abstract: This article presents the results of a study of academic e-books that compared the metadata and search results from major academic e-book platforms. The authors collected data and performed a series of test searches designed to produce the same result regardless of platform. Testing, however, revealed metadata-related errors and significant variation in search results that could impact the user experience. This article describes how other libraries could perform this type of testing and how this information could be used to inform the selection of e-books that are available on multiple platforms.

Introduction

Academic libraries have the option to purchase e-books from a variety of publishers’ and vendors’ platforms. Most large publishers now have their own proprietary platforms and also license their books through a number of aggregators, which offer a broad selection of books from many publishers. Although this widespread availability positively impacts the average researcher’s access to content, each e-book platform offers different features and functionality that affect usability and accessibility. Librarians expect publishers and vendors to add logos, branding, and other features to distinguish their platform from others. But it may come as a surprise that other elements, such as bibliographic information and search results, can vary depending on the search algorithm and technical infrastructure of the e-book platform. To gain a deeper understanding of the differences between platforms, the authors analyzed a sample of academic e-books to study these variations and to document how e-books are represented across different platforms. Examples of standardized searches from the
platforms illustrate varying levels of recall and precision. Side-by-side comparisons of bibliographic metadata and search results highlight how different e-book platforms vary in presenting the same title. Each e-book platform has strengths and flaws that libraries should take under consideration when given the option to purchase content on multiple platforms.

Preliminary results of this study were presented at a national conference using anonymized data and more general results. Many attendees were surprised to learn about the variations in e-books and requested more information about specific platforms to help inform their selection decisions. While this paper provides more detailed examples and includes platform names, it tries to provide a vendor-neutral analysis. Vendor information has been included in an attempt to clarify the available options and to create awareness of these issues.

Each e-book platform has strengths and flaws that libraries should take under consideration when given the option to purchase content on multiple platforms.

Literature Review

Comparative analysis is a useful methodology to inform selection decisions, such as deciding between databases that are available on multiple platforms, choosing between commercial or open source resources, or ordering e-books that are available on multiple platforms. A number of tools can help librarians compare and select e-book platforms. Many libraries have created charts comparing the specific features of e-book platforms. The Academic Database Assessment Tool (ADAT), originally developed by JISC and later hosted by the Center for Research Libraries (CRL), compared various features of e-book platforms. ADAT’s e-book platform comparison tool provided an overview of access options, search functionality, navigation, linking options, metadata, accessibility, and other functions, such as printing and downloading. Users could select two to six different platforms to compare, and ADAT displayed a comparison table that indicated whether those features were available. ADAT did not, however, provide critical analysis of the features or platforms. Instead, it referred users to the Charleston Advisor, a publication that reviews electronic resources purchased by libraries, for this type of information. Reviews in the Charleston Advisor provide in-depth analysis of a specific platform but do not necessarily give information about other platforms.

ADAT has been discontinued, but descriptive information, reviews, and analysis for e-book platforms now appear on CRL’s eDesiderata website, described as “an interactive space where librarians share opinions and information about electronic resources.” While eDesiderata provides brief reviews for some resources, it also often refers users to the Charleston Advisor for reviews about specific resources, and it no longer includes a comparative analysis of e-book platforms or features.

Another publication, Against the Grain, frequently publishes announcements and articles about e-books written by librarians, publishers, and vendors that reflect various perspectives in the industry. The December 2013–January 2014 special issue of Against the Grain includes multiple articles that describe and compare e-book platforms for academic
The articles cover such topics as technical aspects, business models, aggregators’ platforms, commercial publishers’ platforms, and university press platforms. In that issue, Deborah Lenares compares content and sales models for four major e-book aggregators: ebrary, E-Book Library, MyiLibrary, and EBSCO eBooks. Cris Ferguson describes content, pricing models, and platform functionality in terms of digital rights management (DRM), which provides copyright protection for electronic media. Mark Johnson presents an overview of university press e-book platforms and discusses the position of these presses within the market. Trey Shelton, Tara Cataldo, and Amy Buhler compare content, sales models, user features, administrative tools, and DRM. They additionally describe some of the user features that are not standardized across platforms, including annotation options and automatic citation generators. Their article also reports issues with search functionality, commenting, “There are still platforms which only search the citation and abstract . . . [and] when full-text searching is available, it does not always work the same way across platforms.” Johnson observes that e-book platforms face many of the same challenges that e-journals initially confronted and summarizes the issue by stating that e-books “have just begun their online evolution, and their features and functionality have not yet been standardized to allow for a consistent user experience from book to book, site to site, and platform to platform.”

Another comprehensive comparison of academic e-books can be found in a special issue of *Library Technology Reports* for April 2013. In that issue, Mirela Roncevic’s “Criteria for Purchasing E-book Platforms” covers the features librarians usually consider when choosing an e-book platform and compares 35 platforms, discussing content, technical specifications, functionality, and purchasing models. Like many other authors, Roncevic limits the analysis of content to descriptions of the number of e-books and publishers available, and the examination of full-text searching simply indicates whether the feature is available, without discussing the quality or accuracy of the results.

Other comparative analyses studied e-books within specific disciplines or tested specific features. Tara Tobin Cataldo and Michelle Leonard compared the features on eight publishers’ platforms and six aggregators’ platforms in their evaluation of platforms for science, technology, engineering, and mathematics (STEM) e-books, but they did not conduct a comparative analysis of search functionality across platforms or investigate content quality. An analysis by Christina Mune and Ann Agee evaluated 16 platforms with a focus on features that were important to students with disabilities. Although this study explored the search capabilities and visual presentation of content on the platforms, it did not comparatively analyze the accuracy of either.

Catherine Anson and Ruth Connell’s SPEC [Systems and Procedures Exchange Center] *Kit 313: E-book Collections* presents the results of a survey completed by 75 out of 123 Association of Research Libraries (ARL) members in 2009. It describes how academic libraries select, budget, and assess e-books and lists many of the benefits and challenges associated with the format. Notably, the authors frequently mention searchability as a benefit, while they list “platform diversity” as a challenge.

The purpose of most of the previous research is to inform collection development by presenting features of different platforms. When libraries have multiple options for purchasing content, they evaluate their options according to various selection criteria. Magdalini Vasileiou, Richard Hartley, and Jennifer Rowley reported the criteria and
Inconsistencies between Academic E-book Platforms

processes that academic libraries use to select e-books. They summarized the findings of related studies and found that “the most cited selection criteria across the studies are the cost of e-books and the high usage/demand by the library users, followed by licenses, business models, platform interfaces, and subject coverage.”18 All of these factors are important, but some are more important for librarians, while others are more important for end users. For many libraries, content and cost tend to be the dominant factors driving purchase decisions because “technologies among providers of content are not perceived as critically different.”19 This study provides evidence about how e-book technology affects the user experience and offers additional information to help librarians make informed decisions about selecting an e-book platform.

Existing tools and literature compare and describe important features such as content, sales models, and DRM, but they simply indicate whether these features are available and do not address the quality or accuracy of the features. Moreover, most studies fail to discuss one of the most important features of e-books, search functionality.20 Most studies take search functionality for granted without exploring how well a search works, describing what level search results are presented, or determining if different platforms produce different search results. These basic components of an e-book are assumed to be comparable regardless of platform, but in fact they vary widely across platforms.

For many libraries, content and cost tend to be the dominant factors driving purchase decisions because “technologies among providers of content are not perceived as critically different.”

In addition, few analyses go beyond describing platform-level features. While some studies indicate platform-level differences in search capability, comparisons at the title level are required to understand the differences in search results as a consequence of that functionality. Most libraries try to minimize duplication and will not purchase the same book in multiple formats or from multiple sources.21 Since libraries tend to own e-books on only one or two platforms, it is difficult to compare the same book on more than two platforms to determine which platform is most accurate. However, this type of comparison is necessary to fully test platform-level features and to identify patterns of variation across platforms for the same book.

This study expands on previous research by taking a closer look at two features of e-books that are important to discovery and user experience: metadata and search functionality. It includes a systematic analysis of e-books at the title level that goes beyond a surface-level evaluation of platform functionality and uncovers important details about metadata and search functionality. In addition, this paper presents a rubric and methodology that other librarians could use for testing e-books on different platforms.

Methodology

This study analyzed a random sample of English-language e-books from various academic publishers. E-books were first identified using title lists from the websites of 22 publishers and commercial e-book providers. The sample was limited to e-books published in a single year to create a manageable list of titles, but the sample neverthe-
less included more than 33,000 books. Although the authors wanted to study recently published content, it was useful to analyze e-books that were at least a year old because some new or current titles are not yet available on aggregators’ platforms.

The sample was further limited to e-books that were available on both the publisher’s own platform and the platforms of three aggregators. A significant number of e-books were only available on one or two platforms, so this significantly reduced the suitable examples to 10,646. This requirement also eliminated such publishers as the American Psychological Association, IGI Global, Karger, and McGraw-Hill, who had limited distribution through aggregators. It also excluded such platforms as Safari Books Online, which aggregates content from multiple publishers for exclusive access on the Safari platform. While it is valuable to compare two e-book platforms, it can be difficult to determine which platform is correct if there are discrepancies. Including results from a third platform often provided a tiebreaker, or at the very least further clarification about what information should display. It also helped distinguish between title-level errors, mistakes that were present in every platform, and platform-level errors, where data that should be consistent varied across platforms.

E-book availability on aggregators was determined by searching OASIS (Online Acquisitions and Selection Information System), ProQuest’s online ordering database, which indicated whether an e-book was available from one or more of the aggregators E-Book Library (EBL), EBSCO, and MyiLibrary. While the study intended to analyze all of the major academic e-book providers, some aggregators were excluded because they were not included in the OASIS database or because of an expectation that the platform would significantly change in the near future (for example, ebrary). During the time that the majority of the platforms were evaluated for this article in early 2015, ProQuest announced that it planned to launch a new e-book platform, EBSCO declared that it would update its platform, and MyiLibrary was acquired by ProQuest. Since e-book providers continue to modify their platforms, search functionality and results from a current search of the platform might yield different results from those found at the time of this study. Nevertheless, this methodology could be applied to any e-book platform, and testing should be performed as needed.

The authors considered evaluating specialized e-book platforms, such as Gale Virtual Reference Library, Credo Reference, and University Press Scholarship Online, that aggregate e-book content from multiple publishers. Individual e-books were evaluated, but it was difficult to identify sample titles that were available on two or more additional platforms for comparative analysis. These specialized platforms could, however, be included in future studies as additional aggregators to compare.

Since libraries tend to own e-books on only one or two platforms, it is difficult to compare the same book on more than two platforms to determine which platform is most accurate. However, this type of comparison is necessary to fully test platform-level features and to identify patterns of variation across platforms for the same book.
A random sample of five titles for each publisher’s platform was identified for comparison across all three platforms (those of the publisher, EBSCO, and MyiLibrary). The authors worked with publishers and e-book providers to set up trials or other temporary access to the sample titles. Coordinating and setting up the trials proved more difficult and time-consuming than expected. Publishers and vendors were cooperative, but it is not easy to activate trial access for individual e-books, so the authors could not gain access to every title in the random sample. As a result, more than 125 individual examples were tested that were available or accessible on only two platforms, but only 10 were compared across all three platforms: a publisher’s platform, EBSCO, and MyiLibrary. The exact number of e-books tested comparatively and per platform is summarized in Table 1, which may be seen in the online edition of portal at http://muse.jhu.edu/resolve/3.

Table 1 is online only at http://muse.jhu.edu/resolve/3

The authors developed two rubrics or tools for comparing platforms based on CRL’s Academic Database Assessment Tool.22 A platform-level rubric was used to record the available features and functions on each platform, and a title-level rubric was employed to document features that could vary by individual title. See Appendix A and B for the rubrics. All of the title-level data were recorded exactly as they were presented on each platform. Additionally, if the platform could create a citation formatted in Modern Language Association (MLA) style, the authors copied the platform-generated citation for comparison. Altogether, the authors tested more than 30 elements that are important to usability and the end-user experience, and recorded the results in a spreadsheet.

To test search functionality, the authors selected keywords from a specific page in each book, attempting to pick keywords that an average user might choose, such as words that are important to the subject matter. For each example, the authors searched for the same keywords on all three platforms. The number and contents of the search results for each platform were recorded in a spreadsheet. This process was repeated for each book on all three platforms.

After the data were entered for each example, the results for each platform were concatenated and displayed side by side to illustrate how platforms vary in visual presentation, metadata, search functionality, navigation, and organization. This methodology provided a framework to systematically test and compare e-books across multiple platforms. The same methodology could be used to test e-books in a library’s current collection as well as e-books on new or updated platforms. This type of analysis is extensible and flexible enough for even the smallest libraries to utilize. The authors have included a copy of the rubrics in Appendix A and B to facilitate testing at other institutions.

This exploratory analysis does not claim to portray the entire academic e-book ecosystem but instead demonstrates the need for a thorough review of scholarly electronic content before purchasing. The authors could systematically test only a small percentage of titles, which are representative of academic e-books but cannot yield conclusive findings regarding all e-books. Nevertheless, we believe it unlikely that the random sample of e-books tested differ vastly from other academic e-books. We conclude that the following results present a preponderance of evidence that indicates inconsistencies in metadata and search results across platforms.
Prior to this study, it was assumed that an e-book would have comparable presentation, content, and searchability regardless of platform. Comparative analysis, however, revealed significant variations in all of these aspects. The following results are representative examples of metadata errors and search variations encountered on many different platforms. This study does not attempt to make generalizations or proclaim that one platform performs better than another. Rather, it is intended to provide evidence and examples of how e-books vary and to demonstrate the need for ongoing analysis as e-book technology evolves.

Analysis of Metadata and Bibliographic Information

Librarians appreciate the value of quality descriptive metadata as a tool to help users find the resources they need. Machine-readable cataloging (MARC) records and other descriptive metadata are often considered surrogates for physical materials in a library and are increasingly used to guide users to electronic resources. Ravit David and Dana Thomas argue that quality metadata are even more important for digital formats, such as e-books, because unlike physical materials, e-books cannot be serendipitously found while browsing a shelf:

One may say that they [e-books] exist only in so far as their metadata exists, as their presence is only determined by discovery services—whether local or across the Internet. If metadata is of low quality or incomplete, users will not have sufficient information to determine whether the content is relevant to their research needs.23

Many libraries report that one of the benefits of e-books is that, unlike physical materials, they cannot be misshelved, lost, or stolen. But an e-book without sufficient metadata is just as lost as its misshelved print counterpart. As libraries continue to invest in electronic books, it is important to ensure that e-book records contain robust and accurate bibliographic description to support discovery.24 Metadata and other descriptive elements provide critical information to help users find the content they need. A recent survey of cataloging and metadata professionals who work with digital repositories reported that the majority consider quality metadata “essential for resource discovery and sharing.”25 Despite this need for reliability, as David and Thomas noted, “Research on quality metadata in digital environments is lacking.”26

Incomplete or inaccurate metadata can prevent users from finding an e-book or using it effectively. From an end-user perspective, David and Thomas say, “If metadata is of low quality or incomplete, users will not have sufficient information to determine whether the content is relevant to their research needs. On most ebook platforms, users make their decision to read the work or abort the search based on the first page of
metadata.” From a library perspective, it is frustrating to invest in content that could be dismissed based on inaccurate description. It is also disheartening to think that researchers might miss an opportunity to connect with valuable resources. Publishers feel these missed opportunities as well. Scant or inaccurate metadata could prevent a library from purchasing an e-book, and libraries who are not satisfied with the quality of MARC records received or the usage of the e-books they purchase may not continue to buy e-books. Fortunately, many publishers recognize that robust metadata and description lead to improved discovery, demand, and ultimately, sales. The 2012 Nielsen BookData UK white paper on the impact of metadata on online print book sales found a positive relationship between sales and the completeness of basic metadata elements on a publisher’s website.

Many libraries report that one of the benefits of e-books is that, unlike physical materials, they cannot be misshelved, lost, or stolen. But an e-book without sufficient metadata is just as lost as its misshelved print counterpart.

Given the importance of quality metadata to libraries, publishers, and end users alike, it stands to reason that most academic e-books would have high-quality bibliographic descriptions. Unfortunately, our comparative analysis revealed that basic metadata—including the title, author, publisher, and date for a single e-book—varied by platform. Common discrepancies included listing editors as authors, using different dates, such as copyright or publication date, and not including subtitles. For example, the MyiLibrary platform consistently omitted subtitles, and its “Written by” field did not distinguish between authors and editors.

The example A Companion to Hildegard of Bingen illustrates variations in title, author, and series metadata. While only a slight alteration, the MyiLibrary platform presented titles that begin with an article, such as a or an, by placing the initial article at the end of the title. The publisher’s platform clearly denoted Debra Stoudt, George Ferzoco, and Beverly Kienzle as editors of this book, while the EBSCO and MyiLibrary platforms listed them as authors and presented them in a different order from the publisher’s platform. The publisher’s platform also provided the most detailed information about the series, compared to the basic series note from EBSCO and no series information at all from MyiLibrary.

The example Industrialization in the Modern World: From the Industrial Revolution to the Internet also illustrated variations in titles, attribution, and publication information. The book’s subtitle is listed on the publisher’s and the EBSCO platforms but is omitted from the MyiLibrary platform. Similarly, the authors’ middle initials are omitted from MyiLibrary, and inclusion and punctuation varied on both the publisher’s and the EBSCO platform. A middle initial can be used to distinguish authors with common names, and excluding it could lead to misattribution.

Common discrepancies included listing editors as authors, using different dates, such as copyright or publication date, and not including subtitles.
Table 2.
Example 1: *A Companion to Hildegard of Bingen*

<table>
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<tr>
<th>Platform</th>
<th>Brill</th>
<th>EBSCO</th>
<th>MyiLibrary</th>
</tr>
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<tr>
<td>Title</td>
<td>A Companion to Hildegard of Bingen</td>
<td>A Companion to Hildegard of Bingen</td>
<td>Companion to Hildegard of Bingen, A none</td>
</tr>
<tr>
<td>Subtitle</td>
<td>none</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Author</td>
<td>Authors: Kienzle, Beverly Ferzoco, George Stoudt, Debra</td>
<td>Written By: Kienzle, Beverly, Stoudt, Debra; Ferzoco, George</td>
<td></td>
</tr>
<tr>
<td>Other creators</td>
<td>Editors: Debra Stoudt, George Ferzoco and Beverly Kienzle</td>
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<td>Publisher</td>
<td>not listed</td>
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<td>Date</td>
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</tr>
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<td>Series</td>
<td>Main Series: Brill's Companions to the Christian Tradition</td>
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<td></td>
<td>ISSN: 1871-6377 Volume: 45</td>
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</tr>
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</table>

Table 3.
Example 2: *Industrialization in the Modern World: From the Industrial Revolution to the Internet*

<table>
<thead>
<tr>
<th>Platform</th>
<th>ABC-CLIO</th>
<th>EBSCO</th>
<th>MyiLibrary</th>
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</thead>
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<tr>
<td>Subtitle</td>
<td>From the Industrial Revolution to the Internet</td>
<td>From Industrial Revolution to the Internet</td>
<td></td>
</tr>
<tr>
<td>Author</td>
<td>John Hinshaw and Peter N. Stearns</td>
<td>Authors: Hinshaw, John H. Stearns, Peter N</td>
<td>Written By: Hinshaw, John; Stearns, Peter</td>
</tr>
<tr>
<td>Publisher</td>
<td>Publication Information: Santa Barbara, California : ABC-CLIO</td>
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<tr>
<td>Date</td>
<td>11/30/2013</td>
<td>2014</td>
<td>Published In: 2013</td>
</tr>
</tbody>
</table>
This example also illustrates how different platforms present publication dates. The date is one of the most important fields for citations, yet it was one of the fields with the most variation. MyiLibrary tended to list the publication date, while EBSCO often used the copyright date. Publishers’ platforms varied in supplying published or copyright dates and sometimes listed publication dates for both print and e-book formats. This variation can be problematic when the publication and copyright dates fall into two different years.

Most citation style guides (APA, MLA, and *Chicago Manual of Style*) provide the general guidance of including the “year of publication,” which could be interpreted as either a publication or copyright date. To avoid confusion or misinterpretation, some platforms clearly label a date as copyright or publication. It would, however, be useful to standardize this field so that all platforms included at least the copyright date and other dates if needed. The difficulty is an industry-wide lack of standardization for e-book publication dates. Copyright guidelines suggest, “If the same work is published both online and by the distribution of physical copies and these events occur on different dates, the publication date should refer to whichever occurred first.” In practice, however, “publishers are providing ‘electronic publication dates’ or ‘release dates’ in addition to, and sometimes in place of, copyright dates or publication dates.” This is a growing issue as publishers continue to digitize older print publications. For example, a print book published in 1990 would likely have a copyright date of 1990, but if a publisher digitized that book in 2015, the copyright date for the e-book would just as likely be 2015, regardless that the content originally published in 1990 was not updated.

The lack of clarity about which date best describes the book is a source of confusion for libraries and end users alike. Inaccurate metadata about when a book is produced result in unnecessary interlibrary loan requests, duplicate purchases, and difficulty reconciling what the library has access to compared to the information in e-book license agreements. It is also unfortunate that the copyright date, which is familiar to most users, does not always represent when the book was originally published, which may be more important to the user.

The comparative analysis also found that most aggregators listed publisher information, but it was common for publishers’ platforms to omit publisher information in the metadata. Even though publishers’ platforms tend to have branding, logos, and URLs (uniform resource locators) that indicate the publisher, it is unclear why this information would be omitted.

While these might seem like minor discrepancies, omitting these data could cause confusion, produce inferior search results, and directly impact a platform’s or an end
Table 4.
Example 4: *The Day of Shelly’s Death: The Poetry and Ethnography of Grief*

<table>
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<tr>
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<tr>
<td>Title</td>
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<tr>
<td></td>
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</tr>
</tbody>
</table>
Inconsistencies between Academic E-book Platforms

machine-generated content to be flawless, if platforms offer this functionality, then the metadata should contain all of the necessary information to create a complete citation in most of the major citation styles.

Further discrepancies can be found in other descriptive content, such as assigned keywords or subject headings. Platforms include a range of keywords, subject headings, related subjects, or other terms to describe the content of a book. In the example *The Economic Competitiveness of Renewable Energy: Pathways to 100% Global Coverage*, the subjects listed on each platform vary so much that they could be describing three different books.

Similarly, in *Authoritarian Origins of Democratic Party Systems in Africa*, both aggregators’ platforms provide a detailed hierarchy of subject classification, while the publisher’s platform simply lists an overarching subject. Some publishers use BISAC (book industry subject and category) subject headings, while others use an in-house classification system. Still others provide Library of Congress Subject Headings.

While most catalogers would argue that books can be described in many different ways, the inconsistency in the subjects used to describe the same content on different platforms suggests a need for more uniform data to optimize discovery of the content. In their analysis of metadata found in MARC records for e-books hosted on the Scholars Portal platform, David and Thomas found that subject, title, and author information were the fields that most impacted discoverability and searching on the platform. The authors of this article agree that these are basic metadata components that should be accurately included in MARC records and platform metadata. Additional metadata and description, such as keywords, subject headings, and abstracts, should also improve discovery and help users determine whether an e-book will be useful for their research, but further studies are needed to determine what information best helps users find the resources they need.

**Analysis of search Results**

E-book users consistently rank searching as one of the most important features of the technology. Of 3,000 respondents to ebrary’s 2008 survey on e-book use, 2,647 students (88 percent) listed “searching” as a very important feature. Similarly, JISC’s 2008 survey of e-textbook users in the United Kingdom found “searchability” as one of the top three advantages of e-books compared to print books. The University of California Academic e-Book Usage survey, which included responses from undergraduates, graduate students, and faculty, found that 95 percent of the respondents who had previously used e-books indicated that searching within the text was an important feature of e-books.
Table 5.
Example 5: The Economic Competitiveness of Renewable Energy: Pathways to 100% Global Coverage

<table>
<thead>
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<th>Platform</th>
<th>Wiley Online Library</th>
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<td>Title</td>
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<td>Publication Information: Hoboken, New Jersey : John Wiley &amp; Sons, Inc. 2014 Scrivener</td>
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</table>

Users not only expect to search within e-books but also rely on accurate search results to effectively use the content. Selinda Berg, Kristin Hoffmann, and Diane Dawson’s analysis of how undergraduate science students use print books and e-books for information retrieval found that users “showed a strong preference” for using a search tool in an e-book, as opposed to other information-seeking tools, such as an index or table of contents.37 A longitudinal study of e-book use by undergraduates at Wesleyan University in Middletown, Connecticut, found that many students, given access to both the print and electronic versions of a book, would use the e-book to search and identify relevant sections, and then use the print for deeper reading.38
Most users expect to have the ability to search the full text of an e-book, but it is not always available. On some platforms, searching is limited to text in the citation or abstract. The platform-level rubric recorded whether an e-book platform offered a site search, full-text search within a single book, search within search results, or other search options. See Figures 1 and 2 for examples of different search boxes.
This evaluation found that 16 of the 19 platforms (84 percent) provided an option to search the full text of a book. Some platforms do not provide a separate search box to search within the e-book, but users could use the command to find (control + f) to search for keywords within the pdf. If a platform provided the option to search within a book, the authors conducted a series of searches for the same keywords within each book to evaluate the search results on different platforms. Searching for the same terms should yield the same results, but the authors found key differences between platforms.

**Keyword-, Page-, or Chapter-Level Results**

Variation in the number of search results is due in part to the level of search results presented. Search results are presented at the keyword, page, section, or chapter level. Chapter-level results list a number of results equal to the number of chapters in which the search term appears. Whether the term appears once or multiple times, the chapter is listed only once in the results. Page-level results are similar but instead provide a number equal to the number of pages on which the term appears. Keyword-level results function slightly differently: the number of results is equal to the number of occurrences of the keyword within

The comparative analysis found that 63 percent of e-book platforms presented chapter-level results, 11 percent gave page-level results, and 26 percent displayed keyword-level results.
Inconsistencies between Academic E-book Platforms

Inconsistencies between Academic E-book Platforms

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The example The Social Order of the Underworld: How Prison Gangs Govern the American Penal System illustrates the differences between keyword- and chapter-level search results. A search for decentralized yielded 20 keyword-level matches in EBSCO, but only 5 results on the Oxford Scholarship Online (OSO) platform because OSO returned chapter-level results. EBSCO returned the largest number of search results because it searched for each term entered in the search box and reported every instance of a term within the full text. Platforms like OSO may search the full text for a keyword but only report which chapter or chapters include the search term.

The number of search results can also vary due to errors or platform limitations. A keyword search for the term commercialization in The Economic Competitiveness of Renewable Energy: Pathways to 100% Global Coverage yielded different results on each platform. EBSCO returned three keyword matches on pages 35, 58, and 90. MyiLibrary also returned results for pages 35 and 58, but not page 90. The publisher’s platform, Wiley Online Library, returned no results for this search term, but it is clearly part of the text according to the other two platforms. This example also illustrates the types
Table 7.
Example 7: *The Social Order of the Underworld: How Prison Gangs Govern the American Penal System*

<table>
<thead>
<tr>
<th>Platform</th>
<th>Oxford Scholarship Online</th>
<th>EBSCO</th>
<th>MyiLibrary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
<td>The Social Order of the Underworld</td>
<td>The Social Order of the Underworld</td>
<td>Social Order of the Underworld</td>
</tr>
<tr>
<td><strong>Subtitle</strong></td>
<td>How Prison Gangs Govern the American Penal System</td>
<td>How Prison Gangs Govern the American Penal System</td>
<td>How Prison Gangs Govern the American Penal System, The</td>
</tr>
<tr>
<td><strong>Author</strong></td>
<td>David Skarbek, author</td>
<td>Author: Skarbek, David</td>
<td>Written By: Skarbek, David</td>
</tr>
<tr>
<td><strong>Publisher</strong></td>
<td>not listed</td>
<td>Oxford: OUP Premium</td>
<td>Published By: Oxford University Press, USA</td>
</tr>
<tr>
<td><strong>Date</strong></td>
<td>Print publication date: 2014, Published to Oxford Scholarship Online: June 2014</td>
<td>Date: 2014</td>
<td>Published In: 2014</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Search results for</strong></th>
<th><strong>5 chapter-level results</strong></th>
<th><strong>20 keyword matches</strong></th>
<th><strong>17 results</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>“decentralized”</strong></td>
<td><strong>Social Order of the Underworld x decentralized</strong></td>
<td>Keyword Matches: 20</td>
<td>17</td>
</tr>
</tbody>
</table>

of errors that were observed. In the search results for EBSCO, extra spaces were added throughout words, for example “Th ese [sic]” on page 35 and “eff orts [sic]” on page 58. In the results for the MyiLibrary platform, on page 58, the letters *ff* were replaced with a question mark, and the word *similar* had an unnecessary hyphen, which was included because the word occurred across a line break in the text. These errors prevent a search engine from “reading” these words correctly; if an error occurs in a search term, then that search term will likely not show up in the search results.

A keyword search for the term “Treasury” in the book *Public-Private Partnerships and the Law: Regulation, Institutions and Community* provides an even more striking example
Table 8.

Example 8: *The Economic Competitiveness of Renewable Energy: Pathways to 100% Global Coverage*

<table>
<thead>
<tr>
<th>Platform</th>
<th>EBSCO (pdf format)</th>
<th>MyiLibrary</th>
<th>Wiley Online Library</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>The Economic Competitiveness of Renewable Energy: Pathways to 100% Global Coverage</td>
<td>Economic Competitiveness of Renewable Energy: The Pathways to 100% Global Coverage</td>
<td>The Economic Competitiveness of Renewable Energy: Pathways to 100% Global Coverage</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Authors: Hoffmann, Winfried</td>
<td>Written By: Hoffmann, Winfried</td>
<td>Author(s): Winfried Hoffmann</td>
</tr>
<tr>
<td>Publisher and date</td>
<td>Publication Information: Hoboken, New Jersey: John Wiley &amp; Sons, Inc. 2014</td>
<td>Published By: Wiley-Scrivener</td>
<td>Published Online: 9 MAY 2014 08:37PM EST Copyright © 2014 Publishing LLC. All rights reserved.</td>
</tr>
<tr>
<td>Search results for “commercialization”</td>
<td>3 keyword matches</td>
<td>2 results</td>
<td>0 results</td>
</tr>
</tbody>
</table>

Keyword Matches: 3
1. homogeneously are now at the beginning of commercialization. These light sources emit light not from Page 35
2. Unfortunately, these efforts did not lead to commercialization although the underlying ideas of why Page 38
3. 70,000 roof program" was oriented towards commercialization of PV and especially towards building Page 90

Page 35 ... Light tiles based on Organic Light Emitting Diodes (OLED’s) which emit light homogeneously are now at the beginning of commercialization. These light sources emit light not from a? lament or an arc, but homogeneously over an area. This is similar ...

Page 58 ... The Economic Competitiveness of Renewable Energy. Unfortunately, these efforts did not lead to commercialization although the underlying ideas of why more solar should be used were quite similar to today’s considerations. In...
of variable search results. Once again, EBSCO returned the most results (367), followed by 29 results on MyiLibrary, and 9 “items” on the publisher’s platform, Elgaronline. This example illustrates a nuance of the MyiLibrary platform, which is that at the time of testing, it appeared to limit the number of search results to 29. The platform may be capable of searching for a term within the full text, but users cannot see more than 29 results, which could cause them to miss an important reference.

The level of search results presented also affects the identification of and navigation to search terms. As Shelton, Cataldo, and Buhler say, “The more robust platforms not only search the full text, but they also display a list of where search term(s) can be found in the book and highlights the term(s) within the text.” This study found great variation in the treatment of search terms. Platforms highlight (in a color that varies by platform), boldface, underline, or italicize search terms within the results. Many platforms only highlight terms if the search term was found in the chapter title or preview snippet. Some platforms display a snippet of text that is relevant to or near the search term.

Moreover, the level of search results controls how users link to the terms that were searched. While chapter- and page-level results usually link to the relevant chapter or even the e-book title page, keyword-level results often link to a specific page. Arguably, chapter-level results are more concise and easier to understand, but they often require a user to read through an entire chapter to find a search term. On the other hand, a keyword search that identifies every instance of a search term can be overwhelming. E-book platforms should make it easy for users to locate search terms within the text, but further research is needed to determine whether users prefer keyword- or chapter-level results.

**Phrase Searching**

Another reason the number of search results can vary by platform relates to the platforms’ ability to distinguish between keywords and phrases. It is common for online search engines to recognize that terms within quotation marks should be searched as a phrase instead of individual keywords. This study found that most platforms recognize standard operators, such as using quotation marks to search for an exact phrase. This functionality, however, varies by platform and can significantly impact the results of a search.

A search for the keywords *conventional wisdom* in the example *Authoritarian Origins of Democratic Party Systems in Africa* yielded 3 results on the Cambridge University Press platform, 4 results on MyiLibrary, and 10 keyword matches on EBSCO. A phrase search for “conventional wisdom” using quotation marks yielded the same results on the Cambridge and MyiLibrary platforms but only 4 results on EBSCO, indicating that the use of quotation marks changed how EBSCO searched and retrieved terms.

**Boolean, Lemmatization, and Stop Words**

Variation in the number of search results from different platforms can further be explained by each platform’s use of Boolean operators and automatic stemming or lemmatization. Boolean operators are connecting words such as *and*, *or*, and *not* used to combine or exclude keywords in a search. These operators can be used to limit or expand a search by grouping together search terms or searching for related terms. This study found that most platforms automatically insert the Boolean operator *and* between multiple search...
Inconsistencies between Academic E-book Platforms

Table 9.
Example 9: Public-Private Partnerships and the Law: Regulation, Institutions and Community

<table>
<thead>
<tr>
<th>Platform</th>
<th>ElgarOnline</th>
<th>MyiLibrary</th>
<th>EBSCO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subtitle</td>
<td>Regulation, Institutions and Community</td>
<td>Regulation, Institutions and Community</td>
<td>Regulation, Institutions and Community</td>
</tr>
<tr>
<td>Author</td>
<td>Yseult Marique</td>
<td>Written By: Marique, Y.</td>
<td>Authors: Marique, Yseult</td>
</tr>
<tr>
<td>Publisher</td>
<td>not listed</td>
<td>Published By: Edward Elgar Publishing</td>
<td>Edward Elgar Publishing</td>
</tr>
<tr>
<td>Date</td>
<td>Published in print: 29 Aug 2014</td>
<td>Published In: 2014</td>
<td>2014</td>
</tr>
</tbody>
</table>

Search results 9 items
for “Treasury” You are looking at 1-9 of 9 items for: Public–Private Partnerships and the Law Treasury

terms. This means that if a user searches for multiple terms, both terms must be included in the search results.

There is, however, wide variation across platforms in the use of automatic stemming or lemmatization. Automatic stemming (autostemming) simply removes inflected endings from words in an effort to return them to their base form. Lemmatization removes not only inflected endings but also other variations from words to return them to their base form. Taylor & Francis e-books uses lemmatization, which the site defines as

the process of reducing the word used as a search term to its base, the “lemma,” by removing all inflectional endings, and by taking word categories and relatedness into account. This process is significantly more sophisticated than stemming, which just cuts off word endings in order to determine the word “stem.”

Brill, Elgaronline, Karger, and Wiley Online Library all indicated that their platforms use an algorithm to automatically stem search terms. Some search engines are programmed to ignore common terms, also called stop words—words that have little meaning, such as and, the, a, and an, which are deemed irrelevant for searching pur-
Table 10.
Example 10: Authoritarian Origins of Democratic Party Systems in Africa

<table>
<thead>
<tr>
<th></th>
<th>Cambridge University Press</th>
<th>MyiLibrary</th>
<th>EBSCO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Author</strong></td>
<td>By Rachel Beatty Riedl</td>
<td>Written By: Riedl, Rachel Beatty</td>
<td>Authors: Riedl, Rachel Beatty</td>
</tr>
<tr>
<td><strong>Publisher</strong></td>
<td>Publisher: Cambridge University Press</td>
<td>Published By: Cambridge University Press</td>
<td>Publication Information: Cambridge University Press. 2014</td>
</tr>
<tr>
<td><strong>Date</strong></td>
<td>Print Publication Year: 2014 Online</td>
<td>Published In: 2014</td>
<td>Publication Information: Cambridge University Press. 2014</td>
</tr>
<tr>
<td><strong>Search results for:</strong></td>
<td><strong>&quot;Kitschelt&quot;</strong> Your search returned 5 results.</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td><strong>Search results for:</strong></td>
<td><strong>institutionalization</strong> Your search returned 15 results.</td>
<td>29</td>
<td>183</td>
</tr>
<tr>
<td><strong>Search results for:</strong></td>
<td><strong>conventional wisdom</strong> Your search returned 3 results.</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td><strong>Search results for:</strong></td>
<td><strong>&quot;conventional wisdom&quot; using quotation marks to search as a phrase</strong> Your search returned 3 results.</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>
poses—unless they are searched as an exact phrase. Although many platforms ignore the same common terms, search results could vary depending on the list of stop words and how the platform is programmed to respond.

**Discussion**

The results of this study raise many new questions about the quality control processes for e-books (or lack thereof) and whether e-books satisfactorily meet the expectations of libraries and end users. Publishers and e-book providers have a responsibility to provide quality products. Publishers continue to support a rigorous quality control process for print books, and they need to ensure that e-books are created with the same level of quality control as their print equivalents, whether they are hosted on a publisher’s or an aggregator’s platform. Differences in search functionality, relevancy ranking algorithms, and platform architecture can transform and sometimes distort the original work.

E-books are ubiquitous, and libraries need to trust that the content and quality of an e-book are equivalent to print. Libraries routinely review and inspect print books to check for missing pages, tears in the binding, or other physical damage as part of their workflow for receiving materials. In addition, libraries compare the metadata in a MARC record to the physical item to ensure that the information matches and that the record contains sufficient data to facilitate discovery. Due to the high volume of e-books purchased by academic libraries, it is difficult for libraries to maintain this same level of quality assurance for e-books. However, in the digital world, where users expect information retrieval to be easy and quick, it is important to provide an error-free product.

It may not be necessary for every library to conduct systematic testing or to screen new e-books for errors, but it is important for libraries to report problems and demand better quality from e-book providers. The authors shared some of their findings and feedback with e-book vendors and encourage other librarians to do the same. Most e-book providers are receptive to feedback and will correct simple errors, but it will require greater consensus and demand from the library community for vendors to change some of their practices.
Recommendations for Future Studies

Libraries can investigate these issues on their own by examining the e-books in their collections. We included our rubric as a starting point, but because the needs of users, the platforms available, and the content offered can vary greatly across institutions, we suggest that libraries develop local rubrics based on the specific preferences of local users. Libraries can use their analysis as discussion points when communicating with vendors and when making collection development decisions.

Although we analyzed a random sample of e-books, the sample size was not large enough to make generalizable claims about the entire academic e-book ecosystem. Larger-scale studies are needed to understand the scope and severity of the errors that we discovered. Additionally, further work needs to be done to understand the causes of these disparities and to identify solutions.

This study was based on previous literature that found metadata and searching functionality to be important features on e-book platforms. However, it does not measure the impact of errors and platform variation on end-user experience. More work needs to be done to better understand what features are important to users and how differences in search results impact scholars who use e-books for their research. Task-based usability testing could help identify these preferences and provide direction for further analysis. Users may be willing to accept an imperfect e-book because it still offers the capability to search through the full text. No matter how perfectly it is formatted, a print book can never be searched for specific terms or phrases. But even if users are willing to overlook some errors, librarians can advocate for e-book technology that provides the best possible user experience.

Conclusion

Comparative analysis can be used to identify strengths, weaknesses, and nuances of different e-book platforms. This study explored some of the most important features and functions of academic e-book platforms. Each platform revealed strengths and weaknesses, as the authors expected. Unexpected was that the same content can be represented very differently depending on platform and that a search for the same keyword in the same book on different platforms can yield different results.

Librarians have always had to consider the availability and pricing of content when developing their collections, but they must now also take into account the different user experiences offered by these platforms. While it is not the authors' intent to discourage libraries from purchasing e-books on a specific platform, or to rank platforms according to these functions, this type of information can help librarians distinguish between platforms and develop their own preferences. When content is available on multiple
Inconsistencies between Academic E-book Platforms

Platforms, librarians should consider how metadata and search results function, and purchase content on platforms that best suit local user needs and preferences. Libraries can become more informed about the content they are purchasing by testing and comparing these features during trial periods or by asking e-book providers to supply answers to a rubric (see Appendix B).

E-books have changed the market. Libraries now hold the power to decide which e-book platforms suit the needs of their users. Or, they may decide that no platform meets their standards, as did the Ontario Council of University Libraries, who created their own e-book platform to host and preserve content purchased by the council. Libraries, e-book vendors, and publishers all have a role to play in improving the e-book user experience and a responsibility to provide quality resources.

Acknowledgments

The authors would like to thank all of the e-book vendors, publishers, and providers who granted us trial or temporary access to e-book platforms for the comparative analysis.

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Esta Tovstiadi is the electronic resources librarian at the University of Colorado Boulder; she may be reached by e-mail at: esta.tovstiadi@colorado.edu.
## Appendix A

### Sample Rubric Used to Compare the Same E-book on Different Platforms

<table>
<thead>
<tr>
<th>Time stamp/Review date</th>
<th>Reviewer</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Platform</th>
<th>Platform 1</th>
<th>Platform 2</th>
<th>Platform 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtitle</td>
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<td></td>
</tr>
<tr>
<td>Author</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other creators</td>
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<td></td>
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<tr>
<td>Date</td>
<td></td>
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</tr>
<tr>
<td>Number of pages</td>
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<td></td>
</tr>
<tr>
<td>Subjects</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Go to pages 15, 20, 35, and 50. Does the pagination on page match the pagination in navigation?

One-click downloading options

One-click printing options

Reference type

References checklist

Is there a native citation tool?

If there is a native citation tool, copy and paste citation in Modern Language Association (MLA) format.

Other interesting notes (color images, etc.)
Appendix B

Platform Evaluation Form

Platform name:

Landing page
Check elements available on e-book landing page.

❏ Cover image  ❏ Pub Date  ❏ Summary/Abstract  ❏ Publisher
❏ Title  ❏ ISBN(s)  ❏ Subjects
❏ Subtitle  ❏ DOI  ❏ TOC
❏ Author  ❏ Page #s  ❏ Series

Does the platform have a native reader?

○ Yes
○ No

Reader questions

E-book opens to page
What displays when the user “opens” the e-book?

Page turning options
How can the user navigate through the book? Select all that apply.

❏ Forward one page  ❏ Forward one section  ❏ To start
❏ Back one page  ❏ Back one section  ❏ To end
❏ Other: ________  ❏ Navigate to page

Linked table of contents
Can the user click on the TOC and navigate to a section?

○ Yes
○ No
○ Other: ________
Zoom

What is the default zoom percentage?
- < 100%
- 100% to 150%
- > 150%
- Other: 

Is zoom adjustable?
Either no, or list range in % if available

Viewing formats

Formats available for online viewing. Check all that apply.

- pdf
- HTML
- EPUB
- Text
- Other:

Downloading formats

Formats available for download. Check all that apply.

- pdf (unrestricted)
- pdf (ADE) [Adobe Digital Editions]
- HTML
- EPUB
- Text
- None
- Other:

Note-taking/annotations

Select any options that are available.

- highlighting
- annotating
- bookmarking
- Other:

Citation management tools

Does the platform allow exporting to standard citation management tools?
- Yes
- No
- Other:

Native citation tools

Does the platform have a native citation generator?
- Yes
- No
- Other:
Permanent linking options
Check all that apply

- None
- Title
- Chapter
- Page
- Other:

Search options
Check all that apply

- Site search
- Search within search results
- Search within title
- Other:

Search results display
Describe how search terms are indicated in the results.

- Highlighted
- Bolded
- Underlined
- Italicized
- Not indicated
- Other:

Search results facets
Check all that apply

- Publication year
- Publisher
- Author
- Subjects
- Full-text availability
- Series
- Content type
- Other:

Search results sorting functionality
Check all that apply

- Relevance
- Title
- Publication date
- Author
- Other:

Level of search results
Check all that apply

- Keyword
- Chapter
- Other:
Notes


8. Lenares, “ebook Aggregators.”

9. Ferguson, “Commercial Publisher eBook Platforms.”


11. Ibid., 16.


17. Ibid., 14, 62–71.

27. Ibid., 802.
34. ebrary, “2008 Global Student E-Book Survey.”
35. JISC, “JISC National E-books Observatory Project.”
40. Ibid., 16.