Importance of the Intersection of Library and Information Sciences with System Theory

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ABSTRACT

This paper is an examination on how system theory could provide critical insight into the transdisciplinary field of library and information sciences (LIS). It begins with a discussion on the categorization of library and information sciences as an academic and professional field and what is exactly meant by system theory, drawing upon the general system theory established by Ludwig von Bertalanffy. The main conversation of this paper focuses on the inadequacies of current meta-level discussions of LIS and the relevancy/benefit of general system theory when applied to LIS.

INTRODUCTION

When I plan a trip, I start by looking at a large map that includes my starting point and destination; I like knowing which direction is north, what side of the street I will be arriving from, the number of turns, and so forth. In doing so, I understand where I am located within the entire context of my journey and in relation to the larger world. If I rely on turn-by-turn direction, then I only can rely upon a set path and detours will certainly force me to become lost.

In academia, scholars can navigate within their own area (or neighborhood) of expertise but venturing near the fringes or outside their specialty can become perilous. This narrow, myopic perspective creates a limited understanding of their position within the greater context of the academic map. Without an academic map to situate scholars means a blind understanding of the world around them.

This analogy is the same with the current state of the field of library and information sciences (LIS). Perhaps more so than other fields limited by its subject matter (e.g., medicine is limited to topics on health), the challenge of navigating the LIS field is that it is contextually dependent because of its transdisciplinary nature. For example, health librarians specialize on the subject of health and university archivists limit their scope to materials related to a particular university. As a result of the focus on specialization, LIS lack top-level paradigms (i.e., theories) that govern it. While there are certain informal laws or practices that academics and professionals adhere to, such as S.R. Ranganathan's *Five Laws of Library Science*,[1] an overarching and unifying theory does not exist in LIS.

Therefore, the purpose of this paper is to explore metatheories in LIS that takes into consideration its unique, transdisciplinary nature. Specifically, this paper will advocate for system theory (also known as general system theory or systems theory) as a theory that can provide a way of understanding LIS as a system itself and in relation to other systems (e.g., fields, societies, etc.). The first step is to explore the current state of meta-level discussion in the library and information sciences with a focus on theory. Then, this paper will discuss system theory before finally addressing how it is relevant and benefit to LIS. By exploring the issue of meta-level theories in the form of system theory and applying itf to LIS, this paper seeks to foster discussions on broader applications of LIS as a system that leads to better understand and situate itself in relation to other systems.

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[1] S. R. Ranganathan, *The Five Laws of Library Science* (London: The Madras Library Association, 1931).

TRANS- AND META-ANALYSES OF LIBRARY AND INFORMATION SCIENCES

The following section is a discussion on the current meta-level discussions of the library and information sciences. In particular, this section investigates the treatment of LIS as a transdiscipline that finds its identity in relation to other academic and professional fields or disciplines. However, because of its transdisciplinary nature, meta-analyses that explore essential theoretical frameworks towards understanding LIS's role in contemporary information society is not only difficult, it is sorely lacking.

Library and Information Sciences as Transdisciplinary

LIS is a field (or discipline) of study and practice that encompasses the creation, the management, and the use of information.[2] However, unlike other fields that are limited by its subject matter, LIS is a field that is very much dependent upon subject to give context. The subjects that LIS encompass range from the humanities to the hard sciences, of varying degrees in form to content, and of specialists to generalists.[3]
While non-LIS fields require expertise on its own subject matter, LIS is concerned with information within context. For example, most professionals and academics of a given field are limited in some respect such as subject. So, for example, doctors or lawyers specialize in the fields of medicine or the law, respectively. There may be some overlap with other fields but in general, specialists stay within their own fields of expertise. For example, doctors seeking to advance medical technologies may venture into bioengineering or computer programming but would find little use for the field of geography.

In contrast, LIS is a transdisciplinary field rather than a monodisciplinary field.[4] In other words, academics and professionals identifying themselves as part of the LIS community often exist within the limited context of their institution, subject matter, and/or function. However, even though individual instances exist within a limited context, LIS as a whole is inclusive and broad to span a wide range of disciplines. So the approach

[2] Leigh S. Estabrook, "Library and Information Science," in *Encyclopedia of Library and Information Sciences*, ed. Marcia Bates and Maack, 3rd ed. (Boca Raton: CRC Press, 2010), http://www.tandfonline.com/doi/abs/10.1081/E-ELIS3-120044044.

[3] Hope A. Olson, "Universal Models: A History of the Organization of Knowledge," in *Knowledge Organization and Quality Management*, ed. Hanne Albrechsten and Susanne Oernager, vol. 4 (Third International ISKO Conference, Copenhagen, Denmark: Indeks Verlag, 1994), 72–80; Birger Hjørland, "Library and Information Science: Practice, Theory, and Philosophical Basis," *Information Processing & Management* 36, no. 3 (May 1, 2000): 501–31, doi:10.1016/S0306-4573(99)00038-2.

[4] Marcia J. Bates, "The Invisible Substrate of Information," *Journal of the American Society for Information Science* 50, no. 12 (1999): 1043–1050, doi:10.1002/(SICI)1097-4571(1999)50:12<1043::AID-ASI1>3.3.CO;2-O.

to reference service in LIS is going to be dependent upon the type of institution or user demographic. The reference services for young adults in public libraries require a different skillset and knowledge base than the special collection of a motion picture studio's archive. Yet, reference service as an LIS issue is about providing the ability to access information.

The ability for LIS to exist within the informational confines of other fields is part of the reason there exists such a wide range of professions, institutions, or applications. Libraries, archives, and museums (collectively known as LAMs) are but some of the institutions associated with LIS while scholarly communication, information architecture, and intellectual property are but a tiny fraction of the issues the LIS community addresses. It is through the wide reach and applicability of information within other fields under a single banner that makes LIS transdisciplinary.

Difficulties of Library and Information Sciences as Transdisciplinary on Meta-Levels

The problems involved with a transdisciplinary field is that it is difficult understand it without the context of other fields. LIS in particular does not have many of the key markers that constitute it being a separate field, in part because of its transdisciplinary nature.[5] Theory, for example, makes up the learning framework of other fields: biology is based on the theory of evolution; the theory of relativity and quantum mechanics are constantly being debated in physics; and jurisprudence is one of the dominant theories in law. Yet, LIS does not have its own theories. Rather, it is known for its lack of theory because of its transdisciplinary nature.[6]

Further difficulties arise when attempting a meta-analysis of LIS because LIS as a field is hard to place only on only one point on a map. That is, if all academic and professional fields were put on a map, at the corners would be the physical/chemical sciences, life sciences, humanities, and social sciences.[7] Most fields would be able to fine a single spot on the map but LIS, being transdisciplinary, does not have a single spot. The

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[5] Ibid.

[6] Marcia Bates, "The Information Professions: Knowledge, Memory, Heritage," *Information Research: An International Electronic Journal* 20, no. 1 (2015), http://eric.ed.gov/?id=EJ1060508; Hjørland, "Library and Information Science"; Allan Konrad, "On Inquiry: Human Concept Formation and Construction of Meaning through Library and Information Science Intermediation" (Doctoral Dissertation, University of California, Berkeley, 2007), http://escholarship.org/uc/item/1s76b6hp; D.J. Foskett, "General Systems Theory and the Organization of Libraries," in *Studies in Library Management*, ed. C. Bingley, vol. 2 (New York, 1974), 10–24.

[7] Søren Brier, *Cybersemiotics: Why Information Is Not Enough!* (Toronto, Canada: University of Toronto Press, 2008), https://books.google.com/books?hl=en&lr=&id=Ueiv9cRR9OQC&oi=fnd&pg=PP1&dq=cybersemiotics&ots=tHcRiJiJcx&sig=6yIZ3PGHgEwZAhpHDiolr_HzYaY.

inability to locate LIS in relation to other fields is one of the major criticisms against categorizing it as its own unique field. One suggested solution to this issue is to situate LIS under other fields such as computer sciences.[8] However, pigeonholing LIS into a subcategory of another field (or any other treatments that view transdisciplines as anything other than its own field) creates a situation that changes the very nature of a transdiscipline.

Being able to (re)define "library and information science" is another concern of the LIS community. LIS has many variations that focus upon different subjects under its purview including information sciences that give rise to iSchools or the increasing emphasis on management with corresponding MMLIS (Master of Management in Library and Information Science) degrees.[9] This growing trend of specialization within the wider field of LIS appears to be a response to, in part, the emphasis on the object of information rather than institutions including LAMs.[10] The emphasis on information arises in conjunction with the reliance upon technology and the human-computer-interactions of today's information.[11]

Metatheory in Library and Information Science

Because LIS depends upon other fields and disciplines to create the context for information, this poses difficulties when attempting to discuss theories on a meta-level (i.e., metatheories). Although the benefit of LIS to be transdisciplinary allows for inclusion through the broad applicability of information, this also leads to the adoption of countless theories (and practices) based on individual context of other fields. One scholar goes so far as to describe the theoretical state as, "float[ing] in a philosophical limbo. It has no theoretical foundations".[12] Another describes the library and information sciences as having theoretical foundation in specific applications or cases but nothing that would be

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[8] Konrad, "On Inquiry."

[9] Bradford Lee Eden and Jody Condit Fagan, *Leadership in Academic Libraries Today: Connecting Theory to Practice* (Rowman & Littlefield, 2014), https://books.google.com/books?hl=en&lr=&id=EJRFAwAAQBAJ&oi=fnd&pg=PR5&dq=Leadership+in+Academic+Libraries+Today:+Connecting+Theory+to+Practice&ots=Dh_LjVqFHi&sig=EHrdoDtejvxvAaZr2xtVkp1vK1A.

[10] Gary M. Olson and Jonathan Grudin, "TIMELINES: The Information School Phenomenon," *Interactions* 16, no. 2 (March 2009): 15–19, doi:10.1145/1487632.1487636.

[11] Dan Wu et al., "The State of iSchools: An Analysis on Academic Research and Graduate Education," *Journal of Information Science* 38, no. 1 (February 2012): 15–36.

[12] Bertram C. Brookes, "The Foundations of Information Science Part I. Philosophical Aspects," *Journal of Information Science* 2, no. 3–4 (1980): 125.

considered a general theory of LIS.[13] Little has changed with library and information sciences in the 21st century as scholars still lament the lack of a metatheory for LIS.[14]

The following section proposes the use of system theory that encapsulates the unique qualities of LIS as a transdiscipline that, through its holistic nature, allows for a fluid theory capable of being an inclusive, flexible framework for the library and information sciences for the present and future. It will also expand more on metatheories in the library and information sciences but also the disadvantages that make these theories unlikely candidates that is sorely needed in a field that continually espouses the epistemologies of other fields rather than developing its own.

SYSTEM THEORY

When discussing systems in general, the go-to application of the term "systems" the general population has in mind include features of society such as the healthcare or education system. There are also organizations such as the government, the courts, and similar bureaucracies that are state systems of control. However, within the context of the library and information sciences, most immediately think of systems in terms of control systems including integrated library systems (e.g., Koha, OCLC), classification systems (e.g., Dewey Decimal Classification), libraries with connected branch libraries, or technology/computer systems.

These examples of systems are not necessarily the systems represented in system theory; however, system theory can provide a framework for understanding the examples above. Ludwig von Bertalanffy formalized the concept of system theory in the 1960s in order to bridge the theoretical gap between the hard sciences towards a unification of academic fields.[15] Two of the key components in system theory include systems and environments. The term "system" as used by system theory is a "set of elements or parts that is coherently organized and interconnected in a patter or structure that produces a characteristic set of behaviors".[16] So, in other words, a system is a unit of things that has exhibits a set of behaviors. If the behavior of the system changes, that is an indication that there is something wrong with a system or that a system has changed. Any other use of the term "system" outside of the system theory context will be used accordingly.

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[13] Foskett, "General Systems Theory and the Organization of Libraries."

[14] Bates, "The Information Professions"; Hjørland, "Library and Information Science"; Konrad, "On Inquiry."

[15] Ludwig von Bertalanffy, "The Meaning of General System Theory," in *General System Theory: Foundations, Development, Application* (New York: George Braziller, 1968), 30–53.

[16] Donella H. Meadows, *Thinking in Systems: A Primer*, ed. Diana Wright (White River Junction, Vt: Chelsea Green Publishing, 2008).

The second part of system theory is the environment in which a system exists. Much like a how an ecosystem relies upon the environment consisting of fauna, flora, and other biological environments, systems in system theory rely upon the context of its environment. Since systems do not exist in a vacuum (i.e., a closed system), there must be some sort of environment for systems to exist within. There are certainly environments that exist internally of a system such as the cultural environment or the financial environment in a system like higher education. However, environment used in this paper generally refers to the environment as external to a system unless otherwise stated. And, as implied above, environments are not necessarily only physical environments but can also include more abstract environments such as culture, law, and social constructs that give provide a background for understanding the position of a system.

Taking both systems and its environment means having a lens that sees the whole picture rather than the individual parts. Or, another way of imaging the difference between system theory and other theories is that system theory is a telescope that attempts to capture the big picture rather than the individual, singular moments of a microscope. This does not mean that system theory does not take into consideration the components that make up a system; rather, it acknowledges that the minutiae of a system exist but the focus is on the big picture. Through this broader lens, scholars and practitioners start to understand how different parts outside of their immediate system or immediate environment connect, influence, and relate to other systems and other environments.

System Theory Criticisms

However, system theory is not without its criticisms. Because of the emphasis on broader perspectives, there are complexities that can easily be overlooked or exaggerated. The counterargument to this criticism is that the purpose of specialists or experts is to focus on the complexities and for system theorists to have a better understanding of how everything fits into the larger picture. There is also the criticism that the attempt to define/formalize system theory will paradoxically "limit its generating power".[17] This particular point exists in conjunction with the criticism of system theory being holistic.[18] Because of non-specificity, system theory falls into the danger of being a catch-all theory that becomes an excuse for poor scholarly practices. However, as the following section will explain further, LIS is in need of a holistic theory that can be generalized rather than specified.

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[17] Mihajlo D. Mesarović, "Preface," in *Views on General Systems Theory: Proceedings*, ed. Mihajlo D. Mesarović and Donald P. Eckman (New York: John Wiley & Sons, 1964), xiii–xvi.

[18] Brier, *Cybersemiotics*.

System Theory Alternatives

There are a few alternatives to system theory that, while providing a framework for understanding only parts of LIS, needs to mentioning is only to understand why these theories cannot apply to LIS as a whole. Of the metatheories related to LIS that takes into consideration its transdisciplinary nature, two theories stand out. First is cybernetics, a derivative of system theory, which is related to LIS in that it addresses communication through regulatory controls between animals, men, and machines. [19] However, cybernetics is a theory that seeks to explain the more technical side of the LIS-related human-computer interactions or the stock-flow dynamics of products that makes a system function.[20] In other words, if system theory is a theory that explores inter-systems relations, cybernetics is an intra-systems theory.

Next is cybersemiotics, developed by Søren Brier, that not only integrates system theory and cybersemiotics, he also includes semiotics (the study of signs/symbols) in order to create a theory that explores inter- and intra-systems relationships with a specific goal towards cognition and communication. While this particular theory may be useful in providing a framework where users or other thinking individuals are attempting to understand their information environment/society, it is not as applicable in other technical or mechanically-driven components of LIS such as ILS (integrated library systems) or cataloging.

In contrast to these two theories, system theory is a general, broad theory that is holistic and much more readily applicable to the library and information science. As will be analyzed below, the benefits of system theory as a non-specific theory works well with LIS.

LIBRARY AND INFORMATION SCIENCE AND SYSTEM THEORY

The difficulty of LIS being a transdiscipline is the primary factor as to why a single theory is difficult. There must be a theory that allows for the inclusive nature of a transdiscipline within the larger context of information and its many parts. Given the incredible variety of topics, disciplines, institutions, professions, and overall specializations possible in LIS, system theory encapsulates these diverse epistemologies. This section will explore why system theory is relevant to the library and information sciences and the benefits of LIS to become a more holistic. Finally, this paper will take a brief look as to what the role of system theory in LIS may drive the discipline.

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[19] Ranulph Glanville, "Cybernetics: Thinking Through the Technology," in *Traditions of Systems Theory: Major Figures and Contemporary Developments*, ed. Darrell Arnold (New York: Routledge, 2013), 45–77.

[20] Meadows, *Thinking in Systems*.

Relevancy of System Theory, Holism of LIS

More than a theory, a system theory approach is a holistic paradigm that can expand how scholars and professionals can think about a field in relation to others. LIS, as explored in-depth above, is a discipline with many facets with even more applications in a variety of disciplines. Or, using a system theory framework, LIS is a system with a multi-layered environment. The kinds of environments in LIS in the United States include cultural environments like the LGBTQ+ community, social environments like the immediate community for a given institution, or more abstract environments like intellectual freedom. Yet, a crucial point in this relationship is that the LIS system and its environment interact with each other.[21] It is through this exchange that LIS is an open system (versus a closed system) capable of working within and influencing its environment.

Concrete examples of this interaction occur whenever the American Library Association submits an *amicus curiae* or assessing the growing trends towards digital technology and governance. For example, most of the current work investigated in LIS is a response to the fast-paced, information explosion of the current digital era. The top trends of academic libraries in the United States include data, device neutral digital services, and openness in higher education through the use of online technologies.[22] Internationally, the top-level trends in the future of library and information sciences include new technologies and information access, online education, and privacy/data protection.[23] However, the still-growing electronic information environment is but one kind of environment that LIS as a system exists within.

More than the existence of the LIS system within environments is the understanding of how LIS interact with other disciplines. That is, LIS, as discussed above, is a transdiscipline that interacts with other disciplines. These other disciplines are systems that exist independent of LIS but are still connected through the basic concept of information. System theory provides this framework that can explain how LIS is a system in and of itself while interacting with other systems such as academic disciplines in the hard sciences or systems represented in organizations such as the government.

The added benefit of system theory is that it helps eliminate the familiar plague of silos. Academic and professional silos are essentially the attempt to treat a field as a closed system: independent of influences from the environment and other systems. The problem with the view and practice of silos is that nothing exists independent of

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[21] Ibid.

[22] ACRL Research Planning and Review Committee, "Top Trends in Academic Libraries: A Review of the Trends and Issues Affecting Academic Libraries in Higher Education," *College & Research Libraries News* 75, no. 6 (2014): 294–302.

[23] International Federation of Library Associations, "IFLA Trend Report," 2016, http://trends.ifla.org/.

everything else. Even a black hole is influenced by the celestial bodies brought in through the gravitational force it generates. To have the attitude of and to think that separating an entire system without consideration of historical, contemporary, and future contexts reflects a very close-minded way of thinking. LIS in particular is a field that does not live in a silo; in fact, it must exist outside of closed system silos and into the open precisely because of its very transdisciplinary nature. There is nothing that does not fall under the influence of or is influenced by an LIS system in some manner. A trip to any library, archive, or museum (physical or online) demonstrates the influence of LIS and LIS systems in even the most remote topics.

It is important to note that the LIS literature has not completely ignored system theory. There is certainly evidence that there are scholars that utilize theories inspired by system theory. Cybernetics for example, is a theory that examines regulatory systems that fits well with information architecture, user research, and human-computer interactions.[24] Cybersemiotics is another theory that, as explained above, is a useful theory for explaining cognition in the library and information sciences.[25]

The problem with these theories is that they are not systems theories applying directly to the whole of LIS. When system theory is mentioned in LIS, it usually amounts to, "Here is a theory called (general) system theory; how interesting!"[26] Because LIS is a discipline that is very much dependent upon the external environment and external systems outside of its boundaries, there has to be a way of understanding the whole of LIS.

In other words, while there are individual components that make up LIS, LIS is a whole system that itself is interconnected with its environment and connected to other systems. By its very nature of being a transdiscipline is it necessary to have that provides a perspective of wholeness. Consequently, a view of wholeness in conjunction with an open systems view makes system theory holistic and necessary to LIS.

Imagining System Theory in Library and Information Sciences

The question remains, "What would a theoretical framework of system theory look like for the library and information sciences?" More than anything else, system

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[24] Hjørland, "Library and Information Science."

[25] Brier, *Cybersemiotics*.

[26] Richard Mattessich, "The Systems Approach: Its Variety of Aspects," *Journal of the American Society for Information Science* 33, no. 6 (November 1, 1982): 383–94, doi:10.1002/asi.4630330609; Una Mansfield, "The Systems Movement: An Overview for Information Scientists," *Journal of the American Society for Information Science* 33, no. 6 (November 1, 1982): 375–82, doi:10.1002/asi.4630330608; Jesse Shera, "Towards a Theory of Librarianship and Information Science," *Ciência Da Informação* 2, no. 2 (1973): 87–97; Foskett, "General Systems Theory and the Organization of Libraries."

theory provides the ability to think about the role of the LIS community more broadly. As discussed briefly above, there is always the danger of silos in a given field or discipline. More so because it is a transdiscipline, there needs to be a better of understanding of LIS as a system.

First, LIS needs to understand itself as a system and how the individual components work together to function as a single unit. There are certainly debates on the specific qualities and processes of how these individual components work including simple acts as the latest standard for cataloging. Furthermore, much of what occurs in the everyday lives of the LIS community is to grapple how information fits within the environment. Librarians and archivists serve its community (an environment of users) within the context of a certain city or a specific type of institution.

The most important aspect of system theory as applied to LIS is the understanding that LIS exist in conjunction with other systems. Rather than imaging the library and information sciences with subject specialties, instead, LIS is the connected between it and other systems. A law librarian, for example, would be considered a specialization of LIS. However, this view would imply that although law librarians serve the legal community, it is considered only a small part of the LIS community – a specialization. In this perspective, law librarians are removed from other parts of the LIS community such as genealogists or digital humanists. This view is precisely what promotes silos that close a system from itself. Instead, imagine a law librarian as the intersection of two different systems like a Venn diagram. In this picture, even though a person choses the point connecting LIS and the law, they are still a part of those respective communities. This is a system theory perspective that allows for a broad, inclusive view of how different systems intersect.

How a system theory would drive the future of library and information sciences is yet unknown. To provide any suppositions would be presumptuous and premature since one can never predict how a system will adapt to change. However, what can be hypothesized is to understand LIS as a system in system theory is to adapt to or change due to the environment. The environment, whatever may constitute as the environment, is not a static condition upon which systems simple exist within; a closed system. Instead, systems can and do change. LIS as it exists now is very different from LIS a hundred years ago and will be different a hundred years from now.

CONCLUSION

Proposed here is not a definitive end to meta-discussions in the library and information sciences; instead, it is but the beginning of a longer conversation that seeks to shape LIS as a whole rather than its individual components. What has been explored is a meta-analysis of LIS that establishes it as a transdiscipline. However, its transdisciplinary nature makes meta-analyses difficult since LIS adopts the practices of other disciplines to

give specific context for specific applications. Therefore, system theory can provide a theoretical framework that takes into consideration the diverse epistemologies represented in LIS. Because both system theory and LIS take on a holistic perspective of parts being a part of a greater whole, the former suits the latter not as a definitive theory but more a way of thinking.

Although the future of system theory in LIS is up to debate, what is certain with system theory is a paradigm shift in the way that the LIS community thinks about itself. No longer are those in the library and information sciences limited to thinking about themselves within the narrow confines of academic and professional silos. Instead, thinking beyond libraries or other traditional manifestations of LIS becomes a matter of understanding that we are all part of an information system in a changing information environment.

REFERENCES

ACRL Research Planning and Review Committee. "Top Trends in Academic Libraries: A Review of the Trends and Issues Affecting Academic Libraries in Higher Education." *College & Research Libraries News* 75, no. 6 (2014): 294–302.

Bates, Marcia. "The Information Professions: Knowledge, Memory, Heritage." *Information Research: An International Electronic Journal* 20, no. 1 (2015). http://eric.ed.gov/?id=EJ1060508.

Bates, Marcia J. "The Invisible Substrate of Information." *Journal of the American Society for Information Science* 50, no. 12 (1999): 1043–1050. doi:10.1002/(SICI)1097-4571(1999)50:12<1043::AID-ASI1>3.3.CO;2-O.

Bertalanffy, Ludwig von. "The Meaning of General System Theory." In *General System Theory: Foundations, Development, Application*, 30–53. New York: George Braziller, 1968.

Brier, Søren. *Cybersemiotics: Why Information Is Not Enough!* Toronto, Canada: University of Toronto Press, 2008. https://books.google.com/books?hl=en&lr=&id=Ueiv9cRR9OQC&oi=fnd&pg=PP1&dq=cybersemiotics&ots=tHcRiJiJcx&sig=6yIZ3PGHgEwZAhpHDiolr_HzYaY.

Brookes, Bertram C. "The Foundations of Information Science Part I. Philosophical Aspects." *Journal of Information Science* 2, no. 3–4 (1980): 125–133.

Eden, Bradford Lee, and Jody Condit Fagan. *Leadership in Academic Libraries Today: Connecting Theory to Practice*. Rowman & Littlefield, 2014. https://books.google.com/books?hl=en&lr=&id=EJRFAwAAQBAJ&oi=fnd&pg=PR5&dq=Leadership+in+Academic+Libraries+Today:+Connecting+Theory+to+Practice&ots=Dh_LjVqFHi&sig=EHrdoDtejvxvAaZr2xtVkp1vK1A.

Estabrook, Leigh S. "Library and Information Science." In *Encyclopedia of Library and Information Sciences*, edited by Marcia Bates and Maack, 3rd ed. Boca Raton: CRC Press, 2010. http://www.tandfonline.com/doi/abs/10.1081/E-ELIS3-120044044.

Foskett, D.J. "General Systems Theory and the Organization of Libraries." In *Studies in Library Management*, edited by C. Bingley, 2:10–24. New York, 1974.

Glanville, Ranulph. "Cybernetics: Thinking Through the Technology." In *Traditions of Systems Theory: Major Figures and Contemporary Developments*, edited by Darrell Arnold, 45–77. New York: Routledge, 2013.

Hjørland, Birger. "Library and Information Science: Practice, Theory, and Philosophical Basis." *Information Processing & Management* 36, no. 3 (May 1, 2000): 501–31. doi:10.1016/S0306-4573(99)00038-2.

International Federation of Library Associations. "IFLA Trend Report," 2016. http://trends.ifla.org/.

Konrad, Allan. "On Inquiry: Human Concept Formation and Construction of Meaning through Library and Information Science Intermediation." Doctoral Dissertation, University of California, Berkeley, 2007. http://escholarship.org/uc/item/1s76b6hp.

Mansfield, Una. "The Systems Movement: An Overview for Information Scientists." *Journal of the American Society for Information Science* 33, no. 6 (November 1, 1982): 375–82. doi:10.1002/asi.4630330608.

Mattessich, Richard. "The Systems Approach: Its Variety of Aspects." *Journal of the American Society for Information Science* 33, no. 6 (November 1, 1982): 383–94. doi:10.1002/asi.4630330609.

Meadows, Donella H. *Thinking in Systems: A Primer*. Edited by Diana Wright. White River Junction, Vt: Chelsea Green Publishing, 2008.

Mesarović, Mihajlo D. "Preface." In *Views on General Systems Theory: Proceedings*, edited by Mihajlo D. Mesarović and Donald P. Eckman, xiii–xvi. New York: John Wiley & Sons, 1964.

Olson, Gary M., and Jonathan Grudin. "TIMELINES: The Information School Phenomenon." *Interactions* 16, no. 2 (March 2009): 15–19. doi:10.1145/1487632.1487636.

Olson, Hope A. "Universal Models: A History of the Organization of Knowledge." In *Knowledge Organization and Quality Management*, edited by Hanne Albrechsten and Susanne Oernager, 4:72–80. Copenhagen, Denmark: Indeks Verlag, 1994.

Ranganathan, S. R. *The Five Laws of Library Science*. London: The Madras Library Association, 1931.

Shera, Jesse. "Towards a Theory of Librarianship and Information Science." *Ciência Da Informação* 2, no. 2 (1973): 87–97.

Wu, Dan, Daqing He, Jiepu Jiang, Wuyi Dong, and Kim Thien Vo. "The State of iSchools: An Analysis on Academic Research and Graduate Education." *Journal of Information Science* 38, no. 1 (February 2012): 15–36.