FUTURES THINKING FOR ACADEMIC LIBRARIANS:
Scenarios for the Future of the Book

PREPARED BY:
Dr. David J. Staley
Director, Harvey Goldberg Center for Excellence in Teaching in History
Ohio State University

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About the Author

David J. Staley, Ph.D. is the Director of the Harvey Goldberg Center for Excellence in Teaching in History and an adjunct associate professor in the department of history at the Ohio State University, where he is a member of the History of the Book working group of the Literacy Studies Initiative. LiteracyStudies@OSU was established in 2005 and seeks to foster "an interdisciplinary cross-campus conversation and investigation into the nature of literacy, bringing historical, contextual, comparative, and critical perspectives and modes of understanding together to stimulate new institutional and intellectual relationships." He is Principal of the DStaley Group, a strategic futuring consulting firm, and is the co-author of the ACRL publication *Futures Thinking for Academic Librarians: Higher Education in 2025.* He also serves as National Dean for General Education at Harrison College.

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Executive Summary

As e-books and the emerging digital library occupy today's headlines, there appears to be a tacit consensus emerging from the discourse among academics, journalists, and librarians about the future of the book. That vision of the future, as portrayed in the trade literature and popular press, consigns this centuries-old technology to obsolescence, as if it were merely another information format.

This report explores alternative scenarios, where the technology of the printed book does not disappear or become extinct, but occupies a different position in a technological ecology characterized by the proliferation of e-books and digital libraries. The printed book has for centuries been the chief cognitive object of the library. The future status of that object should be of interest to all librarians, especially as they plan for the future; therefore, this report intentionally favors the continued existence of the printed book as a viable technology.

The goal of this report is to draw attention to our assumptions about the future of the book, assumptions that are grounded in our current e-book zeitgeist. Strategic decisions are often based on underlying—and often unexamined—assumptions about the larger environment in which those decisions will be carried out. The future often turns out not as expected because we do not entertain alternative possibilities and base strategic thinking and actions on one specific belief about the future. Much of our current thinking about the future of libraries appears based on the assumption that printed books will give way to e-books and the digital transmission of textual objects.

This research report presents four scenarios so that academic and research librarians may expand their thinking about the future to include a richer set of environmental conditions:

1. *Consensus:* a scenario where e-books overwhelm and make obsolete the printed book
2. *Nostalgic:* a scenario where printed books are still highly in demand and e-books have proven to be a fad
3. *Privatization of the book:* a scenario where printed books are vestigial to an ecology dominated by e-books
4. *Printed books thrive:* a scenario where e-books and printed books exist in balance and have equal importance

Scenario thinking exercises can help to develop situational awareness. Mica R. Endsley defines situational awareness as "the perception of elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future."[1] Futuring is an exercise in expanding situational awareness by developing greater comprehension of the elements that make up the larger environment of libraries—indeed, viewing the library as a complex dynamic system affected not only by operational elements such

as collections and user services but also by political, economic, social, and technological elements of the environment within which the library is situated.

Beyond comprehending these elements and understanding the complex ways in which they interact, academic and research librarians must also be able to envision the future status of that system. We assume that the complex system that is the library will itself undergo change, and librarians must be able to anticipate those changes. Thus, using the language of situational awareness, scenarios should be viewed as one effort to describe a future state of the system in which decisions will need to be carried out. As academic and research librarians undertake strategic planning for their organizations, awareness of the larger environment and understanding the potential for changes in that environment will prove critical to improved decision making.

After reviewing each of the scenarios, those involved in strategic decision making should then consider their own plans—and their budgets— with respect to these questions:

- Which state of the system do you believe best describes the environment in which your library's strategic thinking and planning will unfold?
- Which of these models of the future currently guides your strategic thinking and actions regarding printed books?

Introduction

As all librarians are aware, information formats occasionally become extinct. For example, the eight-track tape is a format that has largely disappeared from the information landscape, except as a legacy object that needs to be curated and stored, or eventually migrated into a currently accessible format. At the same time that formats become redundant, other technologies may appear dormant, but do not go extinct. Consider radio: an important medium of communication at the beginning of the twentieth century, radio seemed on the verge of becoming an obsolete medium in the wake of the rise of television. Yet radio remains a vibrant technology, its popularity surging in recent years. Audiophiles remind us that vinyl records have made a comeback in the last few years, even as iPods have made CDs seem redundant.

Viewed historically, technologies very rarely become extinct, as with the case of the candle. Despite the development of the incandescent lightbulb, which rendered candles redundant as a source of illumination, the candle as a technology has not disappeared. Indeed, it appears that we produce even more candles today, although in the developed world they are used for atmosphere rather than everyday illumination. Even the horse-drawn carriage has not been made obsolete by the development of the automobile, as rides around Central Park attest. While there are some exceptions to this rule, historically technologies very rarely descend into obsolescence, but—like the candle—are repurposed. Technologies that are surpassed by other technologies might appear vestigial in the new technological environment, but nevertheless remain a functional, even

vibrant, part of that new environment.

Given its long and resilient history, the printed book is unlikely to disappear as a technology of thought and communication. This report presents alternative scenarios so that academic and research librarians may explore strategies under different environmental conditions. Considering the questions at the end of the report will enable librarians to develop more robust and effective strategies for the inherently uncertain future.

Scenarios and Strategic Planning

Scenarios are not predictions about the future. A prediction is a particular kind of statement about the future. It assumes that the future is already in existence someplace and that we can discern that pre-existing future state through some scientific method. A scenario, in contrast, is a narrative that assumes a not-as-yet formed future. It assumes that, rather than one certain future, there are many potentially plausible futures that could happen, many potential directions the system might travel.

Strategic decisions are often based on underlying—and often unexamined—assumptions about the larger environment in which those decisions will be carried out. "The future is a range of possible outcomes, not a specific set of circumstances that will inevitably come to pass," writes the business strategist Michael Raynor. "Most strategies are built on specific beliefs about the future. Unfortunately, the future is deeply unpredictable." "Worse," Raynor concludes, "the requirements of breakthrough [strategic] success demand implementing strategy in ways that make it impossible to adapt should the future not turn out as expected."[2] The future often turns out not as expected because we blind ourselves to competing possibilities, having based our strategy on a prevailing view of the future. Raynor and other business strategists recommend the use of multiple scenarios—descriptions of possible future operational environments, built from different underlying assumptions—in order to make our strategic decisions more adaptable to change. Much of our current thinking about the future of libraries appears based on the belief that printed books will give way to e-books and the digital transmission of textual objects. This assumption is already influencing the strategic choices some library directors are making today.[3]

Considering alternative scenarios means testing our strategies under various environmental conditions. Rather than seeking an optimal strategy under one assumed future, scenario planning seeks robust, flexible strategies that are effective under multiple scenarios. Exploring alternatives to a consensus scenario is important for academic and research librarians who must develop plans and strategies. By considering a future where physical books are repurposed, librarians can begin to assess the place of the physical book in their collections, not simply as legacies of the past but as an ongoing collections challenge. Importantly, librarians may also begin to think about the expectations and demands of future users of both e-books and printed books. Who are the future readers? Will they still expect to use printed books, or will they expect text to be

delivered in digital form? The goal of this report is to draw attention to these underlying assumptions about the future of the book, assumptions that are grounded in our current e-book moment.

Creating the Scenarios

This report constructs four narratives of the future direction of the system, four of a potentially limitless number of future states of the system. With scenarios, we are attempting to learn from the future,[4] make better informed decisions in the present, and fill the void in our uncertainty about the yet-to-occur future. A scenario is better understood as a model of the future, a model being an imperfect representation of an original that nevertheless allows us to explore or understand something about the original. The four scenarios presented here model different states of the future. What we call "the future" is best understood not as a single prediction of some future event or occurrence, but rather as a description of the state of a system at some future point. In effect, we take the world as it exists at the moment and imagine how that world would look were we able to run the film forward in time.

While the **first scenario** is based on the tacit emerging consensus that printed books will be made largely redundant by e-books, and the **second scenario** (nostalgic one) is well established among bibliophiles, **scenarios three and four** describe possible future states where physical books remain viable, visible technologies.

When we say the future is about change, what we typically mean is that a system will be altered in some structural way. In the spring of 2010, the members of the History of the Book working group worked to define twelve factors that could shape the future of the book. These drivers included

- the *quantity* of printed books that will be produced
- the *cost* to produce printed books
- the *role* of printed books in education
- the demographics of *demand* for printed books[5]

For each driver, three to five possible outcomes or directions were articulated to fully describe the state of that driver. For example, the cost of printed books might be high or low, printed books might be used in higher education or have given way to digital editions, and so on. These drivers contributed to the creation of all four scenarios by defining the system described in each story. *In order to derive a scenario distinct from the consensus scenario (1) and nostalgic scenario (2), the group intentionally defined outcomes which purposefully favored the continued existence of the printed book to produce two additional scenarios where the book exists as a viable technology.*

To create the **third scenario** (privatization of the book), we used a cross-impact matrix. A cross-impact matrix is typically constructed by identifying three hypothetical directions that any given driver might take. These directions are usually defined broadly as "there will more in the future, the future will look much like the present, there will be less in the future," or something similar. For this exercise, more granular outcomes were chosen, each based on a driver moving in one of several directions. For example, the "quantity of printed books" driver had three outcomes:

1. There will be **more** printed books published each year than what is produced in 2010.
2. The number of printed books produced will be roughly **the same** as in 2010.
3. There will be **fewer** printed books published than in 2010.

The "printed book in education" driver had three outcomes:

1. The printed book **will remain** an important educational technology.
2. The printed textbook **will have disappeared** (replaced by digital learning materials), but novels, trade paperbacks, and other forms of long-form prose print books will still be widely used.
3. Most printed books **will have disappeared** from educational settings.

In August 2011 we surveyed a scientifically representative panel of 353 academic library directors representing all Carnegie classifications to determine which states to focus on in creating the third scenario. We sought to determine what they believed to be the most likely outcomes for each driver, based on their expert judgment about the *economics* of the book (setting aside their *preferences* about the future of the book).

We used the survey results as inputs for the cross-impact analysis. Using the Interactive Future Simulations (IFS) software tool, we determined the percentage of responses for each outcome under each descriptor. These are referred to as *a priori* probability, *a priori* meaning they have yet to be placed in the cross-impact matrix.

Cross-impact analysis is based upon the premise that events and activities do not happen in a vacuum and other events and the surrounding environment can significantly influence the probability of certain events to occur. Cross-impact analysis involves running each of the descriptors against each other. So, for example, the outcome "books are used for pleasure reading, in personal collections" is assumed to negatively impact the probability of the "books are obtained from libraries, few people own their own books" outcome. Each outcome affects every other outcome: it may be highly positively affected (+3 score), neutrally affected (0 score), or highly negatively affected (–3 score) with results in between.

Running the cross-impact analysis for each of these outcomes yields a new set of probabilities known as *a posteriori* probabilities. The highest a posteriori results under each descriptor formed

the basis for the "privatization of the book" scenario below.[6] The survey responses served as inputs to the cross-impact simulation (described more fully in Appendix A). Because this third scenario ("privatization of the book") looked in many ways similar to the consensus scenario, we added a disruptive event to the cross-impact matrix and reran the simulation, producing a **fourth scenario**, "printed books thrive." Using this process allows one to imagine the potential state of the printed book system in 2020 and to suggest four directions or paths that the future might follow.

The Scenarios

This report presents the following four scenarios written in the present tense, as if the reader were there living in that moment:

1. *Consensus:* a scenario where e-books overwhelm and make obsolete the printed book
2. *Nostalgic:* a scenario where printed books are still highly in demand and e-books have proven to be a fad
3. *Privatization of the book:* a scenario where printed books are vestigial to an ecology dominated by e-books
4. *Printed books thrive:* a scenario where e-books and printed books exist in balance and have equal importance

All of these scenarios focus on the printed book and use the term *e-book* to encompass evolutions in e-book technology without explicitly describing those changes. For example, while these scenarios do not explore the disaggregation of content in an electronic environment, readers may wish to create scenarios of their own that explore new forms of digital content.

As you read these four scenarios, consider the following questions: Which future will come to pass? Will the library of the future be devoid of printed books? Or will it continue to collect and house printed books? Which scenario informs your library's strategic planning? Read on for a glimpse of possible futures.

Scenario 1: Consensus

By 2020, the last of the remaining lawsuits have long been settled, and Google's digital library is now a reality. Libraries acquire fewer and fewer printed books. What books remain are now legacy objects, and once they are digitized and made fully available through the Google library, they are either sold off to collectors, given away to the needy, or pulped to make way for the bookless library. While scholars still profess a preference for physical books, the economic and technical reality makes this preference untenable. Some publishers still make printed books available in limited numbers for scholars and intellectuals in elite academic settings, but the price of these books is quite steep. Many university presses have gone under or have switched to all-digital formats, unable to sustain a viable model of print publication.

A tipping point was reached in the early part of the 2010s, when e-book sales by major book retailers overtook their printed book sales. As the reading public aged, younger readers expressed a preference for digital texts—when they read at all—meaning that the overall demand for physical books dropped precipitously. The spiraling cost of textbooks in the early part of the last decade also meant that new forms of delivery were required; for both economic and political reasons, textbook publishers found that they had to compete on cost and found that they could lower cost, and thus prices, by switching to digital delivery formats. The bulky $200 chemistry textbook has given way to $0.99-per-chapter digital learning objects.

The digitized novel has long supplanted the cheap paperback version, especially as the cost of digital readers dropped significantly in comparison to the first generation of e-readers such as Kindles and Nooks. The success of Al Gore's book Our Choice: A Plan to Solve the Climate Crisis, *designed for the iPad, meant that popular authors such as James Patterson and Thomas Friedman made the decision to concentrate on writing for the particular affordances of the e-book. Barnes & Noble and Amazon remain the leading publishers/distributors of e-books, although Google and Apple have eroded their market share. Because popular authors put their collective influence behind e-publishing, the sales of their printed books dropped such that publishers produced only electronic versions of these popular authors.*

Tablet readers have greater functionality than the versions that existed a decade ago, allowing readers to easily annotate and write in the margins of their texts as if they were using pencils on a paper book. Once that functionality was incorporated into e-books, one of the last remaining obstacles to widespread preference for e-books over printed books was removed. The home personal library has been supplanted by the cloud library, meaning all of one's e-books reside on a Google or Apple or Barnes & Noble server. Indeed, personal library storage services have emerged as a new business model for publishers. What printed books do remain are confined to personal libraries or stored in ever-decreasing library depositories. Readers in their seventies still prefer printed books, but the number of such readers and the choices available to them have dwindled. The last printed book in the Western world is scheduled to be published in about five years.

Underlying Assumptions

In this scenario, the future belongs to e-books and the digitized word, which will render physical books obsolete. This has been the consensus scenario of the future asserted by many observers since 2000—and perhaps even further back to Marshall McLuhan—and it is the scenario that appears to be underlying many library directors' strategic decisions.[7] It is this scenario that undergirds recent strategic initiatives like the bookless library at the University of Texas at San Antonio's Applied Engineering and Technology Library[8] or the plans to eliminate textbooks by requiring students to download their course materials to mobile devices. It is this scenario that

influences the business decisions made by the large chain stores to emphasize e-books over traditional printed copies of books. (Amazon claims to now sell more e-books than printed books; Barnes & Noble seem to be throwing its lot in with its Nook reader.)

The end of the physical book has been predicted for many years, but has been taken up with particular urgency since 2000. The consensus scenario invites comparisons to the music industry, where the physical CD (which itself supplanted the cassette tape and vinyl records) has been largely displaced by the MP3 player that stores digitized music. The key assumption of the consensus scenario is that the publishing industry will begin to look like the record industry: that publishers will resist the inevitable technological evolution of the e-book with lawsuits and other maneuvers to slow the evolution to dematerialized e-books (as we have seen with the many lawsuits aimed at Google and its efforts to digitize whole libraries of books). As with music, users will stop reading physical books as soon as they are able to easily and cheaply download digital books to their mobile devices. This scenario also invites comparisons to the experiences of the newspaper industry—a comparable print industry—where physical newspapers are cascading toward obsolescence and publishers scramble to create a new business model based on digital rather than physical delivery. In August 2011, Ewan Morrison asserted, "within 25 years the digital revolution will bring about the end of paper books."[9] In his 2008 book, Jeff Gomez was but one of many authors who declared that "Print Is Dead."[10]

The scenario that foresees the end of the physical book has been told for many years, that e-books and digitized books will render the physical book obsolete. In 1995, Nicholas Negroponte led a chorus of commentators who predicted that all information formats, the book included, would soon be digitized. "The change from [physical] atoms to [digital] bits is irrevocable and unstoppable," he wrote in *Being Digital*.[11] William J. Mitchell predicted in the mid-1990s that the printed word would be wholly digitized, rendering unnecessary the centralized physical production of books. Mitchell argued then that, once all books, magazines, and other printed materials were so digitized, they could be accessed from any location. One would not need to travel to a bookstore or a newsstand or a library to access books. One would not need a centralized publisher to create physical copies and bear the cost of physically distributing them. Mitchell referred to those who still favored a physical version as "addicted to the look and feel of tree flakes encased in dead cow."[12] Those addicts could still print physical books at their own workstations, if they wished. But in Mitchell's scenario from the mid-1990s, most readers would be looking at books on screens or downloaded on information storage devices.

At around the same time, Jay David Bolter predicted the inevitable arrival of the digital book and the end of the physical book from historical grounds. The printed word has historically been housed in a variety of media, noted Bolter, and he traced the history of this information storage from clay tablets and papyrus scrolls through manuscripts and the printed book. Digitized words in the computer, he argued, were nothing more than the next stage in a larger historical

evolution; the end of the physical book is to be placed within a larger historical narrative as the end of the scroll or the end of the manuscript.[13] The writer and bibliophile Sven Birkerts lamented in his 1994 *Gutenberg Elegies* the passing of the printed book, noting "the displacement of the page by the screen is not yet total—but the large scale tendency has to be obvious to anyone who looks."[14]

We should note, however, that fifteen years after the predictions of the mid-1990s we continue to await the demise of the physical book.

Scenario 2: Nostalgic

By 2020, the e-book fad has ended. While the number of readers has declined, those readers speak with one voice in their preference for the printed book, which has enjoyed a resurgence. Even though electronic text is still a feature of life, most consumers found that in many reading situations electronic books were just not a satisfactory substitute for the physical book. Readers in their 30s and 40s never developed a taste for e-books; as students, they never really adopted e-books, and this preference for the affordances of printed books stayed with them into adulthood.

Printed books remain relatively inexpensive to obtain and maintain, in comparison to e-books. Because of format changes and upgrades, readers found that they were forced to purchase a new e-book every few years, and this expense was simply too great for many. Publishers found that they could control the consumption of books in electronic form (making it difficult to share books with friends or lend to library patrons for periods of no more than a few days or weeks), and so readers have made a choice for physical books, as they felt they actually owned them (readers of e-books never felt they ever owned them, only rented them). While there are fewer readers, those who continue to read are not generally technophiles, or at least feel that the reading experience should not be mediated by the screen. The Bible on Kindle *never really caught on, and readers of all ages found that their reading experience was best served by the centuries-old print format.*

Print-on-demand technologies are now a common feature of libraries, bookstores, and other retail outlets, making the publication of books easier and cheaper. Indeed, there are more books published now because it is so easy to do. Not only do big-name authors publish books; many people now self-publish their own books, usually in batches of about twenty to thirty, to share with friends or as mementos. Most self-published books do not have ISBNs. Since self-publishing is so much technically easier and less costly than it was a decade ago, there are a larger number of serious fiction and nonfiction titles than in the previous decade, as well as an explosion of poetry anthologies, novels, and crackpot conspiracy theories in print runs of a couple of dozen to upwards of 10,000. Authors continue to find that a physical book is taken more seriously than an electronic version. This is true of scholars, who continue to value the printed book as the best way to ensure quality scholarship; publishing a printed book is still the best way to achieve

tenure. Books have become the new business card; to be taken seriously, clients want to be given a copy of the book you've written. The world seems awash in books, ironically made possible by digital technologies. Libraries now scramble for physical space to house these books, as acquisition strategies a decade earlier assumed fewer books, an assumption now proven to be erroneous.

Underlying Assumptions

Those "addicted to the look and feel of tree flakes encased in dead cow" present a competing nostalgic vision of the future. If *nostalgia* refers to a kind of sentimental or wistful longing for what was, then a nostalgic vision of the future of the book is one that, despite technological and economic forces to the contrary, maintains printed books will never be replaced by the e-book because books are comfortable, emotionally satisfying objects, easy to take to the beach, resting familiarly in the hand. E-books will never proliferate because they lack the feel of printed books, and besides, "we have always read books," so this view goes. "Books are a cheap, simple, durable, transferable, and persistent technology. Most e-books I have seen so far meet none of these criteria," says one respondent to the Library Research Service's (LRS) recent *60-Second Survey, The Future of the Book.*[15] "Who wants to read their kid a bedtime story using a Kindle? And what e-reader can simulate the experience of looking at a large hardcover art book with high-quality reproductions? I just don't see how e-readers supplant the paper book in areas such as this," reported another respondent who gives eloquent voice to this nostalgic view of the future of the printed book.[16]

It is not only wistful librarians who hold this view: surveys suggest that today's college students—those who have been quick to adapt to electronic delivery of music—have been only lukewarm to e-textbooks and to e-book readers such as Kindles and Nooks, at least for the moment. Many of these students still print off electronic textual materials, saying that reading on the screen for too long is stressful on the eyes. Many say that they cannot easily annotate their e-books. A new publication service allows students to purchase textbooks in one of three ways: an inexpensive digital version, a more expensive paperback version, and a high-end hardback version. Despite the lower cost of the digital version, the company reports that 80 percent of students purchase a printed version of the textbooks.[17] A recent survey by the University of California Libraries found that a majority of students preferred printed text books to e-textbooks—in part because the computer presented too many distractions.[18] Will this preference for physical books continue as these students mature? Even if they demand fewer books—because of an indifference to reading, whatever the format—will these users still prefer physical books to electronic devices?[19]

To conclude this scenario, it might be useful to contrast the bookless library at the University of Texas San Antonio with the recently constructed Joe and Rika Mansueto Library at the University of Chicago, which has also been described as "the library of the future."[20] On its

surface, it appears to be a bookless library, its reading room dominated by rows of screens. But the bookless reading room sits above a massive high-tech underground storage facility with a capacity for 3.5 million books. The $81 million library would seem to be as firm a statement about the persistence of books as the Texas library is a statement about their obsolescence.

Scenario 3: Privatization of the Book

Neil Taggert retired two years ago, and now spends most of his time volunteering at his church, gardening, traveling with his wife, and reading books. Like the many other lovers of printed books, Neil maintains his own personal library. The cost of books to consumers like Neil has risen in both real and nominal terms such that only the relatively well-off purchase these luxury items. Indeed, having an extensive personal library of books is much like having an extensive wine collection in that it is a mark of a certain social status and distinction, a form of connoisseurship that is only engaged in by relatively few. He understands this is a quixotic hobby, as fewer and fewer printed books are published each year. Because demand for printed books declines, they are more expensive to produce and distribute. Random House-HarperCollins and Harvard-Oxford University Press still publish printed books, but there are a smaller number of these larger companies, most of which have merged with competitors over the last ten years. Harvard-Oxford continues to publish works of scholarship, some of which Neil reads, although most are intended for scholars, most of whom maintain these in their own personal collections.

Libraries still acquire these printed books, but in much smaller quantities and in a radically dispersed distribution pattern as libraries specialize in acquiring a specific area of research. Neil's local university specializes in the collection of printed books in linguistics; this collection is shared with other libraries through an interlibrary loan system, but most scholars must travel to visit these specialized collections in order to read them. There are only a small handful of libraries that maintain large collections of all scholarly books produced. (In addition to the Library of Congress, Harvard, Michigan, and Stanford maintain regional centers.) Many libraries acquire new books with the intention to display and maintain them like fine art, with librarians serving as curators of these pieces. However, such a curatorial mission is secondary to the library's main role as collector and distributor of digital texts. Only a handful of Luddite professors still require printed books in their classes, textbooks having long given way to the digitized reader.

Neil used to frequent the big box Barnes & Noble store downtown, but that store closed six years ago. Neil still purchases books from B&N, however, and his purchases arrive in the mail three to five business days after he browsed and purchased them online. Neil's local public library caters to his needs, maintaining a small circulating collection of printed books. But the vast majority of reading material in libraries is in digital form. After a working lifetime spent in front of screens, for Neil books represent an escape from that world. The page has become a favorite leisure-time

escape in the same way that audiophiles rediscovered vinyl records. Lovers of printed books like Neil prize them as much for their analog look and feel in a world dominated by electronic bits. Neil laments his choices today; only a few authors write in the medium of printed books, as most popular authors now write for digital media.

Underlying Assumptions

While the consensus and nostalgic scenarios are well established in the public imagination and higher education trade press, this scenario was developed especially for this report to provide a countervailing view that the book is still a viable and visible technology. This scenario is based on input from academic library directors that was converted into narrative form. (For more detail see preceding section and Appendix B.) The outcomes selected by the library directors for each driver formed the underlying assumptions of the scenario (see appendices C and D). So, for example, the survey revealed that library directors judged that older generations, those sixty years of age and older, will form the bulk of the demand for books. Therefore, we developed a narrative that centered on a retiree and his personal library (another one of the key outcomes suggested that most books would be contained in private libraries). Library directors felt that fewer books will be published by 2020, and so our fictional character "understands this is a quixotic hobby, as fewer and fewer printed books are published each year." Other key assumptions of the scenario are that most books will disappear from education, that there will be few traditional publishers, and that books will be distributed largely through online stores rather than big box retailers.

In running the survey data through the cross-impact simulation, we discovered that the highest probability scenario (the privatization of the book) closely resembled the consensus scenario. The appendices of this report contain a description of the IFS method (Appendix A), the survey questions (Appendix B), and the survey data (Appendices C, D, and E).

Scenario 4: Printed Books Thrive

While e-books and other electronic means to deliver text now dominate the market, just as many printed books are published in 2020 as there were a decade earlier. This is because the cost to produce a book has not risen over the last decade, influenced largely by a new, disruptive process for producing and distributing printed books: print-on-demand technologies are now a common feature of libraries, bookstores, and other retail outlets, making the publication of books easier and cheaper. Retail prices for printed books have held steady over the last decade, meaning they remain affordable even in relation to the costs for e-books. In educational settings, the printed textbook has largely disappeared, having long been replaced by digital learning materials.

However, novels, trade paperbacks, and other forms of long-form prose printed books are still widely used in classes. Outside of educational settings, printed books continue to be read for

pleasure, with many consumers maintaining personal collections. While printed books have lost market share to e-books in the developed world (North America, Europe), printed books are still in demand and highly valued in significant parts of the developing world. Indeed, even while print-on-demand has decentralized the location of publishing, the center of print publishing has shifted from New York and London to Sao Paulo and Mumbai. Traditional publishers and distributors of printed books have either consolidated or have disappeared entirely, squeezed either by the new competition from e-publishers or unable to adapt to the distributed model of print-on-demand.

New entrants to the publishing world have emerged, led by Google, which now dominates traditional print publishing. Additionally, print-on-demand has made it possible for anyone to be their own author and publisher, adding to the stock of printed books available. Those printed books not produced onsite at retail locations are sold chiefly through online distribution, further eroding the number, size, and importance of big box distributors.

Futurists had predicted that printed books would become equipped with digital smart paper or with e-ink, allowing for dynamic and networked information to be embedded inside traditional printed books. However, these never really caught on with consumers, who continue to prefer the simplicity of traditional paper-based books (although much of the paper used in books is made from post-consumer recycled paper). Because they remain relatively inexpensive to purchase, most printed books are still owned by individuals and kept in their own personal libraries, rather than rented or borrowed from libraries. While many libraries have slashed their acquisitions budgets, most still spend resources and staff time on the collection and maintenance of printed books.

Underlying Assumptions

The three preceding scenarios are built upon demand-side assumptions: either users will no longer demand printed books, or user demand for printed books will remain high. In creating this fourth scenario, we asked "What if there was a significant change in the supply side of the equation?" (see Appendix E). What would need to happen to create a scenario where books continue to thrive in an environment dominated by e-books? Scenario 4 was based upon the same outcomes derived for scenario 3. In the case of scenario 4, we added another driver (a 13th driver) as a disruptor to the system: the widespread adoption of print-on-demand technologies for book production. Running the IFS simulation with this disruptive driver produced the variation that is scenario 4. Based on this scenario, the continued existence of the printed book in an ecology dominated by e-books may depend upon a new production process and business model that makes it easier and cheaper to publish and sell printed books.[21]

Using This Report

Traditionally, the way we approach setting strategies in our organizations is based on (often

unspoken) beliefs that planning is rational, the future is predictable, and change follows a logical path over time. Although we all have experience showing this is not the case, it remains a challenge to keep our eyes on the distant horizon in order to develop more flexible, outward-facing strategies. Again, this report is a tool to help support librarians in developing greater awareness of the larger environment affecting libraries. It is intended to aid librarians in taking a step back and reflecting critically on the operating assumptions they use on a daily basis. To return to Raynor and strategic planning: the success or failure of a strategic plan is dependent upon the environment in which such plans will be carried out, and that future environment is deeply uncertain.

After considering each of the potential environments described above in the four scenarios, librarians should then consider their own strategic decision making—and their own budgets—with respect to the following questions:

1. Which state of the system do you judge best describes the environment in which your library's strategic planning will play out?
2. Who will your future users of printed books be? Scholars and researchers at your library? Members of the reading public, users outside the university community?
3. Which one of these models of the future currently guides your strategic planning regarding printed books? As you consider question 2, ask yourself:
    a. Does your strategic plan assume the future state of the system will be dominated by digitized books? Does your strategic plan therefore include a smaller budget for printed collections and the assumption that future users will demand and expect digitized access to e-books?
    b. Is your strategic plan based on the assumption that printed books will be vestigial?
    c. Will your library still acquire printed books, even as publishers produce fewer of them?
    d. Does your plan assume that e-books are a fad and the printed book will remain a robust information technology?
    e. Will the library be expected to play the role of curator, treating printed books as valued objects to be preserved, stored and displayed, and cared for like fine wine, but not widely circulated?
    f. What kinds of titles will you buy in print, which electronic?
    g. Will you look at developing cooperative buying efforts with other institutions?
    h. If you view your budget as a manifestation of your strategies, where are you allocating financial resources?
    i. Where are your greatest human resources concentrated?
    j. Are these choices about budget, staffing, and strategy able to flex to different possible futures for printed books?
    k. Where are the blind spots in your organization?
    l. What can you do now to mitigate possible weaknesses?

Conclusion

Scenario thinking exercises hone leaders' strategic situational awareness. Situational awareness is usually applied to people engaged in high-risk tasks in dynamic environments, such as air traffic controllers, fighter pilots, or military commanders. But the idea of situational awareness applies equally well to anyone who must lead a complex organization. In this formulation, futuring is an exercise in situational awareness, meaning comprehending the elements that make up the larger environment of libraries (indeed, viewing the library as a complex dynamic system) with elements that range widely. These include not only operational elements such as collections and user services but also elements of the political, economic, social, technological, and academic environment within which the library is situated.

Beyond comprehending those elements and understanding the complex ways in which they interact, the library leader must also be able to project the future status of that system. An embedded assumption here is that the complex system that is the library will itself undergo change, and an effective leader must be able to anticipate those changes. Thus, using the language of situational awareness, scenarios should be viewed as one effort to describe a "future state of the system" in which decisions will need to be carried out. As library leaders think about strategic planning for their organizations, awareness of the larger environment and understanding potential changes in that environment prove critical in improving decision making. The printed book has been the chief cognitive object of the library for centuries. Changes in user demand for books would therefore have dramatic implications for the library.[22]

Notes

1. Mica R. Endsley, "Toward a Theory of Situation Awareness in Dynamic Systems," *Human Factors* 37, no. 1 (1995): 36.
2. Michael Raynor, *The Strategy Paradox: Why Committing to Success Leads to Failure (And What to Do about It)* (New York: Doubleday, 2007), 7, 1.
3. See, for example, this report on the situation at the University of California at San Diego: Erica Perez, "UCSD Library Cuts Mean 150,000 Books Must Go," California Watch, August 26, 2011, http://californiawatch.org/dailyreport/ucsd-library-cuts-mean-150000-books-must-go-12293.
4. See Bob Johansen, *Get There Early: Sensing the Future to Compete in the Present* (San Francisco: Berrett-Koehler Publishers, 2007), especially ch. 6.
5. The twelve descriptors were quantity of print books, cost to produce print books, cost to purchase print books, the print book in education, relationship with other media, value of physical books to consumers, demographics of demand for print books, publishing, retail distribution, physical form of print books, creators and writers of print books, and ownership patterns. The choice of these descriptors derived in part from an exercise

conducted by the author with the History of the Book working group at the Ohio State University.

6. See appendices C and D for data results.
7. See Steve Kolowich, "P.D.A in the Library," *Inside Higher Ed*, October 28, 2011, www.insidehighered.com/news/2011/10/28/e-book-acquisition-based-use-and-demand-could-save-libraries-thousands: "The Advisory Board report . . . predicts a shift in the way academic libraries provide book content to their patrons that mirrors a broader trend in digital media. . . . Academic libraries will jettison 'large collections of physical books in open stacks with low circulation,' the report says, in favor of licensing agreements with e-book vendors that will enable libraries to purchase only those books that are highest in demand, while paying short-term access fees for books that students use a little and nothing at all for books they do not use."
8. See Steve Kolowich, "A Truly Bookless Library," *Inside Higher Ed*, September 17, 2010, www.insidehighered.com/news/2010/09/17/libraries.
9. Ewan Morrison "Are Books Dead, and Can Authors Survive?" *The Guardian* website, August 22, 2011, www.guardian.co.uk/books/2011/aug/22/are-books-dead-ewan-morrison.
10. Jeff Gomez, *Print Is Dead: Books in Our Digital Age* (New York: Macmillan, 2008), esp. 175–193.
11. Nicholas Negroponte, *Being Digital* (New York: Vintage Books, 1996), 4.
12. William J. Mitchell, *City of Bits: Space, Place, and the Infobahn* (Cambridge, MA: MIT Press, 1995), 56.
13. Jay David Bolter, *Writing Space: The Computer, Hypertext, and the History of Writing*, 1st edition (Mahwah, NJ: Lawrence Erlbaum Associates, 1991), 2. Bolter wrote in 1991, "The printed book, therefore, seems destined to move to the margin of our literate culture." In the second edition of the book, published in 2001 and substantially rewritten, that quote does not appear.
14. Sven Birkerts, *The Gutenberg Elegies: The Fate of Reading in an Electronic Age* (London: Faber and Faber, 1994), 3.
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16. Jamie Helgren, "The Future of the Book, Part 2: Beyond the Bathtub, Personal Preference among Many Factors Influencing Format Choice," *Fast Facts: Recent Statistics from the Library Research Service* ED3/110.10, no. 286, August 18, 2010, www.lrs.org/documents/fastfacts/286_Future_of_the_Book_Format_Factors.pdf.
17. See Alex Campbell, "New Digital Tools Let Professors Tailor Their Own Textbooks for Under $20," *The Chronicle of Higher Education* website, October 9, 2011, http://chronicle.com/article/New-Digital-Tools-Let/129309.
18. Jonathan D. Lauer, "Baseball Bats and the Wired Library: A Cautionary Tale," *The*

Chronicle of Higher Education website, April 29, 2012, http://chronicle.com/article/Baseball-Batsthe-Wired/131669.

19. See "Different Reading Devices, Different Modes of Reading?" news release, Johannes Gutenberg-Universität Mainz, October 20, 2011, www.uni-mainz.de/eng/14685.php. Research conducted by the Research Unit Media Convergence of Johannes Gutenberg University Mainz found that there are no neurological differences between reading text on screens and reading a print book. By measuring eye movements and tracking electrophysiological brain activity by means of an electroencephalogram (EEG), the researchers concluded, "This study provides us with a scientific basis for dispelling the widespread misconception that reading from a screen has negative effects." But significantly, the researchers also learned that when test subjects were asked their subjective preferences for print books or e-books, nearly all expressed a preference for print books.
20. Peter Murray, "Robots, Not Humans, Retrieve Your Books at $81 Million 'Library of the Future,'" Singularity Hub, May 24, 2011, http://singularityhub.com/2011/05/24/robots-not-humans-retrieve-your-books-at-81-million-library-of-the-future-video.
21. See Jason Epstein, "Reading: The Digital Future," afterword to *Book Business: Publishing, Past Present and Future* (New York: W. W. Norton, 2002), 177–192. Here, Epstein describes what he terms "point-of-sale bookmaking machines."
22. For their comments and suggestions in preparing this report, the author thanks Kara Malenfant, Shawn Martin, Lee van Orsdel, Scott Seaman, Eileen Theodore-Shusta, and Alan S. Inouye. For both his critical reading and for providing access to the IFS cross-impact and simulation tool, my thanks also to Stephen Millett.

Appendix A: Interactive Future Simulations (IFS)[1]

Cross-impact analysis is an analytic methodology employed by futurists to generate scenarios about the future state of a system. A key assumption of cross-impact analysis is that events or trends do not occur in isolation from other events or trends; cross-impact analysis thus accounts for the manner in which events influence other events. The Interactive Future Simulations (IFS) application identifies a number of drivers, or states of the system, each with three to five potential outcomes for each driver. Probabilities are assigned by expert judgment to each of the outcomes under each driver. The IFS method includes an algorithm that assesses the impact each outcome will have on other outcomes and how that will alter the probability. The final result of the IFS simulation is a single outcome for each driver; these outcomes form the basis of a narrative scenario.

Interactive Future Simulations (IFS) is an analytical method of generating scenarios using Bayesian probabilities[2] and cross-impact analysis as a model for considered expectations and for simulations of logically consistent possible conditions in the future. The method employs a software program that originated at the Battelle Memorial Institute in the 1980s.

The IFS method relies heavily upon expert judgments that are made explicitly in a rigorous manner. Because the inputs are recorded electronically, values may be changed, simulated, and updated whenever necessary.

The IFS method requires the following inputs:

1. a topic question.
2. descriptors (trends, issues, and factors) as elements of the model.
3. alternative states, or outcomes, for each descriptor. Each alternative state is assigned an a priori probability of occurrence by the target date in the future.
4. cross-impact values arrayed in a cross-impact matrix.

Scenario analysis begins with a topic question that provides focus for everything that follows. A typical topic question consists of the following parts:

- a focus topic or descriptor
- a way to measure or define the topic descriptor
- a geographical scope
- a time frame, or target date in the future.

The identification of descriptors (trends, issues, factors, variables, or elements), their alternative outcomes (states), and their a priori probabilities of occurrence by a target date in the future are determined by expert judgment subject to peer review and modification with the availability of new information. Expert judgment is the product of knowledge about past trends and present

conditions and expectations for the future based on intuition of potential changes, both great and small.

A typical set of descriptors ranges from 8 to 18. The IFS software program will accommodate as many as 24 descriptors, but that is usually too large a set to interpret. There is also the risk of overspecifying the model by putting in too many descriptors that are redundant.

Below is an example of a descriptor with alternative states and probabilities:

1. U.S. economic growth
    a. high range (annual average >5%) 0.20
    b. middle range (annual average 2.5%–5%) 0.45
    c. low range (annual average <2.5%) 0.35

The a priori probabilities should be based on trends and reasoned expectations for the future in the judgment of the expert.

The IFS computational approach is based on Bayesian probabilities and statistical calculations. The initial, judgment-based probabilities are a priori in the sense that they are intuitive approximations used as a starting point for calculating a posteriori probabilities resulting from new information.

The a priori probabilities placed on alternative states for each descriptor will sum to 1.0. Each a priori probability reflects a degree of uncertainty about a future outcome. New information will adjust the a priori probabilities for each descriptor so that the result will be that one alternative future will have an a posteriori probability of 1.0 (it will occur) and the alternatives states for each descriptor will have a posteriori probabilities of 0 (will not occur). Occurring and nonoccurring descriptor sets are organized into scenarios. Alternative scenarios happen when at least one occurring descriptor state differs from another set (scenario).

One form of new information in the IFS computational approach takes the form of cross-impact values in the cross-impact matrix. The matrix contains all the descriptors and their alternative states on each axis. The procedure is to go down each column from left to right and to determine how the occurrence of each descriptor state (as though its probability were set to 1.0) would likely change the a priori probabilities of all other descriptor states.

(New information may also be included in the method by changing a priori probabilities, changing cross-impact values, and introducing disruptive events, which are new descriptors with a hypothetical single state with an a priori probability of 1.0 with impacts, but not impacted by, other descriptors in the matrix).

Cross-impact values are index values that reflect the judgment of how one descriptor impacts another. A positive impact means that if one descriptor state were to occur ("new information"), then it is expected to increase the a priori probabilities that other descriptor states will also occur. A zero means that there is no direct cause-and-effect relationship or there is no net impact. A negative impact means that the impact of one makes the probabilities of other states less likely to occur in the future.

Cross-impact values are based on a judgment of a direct (primary, not derivative) cause-and-effect impact. The impact values range from +3 to −3.

Once the IFS algorithm calculations set an a priori probability to 1.0 or 0, it is set. The algorithm continues to recalculate all a priori probabilities according to the formula until one state of each descriptor reaches 1.0.

Notes

1. The content of this appendix is adapted, with permission, from Stephen Millett, http://futuringassociates.com/text/IFS_Theory_DEC 2008.pdf Copyright 2008 Futuring Associates LLC (All rights reserved).
2. Bayesian probability is a subjective probability based upon expert judgment, and such probabilities are refined in the face of new data or evidence. Thus, we used the results of the survey—the expert judgments of the library directors—as the means of establishing the baseline probabilities. Bayesian probabilities are "a measure of the plausibility of an event given incomplete knowledge." See Charles Annis, "Bayesian Thinking," Charles Annis, P.E., Statistical Engineering website, last modified August 10, 2010, www.statisticalengineering.com/bayes_thinking.htm.

Appendix B: Survey Sent to Panel

Below is the text of a survey sent to 335 academic library directors representing a statistically valid sample of all Carnegie classifications in August 2011. Sixty percent of the panel responded. Responses served as inputs to the IFS simulation, with responses determining the a priori probabilities.

Topic question: What will be the role of printed books in an age of digital/e-books by 2020?
ACRL is developing a futures research project on the future of printed books. The scenarios we are developing assumes that, by 2020, printed books will remain viable, vibrant technologies. Although in this scenario e-books and the digitalization have advanced to the point where they are the dominant (although not exclusive) textual technology, physical books remain robust technologies, and not simply as legacy objects. We are constructing a scenario in which the centuries-old printed book competes with digital books in this larger media ecology.

Given this assumption, we would like your response to the follow 12 questions. Under each heading, select the one outcome that you believe is *most likely* to occur given the assumptions we are making. (Note: the choice here is not your preferred or most desired outcome, but rather the future state you believe, based on your expert judgment, to be the most likely outcome given the circumstances we have identified.) The survey should take no longer than 10 minutes.

By 2020, it is most likely that:

Quantity of printed books (select one most likely)

1.) There will be more printed books published each year than what is produced in 2010
2.) The number of printed books produced will be roughly the same as in 2010
3.) There will be fewer printed books published than in 2010

Cost to produce printed books (select one most likely)

1.) It will be more expensive to produce a printed book than in 2010
2.) The costs to produce a printed book will be about what they are in 2010
3.) It will be much cheaper to produce a printed book

Cost to purchase printed books (select one most likely)

1.) It will be more expensive to buy a printed book than in 2010
2.) Printed books cost about the same as in 2010 (adjusted for inflation)
3.) Printed books are much less expensive

The printed book in education (select one most likely)

1.) The printed book will remain an important educational technology
2.) The printed textbook will have disappeared (replaced by digital learning materials), however novels, trade paperbacks and other forms of long-form prose printed books will still be widely used
3.) Most printed books will have disappeared from educational settings

Relationship with other media (select one most likely)

1.) Printed books will outsell e-books and other digital formats
2.) Printed books continue to sell, but will have lost out to e-books and other digital formats
3.) Printed books will be "packaged" with other media (in the same way Disney sells movies in a packaged DVD/Blu-ray/digital download, publishers will sell printed books along with a digital download)
4.) Readers will access digital books electronically, and then print out their own paper copies to read, making their own "DIY printed book"

Value of physical books to consumers (select one most likely)

1.) Printed books will be for pleasure reading, and maintained in personal collections
2.) Printed books will be produced only for a limited number of scholars and intellectuals in elite academic settings
3.) Physical books will be used largely for archiving and storing of information that exists in digital form
4.) Printed books will be personal artifacts, and will be self-published for special occasions such as weddings or other commemorative events
5.) Printed books will be like museum pieces, of interest to a few collectors and connoisseurs, as fine art is valued today

Demographics of demand for printed books (select one most likely)

1.) The largest segment of readers of printed books will be a few avid collectors or hobbyists
2.) Older generations—those in their 60s and 70s—will be the chief readers of printed books
3.) The most robust demand for books will be in the developing world, less so in the developed world, where most readers use e-books
4.) Millennials, now in their 30s and 40s, and who failed to embrace e-books in their youth, will have retained their preference for printed books over "text on the screen" and will be the largest buyers of printed books

Publishing (select one most likely)

1.) Traditional publishers—although fewer in number and many having merged and consolidated—will continue to dominate
2.) University libraries will take over this role from traditional publishers, many having merged with university presses
3.) Authors (especially big-name authors) will have become their own publishers, especially through print-on-demand technologies, and will have supplanted the traditional publishers
4.) There will be new entrants who dominate, especially Google which has parlayed its

control over digital content with a move into the publication of printed books

5.) New publication centers will emerge in the developing world—shifting the center of print book production from New York and Berlin to Brazil and Indonesia—places where printed books are still in demand

Retail distribution (select one most likely)

1.) Big box bookstores like Barnes & Noble will continue to dominate
2.) Printed books will be sold chiefly through online distribution (the Amazon model)
3.) Printed books will be sold in traditionally non-book retail establishments like Walmart or Target, which have supplanted the big-box book stores
4.) Printed books will be sold and distributed chiefly through libraries, whose coffee bars have been replaced by retail printed book outlets
5.) Print-on-demand devices will be located in bookstores and libraries or in individual homes

Physical form of printed books (select one most likely)

1.) Printed books will retain their current form, looking much the same as they do now
2.) Printed books will include smart paper or e-ink, allowing dynamic, networked information to be included
3.) The "artist book" will be the main physical form of printed books: printed books are prized for their quirky, individual styles. Experiments with font design and textures emphasize the physicality of printed books, qualities that digital e-books cannot match

Creators and writers of printed books (select one most likely)

1.) Only a handful of bestselling authors write printed books
2.) Academics and intellectuals are the only ones who will write printed books
3.) Almost everyone will write their own printed books, as book production is within easy reach (because of print-on-demand services)
4.) Fewer and fewer people will write printed books, preferring instead to write in other digital media

Ownership patterns (select one most likely)

1.) Most printed books will be owned by individuals, and kept in their own personal libraries
2.) Few people will own their own printed books, but will rather rent them for a short while from retail outlets (Netflix model for printed books)
3.) Most people obtain printed books from libraries; few people own their own printed books

Appendix C: Cross-Impact Values for Each Descriptor

Occurrence	1 Quantity of Printed			2 Cost to Produce			3 Cost to Purchase			4 Printed Book in			5 Relationship with				6 Value to Consum					7 Demographics of			
	0.16 A. more than in	0.22 B. about the sam	0.62 C. fewer than in	0.54 A. more expensi	0.30 B. about the sam	0.16 C. much cheaper	0.53 A. more expensi	0.39 B. about the sam	0.08 C. much less exp	0.33 A. books remain	0.54 B. textbooks dis	0.13 C. most books	0.02 A. outsell digital	0.67 B. continue to se	0.10 C. packaged with	0.21 D. readers access	0.67 A. pleasure read	0.15 B. for scholars in	0.13 C. archiving and	0.04 D. personal artif	0.01 E. museum piece	0.08 A. few avid coll	0.27 B. older generat	0.23 C. in developing	0.42 D. millennials
1. Quantity of Printed																									
0.16 A. more than in	*	*	*	–1	0	1	–3	–1	3	1	0	–1	–1	0	0	1	–1	0	0	0	1	–2	0	0	2
0.22 B. about the sam	*	*	*	0	1	0	–1	1	1	0	0	0	0	1	1	0	0	1	0	0	0	–1	1	0	1
0.62 C. fewer than in	*	*	*	1	0	–1	3	1	–3	–1	0	1	1	0	0	–1	1	0	0	0	–1	2	0	0	–2
2. Cost to Produce																									
0.54 A. more expensi	–1	0	1	*	*	*	0	0	0	0	0	0	1	0	0	–1	1	0	0	0	–1	1	0	0	–1
0.30 B. about the sam	0	1	0	*	*	*	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1	0	0
0.16 C. much cheaper	1	0	–1	*	*	*	0	0	0	0	0	0	–1	0	0	1	–1	0	0	0	1	–1	0	0	1
3. Cost to Purchase																									
0.53 A. more expensi	–1	0	1	3	1	–3	*	*	*	2	0	–2	–1	0	0	1	2	0	0	0	–2	3	1	–1	–3
0.39 B. about the sam	0	1	0	1	1	–1	*	*	*	1	1	–1	0	1	0	0	1	1	0	0	–1	1	1	–1	–1
0.08 C. much less exp	1	0	–1	–3	–1	3	*	*	*	–2	0	2	1	0	0	–1	–2	0	1	0	2	–3	–1	1	3
4. Printed Book in																									
0.33 A. books remain	0	0	0	0	0	0	–2	0	2	*	*	*	0	0	0	0	–2	0	0	0	2	–2	0	0	2
0.54 B. textbooks dis	0	0	0	0	0	0	–1	1	1	*	*	*	0	0	0	0	–1	1	0	0	1	–1	1	0	1
0.13 C. most books	0	0	0	0	0	0	2	0	–2	*	*	*	0	0	0	0	2	0	1	0	–2	2	0	0	–2
5. Relationship with																									
0.02 A. outsell digital	0	0	0	–1	0	1	–1	0	1	2	0	–2	*	*	*	*	–2	0	0	0	2	–1	0	0	1
0.67 B. continue to se	0	0	0	0	1	0	0	1	0	1	0	–1	*	*	*	*	–1	1	0	0	1	0	1	0	0
0.10 C. packaged with	0	0	0	0	1	0	0	1	0	–1	0	1	*	*	*	*	1	0	1	0	–1	0	0	1	0
0.21 D. readers access	0	0	0	1	0	–1	1	0	–1	–2	0	2	*	*	*	*	2	0	0	0	–2	1	0	0	–1
6. Value to Consum																									
0.67 A. pleasure read	0	0	0	1	0	–1	–1	0	1	1	0	–1	–1	0	0	1	*	*	*	*	*	–3	–1	1	3
0.15 B. for scholars in	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	*	*	*	*	*	–1	–1	1	1
0.13 C. archiving and	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	*	*	*	*	*	0	0	0	0
0.04 D. personal artif	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	*	*	*	*	*	1	1	–1	–1
0.01 E. museum piece	0	0	0	–1	0	1	1	0	–1	–1	0	1	1	0	0	–1	*	*	*	*	*	3	1	–1	–3
7. Demographics of																									
0.08 A. few avid coll	–1	0	1	0	0	0	3	1	–3	1	0	–1	1	0	0	–1	3	1	0	–1	–3	*	*	*	*
0.27 B. older generat	0	1	0	0	0	0	1	1	–1	0	1	0	0	1	0	0	1	1	0	–1	–1	*	*	*	*
0.23 C. in developing	0	1	0	0	0	0	–1	–1	1	0	1	0	0	0	1	0	–1	–1	0	1	1	*	*	*	*
0.42 D. millennials	1	0	–1	0	0	0	–3	–1	3	–1	0	1	–1	0	0	1	–3	–1	0	1	3	*	*	*	*
8. Publishing																									
0.44 A. traditional pu	–1	0	1	2	0	–2	2	0	–2	–2	0	2	–1	0	0	1	1	0	0	0	–1	1	0	0	–1
0.04 B. university libr	0	–1	0	1	1	–1	1	1	–1	–1	1	1	0	1	0	0	0	1	0	0	0	0	1	0	0
0.13 C. authors beco	0	1	0	0	1	0	0	1	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	1	0
0.31 D. new entrants	0	1	0	–1	1	1	–1	1	1	1	1	–1	0	0	0	0	0	0	0	1	0	0	0	1	0
0.08 E. new publicati	1	0	–1	–2	0	2	–2	0	2	2	0	–2	1	0	0	–1	–1	0	0	0	1	–1	0	0	1
9. Retail Distribution																									
0.08 A. big box book	0	0	0	–1	0	1	–2	0	2	0	0	0	2	0	0	–2	1	0	0	0	–1	–1	0	0	1
0.64 B. online distrib	0	0	0	0	1	0	–1	1	1	0	0	0	1	1	0	–1	0	1	0	0	0	0	1	0	0
0.05 C. traditionally n	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0
0.01 D. sold and distr	0	0	0	0	1	0	1	1	–1	0	0	0	–1	0	1	1	0	0	0	1	0	0	0	0	0
0.22 E. print-on-dema	0	0	0	1	0	–1	2	0	–2	0	0	0	–2	0	0	2	–1	0	0	0	1	1	0	0	–1
10. Physical Form of																									
0.62 A. current form	0	0	0	0	0	0	–1	0	1	–1	0	1	1	0	0	–1	1	0	0	0	–1	–1	0	0	1
0.21 B. smart paper a	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0	1	0	0
0.17 C. “artist book”	0	0	0	0	0	0	1	0	–1	1	0	–1	–1	0	0	1	–1	0	0	0	1	1	0	0	–1
11. Creators and Wri																									
0.07 A. handful of be	0	0	0	0	0	0	0	0	0	1	0	–1	1	0	0	–1	1	0	0	0	–1	0	0	0	0
0.05 B. academics an	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0
0.30 C. almost everyo	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0
0.58 D. fewer and few	0	0	0	0	0	0	0	0	0	–1	0	1	–1	0	0	1	–1	0	0	0	1	0	0	0	0
12. Ownership Patter																									
0.43 A. owned by pri	0	0	0	1	0	–1	1	0	–1	1	0	–1	1	0	0	–1	3	1	0	–1	–3	3	1	–1	–3
0.15 B. rented from re	0	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	1	0	–1	–1	1	1	–1	–1
0.42 C. obtained from	0	0	0	–1	0	1	–1	0	1	–1	0	1	–1	0	0	1	–3	–1	0	1	3	–3	–1	1	3
Sum of Values	0	5	0	1	14	–1	–2	15	2	1	10	–1	0	10	8	0	1	9	7	1	–1	0	9	2	0
Non-Zero Entries	8	7	8	17	16	17	26	21	26	23	10	23	22	10	8	22	29	15	7	9	29	26	17	14	26

	8					9					10			11				12				
	Publishing					Retail Distribution					Physical Form of			Creators and Wri				Ownership Pattern				
Occurrence	0.44 A. traditional pu	0.04 B. university libr	0.13 C. authorsbeco	0.31 D. new entrants	0.08 E. new publicati	0.08 A. big box book	0.64 B. online distrib	0.05 C. traditionally n	0.01 D. sold and distr	0.22 E. printon0dema	0.62 A. current form	0.21 B. smart paper a	0.17 C. "artist book"	0.07 A. handful of be	0.05 B. academics an	0.30 C. almost everyo	0.58 D. fewer and few	0.43 A. owned by pri	0.15 B. rented from re	0.42 C. obtained from	Sum of Values	Non-Zero Entries
1. Quantity of Printed																						
0.16 A. more than in	–1	0	0	0	1	–1	0	0	0	1	–1	0	1	–1	0	0	1	–1	0	1	–1	23
0.22 B. about the sam	0	1	0	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	1	0	11	15
0.62 C. fewer than in	1	0	0	0	–1	1	0	0	0	–1	1	0	–1	1	0	0	–1	1	0	–1	1	23
2. Cost to Produce																						
0.54 A. more expensi	1	0	0	0	–1	0	0	0	0	0	2	0	–2	1	0	0	–1	0	0	0	0	14
0.30 B. about the sam	0	1	0	0	0	0	0	0	0	0	1	1	–1	0	1	0	0	0	0	0	7	9
0.16 C. much cheaper	–1	0	0	0	1	0	0	0	0	0	–2	0	2	–1	0	0	1	0	0	0	0	14
3. Cost to Purchase																						
0.53 A. more expensi	2	0	0	0	–2	–1	0	0	0	1	2	0	–2	0	0	0	0	1	0	–1	1	23
0.39 B. about the sam	1	1	0	0	–1	0	1	1	0	0	1	1	–1	0	0	0	0	0	1	0	10	24
0.08 C. much less exp	–2	0	1	0	2	1	0	0	0	–1	–2	0	2	0	0	0	0	–1	0	1	1	25
4. Printed Book in																						
0.33 A. books remain	0	0	0	0	0	0	0	0	0	0	–1	0	1	–1	0	0	1	–1	0	1	0	12
0.54 B. textbooks dis	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	6	12
0.13 C. most books	0	0	0	0	0	0	0	0	0	0	1	0	–1	1	0	0	–1	1	0	–1	1	13
5. Relationship with																						
0.02 A. outsell digital	1	0	0	0	–1	0	0	0	0	0	1	0	–1	1	0	0	–1	1	0	–1	0	18
0.67 B. continue to se	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	8	12
0.10 C. packaged with	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	7	11
0.21 D. readers access	–1	0	0	0	1	0	0	0	0	0	–1	0	1	–1	0	0	1	–1	0	1	0	18
6. Value to Consum																						
0.67 A. pleasure read	0	0	0	0	0	0	0	0	0	0	1	0	–1	2	0	0	–2	2	0	–2	0	18
0.15 B. for scholars in	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	–1	1	1	–1	6	14
0.13 C. archiving and	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	0	6	6
0.04 D. personal artif	0	0	0	0	0	0	0	0	0	0	0	1	0	–1	0	0	1	–1	1	1	5	13
0.01 E. museum piece	0	0	0	0	0	0	0	0	0	0	–1	0	1	–2	0	0	2	–2	0	2	0	18
7. Demographics of																						
0.08 A. few avid coll	0	0	0	0	0	–1	0	0	0	1	1	0	–1	1	0	0	–1	3	1	–3	2	22
0.27 B. older generat	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	1	1	–1	8	16
0.23 C. in developing	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	–1	–1	1	4	16
0.42 D. millennials	0	0	0	0	0	1	0	0	0	–1	–1	0	1	–1	0	0	1	–3	–1	3	–2	22
8. Publishing																						
0.44 A. traditional pu	*	*	*	*	*	1	0	0	0	–1	1	0	–1	1	0	0	–1	1	0	–1	0	22
0.04 B. university libr	*	*	*	*	*	0	1	0	0	0	0	1	0	0	1	0	0	0	1	0	9	17
0.13 C. authors beco	*	*	*	*	*	0	0	1	0	0	0	1	0	0	0	1	0	0	1	0	11	11
0.31 D. new entrants	*	*	*	*	*	0	0	0	1	0	0	1	0	0	0	1	0	0	1	0	10	16
0.08 E. new publicati	*	*	*	*	*	–1	0	0	0	1	–1	0	1	–1	0	0	1	–1	0	1	0	22
9. Retail Distribution																						
0.08 A. big box book	2	0	0	0	–2	*	*	*	*	*	1	0	–1	1	0	0	–1	–1	0	1	0	18
0.64 B. online distrib	1	1	0	0	–1	*	*	*	*	*	0	1	0	0	1	0	0	0	1	0	9	15
0.05 C. traditionally n	0	0	1	0	0	*	*	*	*	*	0	1	0	0	0	1	0	0	1	0	9	9
0.01 D. sold and distr	–1	0	0	1	1	*	*	*	*	*	0	1	0	0	0	1	0	0	1	0	8	14
0.22 E. print-on-dema	–2	0	0	0	2	*	*	*	*	*	–1	0	1	–1	0	0	1	1	0	–1	0	18
10. Physical Form of																						
0.62 A. current form	1	0	0	0	–1	1	0	0	0	–1	*	*	*	2	0	0	–2	1	0	–1	0	18
0.21 B. smart paper a	0	1	0	0	0	0	1	0	0	0	*	*	*	1	1	0	–1	0	1	0	9	11
0.17 C. "artist book"	–1	0	0	1	1	–1	0	1	0	1	*	*	*	–2	0	0	2	–1	0	1	2	20
11. Creators and Wri																						
0.07 A. handful of be	2	0	0	0	–2	2	0	0	0	–2	1	0	–1	*	*	*	*	1	0	–1	0	14
0.05 B. academics an	1	1	0	0	–1	1	1	0	0	–1	0	1	0	*	*	*	*	0	1	0	7	11
0.30 C. almost everyo	–1	0	0	0	1	–1	0	1	0	1	0	1	0	*	*	*	*	0	1	0	6	10
0.58 D. fewer and few	–2	0	0	0	2	–2	0	0	1	2	–1	0	1	*	*	*	*	–1	0	1	1	15
12. Ownership Pattern																						
0.43 A. owned by pri	0	0	0	0	0	–1	0	0	0	1	1	0	–1	2	0	0	–2	*	*	*	0	22
0.15 B. rented from re	0	0	0	0	0	0	1	0	0	0	0	1	0	1	1	0	–1	*	*	*	7	17
0.42 C. obtained from	0	0	0	0	0	1	0	1	0	–1	–1	0	1	–2	0	0	2	*	*	*	1	23
Sum of Values	1	7	3	2	–1	0	6	7	2	0	2	19	–2	2	10	7	–2	0	17	0		
Non-Zero Entries	19	7	3	2	19	16	6	7	2	16	24	19	24	24	10	7	24	24	21	24		

Appendix D: IFS Simulation: Physical Books 2020

Multiple Scenario Results (Original Algorithm)

Scenario Type	1	2	3	4	5	6	7	8	9	10	11	A Priori	Total	A Posteriori
Frequency	**23**	**10**	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**Prob**	**Occurs**	**Prob**
1. Quantity of Printed Books														
A. more published than in 2010	0	0	0	0	0	0	0	0	0	0	0	0.16	6	0.07
B. about the same published as in 2010	0	0	0	0	0	0	0	0	0	1	0	0.22	6	0.07
C. fewer published than in 2010	1	1	1	1	1	1	1	1	1	0	1	0.62	78	0.87
2. Cost to Produce Printed Books														
A. more expensive	0	1	1	1	1	1	1	1	1	0	1	0.54	52	0.58
B. about the same	1	0	0	0	0	0	0	0	0	1	0	0.30	35	0.39
C. much cheaper	0	0	0	0	0	0	0	0	0	0	0	0.16	3	0.03
3. Cost to Purchase Printed Books														
A. more expensive	0	1	0	1	1	1	1	1	1	0	1	0.53	45	0.50
B. about the same (adjusted for inflation)	1	0	1	0	0	0	0	0	0	1	0	0.39	42	0.47
C. much less expensive	0	0	0	0	0	0	0	0	0	0	0	0.08	3	0.03
4. Printed Book in Education														
A. printed book will remain an important educational technology	0	0	0	0	0	0	0	0	0	0	0	0.33	6	0.07
B. textbooks will have disappeared, but other printed books widely used	0	0	0	0	0	0	0	0	0	0	1	0.54	11	0.12
C. most printed books will have disappeared from education	1	1	1	1	1	1	1	1	1	1	0	0.13	73	0.81
5. Relationship with Other Media														
A. printed books outsell e-books and digital formats	0	0	0	0	0	0	0	0	0	0	0	0.02	1	0.01

B. printed books sell but lose out to e-books and digital formats	1	0	1	1	0	0	0	0	0	1	1	0.67	57	0.63
C. printed books "packaged" with other media	0	0	0	0	0	0	0	0	0	0	0	0.10	1	0.01
D. readers access digital books electronically, print out their own copies	0	1	0	0	1	1	1	1	1	0	0	0.21	31	0.34
6. Value of Books to Consumers														
A. pleasure reading, personal collections	0	1	1	1	1	1	1	1	1	1	1	0.67	55	0.61
B. produced for scholars in academic settings	1	0	0	0	0	0	0	0	0	0	0	0.15	31	0.34
C. archiving and storing information also in digital form	0	0	0	0	0	0	0	0	0	0	0	0.13	2	0.02
D. personal artifacts, self-published for special occasions	0	0	0	0	0	0	0	0	0	0	0	0.04	1	0.01
E. museum pieces, of interest to collectors and connoisseurs	0	0	0	0	0	0	0	0	0	0	0	0.01	1	0.01
7. Demographics of Demand														
A. a few avid collectors and hobbyists	0	0	0	1	1	1	1	1	1	0	1	0.08	24	0.27
B. older generations, in their 60s and 70s	1	1	1	0	0	0	0	0	0	1	0	0.27	57	0.63
C. in the developing world	0	0	0	0	0	0	0	0	0	0	0	0.23	2	0.02
D. millennials, now in their 30s and 40s	0	0	0	0	0	0	0	0	0	0	0	0.42	7	0.08
8. Publishing														
A. traditional publishers, fewer in number	1	1	1	1	1	0	1	1	1	1	1	0.44	76	0.84
B. university libraries take over from traditional publishers	0	0	0	0	0	0	0	0	0	0	0	0.04	1	0.01

C. authors become their own publishers, especially through print on demand	0	0	0	0	0	1	0	0	0	0	0	0.13	2	0.02
D. new entrants dominate, especially Google	0	0	0	0	0	0	0	0	0	0	0	0.31	8	0.09
E. new publication centers in the developing world	0	0	0	0	0	0	0	0	0	0	0	0.08	3	0.03
9. Retail Distribution														
A. big box bookstores like B&N	0	0	0	0	0	0	0	0	0	0	0	0.08	1	0.01
B. online distribution (Amazon model)	1	1	1	1	1	0	1	1	0	1	1	0.64	78	0.87
C. traditionally non-book retailers like Walmart or Target	0	0	0	0	0	0	0	0	0	0	0	0.05	1	0.01
D. sold and distributed through libraries	0	0	0	0	0	0	0	0	0	0	0	0.01	1	0.01
E. print-on-demand devices in bookstores, libraries, or homes	0	0	0	0	0	1	0	0	1	0	0	0.22	9	0.10
10. Physical Form of Printed Books														
A. printed books retain their current form	1	1	1	1	1	1	1	1	1	1	1	0.62	75	0.83
B. printed boooks include smart paper or e-ink, allowing dynamic info	0	0	0	0	0	0	0	0	0	0	0	0.21	9	0.10
C. “artist book” main physical form of printed books	0	0	0	0	0	0	0	0	0	0	0	0.17	6	0.07
11. Creators and Writers														
A. handful of bestselling authors	0	0	0	0	0	0	0	1	0	0	0	0.07	5	0.06
B. academics and intellectuals	0	0	0	0	0	0	0	0	0	0	0	0.05	1	0.01
C. almost everyone, using print-on-demand services	0	0	1	1	1	0	0	0	1	1	1	0.30	26	0.29
D. fewer and fewer people, preferring digital media	1	1	0	0	0	1	1	0	0	0	0	0.58	58	0.64

12. Ownership Patterns														
A. owned by individuals in their personal libraries	1	1	1	1	1	1	1	1	1	1	1	0.43	76	0.84
B. few people will own, but rather rent from retail outlets	0	0	0	0	0	0	0	0	0	0	0	0.15	4	0.04
C. most people obtain books from libraries; few own their own	0	0	0	0	0	0	0	0	0	0	0	0.42	10	0.11

Appendix E: IFS Simulation: Physical Books 2020 with Disruptive Event

Multiple Scenario Results (Original Algorithm)

Scenario Type	1	2	3	4	5	6	7	8	9	10	11	12	A Priori	Total	A Posteriori
Frequency	**17**	**5**	**4**	**4**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**Prob**	**Occurs**	**Prob**
1. Quantity of Printed Books															
A. more published than in 2010	0	0	0	0	0	0	0	0	0	1	0	0	0.16	10	0.11
B. about the same published as in 2010	1	1	0	1	0	0	0	1	1	0	0	0	0.22	55	0.60
C. fewer published than in 2010	0	0	1	0	1	1	1	0	0	0	1	1	0.62	26	0.29
2. Cost to Produce Printed Books															
A. more expensive	0	0	1	0	1	1	1	0	0	0	0	1	0.54	28	0.31
B. about the same	1	1	0	1	0	0	0	1	1	0	1	0	0.30	49	0.54
C. much cheaper	0	0	0	0	0	0	0	0	0	1	0	0	0.16	14	0.15
3. Cost to Purchase Printed Books															
A. more expensive	1	0	1	0	1	1	1	0	0	0	1	1	0.53	44	0.48
B. about the same (adjusted for inflation)	0	1	0	1	0	0	0	1	1	1	0	0	0.39	45	0.49
C. much less expensive	0	0	0	0	0	0	0	0	0	0	0	0	0.08	2	0.02
4. Printed Book in Education															
A. printed book remains an important educational technology	0	0	0	0	0	0	0	0	0	1	0	0	0.33	6	0.07
B. textbooks have disappeared, but other printed books widely used	1	1	0	1	0	1	1	1	1	0	1	1	0.54	73	0.80
C. most printed books have disappeared from education	0	0	1	0	1	0	0	0	0	0	0	0	0.13	12	0.13
5. Relationship with Other Media															
A. printed books outsell e-books and digital formats	0	0	0	0	0	0	0	0	0	0	0	0	0.02	1	0.01

B. printed books sell but lose out to e-books and digital formats	1	1	0	1	1	1	1	1	1	1	1	1	0.67	80	0.88
C. printed books "packaged" with other media	0	0	0	0	0	0	0	0	0	0	0	0	0.10	2	0.02
D. readers access digital books electronically, print out their own copies	0	0	1	0	0	0	0	0	0	0	0	0	0.21	8	0.09
6. Value of Books to Consumers															
A. pleasure reading, personal collections	1	1	1	1	1	1	1	0	1	0	1	1	0.67	72	0.79
B. produced for scholars in academic settings	0	0	0	0	0	0	0	1	0	1	0	0	0.15	16	0.18
C. archiving and storing information also in digital form	0	0	0	0	0	0	0	0	0	0	0	0	0.13	1	0.01
D. personal artifacts, self-published for special occasions	0	0	0	0	0	0	0	0	0	0	0	0	0.04	1	0.01
E. museum pieces, of interest to collectors and connoisseurs	0	0	0	0	0	0	0	0	0	0	0	0	0.01	1	0.01
7. Demographics of Demand															
A. a few avid collectors and hobbyists	0	0	1	0	0	0	0	0	0	0	0	0	0.08	6	0.07
B. older generations, in their 60s and 70s	0	0	0	0	1	0	1	1	1	0	0	0	0.27	24	0.26
C. in the developing world	1	1	0	1	0	1	0	0	0	0	1	1	0.23	52	0.57
D. millennials, now in their 30s and 40s	0	0	0	0	0	0	0	0	0	1	0	0	0.42	9	0.10
8. Publishing															
A. traditional publishers, fewer in number	0	0	1	0	1	0	1	0	0	0	0	1	0.44	20	0.22
B. university libraries take over from traditional publishers	0	0	0	0	0	0	0	0	0	0	0	0	0.04	1	0.01

C. authors become their own publishers, especially through print on demand	0	0	0	0	0	1	0	0	0	0	0	0	0.13	4	0.04
D. new entrants dominate, especially Google	1	1	0	1	0	0	0	1	1	0	1	0	0.31	59	0.65
E. new publication centers in the developing world	0	0	0	0	0	0	0	0	0	1	0	0	0.08	7	0.08
9. Retail Distribution															
A. big box bookstores like B&N	0	0	0	0	0	0	0	0	0	0	0	0	0.08	1	0.01
B. online distribution (Amazon model)	1	1	1	1	1	1	1	1	1	1	1	1	0.64	86	0.95
C. traditionally non-book retailers like Walmart or Target	0	0	0	0	0	0	0	0	0	0	0	0	0.05	1	0.01
D. sold and distributed through libraries	0	0	0	0	0	0	0	0	0	0	0	0	0.01	1	0.01
E. print-on-demand devices in bookstores, libraries, or homes	0	0	0	0	0	0	0	0	0	0	0	0	0.22	2	0.02
10. Physical Form of Printed Books															
A. printed books retain their current form	1	1	1	0	1	0	0	0	0	0	1	1	0.62	42	0.46
B. printed boooks include smart paper or e-ink, allowing dynamic info	0	0	0	1	0	1	1	1	1	0	0	0	0.21	37	0.41
C. “artist book” main physical form of printed books	0	0	0	0	0	0	0	0	0	1	0	0	0.17	12	0.13
11. Creators and Writers															
A. handful of bestselling authors	0	0	0	0	0	0	0	0	0	0	0	0	0.07	1	0.01
B. academics and intellectuals	0	0	0	0	0	0	0	0	0	0	0	0	0.05	1	0.01
C. almost everyone, using print-on-demand services	1	1	1	1	1	1	1	0	1	0	1	1	0.30	69	0.76
D. fewer and fewer people, preferring digital media	0	0	0	0	0	0	0	1	0	1	0	0	0.58	20	0.22

12. Ownership Patterns															
A. owned by individuals in their personal libraries	1	1	1	0	1	1	1	0	0	0	1	1	0.43	54	0.59
B. few people will own, but rather rent from retail outlets	0	0	0	0	0	0	0	1	1	0	0	0	0.15	12	0.13
C. most people obtain books from libraries; few own their own	0	0	0	1	0	0	0	0	0	1	0	0	0.42	25	0.27
13. Disruptive Event															
A. new process, new business model, lower costs	1	1	1	1	1	1	1	1	1	1	1	1	1.00	91	1.00