S e b a s t i a n   D a w i d   K o t u ł a
sebastian.kotula@mail.umcs.pl
Institute of Cultural Studies, University of Maria Curie-Skłodowska in Lublin
ORCID: 0000-0002-5195-7289

FROM BOOK CULTURE TO LIBRARY CULTURE IN THE CONTEXT OF INFORMATION TECHNOLOGY

ABSTRACT

This article explores the concepts of book culture and library culture, highlighting their interconnections. *Book culture* refers to the social circulation of information, data, and content fixed in the form of the printed codex. *Library culture* remains closely connected to book culture, as it continues to rely on information carriers largely produced within its paradigm. However, library culture is a broader concept, encompassing a wider range of practices, media, and institutional frameworks. Its primary objective is the preservation, organization, and dissemination of collections. It is significantly shaped by advancements in information technologies, which offer essential tools for managing various information carriers, including, among others, printed codex books. Consequently, information technologies drive transformations in both library culture (through the introduction of digital tools that facilitate library operations) and book culture (by offering new digital tools that accelerate the social circulation of books). Together, these technologies play a crucial role in supporting the evolving functions and objectives of library culture.

KEYWORDS: book culture, library culture, information technologies

Introduction

The history of communication through language has developed from orality, to writing and textuality (printing), and finally to the visual (digital environments). *Book culture* refers to the material forms of preserving language – specifically, the physical media that store textual content. *Library culture*, by contrast, concerns the management of these material media. In research publications, both terms are often inadequately explained or defined; moreover, the interrelationships between these cultural formations have to date been neglected. This article aims to clarify both concepts. To this end, the following theses are proposed: Book culture, in the strict sense, denotes the social circulation and use of printed codex books as primary carriers of recorded knowledge (information, data, content), while library culture emerged alongside the need to manage (store, organize, and disseminate) media that store information, data, and content – including printed codex books, alongside other media. Today, both cultures operate within the context of information technologies, which in turn shape and influence their development and structure. Information technologies catalyze significant transformations in both library culture (through the integration of digital tools that enhance the efficiency of library operations) and book culture (by introducing new digital instruments that facilitate the accelerated social circulation of books). These technologies are instrumental in advancing the functions and objectives of library culture, providing essential support for its evolving practices. Consequently, this study seeks to investigate the interrelationships between these two cultural formations.

Book culture

Without book culture there would be no library culture. This statement assumes that pre-book forms of information preservation already fall within the scope of the term *book culture*: They represent

stages on the way to developing a book project in the strict sense. Libraries were created along with material forms of preserving information, and they developed along with the creation of codex books. In the discourse of book studies, the term *book* is predominantly understood to refer to printed codex books, and historical forms of the book are generally excluded from this definition.[1] Book culture is also a well-established research field within book science.

The term *book culture* refers to everything related to books.[2] Specifically, it relates to all possible compounds of books within society as part of current and past culture. The term integrates components such as: the book as object and as content; the book as a product of culture; the book as a communication tool, method of organizing information and knowledge and as the form of their presentation; processes associated with the social circulation of books, that is, the processes of interaction with books, namely writing (creating), manufacturing (publishing), dissemination and reading (consuming), these processes together constituting bibliological communication[3]; and actors involved in the social circulation of books.[4]

Book culture is a culture of reading (and writing).[5] As Anttonen, Af Forselles & Salmi-Niklander write: "Book culture not only

---

1 See S. D. Kotuła, *Komunikacja bibliologiczna wobec World Wide Web*, Lublin 2013, p. 60.

2 See P. Raabe, 'The Importance of Book Culture for Europe', *Knygotyra* 39 (August), pp. 84–97. https://doi.org/10.15388/Knygotyra.39.7 [Accessed June 3, 2025].

3 Bibliological communication is discussed in: S. D. Kotuła, 'Bibliological communication and the World Wide Web', *Zeszyty Prasoznawcze* 2014, vol. 57, no. 4, pp. 661–677.

4 See K. Migoń, 'Kultura książki – wyrażenie potoczne, kategoria badawcza, czy specjalność naukowa?', in: *Ludzie i książki. Studia i szkice bibliologiczno-bibliograficzne. Księga pamiątkowa dedykowana Profesor Hannie Tadeusiewicz*, ed. E. Andrysiak, Łódź 2011, p. 57; idem, 'Kultura książki. Program dla bibliologii i potrzeba dla studiów bibliotekoznawczych', in: *Nauka o książce, bibliotece i informacji we współczesnym świecie*, ed. M. Banacka, Warszawa 2003, p. 16; idem, 'O współczesnej sytuacji badawczej w naukach o książce, bibliotece i informacji', *Przegląd Biblioteczny* 2008, vol. 76, no. 1, p. 18; idem, *Nauka o książce wśród innych nauk społecznych*, Wrocław 1976, p. 81; idem, *"O przedmiocie badań współczesnej bibliologii"*, http://www.up.krakow.pl/konspekt/19/migon.html [Accessed October 10, 2011]; K. R. Schaeffer, *The culture of the book in Tibet*, New York 2009, p. 17; S. Young, *The book is dead. Long live the book*, Sydney 2007, p. 29.

5 See S. Birkerts, *The Gutenberg elegies. The fate of reading in an electronic age*, New York 2006, p. XIV.

means the use and dissemination of printed books but also the transmission and circulation of written texts, such as documents of oral tradition, for example, through the archive into public collections in book format".[6] Book culture grew out of the foundation of handwriting, and handwriting out of the foundation of spoken language. Simplifying considerably for the purposes of argument, in the oral world, the spoken word is the main carrier of information – an audio materialization of language. Subsequently, writing appeared, where the information carrier is the written word – a visual materialization of language. For this to happen, however, suitable information carriers were needed, such as papyrus and parchment.

Humans first attempted to transmit information, create symbolic messages, and communicate various contents in the Paleolithic period, using the static and portable materials available at the time. This was when the first carriers of information, data and content began to appear (it is not always clear if the shapes preserved by techniques such as engraving, gouging, carving and cutting held symbolic meaning).[7] While various types of prehistoric book-like forms can be distinguished for the sake of discussion, the birth and development of book culture is directly linked to the materialization of natural languages in the form of the codex.

Several milestones mark the development of book culture. Eisenstein notes that for millennia, handwritten texts were the sole means of preserving knowledge and information. In more recent times, scribes and scriptoria guilds – particularly in France – held a monopoly on manuscript production, resulting in high prices. Not surprisingly, outside France there were attempts to break that hegemony. The most significant breakthrough came in the mid-

---

6 P. Anttonen, C. Af Forselles, K. Salmi-Niklander, 'Introduction: Oral Tradition and Book Culture', in: *Oral Tradition and Book Cutlure*, ed. P. Anttonen, C. Af Forselles, K. Salmi-Niklander, Helsinki 2018, p. 10.

7 See S. D. Kotuła, 'Origins of the Book - Early Beginnings', *The International Journal of the Book*, 2019, vol. 17, is. 1, p. 6; Idem, '«Biblioteki» w paleolicie', *Biblioteka*, 2017, no. 21, p. 11.

fifteenth century with Johannes Gutenberg's invention of a new technology for communication in Europe – the printing press.[8] By the end of the fifteenth century, all major European cities had their own printing presses.[9]

The invention of printing enabled publishing on a previously unknown scale and led to a dramatic increase in information production.[10] It also accelerated the distribution of book content. Over the past 500 years, printing technology has advanced significantly, allowing for faster, cheaper, and higher-volume production.

The print revolution not only hastened the dissemination of information, data, and content, but also triggered a whole range of other social changes – for example, by altering the way written texts are received. Like handwritten texts, printed texts represent natural language materialized in visual form, but through the mechanical process of printing. In this case, the carrier is the printed word, and the carrier of the carrier – the printed word – is paper.

Another major change in the history of the book – and the development of carriers of carriers of information in general – was the invention of computers, and later the Internet. As Anttonen, Af Forselles & Salmi-Niklander writes: "The culture of the book has brought about new forms of communication as well as new forms of materiality in that communication. Books, manuscripts and related media constitute relevant aspects of vernacular literacy and communication".[11] The digital world, for the purposes of this article, is understood as a space in which the main carrier of information, both data and content, is binary digital code. With the aid of appropriate software encoded in binary, the digital world is populated with a wide range of cultural products. Some are the result of digitalization – a process that can be compared to technological

---

8   See E. L. Eisenstein, *The printing revolution in early modern Europe,* ed. 2, Cambridge 2005, p. 313.

9   See H. A. Innis, *Empire and communication*, Toronto 2007, pp. 164–166.

10   See E. L. Eisenstein, *The printing press as an agent of change*, Cambridge 1994, p. 30.

11   P. Anttonen, C. Af Forselles, K. Salmi-Niklander, 'Introduction: Oral Tradition and Book Culture…', op. cit., p. 11.

convergence, the transformation of atoms into bits. Many more are born digital or are native to digital networks – for example, digital books and hypermedia.

The digital world influences and changes book culture. For example, the creation of digital books (compare the phenomenon of digital bibliological communication) and the connection of computers into a network (or rather one large global network) have resulted in the emergence of, among other things, networked books (compare network bibliological communication).[12] In the third decade of the 21st century, thanks to the significant development of artificial intelligence (AI), accessing the contents of books has become much easier (although they must be digitalized and/or be available in digital formats). As a result, a few simple prompts – although the final effect depends on their structure – can generate a new book, or at least its content, within minutes. We could, therefore, speak of something like bibliological AI communication.

In the context of content generation, the term *generative artificial intelligence* (GenAI) is most appropriate. GenAI models are trained on large and diverse datasets curated from multiple sources, including but not limited to books, academic journals, digital archives, and Internet-based texts. Among these, the products of book culture – such as printed codex books, scholarly publications, and periodicals – constitute significant and enduring repositories of valuable knowledge, information, and content. While GenAI systems generate new content based on patterns learned from this extensive human-created corpus, a substantial portion of these resources originate within the framework of book culture. Consequently, many of these valuable materials are managed, preserved, and disseminated by various types of libraries, which continue to play a critical role in knowledge stewardship.[13]

---

12 See S. D. Kotuła, *Komunikacja bibliologiczna wobec World Wide Web*, Lublin 2013, pp. 129–140.

13 See A. Buick, 'Copyright and AI training data – transparency to the rescue?', *Journal of Intellectual Property Law & Practice*, 2025, vol. 20, issue 3, March, pp. 182–192.

Despite this, after the experiences of the scriptographic and typographic eras, books became entangled in the context of the digital-network environment.[14]

Book culture belongs to a different system. Writing, print and digital binary code are all carriers of information – that is, carriers of words encoded in language – whereas the book is a materialization of specific content in specific forms, such as handwritten, printed, or digital books. This also means that the book functions as a carrier of carriers of information. Each carrier requires its own medium: Writing requires for example parchment; printing requires for example paper; and digital code requires physical storage devices such as HDDs, SDDs, or flash drives. By assembling parchment leaves into a codex, a handwritten book is created; arranging printed sheets into codex form produces a printed book. Similarly, digital code needs appropriate software to produce a digital book – either born digital or created through the digitalization process - in which the encoded content can be expressed, for example, in Polish.

Book culture can be viewed globally, locally, regionally, nationally, and socially (within specific social groups).[15] Book culture also implies a defined access to books. In some societies, this access may be limited; in others, it is widely accessible. The degree of accessibility is another determinant of book culture. Today, this access is shaped, and also determined, by access to the Internet. If the Internet signal (cable, wireless, satellite) is now global, then we can speak of a single global book culture. It consists of a wide range of local book cultures, as well as supralocal phenomena.

Within book culture, the book is involved in a social system. On the axis book–society, certain relations are formed. The book as an artifact (a material object) and as a materialized message within

---

14 See K. Migoń, 'Uniwersum piśmiennictwa, jego właściwości, granice i sposoby istnienia', in: *Uniwersum piśmiennictwa wobec komunikacji elektronicznej*, ed. K. Migoń, M. Skalska-Zlat, Wrocław 2009, p. 19.

15 See K. Migoń, 'Bibliologia wśród innych nauk. Koncepcje, realizacje, perspektywy', in: *Bibliologia. Problemy badawcze nauk humanistycznych*, ed. D. Kuźmina, Warszawa 2007, p. 23.

this artifact becomes a constitutive element of certain social interactions. The book is a material (physical) object, a tool of communication, and a method of its preservation. It is also a way to present information. Finally, it is also a model (as an object, a tool, a method and a mode) for other social interactions – for example, for network communication via the Internet and the World Wide Web.[16]

More and more products of book culture are being incorporated into the sphere of digital-network communication, which, among other things, makes as much content as possible accessible. In the context of the development of artificial intelligence (AI), this is worth noting, as AI tools require access to large-scale datasets, including language corpora and text databases, which serve as the basis for their training and development. Books remain the most important and primary sources of, among other things, verified and reliable scientific knowledge – developed with the help of specialized institutions that ensure, for example, the linguistic correctness of the syntagms used – and are therefore crucial for the development of AI. The digital domain incorporates not only cultural artifacts, including manuscripts and printed books along with their intellectual and informational content, but also the methods and solutions employed in them, which positively affirm the value of a centuries-old tradition.

Library culture

Libraries were established alongside the emergence of information carriers. To generalize and simplify, library activities over the years have focused on the collection, storage, and utilization of information media – that is, carriers of carriers of information or physical media (from ancient clay tablets and papyrus scrolls, through widely distributed printed books, to modern electronic

---

16   See S. D. Kotuła, 'Digital book culture', *Toruńskie Studia Bibliologiczne*, 2015, vol. 8, no. 1, p. 118; idem, 'Ewolucja kultury książki', in: *Czytelnicy – zasoby informacji i wiedzy. Tradycja i przemiany w czasach kultury cyfrowej*, ed. A. Dymmel, S. D. Kotuła, Lublin 2017, s. 20; idem, 'Wykorzystanie schematu książki na potrzeby środowiska cyfrowego', *Folia Bibliologica*, 2016, vol. LVIII, pp. 149–157.

formats). Library culture emerged with the advent of information carriers, or more precisely, physical media (see Fig. 1). More specifically, it arose when these physical media began to be collected, stored, preserved, and made accessible to selected individuals – in other words, along with certain information processes.
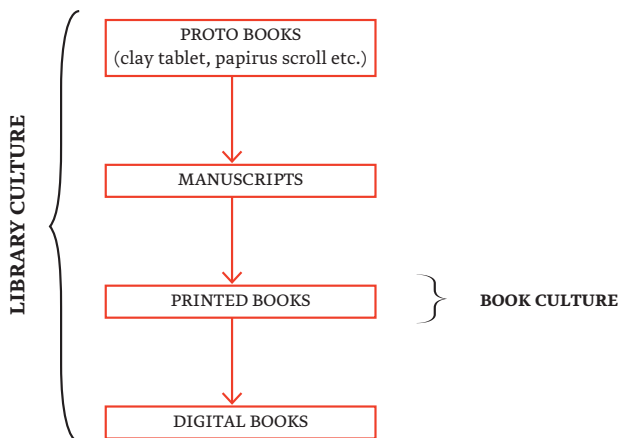

FIG. 1. The relationship between book culture and library culture. [own elaboration]

To this end, libraries have developed appropriate methods for managing information, data, and content. Libraries adapt to the changing conditions and circumstances in which they operate. The public expresses demand for certain carriers of information (such as natural language codes) and carriers of carriers of information (such as clay tablets or printed books). This, in turn, leads to the need to modify the activities carried out within the framework of library culture in order to manage these new information objects more effectively.

Colloquially, library culture is identified with libraries containing books – that is, traditionally understood libraries. Since libraries function, in part, to disseminate collected resources, library culture is also associated with dissemination activities. Library culture (in other words, the library process) falls within the scope of bibliological processes and book culture.[17] It reflects society as

17   See K. Migoń, *Nauka o książce wśród...*, op. cit., p. 102.

a whole.[18] Libraries have always provided specific services within the communities in which they operate. *Library culture* refers to the way the library functions and works, that is, its mission, principles, structure, vision, and organization.[19]

People are an important part of this. As Middleton notes, on the one hand, regarding employees, it is a "fickle environment that drives how people in libraries think, behave and work".[20] Hence, library culture also refers to the "behaviors, values, beliefs, and norms that are currently operating at your library,"[21] in the words of Ottolenghi. On the other hand, users must also be considered. Library culture should focus on meeting users' needs; therefore, it is necessary to clearly identify and define who the library customers are, why they are using the library, what they follow, what they like, and so on.[22]

The task of library culture is also to serve culture in general. The library's collections, which are mainly composed of the products of literary culture, should be made available to user-readers in the most effective way, using the most contemporary digital and network technologies.[23] Thus, *library culture* also refers to the specific behaviors of library readers and users.[24]

---

18   See D. Gall, D. Hirst, 'Geeks and Luddites: Library Culture and Communication', in: *An Overview of the Changing Role of the System Librarian. Systemics Shifts*, ed. E. G. Iglesias, Oxford 2010, p. 59.

19   See B. McCafferty, *Library Management: A Practical Guide for Librarians*, Lanham 2021, p. 88; J. Henry, J. Eshleman, R. Moniz, *The Dysfunctional Library : Challenges and Solutions to Workplace Relationships*, Chicago 2018, pp. 17–21.

20   K. L. Middleton, *Yes! On demand. How to Create Winning Customized Library Service*, Santa Barbara 2017, p. 25.

21   C. Ottolenghi, *Intentional Marketing : A Practical Guide for Librarians*, Lanham 2018, p. 22.

22   See M. Kowalsky, J. Woodruff, *Creating Inclusive Library Environments. A planning Guide for Serving Patrons with Disabilities*, Chicago 2017; D. S. Garson, D. Wallace, 'Leadership Capabilities in the Midst of Transition at the Harvard Library', in: *Leadership in Academic Libraries Today: Connecting Theory to Practice*, ed. B. L. Eden, J. C. Fagan, Lanham 2014, p. 49.

23   See X. S. Kong, 'University Library Cultural Construction Under Network Environment', in: *Information, Computer and Application Engineering*, ed. by Hsiang-Chuan Liu, Wen-Pei Sung, Wenli-Yao, Leiden 2015, pp. 201–203.

24   See W. Babik, 'Biblioteka akademicka na rozdrożu: o współczesnych przemianach w środowisku informacyjnym bibliotek', in: *Biblioteka akademicka : infrastruktura – uczelnia – otoczenie : Gliwice, 24–25 października 2013 r.*, ed. M. Odlanicka-Poczobutt, K. Zioło, Gliwice 2014, p. 37.

In addition, library culture requires the ability to set goals and achieve them in order to perform the most important tasks for a given library – or for libraries of a particular country or type, say – as efficiently as possible. Therefore, it also requires specific knowledge of library activity.

Marcin Drzewiecki uses a broader term here: *information and library culture*.[25] He conceptualizes it as the utilization of media and the information they encompass. In this context, he views the library as an institution that, through its activities, creates a library and information culture among its users/readers, with librarians as its creators.

The digital space has left its mark on library culture, at least to the extent that, today, library collections can be accessed via the World Wide Web. In turn, the WWW offers many other tools that make library work more effective – most notably, AI tools. Of course, library culture is not only about organized resources and the information technologies that help manage them, but also about the people who work with these resources (staff and readers). After all, these collections still have to be organized by someone, in some way. Since the emergence of digital resources, libraries have begun to develop appropriate rules for dealing with these collections, including their management, organization, and sharing. A new term has even been introduced to highlight this change: *digital library culture*.[26]

Most generally, *library culture* refers to a whole range of activities related to the management of library resources. In other words, it describes the conduct of library staff in relation to the objects located in libraries. Thus, library culture is revealed in the relationship between librarians and library resources. Some desired components of library culture might include integrating the fullest possible range of library resources into global online circula-

---

25 See M. Drzewiecki, *Edukacja biblioteczna i informacyjna w polskich szkołach*, Warszawa 2005, pp. 31–32.

26 See E. Magusin, K. Johnson, *Exploring the Digital Library. A Guide for Online Teaching and Learning*, San Francisco 2013, pp. 10–11.

tion or incorporating the latest technological achievements into the library's repertoire of tools offered to readers, for example, to facilitate access to relevant information.[27] In summary, library culture is concerned with organizing valuable collections in a certain way and delivering those collections to users (Fig. 2).

LIBRARY CULTURE

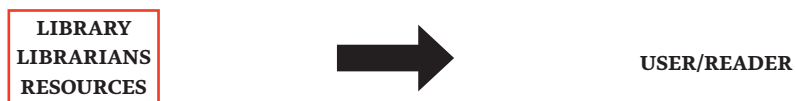LIBRARY
LIBRARIANS
RESOURCES

USER/READER

FIG. 2. Library culture. [own elaboration]

Library culture changes alongside changes in book culture. New forms of books have appeared, forcing the reorganization of collections and the creation of new methods for their arrangement. The circle of recipients has also changed. In the initial period, library collections were reserved for a select few, as they primarily served rules in the governance of states. Later, with the rise of literacy and the broader development of civilization, access expanded to a wider circle of recipients. The rules regarding what to store and collect also changed. In some cases, rulers ordered that anyone passing through their territories leave the books they were transporting for copying, and so on.[28] The increasing production of writing materials associated with the development of printing also significantly accelerated the expansion of collections. Generally, methods have changed over the years in line with social changes. For the purposes of this article, we will focus only on the second half of the twentieth century to highlight several key turning points in the development of library culture.

---

27   See R. H. McDonald, C. Thomas, 'Disconnects Between Library Culture and Millennial Generation Values', *Educause Quarterly*, 2006, no. 4, pp. 4–6.

28   See M. El-Abbadi, *Library of Alexandria* - https://www.britannica.com/topic/Library-of-Alexandria [Accessed April 30, 2025].

Library culture and information technologies

It is possible to identify several important turning points in the development of library culture, especially in the 20th century. In the 1950s, during the Cold War, the US Department of Defense engaged in cooperation with libraries, initiating several projects aimed, *inter alia*, at their computerization. The history of computers is complex and spans a long period of time. It has been shaped by numerous visionaries, each of whom made a significant contribution to the development and evolution of computing devices.[29]

In the four decades since the introduction of the first personal computer in 1974, PCs have become deeply integrated into virtually every sphere of human life.[30] A centuries-long history of diverse developments led to the emergence of digits and mathematics as a universal code embedded in computers. This code, along with the practice of coding, has attained the status of a universal language of media communication.[31] To simplify somewhat, the history of software begins in the 1950s.[32] Software sets in motion a universe of digital data.[33] The new trajectory of information technology development has led to the creation of a digital environment and the emergence of a new form of reality – virtual reality. Software has made it possible to implement and expand upon ideas rooted in book culture.

The library community had the opportunity to leave its mark on information technology. Research centers – including military institutions – needed knowledge resources drawn largely from libraries. For the purposes of scientific research, they sought to facilitate access to, and later the transmission of, information (data,

---

29 See Z. W. Pylyshyn, L. J. Bannon, *Perspectives on the Computer Revolution*, Intellect Ltd., Nortwood 1989, pp. 1–2; R. Ligonnière, *Prehistoria i historia komputerów : od początków rachowania do pierwszych kalkulatorów elektronicznych*, Wrocław 1992.

30 See P. Gawrysiak, *Cyfrowa rewolucja. Rozwój cywilizacji medialnej*, Warszawa 2008, p. 217.

31 See P. Celiński, *Postmedia. Cyfrowy kod i bazy danych*, Lublin 2013, pp. 83–84.

32 See U. Hashagen, R. Keil-Slawik, A. Norberg, H. Nixdorf, *History of Computing. Software Issues*, Berlin 2002, pp. 11–22.

33 See P. Celiński, *Postmedia…*, op. cit., p. 33.

content). Consequently, in subsequent years, significant subsidies were provided for these tasks. Initially, computers supported the acquisition of books and later facilitated the management of circulation records within library departments. During this period, the first electronic bibliographies, catalogs, and electronic libraries (such as the project started by the Library of Congress) began to emerge. In the early phase, however, these efforts were carried out internally. Libraries, individually or in consultation with their parent universities, created their own software to manage collections – that is, they created their own applications and systems. It was only with advancements in telecommunications that the integration of these activities into broader library networks became feasible. Beginning with the introduction of computers into library work in the late 1950s and continuing through the following decade, these actions were – and still are – dominated by a "pro-book" orientation, so to speak. The book and the processes associated with its circulation, despite efforts to bring the idea of "information" into the foreground, have remained the foundation of electronic communication activities.[34]

Making library resources available online required the creation of databases and technologies that enabled intercommunication between remote computers – that is, the Internet. As Bourne & Hahn note: "Even the earliest online retrieval systems needed some sort of database in order to function".[35] There is a long history behind the concept of organizing knowledge, information, and data. In ancient times, Aristotle, in *Organon*, developed one version of a knowledge database[36] when he introduced the distribution of types of existence into certain categories.[37] This method of dividing reality into categories, derived from ontological foundations and introduced by

---

34 This paragraph draws significantly on K. Cmiel, 'Libraries, Books, and the Information Age', in: *A History of the Book in America*, ed. D. P. Nord, J. S. Rubin, M. Schudson, Chapel Hill 2007, pp. 325–337.

35 C. P. Bourne, T. B. Hahn, *A History of Online Information Services, 1963–1976*, Cambridge 2003, p. 8.

36 See W. M. Turski, *Nie samą informatyką*, Warszawa 1980, p. 51.

37 See Arystoteles, *Dzieła wszystkie*, vol. 1, Warszawa 1990.

Aristotle into philosophy, became useful for the classification of the sciences and, further developed by philosophers, began to seep into other fields. The method of categorization dominated the classification of literature (writings) in the twentieth century and is also reflected in various information-retrieval languages. Introduced by Ranganathan, a prominent theorist of librarianship, the colon classification system enhances the textual analysis of documents and enables a more precise characterization of their content.[38] Ancient scholars' knowledge remains useful for thinking through the theory of information-retrieval languages and computer science (for example, database design). As a result, emerging digital technologies began to be incorporated into library activities.

In 1960, ARPA (Advanced Research Projects Agency) initiated one of the first interactive online information retrieval systems – Synthex (or Prototype Synthex, that is Protosynthex I), later developed into several versions – which provided full-text access to the *Golden Book Encyclopedia.*[39] Beginning in 1963, SATIRE (*Semi-Automatic Technical Information Retrieval*) became operational; it was a semiautomatic information retrieval system based on punched cards. In the same year, the Stanford Research Institute introduced the first online bibliographic search system that allowed full-text searching. In 1964, TIP (*Technical Information Project*) was created – an online system that enabled citation searches based on bibliographic references. Also developed in 1964 was LUCID (*Language Used to Communicate Information System Design*), the first search system able to modify an online database. In 1965, the first fully online system – BOLD (*Bibliographic On-Line Display*) – was built. It offered real-time document searching based on bibliographic records with abstracts. The same year, MICRO (*Multiple Indexing with Console Retrieval Options*) was developed as a system for searching online resources,

---

38 See J. Ćwiekowa, *Opracowanie tematyczne piśmiennictwa*, Warszawa 1988, pp. 13–14.

39 See K. La Barre, *The use of faceted analytic-synthetic theory as revealed in the practice of website construction and design*, https://netfiles.uiuc.edu/klabarre/www/LaBarre_FAST.pdf [Accessed October 10, 2012].

such as abstracts. Additionally, the *Chemical Information and Data System* (CIDS) was introduced in 1965, enabling the online retrieval and searching of chemical data.[40]

Library culture, focused on organizing valuable collections in a certain way and delivering them to users, has become increasingly willing to adopt the technological achievements of information technology in its broadest sense – or more precisely, databases, online services, and systems, catalogues (Fig. 3).
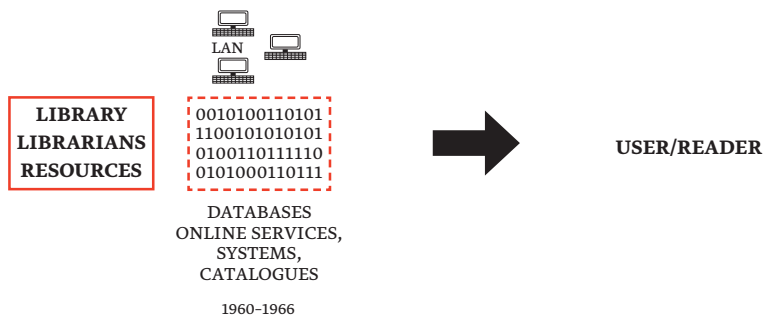
LIBRARY CULTURE

FIG. 3. Library culture using databases, online services systems, and catalogues. [own elaboration]

Although appropriate communication technologies were still lacking, many different online information services were created during this time. One such example was TIRP (*Textile Information Retrieval Project*), a bibliographic system developed by MIT in 1966–67. The database contained approximately 11,000 records and was the first bibliographic search system to allow users to view the thesaurus online as a form of search support. In addition, it automatically displayed alternative terms if the query did not yield any results – that is, if the desired records were not found. In 1966, AUDACIOUS (*Automatic Direct Access to Information with the On-Line UDC System*) appeared. The main objective of this project was to test the possibil-

---

40   Information on systems, starting with Protosynthex, based on the book: C. P. Bourne, T .B. Hahn, *A History of Online Information...*, op. cit., pp. 14–44.

ity of using the Universal Decimal Classification for the purpose of indexing language in a mechanized search system.[41]

Within the broader analysis of information retrieval systems, it is important to closely examine selected systems that are deeply embedded in the traditions of the book culture, as they illuminate the transitional dynamics between print-based and digital modes of knowledge organization and access. One such system was DIALOG.

In December 1968, the US Office of Education (USOE) awarded Lockheed a contract to use the existing DIALOG software to provide an experimental online retrieval service. In early 1969, Lockheed staff loaded magnetic tapes containing 12,300 bibliographic citations and abstracts, including records from the ERIC index, among others. Consistent with practices of the time, all records were stored in uppercase. Abstracts were available only for display or printing and were not searchable due to limited disk capacity, which constrained the online storage of index entry titles necessary for searching. A central competitive strategy of DIALOG was to provide users with the richest possible record content, including comprehensive abstracts and indexing. Its long-term competitive strategy focused on offering extensive record data – such as indexing all possible fields, full-text indexing, and word and phrase indexing – at minimal cost. This approach aimed to rapidly build a critical mass of users, secure market leadership and create significant barriers to entry for competitors. During the one-year evaluation period at Stanford, clearinghouse personnel conducted more than 800 online searches in response to mail and telephone requests, producing more than 51,000 printed citations and abstracts. The DIALOG system also attracted a small but dedicated group of education faculty who, while working on books, discovered that searching ERIC's education research reports significantly reduced their research time. This initiative represents one of the earliest examples of empowering end users to perform their own searches.[42]

---

41 Ibidem, pp. 66–73.
42 See C. P. Bourne, T. B. Hahn, *A History of Online Information Services, 1963–1976*, Cambridge 2003, pp. 170–173.

In 1968, SUPARS (*Syracuse University Psychological Abstracts Retrieval Service*) was also developed. It was the first well-known database available to the entire academic community of the home university. It was also the first online search engine that allowed users to take advantage of search strategies used by other users. Bourne & Hahn write that "SUPARS, with Psychological Abstracts, was the first instance of extensive availability of abstracts online for both searching and output."[43] During the 1960s, LEADER (the *Lehigh Automatic Device for Efficient Retrieval*, or *Lehigh Answer to Demand for Efficient Retrieval*) was also created. Its most important function was the use of advanced software that generated an abbreviated version of the full text of a document, greatly improving searchability and enabling faster familiarization with the content. LEADER was the first search engine to provide access to 10,000 full-text source documents online.

Among the many other systems operating in online mode, the following should be mentioned: COLEX, the pioneering online retrieval system to utilize time-window-based methodologies for efficient querying across large or distributed databases; CIMARON, the first online search system to demonstrate phonetic searching; DIRAC, capable of searching both numeric and bibliographic databases, though primarily designed for scientific databanks; SARA, designed for real-time online use, which supported weighted terms, Boolean logic, arithmetic comparisons (such as historical dates), and hierarchical subject expansion, with response times that were nearly instantaneous; STAIRS, possibly the first system to feature a substantial built-in tutorial and help capability); and TEXTIR, the first online search system to process natural language queries and identify source documents most closely matching the query's content.[44] In the years 1961-76, dozens of online information services were created.

The emerging systems, as we can see, were directly influenced by library culture – that is, by the methods of managing informa-

---

43   Ibidem, p. 75.
44   Ibidem, pp. 27–190.

tion, knowledge, and content developed through library practices.[45] During this period, several *de facto* database programs were created based on library resources (that is to say, properly organized library collections databases). These resources – the databases – served as models for a large group of early projects and ideas for the use of computers – apart from their original function of performing calculations, of course, in line with the etymology of the word *computer*.

The next stage was to make resources available remotely through the infrastructure of the global computer network (Internet) that was being developed at the time (Fig. 4).
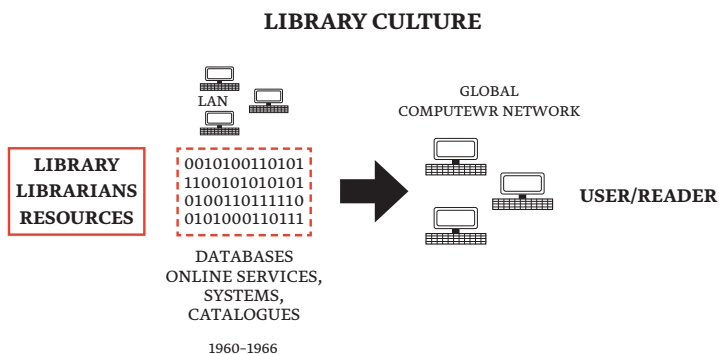
LIBRARY CULTURE

FIG. 4. Library culture using computer networks. [own elaboration]

Both information retrieval systems and the Internet were developed at the same time. By the end of the 1960s, a network had been built, but the first ideas for connecting computers in a network were presented earlier by Licklider, who observed that scientific work was often preceded by the time-consuming and labor-intensive task of collecting materials from libraries. He proposed writing appropriate software to facilitate communication between

---

45   Initially, operating the systems was complicated. Each had its own set of commands and rules for building information inquiries, so librarians were needed as intermediaries between the end user and the information and search system. These services were also often paid for. This has changed somewhat today. Most online databases are available free of charge, however, the user must know which database they are looking for, what collections they are interested in, how to use a given database, and so on. As a result, more of the work now falls on the user. See E. Magusin, K. Johnson, *Exploring the Digital Library...*, op. cit., pp. 11–12.

people and computers, and the creation of an information retrieval system that would serve the role of the library – that is, to store needed information and make it available.[46] This was the first work in which the author conceptualized the foundations of a computer network – *de facto*, the Internet. The establishment of the ARPA IPTO (Advanced Research Projects Agency Information Processing Technology Office) in 1962 changed the perception of computers: They were no longer seen solely as computing machines, but also as devices that could be used for communication.[47] This shift was undoubtedly due to the work of Licklider; indeed, he was offered the position of the first director of ARPA IPTO. The office's task was to find a way to ensure uninterrupted and efficient data transfer via a computer network – that is, communication between computers.[48] A few years later, in 1965, Licklider published a book entitled *Libraries of the Future*, in which he presented visionary ideas for the use of information technology in library and information services, and specifically described a project for an information retrieval system. He argued that computers were not merely computing machines. Their true potential lies not only in the fact that it would become possible to combine them with each other to perform complex calculations even more efficiently, but in the fact that, thanks to them, it would be possible to connect people with each other.[49] Similarly, libraries connect people – mainly the authors of books, articles, and so on – with readers who receive these materials.

In 1965, Licklider resigned from his position at ARPA IPTO, and its new director conducted the first network communication experiment – that is, information was transferred from one comput-

---

46 See J. C. R. Licklider, 'Man-computer symbiosis', *IRE Transactions on Human Factors in Electronics* 1960, vol. HFE-1, March, pp. 4–11.

47 See H. P. Alesso, C. F. Smith, *Connections. Pattern of Discovery*, Hoboken 2008, p. 116.

48 See B. Porter, *The net effect*, Bristol 2001, p. 43.

49 Ibidem.

er to another.[50] This experimental data transmission was quickly put to use: In 1965, the first nationwide computer network was launched, providing 13 selected institutions with access to a database of 200,000 bibliographic records in the field of technical literature.[51] The success of this project led to the creation of ARPANET (*Advanced Research Projects Agency Network*) at the end of 1966.[52] However, this network did not enable full intercommunication, only giving access to specific data. Initially, the ARPANET project was intended to enable connections between scientists and remote computer centers.[53]

Such a network would not have been conceivable without the simultaneous development of the personal computer sector and the relevant software, which ultimately made it possible to connect computers with one another. This also required the work of many individuals.[54]

The concept of connecting computers within a network emerged from the fundamental need to exchange information, data, and content – a need that is intrinsically linked to the nature of information carriers. Writing was developed as a means for humans to record information materially, enabling its transmission across distance. Through such carriers, communication extends across both time and space. The advent of the digital-network environment further expanded this capability, allowing communication to occur globally and nearly instantaneously. Digital-network communication is facilitated, among other technologies, by the World Wide Web's

---

50   See A. A. Huurdeman, *The Worldwide history of Communications*, J. Wiley, Hoboken, 2003, p. 583.

51   See B. Houghton, 'On-line Information Retrieval Systems' in: *Printed reference material*, ed. G. Higgens, Library Association (Handbooks on Library Practice), London 1980, p. 422.

52   See J. M. Norman, *From Gutenberg to the Internet. A Sourcebook on the History of Information Technology*, Historyofscience.com, Novato 2005, p. 863.

53   See T. Sheldon, *Wielka encyklopedia sieci komputerowych, tom 1*, Łódź 1999, p. 684.

54   Individuals contributing to the creation of the Internet include Bob Taylor, Bob Kahn, Larry Roberts, Vint Cerf, J. C. R. Licklider, Donald Davies, and Paul Baran. See J. Vallee, *The Heart of the Internet. An Insider's View of the Origin and Promise of the On-line Revolution*, Hampton Roads Pub. Co., Charlottesville 2003, pp. 52–54.

hypertext system. This development, in turn, necessitated both the widespread adoption of personal computers and the establishment of an Internet infrastructure to support its operation.

In brief, in March 1991, Berners-Lee began promoting the World Wide Web on his own, initially to a select group of employees at CERN, then later to people outside the facility. An important moment came when the WWW was presented to Paul Kunz, an employee of the Stanford Linear Accelerator Center (SLAC) in Palo Alto, who, after returning home, introduced the Web to librarian Louise Addis. Recognizing the potential of the WWW, she began implementing W3 to support the needs of the local library. The Web appeared well suited for presenting a catalog of SLAC's online collection to physicists around the world. At her instigation, the first web server outside Europe was set up at SLAC.[55] The Internet – along with the advent of the WWW – opened a new chapter for the library world (Fig. 5).
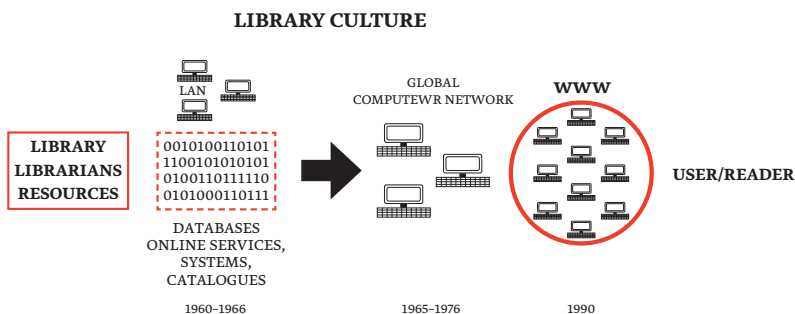

FIG. 5. Library culture using World Wide Web. [own elaboration]

The use of computers and software would have been greatly limited if computers had not been connected to networks, ranging from small local setups of just a few units to the global network of networks that is the Internet. The growing number of computers connected to the Internet spurred the development of programming and products designed to facilitate the work of computers. At the same time, the growth of information, rising annual pub-

---

55   See T. Berners-Lee, *Weaving the Web. The Original Design and Ultimate Destiny of the World Wide Web*, New York 2000, pp. 45–46.

lishing output, the expanding number of published scientific articles, and the expanding number of born-digital resources have forced libraries to search for new technological solutions to fulfill their responsibilities. To date, libraries have largely provided their services through the hypertext-based World Wide Web, supplemented by numerous tools and technologies that ensure faster and more effective access to the needed results. Among the latest trends in the development of contemporary library culture are solutions based on artificial intelligence.

Actions taken by the American library community – under guidelines from the Department of Defense – and initiatives by universities focused on the transition to digital, helped establish rules, methods, and principles rooted in the traditions of the book and the library. This work intensified with the emergence of the concept of connecting computers in networks and the enabling of data transmission between them. Ultimately, the potential of this idea was both recognized and realized.

Library culture focuses on organizing the functioning of the library – its resources and staff – in a way that takes advantage of currently available innovations in the field of information technology to best fulfill its task of making its resources available to interested readers around the world. Currently, the primary challenges encountered by libraries are increasingly being addressed through technologies in the field of artificial intelligence, including generative artificial intelligence (GenAI). GenAI systems can be used in library management to assist with decision-making concerning resource organization, user services, and the optimization of daily operations. In addition, GenAI can be used to enhance the efficiency of tasks assigned to library staff, particularly in the area of user education – for example, by generating instructional materials such as presentations or speech content. It can also support the dissemination of library resources by generating materials such as summaries, abstracts, and syntheses, and by creating bibliographies with references to specific items in the library's collection (Kirtania, 2023; Lund & Wang, 2023). In Poland, most academic li-

braries affiliated with public universities (57%) express support for the integration of GenAI into their toolsets; however, only 39.3% report actively engaging with GenAI-related issues. While 50% of libraries have established conditions conducive to the implementation of GenAI, only 46% report actual usage of such tools in practice (Gmiterek & Kotuła, 2025).

We can therefore propose an additional schema showing the mutual relations between book culture, library culture and information technologies (Fig. 6).

INFORMATION TECHNOLOGIES

BOOK CULTURE   **LIBRARY CULTURE**
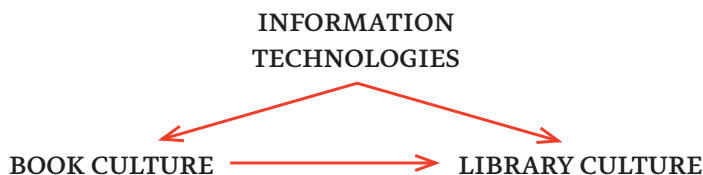
FIG. 6. Relationships between information technologies, book culture and library culture. [own elaboration]

Conclusion

Book culture, in its narrower sense, refers exclusively to printed codices, while in a broader sense, it encompasses various material carriers of all types of symbolic codes. In contrast, library culture concerns the management of these carriers, including books. The differences between the two are manifested in the actors involved, the processes undertaken, and consequently the technologies employed. Although book culture and library culture occupy distinct spheres of human activity, they are related to each other. Library culture draws on the achievements of book culture, if only to the extent that any change in book culture – for example, the creation of new types of books – necessitates changes in library culture, which must somehow manage these new forms of books. When the first material information carriers appeared, a book culture – in a broad sense – began to emerge. Library culture, on the other hand, developed when these carriers began to be collected and stored for access by selected groups of users. Library culture

facilitates access to the products of book culture – and beyond – by leveraging all available modern information technologies to serve library users. Consequently, projects related to books, bibliological processes, and knowledge management methods are now carried out through digital platforms such as online library information systems, catalogs, online information services, and information retrieval systems. For this reason, these information technologies appear to influence both book culture and library culture, having been designed to improve the functioning of the content produced within the framework of library culture.

Library culture is primarily a collection of valuable content – mainly books and periodicals – distributed across different locations. Its purpose is to secure, store, organize, and share these collections. Information technologies support these tasks.

REFERENCES

Alesso H. P., Smith C. F. , *Connections. Pattern of Discovery*, Wiley-Interscience, Hoboken 2008.

Anttonen P., Af Forselles C., Salmi-Niklander K., 'Introduction: Oral Tradition and Book Culture', in: *Oral Tradition and Book Culture*, ed. P. Anttonen, C. Af Forselles, K. Salmi-Niklander, The Finnish Literature Society (SKS), Helsinki 2018, pp. 7–18.

Arystoteles, *Dzieła wszystkie*, vol. 1, PWN, Warszawa 1990.

Babik W., 'Biblioteka akademicka na rozdrożu: o współczesnych przemianach w środowisku informacyjnym bibliotek', in: *Biblioteka akademicka : infrastruktura – uczelnia – otoczenie : Gliwice, 24–25 października 2013 r.*, ed. M. Odlanicka-Poczobutt, K. Zioło, Wydawnictwo Politechniki Śląskiej, Gliwice 2014, pp. 31–50.

Barre K. La, *The use of faceted analytic-synthetic theory as revealed in the practice of website construction and design* – https://netfiles.uiuc.edu/klabarre/www/LaBarre_FAST.pdf [Accessed October 10, 2012].

Berners-Lee T., *Weaving the Web. The Original Design and Ultimate Destiny of the World Wide Web*, Harper Business, New York 2000.

Birkerts S., *The Gutenberg elegies. The fate of reading in an electronic age*, Ballantine Books, New York 2006.

Bourne C. P., Hahn T. B., *A History of Online Information Services, 1963–1976*, Massachusetts Institute of Technology, Cambridge 2003.

Buick A., 'Copyright and AI training data – transparency to the rescue?', *Journal of Intellectual Property Law & Practice* 2025, vol 20, is. 3, March, pp. 182–192.

Celiński P., *Postmedia. Cyfrowy kod i bazy danych*, Wydawnictwo Uniwersytetu Marii Curie-Skłodowskiej, Lublin 2013.

Cmiel K., 'Libraries, books, and the information age', in: *A history of the book in America*, ed. D.P. Nord, J.S. Rubin, M. Schudson, The University of North Carolin Press, Chapel Hill 2007, pp. 325–346.

Ćwiekowa J., *Opracowanie tematyczne piśmiennictwa*, PWN, Warszawa 1988.

Drzewiecki M., *Edukacja biblioteczna i informacyjna w polskich szkołach*, SBP, Warszawa 2005.

Eisenstein E. L., *The printing press as an agent of change*, Cambridge University Press, Cambridge 1994.

Eisenstein E. L., *The printing revolution in early modern Europe,* ed. 2, Cambridge University Press, Cambridge 2005.

El-Abbadi M., *Library of Alexandria* – https://www.britannica.com/topic/Library-of-Alexandria [Accessed April 30, 2025].

Gall D., Hirst D., 'Geeks and Luddites: Library Culture and Communication', in: *An Overview of the Changing Role of the System Librarian. Systemics Shifts*, ed. E. G. Iglesias, Chandos, Oxford 2010, pp. 39–61.

Garson D. S., Wallace D., 'Leadership Capabilities in the Midst of Transition at the Harvard Library', in: *Leadership in Academic Libraries Today: Connecting Theory to Practice*, ed. B. L. Eden, J. C. Fagan, Rowman & Littlefield Publishers, Lanham 2014, pp. 41–74.

Gawrysiak P., *Cyfrowa rewolucja. Rozwój cywilizacji medialnej*, PWN, Warszawa 2008.

Gmiterek G., Kotuła S. D., '*Generative artificial intelligence in the activities of academic libraries of public universities in Poland*', *The Journal of Academic Librarianship*, 2025, vol. 51, is. 3. https://doi.org/10.1016/j.acalib.2025.103043 [Accessed June 3, 2025]

Hashagen U., Keil-Slawik R., Norberg A., Nixdorf H., *History of Computing. Software Issues*, Springer, Berlin 2002.

Henry J., Eshleman J., Moniz R., *The Dysfunctional Library : Challenges and Solutions to Workplace Relationships*, American Library Association, Chicago 2018.

Houghton B., 'On-line Information Retrieval Systems' in: *Printed reference material*, ed. G. Higgens, Library Association (Handbooks on Library Practice), London 1980.

Huurdeman A. A., *The Worldwide history of Communications*, J. Wiley, Hoboken, 2003.

Innis H. A., *Empire and communication*, University of Toronto Press, Toronto 2007.

Kirtania D. K., 'OpenAI ChatGPT for Library and Information Science (LIS) Professionals', *SSRN* 2023, March 30. http://dx.doi.org/10.2139/ssrn.4404903 [Accessed June 3, 2025]

Kong X. S., 'University Library Cultural Construction Under Network Environment', in: *Information, Computer and Application Engineering*, ed. by Hsiang-Chuan Liu, Wen-Pei Sung, Wenli-Yao, CRC Press, Leiden 2015, pp. 201–203.

Kotuła S. D., 'Bibliological communication and the World Wide Web', *Zeszyty Prasoznawcze*, 2014, vol. 57, no. 4, pp. 661–677.

Kotuła S. D., '«Biblioteki» w paleolicie', *Biblioteka*, 2017, no 21, pp. 7–20.

Kotuła S. D., 'Digital book culture', *Toruńskie Studia Bibliologiczne*, 2015, vol. 8, no 1, pp. 107–122.

Kotuła S. D., 'Ewolucja kultury książki', in: *Czytelnicy – zasoby informacji i wiedzy. Tradycja i przemiany w czasach kultury cyfrowej*, ed. A. Dymmel, S. D. Kotuła, Wydawnictwo UMCS, Lublin 2017, pp. 15–29.

Kotuła S. D., *Komunikacja bibliologiczna wobec World Wide Web*, Wydawnictwo Uniwersytetu Marii Curie-Skłodowskiej, Lublin 2013.

Kotuła S. D., 'Origins of the Book – Early Beginnings', *The International Journal of the Book*, 2019, vol. 17, is. 1, pp. 1–12.

Kotuła S. D., 'Wykorzystanie schematu książki na potrzeby środowiska cyfrowego', *Folia Bibliologica*, 2016, vol. LVIII, pp. 149–157.

Kowalsky M., Woodruff J., *Creating Inclusive Library Environments. A planning Guide for Serving Patrons with Disabilities*, American Library Association, Chicago 2017.

Licklider J. C. R., 'Man-computer symbiosis', *IRE Transactions on Human Factors in Electronics* 1960, vol. HFE-1, March, pp. 4–11.

Ligonnière R., *Prehistoria i historia komputerów : od początków rachowania do pierwszych kalkulatorów elektronicznych*, Zakład Narodowy im. Ossolińskich – Wydawnictwo, Wrocław 1992.

Lund B. D., Wang T., 'Chatting about ChatGPT: how may AI and GPT impact academia and libraries?, *Library Hi Tech News*, 2023, vol. 40, is. 3, pp. 26–29. https://doi.org/10.1108/LHTN-01-2023-0009 [Accessed June 3, 2025]

Magusin E., Johnson K., *Exploring the Digital Library. A Guide for Online Teaching and Learning*, Jossey-Bass, San Francisco 2013.

McCafferty B., *Library Management : A Practical Guide for Librarians*, Rowman & Littlefield, Lanham 2021.

McDonald R. H., Thomas, C. 'Disconnects Between Library Culture and Millennial Generation Values', *Educause Quarterly* 2006, no. 4, pp. 4–6.

Middleton K. L., *Yes! On demand. How to Create Winning Customized Library Service*, ABC-CLIO, Santa Barbara 2017.

Migoń K., 'Bibliologia wśród innych nauk. Koncepcje, realizacje, perspektywy', in: *Bibliologia. Problemy badawcze nauk humanistycznych*, ed. D. Kuźmina, SBP, Warszawa 2007, p. 13–24.

Migoń K., 'Kultura książki. Program dla bibliologii i potrzeba dla studiów bibliotekoznawczych', in: *Nauka o książce, bibliotece i informacji we współczesnym świecie*, ed. M. Banacka, SBP, Warszawa 2003, pp. 11–20.

Migoń K., 'Kultura książki' – wyrażenie potoczne, kategoria badawcza, czy specjalność naukowa?', in: *Ludzie i książki. Studia i szkice bibliologiczno-bibliograficzne. Księga pamiątkowa dedykowana Profesor Hannie Tadeusiewicz*, ed. E. Andrysiak, Wydawnictwo Ibidem, Łódź 2011, pp. 47–57.

Miogń K., *Nauka o książce wśród innych nauk społecznych*, Ossolineum, Wrocław 1976.

Migoń K., *O przedmiocie badań współczesnej bibliologii* – http://www.up.krakow.pl/konspekt/19/migon.html [Accessed October 10, 2011].

Migoń K., 'O współczesnej sytuacji badawczej w naukach o książce, bibliotece i informacji', *Przegląd Biblioteczny* 2008, vol. 76, no. 1, p. 14–21.

Migoń K., 'Uniwersum piśmiennictwa, jego właściwości, granice i sposoby istnienia', in *Uniwersum piśmiennictwa wobec komunikacji elektronicznej*, ed. K. Migoń, M. Skalska-Zlat, Wydawnictwo Uniwersytetu Wrocławskiego, Wrocław 2009, pp. 11–20.

Norman J.M., *From Gutenberg to the Internet. A Sourcebook on the History of Information Technology*, Historyofscience.com, Novato 2005.

Ottolenghi C., *Intentional Marketing : A Practical Guide for Librarians*, London Rowman et Littlefield, Lanham 2018.

Porter B., *The net effect*, Intellect, Bristol 2001.

Pylyshyn Z..W., Bannon L. J., *Perspectives on the Computer Revolution*, Intellect Ltd., Nortwood 1989.

Raabe P., 'The Importance of Book Culture for Europe', *Knygotyra* 39 (August), pp. 84–97. https://doi.org/10.15388/Knygotyra.39.7

Schaeffer K. R., *The culture of the book in Tibet*, Columbia Univ. Press, New York 2009.

Sheldon T., *Wielka encyklopedia sieci komputerowych, tom 1*, Wydawnictwo Robomatic, Łódź 1999.

Turski W. M., *Nie samą informatyką*, PIW, Warszawa 1980.

Vallee J., *The Heart of the Internet. An Insider's View of the Origin and Promise of the On-line Revolution*, Hampton Roads Pub. Co., Charlottesville 2003.

Young S., *The book is dead. Long live the book*, University of New South Wales Press, Sydney 2007.