Steven L. MacCall (smaccall@slis.ua.edu)
University of Alabama, Tuscaloosa, AL USA

Knowledge Organization Under Digital Inversion: Toward a Theory for Cooperative Librarian Organizing Methods for Online Books

Abstract: Theories can provide frameworks with which to construct models for cooperative professional practices. The knowledge organization theorizing of Cutter, Dewey and others leading up to and following the 1876 first meeting of the American Library Association set this precedent for over 130 years of professional librarianship. With the relatively recent advent of the possibility for publishing texts online, librarians are potentially at another epochal time when basic theoretical frameworks for cooperative professional practice are due for re-examination and possible wholesale changes. This paper provides a preliminary theoretical investigation of a framework, digital inversion theory, for thinking about possible the cooperative knowledge organization practices for the existing network of librarians.

1.0 Introduction

The philosophical question guiding this research is: "What if the affordances of online publishing were such that a new online format ended up superceding the print book and then all past works were textually transmitted accordingly?" This would mean yet another textual transmission for many existing works some of which span the entire history of publishing formats from clay tablet to parchment scroll to manuscript and print codex. From a knowledge organization perspective, publishers of transmitted texts look to take advantage of the internal arrangement capabilities of new formats in order to improve random access via book indexes and other techniques. For example, it makes sense to think that most modern publishing houses would not consider publishing Plato's *Republic* without an index in order to leverage the very advantage that the codex had over its prior competitor format, the scroll. Similarly, librarians have successfully looked to take advantage of the evolution of textual formats over time in devising optimal cataloging and classified shelf arrangement systems for their collections.

With a focus on organizing texts, librarians have always been dependent on format types and are therefore sensitive to changes in the publishing industry. At the present time, the advent of an online publishing option is challenging librarians to evolve their cooperative knowledge organization methods. The study of publishing, including its history, standards development, and production techniques, can thus provide librarians with valuable perspectives and insights when considering the present day publishing situation. An excellent example of the historical study of publishing is Pierce Butler's *The Origin of Printing in Europe* (Butler 1940), which also provides philosophical guidance to present day librarians in terms of showing how even complex changes in society have gradualist tendencies:

> The origin of printing itself was but the first stage in the development of books as we know them. To understand the modern book, one should know something of its history and comprehend the gradual process whereby it emerged from the pen-written medieval manuscript.

In summary form, these were the phases in the development of the modern book that Butler suggested:

> 1. Phase I: Origin of the mechanical process of printing – existing works migrated to the printed book, but retained their original appearance as handwritten script;
> 2. Phase II: Exploitation of movable type – new fonts designed for the printing process and new facilities were provided for readers, including title pages, tables, indexes, etc.;
> 3. Phase III: Discovery of true publication – the move from (re)printing existing works to the seeking of newly written works so that publishers had more inventory for sales;
> 4. Phase IV: Printed book as determinative agent – the societal realization that the printing press has become "a potent instrument of public appeal and propaganda."

The introduction of Butler's analysis here is not meant to indicate belief in a historical determinism going forward in terms of the present and future possibilities of online publishing and its impact on librarianship. The historian, of course, has the natural advantage of analyzing existing evidence, and Butler's observation of gradualism in the history of the development of print techniques is based on his investigation of a fertile field of historical evidence generated over 500 years of print history. Looking forward in time, this paper is necessarily theoretical and speculative in nature, and the invocation of Butler's work is only meant to place this work at a similar level of abstraction pertaining to gradualism: What is seen in today's world of online publishing may not become the established method and that there remains a need for continued theoretical and speculative work in publishing and librarianship futures.

There is one crucial difference in Butler's book, however, compared to the present matter at hand: He concentrated on gradualism pertaining to textual inscribing technologies, namely, the supersession of print codex over manuscript codex, rather than pertaining to the evolution of textual formats, which will be argued is how the advent of online publishing should be viewed. The present study suggests that the advent of an online publishing option is related to the arrival of a new basic textual format, a situation in publishing that has not been experienced since the rise of the codex (Roberts and Skeat, 1983; O'Donnell 1998).

The online format for publishing texts provides an important new technological opportunity for 21st century publishing. However, the emergent online publishing infrastructure is not simply a platform for yet another variation of physical textual format like the tablet, scroll, or codex whose imprinted, manuscript or printed textual forms once published remained static. Rather, it enables a dynamic textual format, the online book, whose dynamic ontological status allows for continual periodic or non-periodic "real time" updates as needed after the text is published (Table 1). The immediate benefit of an online book as a potential format is that its parts can be updated as necessary. For example, an author does not have the option of updating part of a

physical book without the introduction of a new edition of that text while the online book can be updated as needed: If an author needs to update Chapter 6, this can be accomplished by recognizing that as part of an online book, Chapter 6 can be updated without disturbing Chapters 1-5. This logic extends to updating portions of Chapter 6 as well.

Textual Format	Inscribing Method	Ontological Status	Label
Tablet	Imprinting	Static	"Tablet"
Scrolls	Script	Static	"Scroll"
Codex	Script	Static	"Book"
Codex	Print	Static	"Book"
Digitized codex	Digital	Static	"eBook"
Online	Digital	Dynamic	"Online book"

Table 1. Textual formats over time

Given the possibility of an online textual format for dynamic publishing, several questions arise: Which format should take precedence? Might a case be made for a digital inversion in which the online textual format takes precedence over the codex? How would this modify the very nature of the abstract concept of the work? What would librarianship be like if it were to become known primarily for managing the dynamic texts in online books and secondarily for managing texts contained in physical codices? As these questions are explored in this paper, it will be helpful to understand the various aspects of texts, their production, and their use:

1. Textual generation: The creation of a new text by an authoring entity;
2. Textual transmission: The publishing history of a text as it is updated and/or modified:
   a. Into new editions published using the type of textual format,
   b. Into new editions published using different type of textual format carrier (e.g., from tablet to scroll to codex);
3. Textual multiplication: The distribution of copies of texts to different contextual situations, from samizdat to formal, a necessary precursor capability before texts can be intentionally selected and aggregated into usable (library) collections (Tanselle 1989);
4. Textual reception: The impact of distributed texts on readers, including those impacts recorded in specific copies of texts (e.g., marginalia), those impacts traced through the apparatus of citation and documentation, and those impacts analyzed through literary criticism;
5. Textual use: The outcome of the use of distributed texts in contextualized situations.

Understanding the formal study of texts is important because all five aspects of texts are potentially impacted by the advent of an online publishing option, and library-based knowledge organization must attempt to account for these textual functions.

2.0 Library Cooperative Knowledge Organization

Theories can provide frameworks with which to construct models for cooperative professional practices. The knowledge organization theorizing of Cutter, Dewey and others leading up to and

following the 1876 first meeting of the American Library Association set this precedent for over 130 years of professional librarianship. With the relatively recent advent of the possibility for publishing texts online, librarians are potentially at another epochal time when basic theoretical frameworks for cooperative professional practice are due for re-examination and possible wholesale changes.

Cooperative knowledge organization was a central theme of the 1876 first meeting of the American Library Association. In particular, Cutter and his Objects of the Catalog and Dewey with his universal classification set up a planning period leading to the eventual development of a cooperative cataloging code and of common shelf arrangement methods for deployment across libraries. By 1876, there were thousands of libraries in the United States clustering into categories that are familiar even today: Academic libraries, public libraries, school libraries and special libraries. However, as Miksa (1977) notes that despite these various library practice contexts, Cutter saw a single library system:

> Cutter also stressed that all libraries together made up a system of resources for users at all levels of expertise, but especially for serious scholars…. His view of the total library system also affected his view of the modern history of libraries in the United States. He concluded that the libraries of the country were in actuality an expression of an evolutionary development that had had its greatest moment in the nineteenth century. Libraries had progressed from private to public ownership and together constituted a single national resource (Miksa 1977, 47-48).

Cutter's central role in laying the groundwork for library cooperative practices in knowledge organization is cited because it can be credited in part for today's network of libraries and well established cooperative organizing methods, from the Anglo-American Cataloging Rules/Resource Description and Access to shared subject vocabularies and classification schemes. The sharing of these systems provides for library economy and consistent library user experiences in branch libraries that are crucial to the success of libraries today.

Upon reflection, one can conclude that successful cooperative cataloging and classification across libraries is made possible by common collections of texts. The essence of cooperative cataloging is that the intellectual effort of catalog record creation does not have to be duplicated across libraries holding the same texts in physical book form. The preferred method, of course, is the sharing of a record across those libraries holding the same book with the cost calculus of paying for original cataloging versus copy cataloging tilting in the favor of the latter. But what of the cooperative organizing of online books? Does it make sense for librarians to deploy knowledge organizing techniques developed around the notion of common collections of physical books when organizing online collections?

3.0 Foundational Issues in Bibliography

Atkinson (1989) defines bibliography "quite simply as that discipline which takes as its object the record as such". The central theoretical question, however, is concerned with whether this traditional view of bibliography remains appropriate as a basis for organizing access to online books due to a shift in understanding ontological status from a static to a dynamic format. It will

be suggested that an inversion of the current understanding of bibliography is needed that shifts its object from the record as such to the contexts that generate records. The recordkeeping role has generally been referred to as reference bibliography and is distinguished from physical bibliography in terms of the object of interest. Following Krummel:

> Bibliography cites and studies books. The citing and compiling of citations into lists (i.e., bibliographies) are reference (or enumerative, or systematic) bibliography, the studies of printed artifacts are physical bibliography. The two activities go together (Krummel 2009, 522).

In the article cited above, Atkinson provides a library-oriented breakdown of types of what he terms representational bibliographical activity that provides further helpful distinctions. The synoptic activity summarizes a text (or group of related texts) and is closely related to the writing of abstracts or summaries such as encyclopedia articles; the critical activity produces authorized texts (also referred to as textual criticism) and bases editorial decisions in part on results gleaned from physical bibliography; the enumerative activity is the systematic work that results in compiled bibliographical lists or catalogs of (library) collections; and the aggregative activity is the work that results in the assembling of whole texts into collections (in the case of library collections, these "whole texts" are subsequently cataloged using rules-based enumerative bibliographical activities).

In examining the enumerative and aggregative bibliographical activities of librarians, Atkinson emphasizes the abstract representative nature of the tasks:

> Referential abstraction, which is a feature of all bibliography, derives primarily from bibliography's representation function. It is a consequence, in other words, of the relationship between the bibliographical product and the original document. Bibliography, however, always serves as an intermediary between the original text and the user. The other fundamental relationship in bibliography is, therefore, that of the reader of the text. Because of the use of library materials as a criterion for that form of aggregative bibliography which is collection development, the relationship of the user to the text is of exceptional important to the library selector. This relationship is characterized, however, by another, equally problematic manifestation of abstraction, which we will designate as the abstraction of reception (Atkinson, 1989, 209).

The insight in Atkinson's article relates to the twin aspects of bibliographical abstraction, namely referential abstraction and the abstraction of reception. The former is concerned with how documents are to be represented by a bibliographical record, and the latter with the relative and possibly unique impacts that texts have on their individual readers. Two types of abstractions are in play here. In the first case, the parts of the documents are quoted (title, author, etc) when reducing a document to its bibliographical record. In the second case, no quotation is involved because this type of abstraction has nothing to do with bibliographical records per se; rather, it has to do with the documentary identity of individual texts as they assumes their position relative to other texts in an aggregated library collection.

Atkinson's key point is that the object of the record (i.e., the document being bibliographically represented) exhibits a false stability in terms of its reception by readers due to the subjective nature of reception during and after the reading process. The illusion of stability is due to the physicality of the various kinds of documents in library collections. Citing Stanley Fish, Atkinson notes the illusion of physicality falsely attributed to the text due to the physical nature of the document carrier. The inference here is that the ontological status of the object of bibliographical representation gives the illusion of stability, when in essence that is false because what is actually represented is the text and not the documentary container of the text.

The invocation of bibliography, though, commits the book as continuing to be the optimal conceptual organizing framework when thinking about a future online textual format. As libraries, themselves, have been long associated with the book, this invocation further provides a basis for a continuing identity for the practice of librarianship over time. Given the myriad definitions of "bibliography," certain specifications will be made to carefully define its role in the context of digital inversion theory. These definitions, however, cannot stray too far from the traditional as there remains the need for the foreseeable future for bibliographical analytical and description activities on physical books. The purpose of invoking bibliography in the present study is thus for its theoretical augmentation rather than its reinvention.

Deploying bibliography and the online book as a useful concept for networked digital publishing is based primarily on the work of Stallybrass (2002) and his identification of the need for the continued evolution of the book as textual form because of its strength in facilitating discontinuous reading. Digital inversion theory is a formalized extension of "the book as indexical computer" concept to online publishing in order to continue this facilitation of random access capabilities while also facilitating textual transmission. Indeed, extending the concept of "book as indexical computer" to organized library collections of such books will serve as the pivot point for digital inversion theory in which theoretical primacy is established for the online book format.

4.0 Digital Inversion Theory

Armed with Atkinson's localization of librarians' bibliographical duties within the larger representative bibliographical enterprise coupled with his observation of the underlying unstable nature of the textual object of the bibliographical record, attention may now be turned toward shifting the object of bibliography from the record to the context that generates a record, which is needed due to the inherent ontological dynamism of online books. The OED defines *inversion* as a reversal of position, order, sequence, or relation. Digital inversion is a theoretical framework for reorienting thinking about online publishing options analogous to Butler's phase I to phase II transition in the history of printing, described in the introduction, in terms of an exploitation of online publishing based on a defense of the following digital inversion contexts:

1. Ontological inversion: The nature of the textual artifact inverts from a static physical form to a dynamic online form taking on the proposed identity of "online book";
2. Locational inversion: The multiplication and reception of online books invert from centralized physical locations such as libraries to a distributed network of cooperatively managed branch digital libraries;

3. Bibliothecal inversion: The primary knowledge organizing techniques of librarians inverts from the creation of indirect bibliographic records to the direct bibliothecal arrangement of collections of online books that are cooperatively organized and optimized for location-based services.

4.1 Ontological Inversion

The two aspects of textual studies impacted by ontological inversion are the production and transmission of texts. During textual production, the online book format allows for the structured presentation of content as is the case with the print book format. The dynamic nature of the online book permits ease of contextual updating of the structured microcontent as warranted with a record of past content changes archived for future study. The facilitation of textual transmission would depend on the precursor format of a particular. If a work began its textual existence as an online book, then the transmission of that text occurs with each update. If a work began its textual existence in a format other than an online book, then the labor of textual transmission must commence, the specific procedures for which are beyond the scope of this paper.

4.2 Locational Inversion

The central notion deployed to support the concept of location-specific contextualized branch digital library services is the second digital inversion: locational inversion. The book as a physical format made necessary their aggregation into physical libraries and required that users go to those collections. However, taking into consideration ontological inversion and the proposed online book format, a second possibility can manifest that is based on the availability of the nearly ubiquitous wired and wireless Internet infrastructure. Locational inversion recognizes the capability for librarians to provide digital libraries of online book collections at the point of user need rather than having to have users come to the collections of print books.

Locational inversion has implications for textual multiplication, reception, and use. For physical texts, the more copies there are, the higher the likelihood of survival over time. However, from a librarian's perspective, multiplication means something more, and that is the ability to create location specific collections of books with the convenience of users in mind. Thus, going forward into the realm of online books, the continued availability of textual multiples is not alien to the librarian but can be leveraged across the network of libraries as librarians share their knowledge organization efforts across contextualized branch digital library collections. These location-specific collections are also valuable for the systematic recording, aggregation, and preservation of textual reception (e.g., marginalia) and use data of digital library users.

4.3 Bibliothecal Inversion

What librarians can provide to today's online publishing environment is an existing network of cooperating organizers who serve a wide variety of user environments. It is important to note, though, that the nature of library organizing is essentially of two minds: The bibliographic and the bibliothecal. Since 1876, librarians have developed and deployed these organizing approaches in tandem. But even before 1876, librarians had long understood that bibliographic

catalogs effected efficient access to physical books through the systematic surrogation of those books. But surrogation alone was not enough for librarians in terms of facilitating access to books. Since 1876, librarians have traditionally deployed a second method complementary to providing indirect bibliographic access through catalog searching and that method, bibliothecal arrangement, facilitated direct browse access to books by way of open stacks in libraries organized by classification. In his 1982 book on shelf access in libraries, Hyman (1982) provides evidence for the "natural" inclination of librarians to make their content directly accessible. The movement toward expanding direct access to shelf arranged open stack libraries in the last quarter of the 19th century led to libraries as they are known today.

The bibliothecal organizing of online books in the branch digital library would require domain-specific classification and is based on the assumption of the stability of the classification relative to the regular activities in user environments. For example, a clinical digital library serving an ambulatory clinic in a middle class neighborhood with known age, race, and other demographics would provide enough information to form the basis for bibliothecal arrangement of a well-organized clinic-specific collection. An added benefit would be that updating online books would likely retain their position in a classified arrangement, as normal textual updating tends to be incremental in nature. Further, the knowledge organization work of the local librarian can be shared across the network of library professionals as it is highly unusual that a local neighborhood clinic would be unique in its demographic makeup.

5.0 Conclusion

This paper is principally about new challenges for the cooperative knowledge organization practices of libraries due to the evolution of publishing. Digital inversion theory is introduced to serve as a basis in that it builds on the fundamental difference in the physical book and the proposed online book format. Concern is centered on newly created texts as well those undergoing textual transmission. This latter task is no small task as textual scholar Jerome McGann points out:

> Let me make a forecast: In the next fifty years the entirety of our inherited archive of cultural works will have to be reedited within a network of digital storage, access, and dissemination. This system, which is already under development, is transnational and transcultural. Let's say this prophecy is true. Now ask yourself these questions: Who is carrying out this work, who will do it, and who should do it? (McGann 2004, 410).

Currently, librarians have established a large network of libraries in North America that are cooperatively organized, yet contextually optimized for local service populations. This paper argues that librarians are potentially well suited deal with various needs of texts and text users by extending their network model to online book collections that form an even larger network of branch digital libraries, on the order of millions, that are likewise cooperatively organized. The goal is to bring library-scale organizing techniques and methods to online. In keeping with digital inversion theory, however, the proposition will be such that the knowledge organization method will not be based on bibliographic surrogation, but rather on direct access to online books that form collections optimally organized for local service nodes of the branch digital library network using bibliothecal methods.

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