A Short history and demonstration of the dynamic table of contexts

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Abstract

This article presents a brief account of the form and function of the "table of contents" to establish a theoretical framework for understanding the form and function of this common element of book architecture with the aim of informing the development of a dynamic table of contexts for books and reading in the digital medium. This article will thus theorize the relationship between textual studies and interface design in INKE, a project for Implementing New Knowledge Environments.

Keywords

Table of contents; Index; Table of contexts; INKE; Ebook

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Implementing New Knowledge Environments (INKE) is a multi-year major collaborative research program whose objective is to inform and influence the design and implementation of powerful new reading environments in the digital medium. Central to this project is the study of a mature reading technology that is so familiar and comfortable to us as modern readers (i.e., the printed book) as to render its effectiveness as a technology almost invisible, in order to understand more fully and think more critically about the desirable functionality of new and as-yet-unimagined reading environments for the digital medium. The familiarity of the table of contents, for example, can easily obscure the complexity of its function and the malleability of its form. On the surface of it, a table of contents gives a simple account of a book's major sectional divisions correlated with page markers that point to the beginning of each division, and it represents this information in a tabular form. But in the history of the book, especially in its more complex instances, the representation of a book's contents has taken many, often multi-faceted forms. The etymology of the qualifying term "table" is evocatively ambiguous. It comes from the Latin *tabula*, which means a flat writing surface, hence a document or a register, sometimes applied to a list of intellectual content. Accordingly, in its first English applications to writing technology, it refers to a single tablet of stone or other material used as a writing surface, and so by extension, to a single reading surface. The second relevant sense (OED II.14.a.), of a systematic arrangement of numbers, words, and other symbols, is first recorded in the late fourteenth century. The Oxford English Dictionary's definition of the latter sense incorporates the first: "*esp.* an arrangement in rows and columns, *typically occupying a single page or sheet*" (emphasis added). For complex books, this latter stipulation rarely holds, but an implied principle is generally true: a representation of contents should ideally present the reader with a single visualization that is, on some level, comprehensive. A more precise application of the later definition (II.14.b.) adds further resonance for the purposes of this paper: "[o]riginally: a concordance or index to a book. In later use usually: =table of contents" (which then points to the entry under the general head "CONTENTS"). In the early age of the printed book, before its architecture became conventionally standardized, the "table" of "contents" sometimes assumed forms that we usually regard as distinct from it, most notably, the index.

This article will present a brief account of the vagaries of the "table of contents" to establish a theoretical framework for understanding the form and function of this common element of book architecture with which to inform the next iteration in our development of a dynamic table of contexts for books and reading in the digital medium.

Function

To begin, we must consider the basic functions of the table of contents: summation, location, visualization, and conceptualization. The two functions of summation and location will be immediately recognized by any reader of the printed book. Typically, the content of the chapters are represented (sometimes in explicit summary, but more often obliquely or allusively) in a short string of text, and correlated with chapter numbers to provide a breakdown of the book's material. Sometimes chapters are grouped into larger partitions, sometimes they are broken down into smaller sections, and usually preliminaries (list of figures, list of tables, forward, preface, etc.) and back matter (appendices, glossaries, indexes, bibliographies, etc.) are also itemized, so that a

table of contents becomes something like a structural outline of the book. The chapter numbers also, then, serve as structural milestones for mentally mapping the content of the book and navigating its structure. More precise location of the major elements of content is facilitated by page numbers. These elements together constitute the tabular form often associated with such an account of a book's contents. Some tables of contents are so detailed that they amount to an extensive outline, as in the case of Fredson Bowers' *Principles of Bibliographical Description* (1962), which goes four levels deep, giving a fairly granular representation of its contents (Figure 1). So detailed is the table of contents for *The Use of the Law* in Spedding, Ellis, and Heath's edition of Francis Bacon's *Works* (1870), that the first five items listed there all occur on page 463 of the text (Figure 2). Indeed, this table of contents requires three and a half tightly-packed pages to represent only forty-one pages of actual content.

Figure 1. Table of contents in Bowers' *Principles of Bibliographical Description* **(1962)**

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Figure 2. Table of contents for *The Use of the Law* in Spedding, Ellis, and Heath's edition of Francis Bacon's *Works* (1870).

Less obvious are the functions of visualization and conceptualization. Even in a simple, standard table of contents, the reader is presented with a visual representation that enables him/her to conceptualize the intellectual content of the whole book. Visualization is implied nominally in the form of a "table," a particular layout of information in columns (chapter number; chapter caption; page locator) and rows (the particular iterations of these combinations of information) (Figure 3).

Figure 3. Table of contents from Murray Roston, *The Soul of Wit* **(1974).**

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This mapping of content enables imagination not only of the ordering of content (facilitated by chapter numbering), but also of spatial quantification by mentally calculating the page spread between sections, and thus the physical size and location of the various sections of the book (a twenty-page first chapter vs. a seventy-one-page final chapter). The table of contents also guides how the reader thinks about the book's intellectual content, abstracting the particulars into high-level concepts: in the case Murray Roston's study of John Donne in *The Soul of Wit* (1974), for example, the concepts of perspective, logic, illusive wit, and faith, etc. (Figure 3). But contents are not always visualized (and conceptualized) in a tabular form. The crucial point here is that, regardless of the form it takes, a rich representation of contents provides context. It enables the user to visualize the part within the whole and to conceptualize the elements of content in their larger intellectual/conceptual context.

Malleability of form

The table of contents, when understood in terms of its functions of summation, location, visualization, and conceptualization, becomes a dynamic piece of architecture that is often expressed in decidedly non-tabular forms and sometimes distributed throughout a book's architecture. The table of contents thus becomes a dynamic and malleable form. Indeed, in many instances the restrictive nominal metaphor is dropped in favour of a more general title of "Contents" (see Figure 1). The representation of these contents then can take any number of forms. In the 19th century it was quite common for the representation of contents to escape the tabular form altogether and migrate into other architectural spaces, such as the header and even the margins. Header titles assumed the role of providing a specific summary, offering a dynamic, page-by-page indicator of content (Figure 5). In this example from John Keble's collected works of Richard Hooker (1888), the header provides a summary statement that indicates the new content on the page—"Disputation against the Laws

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anomalous"— while a marginal note locates the page within the structure of the whole work; for example, this page contains sections 2 and 3 (as per the original publication) of the fifth chapter of the Preface to the present work, *The Laws of Ecclesiastical Polity*. Each page has its own content summary, thus providing supplementary information to a table of contents that is entirely lacking in detail.

Figure 4. Example of a header titles in Richard Hooker's Works (1888).
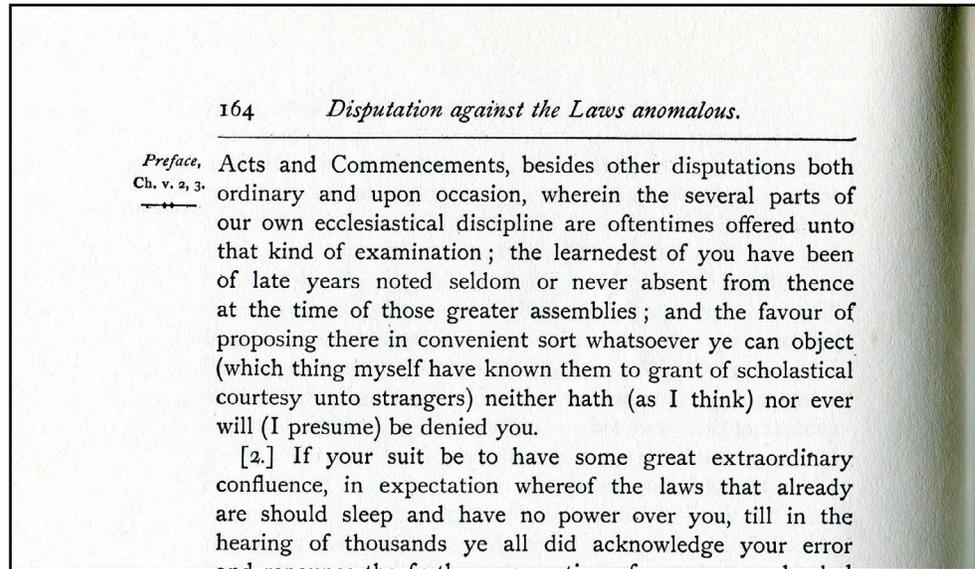
Similar functionality can be expressed in a very different form that more effectively leverages the power of visualization to map not just the structure, but also the conceptual content of the book. The frontispiece of Jan Swammerdam's *Tractatus Physico-Anatomico-Medicus* (1667) functions as a graphical interface that gives the reader a customized means of both locating and imagining the material of the book. This navigational device reflects the interests of an emerging group of readers– early modern natural philosophers–and the need for their reading environment to respond to the particular practices of this group of readers. The desire for objective representation, familiarization with new and, to many readers, strange apparati,[1] and careful representation of physically executed processes provide the impetus for a visualization of the experiment that the tract describes. It also presents a way to navigate the text that is organized around the logic of the type of material the book contains (i.e., the steps and stages of the experiment, rather than the structural arrangement of the book's contents). For example, the reference on the frontispiece to page 40 (Figure 5, at the base of the receiver, to which is attached the pump piston) sends the reader to the corresponding point in the book where that stage of the experiment is described, using alpha-labels to correlate the discussion to a more detailed description of a diagram on the facing page (Figure 6).

Figure 5. Frontispiece to Jan Swammerdam's *Tractatus Physico-Anatomico-Medicus* **(1667) with inset detail added.**

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Figure 6. Correlating diagram and description in Swammerdam's *Tractatus Physico-Anatomico-Medicus* **(1667).**

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Shared functionality and interoperable form: The table of contents and the index

Any account of the function and form of the table of contents must take into account its relationship to the index. To simplify, the table of contents represents the way in from the front and functions in the mode of synthesis, giving an overview representation of the book's content—the shape of the whole—while the book's index represents the way in from the back by way of analysis, giving a break-down of the book's contents in its topical and thematic bits and pieces.[2] Both elements of book architecture typically correlate these nodes of content with a location pointer, usually a page number. In many instances in the history of the book, these functions of analysis and synthesis have overlapped in forms of content indicators that escaped the restrictive confines of the conventional table. Some tables of contents are analytical in that they break the contents of the major sections into granular portions, often approaching the sort of thematic and topical representation one expects of an index. Conversely, astute readers of an index can often conceptualize the shape of the work by inferring larger patterns from the particulars itemized therein.

For some kinds of books, a table of contents is impractical or inadequate, requiring supplementary aid from a dedicated index. Take for example a book of collected verse, such as John Shawcross's edition of *The Complete Poetry of John Donne* (1967). The

extensive table of contents (listing all of Donne's two hundred or so poems) groups the poems into generic categories, so that the reader needs to know something of Donne's corpus in order to locate, say, "The Autumnall." This case is complicated by two factors. First, some editors classify this poem as an elegy, others as one of the "songs and sonnets." Shawcross classifies it among the latter, a grouping that contains dozens of lyrics spanning almost two pages in the table of contents.[3] At best, locating this poem requires a fair bit of scanning of this fairly large generic grouping. The table of contents provides a good representation of the shape of the corpus and a convenient locating aid to the initiated reader, but for readers less familiar with Donne's body of poetry, the indexes at the back of the edition are crucial. Second, the titles of some of Donne's poems vary from witness to witness. Thus, the "Index of Titles" and "Index of First Lines" provide two further, very precise avenues into the poetry, both of which are necessary, not only due to the variations in the titles, but also because the reader might come looking for a poem equipped with only a first line. In the case of Donne, the first line index is the least ambiguous means of identifying and locating a particular poem.

This complementary relationship is even more pronounced in the case of John Carey's edition of Donne's *Major Works* (2000), which includes not only most of Donne's poems, but also selections from his much larger body of prose. Carey's arrangement of material, and thus his representation of his edition in the table of contents, gives a very different shape to Donne's writings. Carey arranges his texts chronologically. Notwithstanding the lack of scholarly consensus in dating many of these texts, this arrangement gives the reader a potentially valuable, temporal view of his writing, whereby each poem is located in a temporal context. But again, this arrangement poses challenges to the uninitiated reader who wants to locate a particular poem. Unless one knows when a poem was written (and for most of these poems, no one, not even the editor, does for sure), it is difficult to locate a poem by scanning the table of contents. Again, an index of titles and first lines is a necessary supplement. Here, we see a dynamic interplay between *synthesis*—a representation of parts that presents a particular shape of the whole—which situates a poem in a particular (in this case, temporal) context, and *analysis*, which breaks the corpus into individual, discrete units for each location.

Larger works present a different kind of challenge in locating certain kinds of content precisely. Most large literary works don't contain an analytical index of the type one finds in, for example, a monograph of literary criticism. A.C. Hamilton's edition of Edmund Spenser's *The Faerie Queene* (1596) recognizes a particular need that arises out of a very long poem that proliferates with characters. While Hamilton's table of contents simply provides the six numbered books identified with their titular characters, together with the mutability cantos, and of course their starting page numbers, a supplementary index preceding the table of contents names all of the characters contained in the poem (well over two hundred of them), in alphabetical order and with a citation locating their first appearance. In contrast, the original edition of all six books of *The Faerie Queene* (1596, STC23082) provides very little help in navigating the content of this 518 page book: there is no other representation of contents. The title page gives only a very vague and misleading indication of the contents of the book, "Disposed into twelue bookes, Fashioning XII. Morall vertues." In fact, only six books are included. Even the most simple representation of contents—a

list of the titular characters, corresponding to the six virtues—would have given the reader some synthetic representation of the content and given some semantic help in using the only navigational aid that is provided, a running title that indicates the book and canto number. Otherwise, the reader is left to thumb through the pages to locate the beginning of each book and canto. It is the job of a good modern edition to make up for any original deficiencies in navigation, and to provide extra help, where warranted, in the book's navigational structure. A.C. Hamilton's Longman edition is a good example of an edition that goes beyond the normal table of contents to provide multifaceted navigation of content. In the age of the electronic text, is it the job of the scholar now to imagine a reading environment that similarly enables a dynamic, empowering environment for navigating the text.

The dynamic table of contexts

The Dynamic Table of Contexts (Ruecker 2005; Ruecker et al. 2009, 2011) represents a digital re-imagining of the two principal forms of summary apparatus (the table of contents and the index), placed in conversation with each other (Figure 8) in an interactive system that allows the reader to dynamically add to and subtract from the table of contents what are essentially index items, i.e., material that has been encoded with semantic-level XML (eXtensible Markup Language). The screenshot of the Dynamic Table of Contexts prototype in Figure 7 shows the reader of Frances Burney's novel *Cecilia* (1782) looking at place names that were encoded in the XML <place> tag. Search results for "Paris" and "Haymarket" are also shown as bubblelines in the panel bottom left.

Figure 7. Screenshot of the Dynamic Table of Contexts

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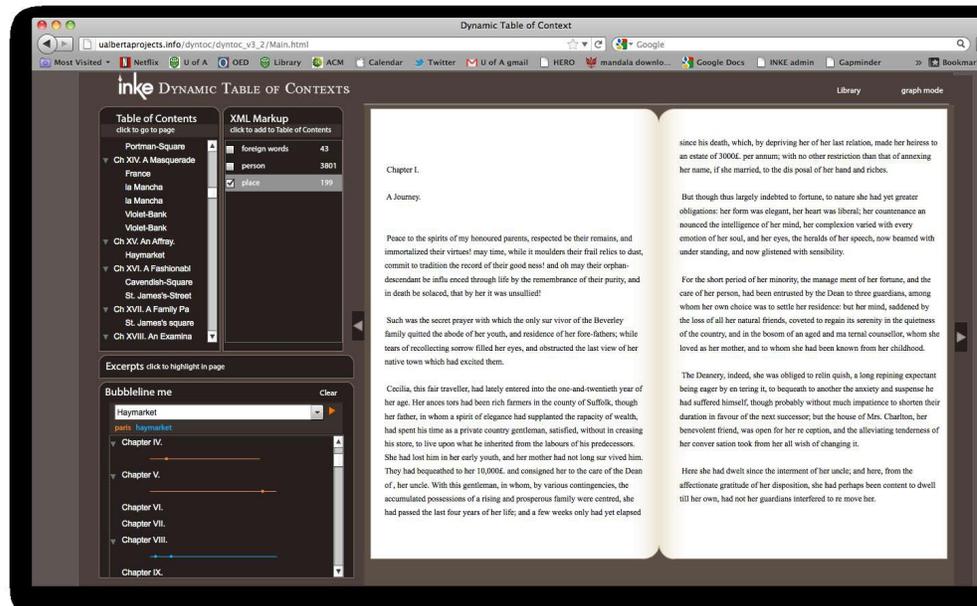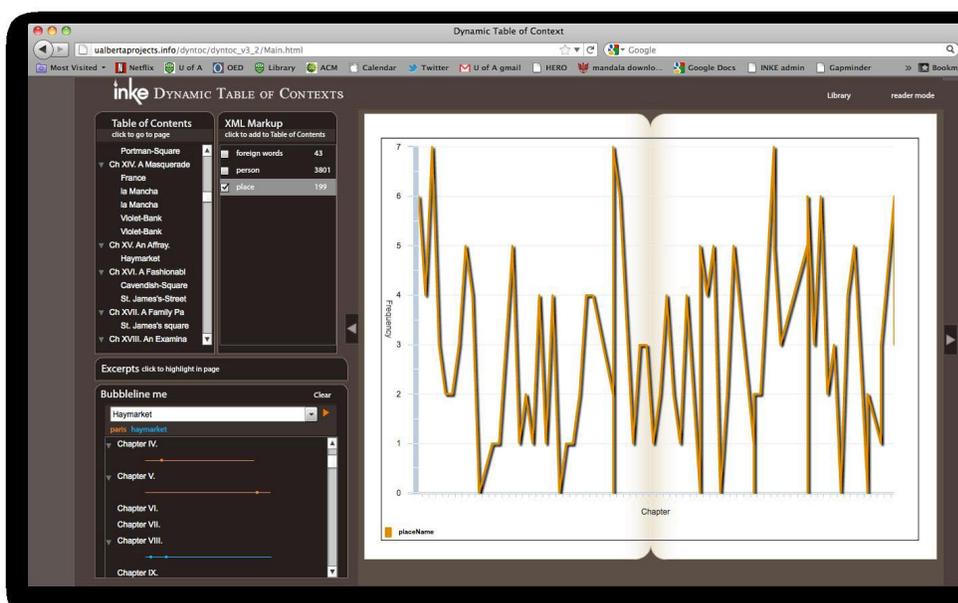
The system is designed so that readers can work without a great deal of familiarity with the XML encoding. Since XML tags are often not semantic, and even those tags that are semantic are defined in shorthand, the Dynamic Table of Contexts includes a curator mode where an administrative user can select which tags will appear on the main screen, and what those tags will be called. In our example of *Cecilia*, for example, what appears as "foreign words," "person," and "place," are actually "term," "persName," and "placeName." This ability for a curator to make the selection of select tags and carry out their translation from technical shorthand into common language is essential to making the XML accessible for use by people who were not involved in the encoding.

The goal of the Dynamic Table of Contexts is to provide readers with a greater range of affordances when reading book-length digital texts. Since the text is digital, the environment is not restricted to a single design choice, so it becomes possible to provide functions such as reorganization of the table of contents according to different criteria. In the case of a digital version of Hamilton's *Faerie Queene*, for instance, the list of characters could be sorted alphabetically by character name, by sequence of first appearance in the book, or by frequency of appearance. It may also be possible to expand it into a search tool for co-occurrence of other characters or even objects, so that the user could ask, for example, where the Red Cross knight appears with and without his horse.

In addition, once we have placed the dynamic table of contexts into an interactive reading environment, it is possible to layer-in additional analytical tools. Figure 7, for instance, shows a visualization of comparative search results across chapters IV to VIII of Cecilia, while Figure 8 is a frequency graph of people's names that have been encoded with XML throughout the book.

Figure 8: This screenshot shows the frequency graph of the <placeName> tag throughout *Cecilia*.

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We are currently at the stage of bringing the prototype into user studies, preparatory to experiments in implementing it in association with the Canadian Writing Research Collaboratory (CWRC). As it stands, the dynamic table of contexts already makes a step towards enhancing the reading experience for digital editions. It is, however, still a relatively simple prototype, with many rich affordances yet to be implemented as we strive to accommodate not only a wider range of digital textual material, but also a broader understanding of the history of the conventional table of contents, its variants in the form of images and lists of figures, characters, and other material, and its complementary relationship to the index.

Conclusion

The form in which contents are represented can have a determining effect on how the reader thinks about and understands a text. Speaking about the development of reading technology in the early days of print, Elizabeth Eisenstein contends that "the thoughts of readers are guided by the way the contents of books are arranged and presented. Basic changes in book format might well lead to change in thought patterns." (1979, vol. 1, p. 88-89). In observing the cultural effect of the printed book in this period, Eisenstein goes on to elaborate the impact of new affordances in this nascent reading technology, as "[i]ncreasing familiarity with regularly numbered pages, punctuation marks, section breaks, running heads, indexes, and so forth helped to reorder the thoughts of all readers, whatever their profession or craft." (vol. 1, p. 105-6). In this article we have argued that in their more thoughtful manifestations, representations of contents in the printed medium experimented with form, and in some cases interplay of form, to create dynamic means for summarizing, locating, visualizing, and conceptualizing the intellectual content of a book. In the digital medium, these dynamic possibilities are manifold. In theory, a more dynamic means of representing contents should open up possibilities for new ways of reading and thinking about a text. The ongoing work of INKE is to leverage the insights afforded by the historical study of the book as reading technology and the affordances of the electronic medium in order to imagine and inform the development of new reading environments.

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Notes

1. On the importance of experimental apparatus and the need for accurate representation to audiences unfamiliar with the apparatus, see Steven Shapin and Simon Schaffer, *Leviathan and the air-pump* (1985), especially chapters 2 and 6.

2. On the index as an expression of textual analysis, see Elizabeth L. Eisenstein, *The printing press as an agent of change: Communications and cultural transformations in early modern Europe* (1979; vol. 1, p. 100).

3. Most editions of Donne's poetry take this genre-based approach to representing its contents. See for example A.J. Smith's Penguin edition (1996) and Charles M. Coffin's Modern Library edition (2001).

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