342.

37   Hildreth Ch, Extending the online catalog: the point of diminishing returns. In: Bishop A P, (ed.) *Emerging communities: integrating networked information into library services. 30ᵗʰ Clinic on Library Applications of Data Processing*, April 4-6, 1993, p. 84-100.

38   Hildreth Ch, The use and understanding of keyword searching in a university online catalog, *Information Technology and Libraries*, 16 (2) (1997) 52-62.

39   Large A and Beheshti J, OPACs: a research review, *Library & Information Science Research*, 19 (2) (1997) 111-133.

40   Borgman Ch, Why are online catalogues hard to use? Lessons learned from information-retrieval studies, *Journal of the ASIS*, 37 (6) (1986) 387-400.

41   Hunter E, Cataloguing, 3ʳᵈedn (Library Assoc. Publ.; London), 1991.

42   Guha T and Saraf V, OPAC usability: assessment through verbal protocol, *The Electronic Library*,23 (4) (2005) 463-473.

43   Hildreth Ch, The GUI OPAC: approach with caution, *The PACS Review*, 6 (5) (1995) 6-18.

44   Madhusudhan M and Aggarwal S, Web-based online public access catalogues of IIT libraries in India: an evaluative study, *Program*,45 (4) (2011) 415-438.

45   Babu R and O'Brien A, Web OPAC interfaces: an overview, *The Electronic Library*, 18 (5) (2000) 316-327.

46   Husain R and Ansari M, From card catalogue to Web OPACs, *DESIDOC Bulletin of Information Technology*, 26 (2) (2006) 41-47.

47   Antelman K, Lynema E and Pace A, Toward a twenty-first century library catalog, *Information Technology and Libraries*, 25 (3) (2006) 128-139.

48   Wilson K, OPAC 2.0: next generation online library catalogues ride the Web 2.0 wave! *Online Currents*, 21 (10) (2007) 406-413.

49   Merčun T and Žumer M, New generation of catalogues for the new generation of users: a comparison of six library catalogues, *Program*, 42 (3) (2008) 243-261.

50   Jetty S, Jain P and Hopkinson A, OPAC 2.0: towards the next generation of online library catalogues. *In: ICoASL, 2ⁿᵈ Intern. Conference of Asian Special Libraries, Tokyo, February 10, 2011.*

51   Breeding M, The birth of a new generation of library interfaces, *Computers in Libraries*, 27 (9) (2007) 34-37.

52   Morgan E, Web-scale discovery indexes and "next generation" library catalogs. Available at http://www.library.nd.edu/daiad/morgan/musings/web-scale/ (Accessed on 29 Oct 2019).

53   Yang S and Hofmann M, Next generation or current generation? A study of the OPACs of 260 academic libraries in the UA and Canada, *Library Hi Tech*, 29 (2) (2011) 266-300.

54   Wang Y and Dawes T, The next generation integrated library system: a promise fulfilled, *Information Technologies & Libraries*, 31 (3) (2012) 76-84.

55   Hofmann M and Yang S, "Discovering" what's changed: a revisit of the OPACs of 260 academic libraries, *Library Hi Tech*,30 (2) (2012) 253-274.

56   Dempsey L, Thirteen ways of looking at libraries, discovery, and the catalog: scale, workflow, attention. In: Chambers S (ed.) *Catalogue 2.0: the future of the library catalogue*, (Facet Publ.; London), 2013, p. 179-201.

57   Moulaison H, Kroeger A and Corrado E, What's driving discovery systems? The case for standards. *IFLA WLIC 2015*, Available at http://library.ifla.org/id/eprint/1300 (Accessed on 2 Dec 2019).

58   Nagy A, Defining the next-generation catalog, *Library Technology Reports*, 47 (7) (2011) 11-15.

59   Breeding M, The future of library resource discovery, *Information Standards Quarterly*, 27 (1) (2015) 24-30.

60   Gross J and Sheridan L, Web scale discovery: the user experience, *New Library World*,112 (5/6) (2011) 236-47.

61   Fox R, "The great pig roast", *OCLC Systems & Services*, 23 (3) (2007) 242-249.

62   Han M, New discovery services and library bibliographic control, *Library Trends*, 61 (1) (2012) 162-172.

63   Osborne H and Cox A, An investigation into the perceptions of academic librarians and students towards next-generation OPACs and their features, *Program*,49 (1) (2015) 23-45.

64   Mi J and Weng C, Revitalizing the library OPAC: interface, searching and display challenges, *Information Technology and Libraries*, 27 (1) (2008) 5-22.

65   Park H and Kipp M, Library Linked Data models: Library Data in the Semantic Web, *Cataloging & Classification Quarterly*, 57 (5) (2019) 261-277.

66   Sandy H, Explaining cataloging to a six year old? *Technical Services Quarterly*, 36 (4) (2019) 379-390.

67   Salaba A, Mercun T and Aalberg T, Complexity of work families and entity-based visualization displays, *Cataloging & Classification Quarterly*, 56 (7) (2018) 628-652.

68   Yee M, FRBRization: a method for turning online public finding lists into online public catalogs, *Information Technology and Libraries*,24 (2) (2005) 77-95.

69 Mimmo D, Crane G and Jones A, Hierarchical catalog records: implementing a FRBR catalog, *D-Lib Magazine* 11 (10) (2005) Available at http://www.dlib.org/dlib/october05/crane/10crane.html (Accessed on 2 Dec 2019).

70 Dickey T, FRBRization of a library catalog: better collocation of records, leading to enhanced search, retrieval and display, *Information Technology and Libraries*,27 (1) (2008) 23-31.

71 Ercegovac Z, Multiple-version resources in digital libraries: towards user-centered displays, *Journal of the ASIST*,57 (8) (2006) 1023-1032.

72 Hickey T, O'Neill E and Toves J, Experiments with the IFLA Functional Requirements for Bibliographic Records (FRBR). *D-Lib Magazine*,8 (9) (2002). Available at http://www.dlib.org/dlib/september02/hickey/09hickey.html (Accessed on 2 Dec 2019).

73 Baker T, Coyle K and Petiya S, Multi-entity models of resource description in the Semantic Web: a comparison of FRBR, RDS and BIBFRAME, *Library Hi Tech*,32 (4) (2014) 562-82.

74 Coyle K, Creating the catalog, before and after FRBR. Available at http://kcoyle.net/mexico.html (Accessed on 15 Oct 2019).

75 Peponakis M, In the name of the name: RDF literals, ER attributes, and the potential to rethink the structures and visualizations of catalogs, *Information Technology and Libraries*, 35 (2) (2016) 19-38.

76 Guerrini M and Possemato T, From record management to data management: RDA and new application models BIBFRAME, RIMMF, and OliSuite/WeCat, *Cataloging & Classification Quarterly*, 54 (3) (2016) 179-199.

77 Greengerg J, Big metadata, smart metadata, and metadata capital: toward greater synergy between data science and metadata, *Journal of Data and Information Science*,2 (3) (2017) 19-36.

78 Krajewski M, Tell data from meta: tracing the origins of big data, bibliometrics, and the OPAC, *OSIRIS*, 32 (1) (2017) 224-240.

79 Bowker G and Star S, Sorting things out: classification and its consequences, (MIT Press; Cambridge, MA), 1999.