1984 Redux

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In July 2009, Justin Gawronski, a high school student from Detroit, sued Amazon after the removal of unlicensed, yet officially purchased, copies of George Orwell's *1984* and *Animal Farm* from Gawronski's Kindle.[1] The backlash caused Bezos to post an apology directly to the Kindle forums, stating: "Our 'solution' to the problem was stupid, thoughtless, and painfully out of line with our principles. It is wholly self-inflicted, and we deserve the criticism we've received."[2] Amazon settled the lawsuit out of court and updated its policy to clarify that ebooks would only be removed in the future to comply with a court order, if the title contained malicious code, or if the user failed to pay for a copy.[3] The incident raised important questions about the ownership of ebooks and Amazon's control of the Kindle: What exactly do customers own when they purchase Kindle hardware and ebooks? If Amazon decides to no longer support the Kindle, what will remain? I conducted research for *Four Shades* between 2013 and 2020, and during those eight years, many services were shut down. The historical record of contemporary publishing is at risk, dependent on the whims of a corporation uninterested in institutional and cultural memory. Indeed, as with instances such as Weathervane Press and Kindle Popular Highlights, Amazon obscures its own history to prioritize new initiatives. While the Kindle ecosystem has many important parts, three areas—hardware, content, and services—present the greatest challenges for the long-term preservation of the ebook's history.

Hardware

The Kindle 1's product page made bold claims about the device's hardiness, including a video of a drop test. Early users found this durability illusory. Electronic paper screens are notoriously delicate, with the electrophoretic capsules susceptible to bursting if excessive pressure is applied to the screen. The screen of a Kindle 3 I owned broke from the pressure of an airplane seat-back pocket. In response to the fragile screens, Silvio Lorusso and Sebastian Schmieg published *56 Broken Kindle Screens*, emphasizing the aesthetic value of ruptured Kindle screens.[4] The reader may still be able to use the device in a zombie form, as unaffected capsules continue to display new content when the reader turns a page. The resulting images in *56 Broken Kindle Screens* feature remixed screen savers with chunks of text from the last book the reader opened or reminders to update the device. Since electronic paper displays an image indefinitely, the final screen is recorded for posterity rather than a blank screen with a crack.

Despite the devices' fragility, users developed sentimental attachments to older Kindle hardware, procuring spare parts to maintain e-readers initially purchased a decade ago. Alongside the electronic paper screen, batteries are the most likely component to fail.[5] Because manufacturers have stopped producing components for the Kindle 1 and DX, two popular devices, Frankenstein ebook readers cannibalize other broken hardware to extend the life of a treasured device. Garnet Hertz and Jussi Parikka, two media archaeologists, coined the term "zombie media" to describe the use of media beyond their planned obsolescence through innovative projects, "resurrecting" the hardware.[6] Hertz and Parikka offer the example of Reed Ghazala's *The Incantor*, which circuit bends devices such as Texas Instruments' Speak & Spell, an educational toy designed to help children's verbal development, "to spew out a noisy, glitchy tangle of sound that stutters, loops, screams and beats."[7] Zombie media build on the Gartner Group's Hype Cycle and Cumulative Consumer Adoption Curve diagram, which maps early adopters through to laggards by introducing a "DIY/Archaeology phase" for technology that has faced "mainstream obsolescence."[8] Kindle hardware is currently in the late stage of consumer technology, as dedicated e-readers have largely been replaced by multifunctional mobile computers except in niche demographics. E-readers sit on the precipice of mainstream obsolescence, which encourages users still interested in the format to experiment with the hardware.

Amazon's resistance to planned obsolescence cycles for the Kindle is a boon for preservation, as older devices are still supported. Budget

versions of the e-reader are sufficient for most consumers and are unlikely to be replaced by newer versions. Amazon attempted to encourage readers to follow more traditional upgrade cycles with the release of Kindle Voyage in 2014, but as the reading system is available on a broad range of operating systems, this is unlikely to encourage users to return to dedicated hardware. The aesthetic of e-readers remains central to Amazon's cross-hardware cloud-based platform development. Reading ebooks on e-readers provides the most authentic experience, but dedicated hardware continues to become less important. The legacy of e-readers will rely on their influence on content rather than hardware design.

Hardware Hacking

While the hardware did not have a major influence on mainstream computational culture, hobbyists worked on creating a vibrant DIY culture of hardware modification. The MobileRead community exploited Lab126's choice of Linux to create a range of alternate hardware projects based on the Kindle's unique features. With the knowledge of this operating system, it is possible to "root" the software (gain administrator access to the firmware) and reuse the device for other purposes. Hardware hackers often turn to id Software's classic first-person shooter *Doom* to demonstrate the scope of subversive creativity for a device,[9] but the Kindle's hardware is limited, and fighting hellspawn with a "Big Fucking Gun" is beyond the limitations of the fastest-refreshing electronic paper. Any creative reuse of the Kindle must instead work within the boundaries of electronic paper rather than pushing the frame rate. For example, the Kindle Weather Station replaces the generic screen savers of classic texts and bookish images with the local weather in the user's area. The platform's early years were a hotbed for innovation, as the Kindle was one of the first devices to feature a cheap electronic paper display. The hardware experimentation was the result of Amazon's decision to run its reading system in Linux, which enables users to quickly manipulate the software. Given the limited specifications of even contemporary versions of the Kindle—the Voyage has 512 megabytes of RAM and a 1 GHz dual core processor, which is optimized for low power consumption rather than as a computational powerhouse—it would be difficult to convert the dedicated hardware into a full computer. The Kindle as a piece of hackable hardware mirrors the rise of the Raspberry Pi and maker culture. Despite the device's extensibility because of the use of open platforms such as Linux, it has limitations. As David Given warns: "The Kindle is a *very fragile device*. It's incredibly easy to crash; there's no isolation between user applications and the system

user interface."[10] The system was designed with a specific purpose and was not tested for more general computational purposes.

Geoffroy Tremblay created the KindleBerry Pi, a device that uses the electronic paper display from the Kindle as a makeshift monitor for the Raspberry Pi.[11] The use of electronic paper in a general personal computer recalls Nick Sheridon's vision of the display technology for desktop computers at Xerox PARC in the 1970s.[12] Tremblay used USBNetwork, one of the Linux files included with the device, to turn the electronic paper screen into a monitor, which unfortunately tied the user to the on-device keyboard. The software only offered command line accessibility, which suited the low refresh rate and fidelity of E Ink's technology.

Other hobbyists built new uses within the Kindle hardware. MobileRead users collaborated on "Kindlets," or Kindle-based Java applets, to enable the development of a hobbyist software ecosystem that included readily compiled bootloaders and shortcuts.[13] The architecture was used to create diverse applications, including Kindle voice control and Kinamp. Kindle voice control exploited Launchpad's ability to change interfaces to allow users to control the keypad via voice commands using the Kindle's integration into local Wi-Fi.[14] The work was largely proof of concept and was never developed beyond a prototype. Kinamp extended the functionality of the "experimental" MP3 player available on the first four Kindle generations by embedding MPlayer, an audiovisual media player for Linux, in the Kindle.[15] Not only did this offer greater control and optionality, but it allowed users to stream audio, a possibility embedded within the Kindle hardware but never natively available owing to the rise in data costs with audio streaming. Users were willing to experiment with the Kindle hardware, as it offered a unique setup without requiring a high start-up cost. The results reveal some of the untaken pathways for computing outside the monolithic smartphone paradigm.

Beyond these changes to the Kindle software, users have also tried to integrate the wider history of digital publishing into the device. Authors have created several text-only digital genres that update slowly enough for the electronic paper screen to keep up. Choose Your Own Adventure style books, including a popular range of "Choose Your Own Erotica," have developed a niche on the Kindle Store through using the Kindle's native support for linking. Other users saw the slow refresh of the Kindle screen as harking back to the terminal-based printer conditions of early interactive fiction (IF).[16] Interactive fiction advances at a perfect pace for the refresh rate of the Kindle, as new content is only displayed once a user responds to a prompt. Electronic paper offered a more authentic experience for early works of IF that had been developed as printed responses.[17]

These early attempts to create interactive content on the Kindle unofficially through both jailbreaking and pushing the limits of the file formats were acknowledged by Amazon when the company launched Kindle Active Content and the Kindle Developer Kit in 2010. In a press release, Amazon announced with bombast that the company would be working with Zagat, Sonic Boom, and EA Mobile to develop interactive guides and word-based games.[18] The scheme led to the development of several board game ports optimized for the Kindle's electronic paper screen, including *The Settlers of Catan*.[19] Kindle Active Content allowed select developers to fulfill the platform's potential beyond ebooks, a potential initially promised by the inclusion of *Minesweeper* as an Easter egg with the original Kindle's launch. The bookish/board game genre, which functions without the requirement for constant screen refresh, offered users interactive content optimized for dedicated hardware. Amazon dropped support for Active Content in 2014.[20] The Fire's success overshadowed a more interesting experiment in developing software within the constraints of electronic paper, leaving this work to Kindlet developers. The potential of electronic paper as a display medium has never extended beyond replicating paper, compared to the dynamism of the Atari VCS 2600's Television Interface Adapter, which contributed to the unique aesthetic of the console.[21] Beyond *56 Broken Kindle Screens*, the aesthetic dimensions of dedicated hardware were never allowed to mature. The lack of new, native born-digital Kindle genres contrasts starkly with Audible's growth in the late 2010s, which was accompanied by extensive and sustained investment in Audible Original podcasts and acquiring rights to produce audiobooks internally. As a result, Audible has developed beyond the initial business model of offering audiobooks of print titles. Unfortunately, this market-driven approach (money begets investment and development) creates a more conservative approach to platforms like the Kindle, where less excitement leads to less interest.

Content

While hardware has become less central to the platform, what about content? Jesse England responded to the removal of *1984* by creating a physical backup of Orwell's novel with photographs of every "page" of his Kindle 3 edition with the hardware remaining in frame. England scanned the book to create a digital facsimile, which he published as a print-on-demand book and a Kindle-readable PDF. The provocation emphasized the ephemerality of a single edition of a book available in other print and digital forms, but more pressing questions surround the preservation of titles only available via the Kindle Store, including digital-only and self-

published works. Peter Purgathofer, a human-computer interaction professor, elaborated on the thought experiment with his DIY Kindle book scanner built with Lego Mindstorms, a lightweight robotics platform.[22] The project replicates the two-part process of print digitization as the scanner automatically turns the page—in this case by pressing a button—followed by taking a photograph. Purgathofer's Rube Goldberg machine was not designed to be scalable and is more cumbersome than making a copy of the book in a digital environment. Nonetheless, the project highlighted the precarity of titles on the platform. Even within professional preservation settings, proprietary formats are at risk of secondary documentation, as national libraries prefer open standards to preserve material.

Amazon has a track record of removing ebooks. While it elected not to acquire NuvoMedia and the Rocket eBook in 1998, selling ebooks directly through the web store could provide additional revenue with low risks. During the early 2000s, Microsoft Reader and Adobe Reader were the most commonly used reading systems, so Amazon offered ebooks in these formats, including popular titles such as Dan Brown novels. It is no longer possible to download these ebooks, as the "E-book and E-Doc" store was removed at the Kindle's launch. The willful erasure of institutional memory is encapsulated in the company's rhetoric of "Day One" emphasized in Bezos's letter to shareholders, which includes reprints of the 1997 letter in full each year and opens with "This is Day 1 for the Internet and, if we execute well, for Amazon.com."[23] If two decades are condensed into an opening day, there is less incentive to preserve the longer history.

Luckily for the historical study of the Amazon infrastructure, ASINs are persistent, making it possible to trace titles and their disappearance. Many public domain titles published between 2007 and 2011 are now no longer available to purchase, but their ASINs are persistent to ensure the titles can be integrated with services such as shared highlights and reviewing. For example, the version of Jane Austen's *Pride and Prejudice* that came bundled with the international Kindle 3 is unavailable in the US store, but the product page remains in the British store with a publication date of "1 Jun. 1998," its publication date on Project Gutenberg. The edition exists in a state of limbo: readers can access the original version via third parties, and this historically important title remains in the catalog; but if one cannot access a user's downloaded version of the ebook, it remains unavailable. Other "out-of-print" ebooks have been less lucky. If users attempt to access an "out-of-print" Microsoft Reader title published before the Kindle's launch, they are redirected to a 404 page. The Internet Archive only holds records of 40,000 ASINs across all product types, which is fewer than the 50,000 Mobipocket titles available via Amazon

before the Kindle's launch, let alone the one million Microsoft and Adobe Reader titles available via Amazon in 2006. This period of ebook history has largely been forgotten owing to the erasure of a core central repository. Given the divergence between the print and ebook markets since the early 2010s, especially with the rise of Kindle Direct Publishing, this not only affects the availability of digital surrogates of print material. The self-publishing boom, fueled in part by the early success stories of John Locke and Amanda Hocking discussed in chapter 5, encouraged authors to cut out print-oriented publishers in return for a greater share of the royalties. While this choice had immediate benefits for the authors, the longer-term durability and sustainability of publications rely on a currently nonexistent working relationship between Amazon and large deposit libraries.

Despite improving discoverability of some out-of-print titles, the prominence of ASINs presents further challenges for preservation in an era beyond Amazon, as the company does not provide contextual information for the standard and does not distinguish between deleted and nonexistent product pages. ASINs are nonsequential and human illegible, so it is impossible to determine the scope of deleted ebooks outside the company's own records, and Amazon denies access to Kindle product pages to third parties such as CamelCamelCamel. Unless Amazon aids preservation, its catalog will become a digital Library of Alexandria. An archive of Kindle titles would depend on the decentralized assembly of readers' copies of individual ebooks, but since these copies would be compiled for specific devices, this would only provide a slice of the actual format and content. Ebook preservation is an urgent concern in a time when publishers are distancing themselves from the medium. Without a stronger collaboration between publishers, archives, and libraries, Amazon's monopoly on ebook sales places the medium in a precarious position.

The company's ability to update ebooks automatically is a more widespread issue for preservation. The service is opt-in, so users are unlikely to select the option unless they are aware of the feature. It is not uncommon for books to receive updates. For example, 54 of the 560 books in my Kindle library have "updates available." Publishers do not issue change logs, making it difficult to know what has changed, and unless an older version is backed up, it is erased, making comparisons difficult. The 10 percent of ebooks requiring updates in my collection will include the occasional update to content, but most will introduce new format specifications to keep up with contemporary style developments. With a print run, by contrast, there is no requirement to update the format to account for new paper requirements. When Amazon introduces new features such as Word Wise, Enhanced Typesetting, and X-Ray, publishers may choose

to use these new features, which require a manual update from readers. The older editions are not officially recorded via Amazon, and unless a publisher has fastidiously kept archives of each update, they likely exist nowhere. Files are processed remotely on Amazon's servers, so publishers cannot archive updates internally. In fact, due to the discrepancies discussed in chapter 4, an authoritative version of a Kindle edition no longer exists.

Legal deposit libraries play a vital role in preserving a nation's cultural record. Publishers are legally obliged to submit copies of print books to national libraries such as the Library of Congress and National Library of Scotland, as well as institutions with historic arrangements such as Oxford University's Bodleian Library or the University of Sydney Library. Legislators revised legal deposit mandates in recent years to account for digital publications including national web archives and ebooks, which can be filed as a surrogate for a print copy. In the the United Kingdom, the Legal Deposit Libraries (Non-print Works) Regulations 2013 outline the requirements for preserving ebooks and other born-digital publications.[24] The legislation covers the legal deposit of future material and does not apply to any ebooks published before 2013. The bill also declares that the legal deposit is not required if "substantially the same work is published in the United Kingdom in print."[25] Despite evidence that platforms are internally variable, the policy follows a "one size fits all" rule for ebooks without considering the difference between a Kindle or Kobo file. While a reprint or new edition is well understood in traditional publishing, should updates be preserved? What constitutes a new edition rather than a constantly iterated update? Ebooks are second-class entities in the framework. No provision exists to ensure the capture of ebooks that do not feature an ISBN—in other words, all self-published books and many digital-only publications. Given the fall in digital sales for books by legacy publishers in comparison to new digital-only and self-published titles, a significant proportion of the current cultural record will remain absent from legal deposit libraries. For example, Bella Forrest's substantial back catalog is unavailable through the British Library or Library of Congress, and if Amazon closes the Kindle Store, these titles will be lost cultural memory. Nonetheless, if an ebook is considered worth cataloging, legal deposit libraries are required to provide hardware access, a practice that is easier for an open format than a platform that requires special software or hardware.[26]

The National Library of Scotland is one of the seven legal deposit libraries in the United Kingdom and has an ancillary role to the British Library for ebook legal deposit. Its catalog boasts at least ten thousand

legal deposit ebooks, and many new titles, such as Dean Koontz's *The Silent Corner*, exist only in digital form, as companies such as HarperCollins and Ingram just provide ebook access.[27] For the national library of a vibrant literary culture, ebook access through EPUB rather than a Kindle format is acceptable except in cases of cultural significance. Publishers including Canongate and Edinburgh University Press must submit print copies regardless of their intent to preserve the cultural record of Scotland to ensure continued preservation if ebook platforms fail.

Amazon's use of digital rights management and encryption with Kindle files presents an obstacle for preservation, since libraries prefer to receive ebooks in a more open format such as EPUB. Even without encryption, the Library of Congress recommends using EPUB instead of other "acceptable" "XML-based formats that use proprietary DTDs or schemas."[28] Library-based preservation of Kindle titles would therefore depend on Amazon releasing the specifications for proprietary standards such as AZW and KFX. Users could then understand exactly how these files were created and interpreted by KindleGen and other cloud-based format parsers. Even if the final documents were not presented in a Kindle reading system, the documentation would allow for a more accurate re-creation of the idiosyncrasies of the Kindle's rendering of ebooks. All these challenges around hardware and content coalesce into a major bottleneck for preserving the history of the ebook in the early twenty-first century. It is still possible to look at copies of the Gutenberg Bible, but how many Kindle titles will still be accessible fifty years after their publication, let alone five hundred? Given the sheer volume of self-published works in the Kindle Store, and the fluidity with which they are released and taken down, we are unlikely ever to have accurate documentation of this significant moment in publishing history.

Services

As discussed in chapter 6, Amazon frequently changes or removes the Kindle's paratext services. While services are often disrupted for users, space also exists for users to exploit the systems. For example, Kunsthal Aarhus commissioned the Kindle Forkbomb (now known as Ubermorgen) to explore the potential for exploiting the Kindle's infrastructure artistically. Ubermorgen published "robot-generated ebooks" consisting of text "from millions of YouTube comments" with the aim of revealing "a compressed written view of our contemporary world, a frozen moment of collective expression sent back into the next recycling loop."[29] Ubermorgen does not identify examples, which would quickly be removed if discovered,

but the documents on the website are less impressive than the blurb, with some titles as brief as twenty-seven pages. The project instead focuses on a self-publishing equivalent to a denial-of-service (DoS) attack, whereby it becomes impossible to find relevant titles in searches, since the store is flooded by automatically generated titles. Ubermorgen weaponized Amazon's infrastructure in the project by using AWS's Elastic Compute Cloud (EC2) and Mechanical Turk to automate the content extraction process to reveal ruptures in the Kindle Direct Publishing process. While it is not unusual for Amazon's cheap computational power to be used for spam,[30] the project demonstrated how this vast infrastructure could be used against Amazon itself. Since the art project wound down in 2013, the expansion of Kindle Direct Publishing and CreateSpace, Amazon's print-on-demand service, has led to further attempts to weaponize the self-publishing platforms for profit and money laundering. In response, Amazon has further altered the algorithms and calculations, creating an indeterminate platform that may shift multiple times daily.

Ubermorgen's experiment revealed one of Amazon's inherent infrastructural tensions: it is easier to input than export material from the company's services. We have encountered these issues throughout this book: from creating new product pages if metadata have been incorrectly entered to the closure of Kindle Popular Highlights while maintaining data collection processes. Retaining content within the Kindle ecosystem clearly benefits Amazon. Exclusive ebooks can encourage readers to use the platform. The accumulation of data that are then difficult for both individuals and publishers to export, even when doing so would be beneficial and potentially profitable, points to a larger shift in Amazon's business model. Shoshana Zuboff coined the phrase "behavioral futures markets" to describe the accumulation of data with the hopes of monetizing it later through predictive marketing.[31] Even if the reading data Amazon collects have no current value for marketing, which they clearly do, the possibilities for future monetization are only enhanced by retaining control of the data.

The rise of the cloud as the dominant computational metaphor has seen a shift from products to services. If the book is a service, then what does it mean to preserve a service? Is it sufficient to preserve examples of the hardware and copy-specific editions? Book historians often have rich archives, such as Robert Darnton's sustained use of the Société typographique de Neuchâtel's archive, to reconstruct the book trade of their chosen period. No such equivalent exists yet for Amazon, and reverse engineering algorithms or mining the patent filings can only provide a partial overview of the platform's development. Even Amazon is unlikely to have a complete archive, since algorithms assemble Kindle files remotely rather

than existing as a coherent set of assets on a corporate server. Because the Kindle depends on its innovations, including subscription-free EV-DO, network capabilities are just as important as ebooks in documenting the platform. Dummy servers could replicate some of the functionality of Amazon Web Services, such as synchronizing across devices and a public record of highlighting practices.[32] My experience of documenting the Kindle platform has led to several of these challenges around reverse engineering, especially in collecting data for chapter 7. These personal struggles reflect the greater challenges in making good use of the Kindle as a platform. If services can be revoked or overhauled at short or no notice, what incentive do publishers have to encourage readers to use personal highlights, integration to external platforms, or born-digital indexes? The inherent instability of the platform only further reinforces a mutual conservatism on the part of both Amazon and publishers.

Amazon's reliance on service paratext marks the greatest weakness of the Kindle platform. Users can still access ebooks on the Kindle 1, but the obsolescence cycle of service paratext reveals further issues in the long-term sustainability of a stable platform. The first-generation device only shares a single service with the Oasis: Whispernet. While other services have been introduced (and removed), Whispersync has been an anchor for the platform by emphasizing "always-on" reading habits despite the relatively static nature of popular highlights and X-Ray indexes. The inconsistent delivery of these features across reading systems makes it difficult to conceptualize a "complete" edition of a Kindle book.

Non-book-related services also define the platform and can be difficult to re-create for posterity. For example, take Ask NowNow, one of the Kindle 1's "experimental" features, which did not even appear on the second device and was slowly eradicated through successive changes to the Amazon platform and Mechanical Turk offerings more generally. Ask NowNow predicted the emergence of Siri, Cortana, Amazon's Alexa service, and other "personal assistants," as it offered a service for asking questions directly from the device. Mechanical Turkers searched for answers, and the three best answers were displayed to the user, who could then select the most helpful response. Although the Mechanical Turk business model was scalable, the costs of the services outweighed the benefits, encouraging Amazon to shut down the service. This ideology pervades technology companies' decision-making, as free services only remain viable if they bring some extra value to the platform. Closing experimental features such as Ask NowNow and removing headphone jacks were part of a wider distinction between products in Amazon's hardware range. The launch of the Fire tablets offered multifunctional devices, which allowed the Kindle

to focus on delivering book-related content rather than a range of unrelated ancillary features.

Re-creating the infrastructure requires archiving material before it is taken down. Often this happens too late. For example, Amazon shut down the dedicated forums for discussing the Kindle, directing users to a specific help forum or Goodreads to replace this void.[33] The Kindle Popular Highlights website, discussed in the previous chapter, was closed in September 2017 without an announcement. Visitors to the site get the message "Looking for something? We can help," while directing users to a notebook on the web-based Kindle app.[34] Readers who wish to discuss books with other users are directed to Goodreads as the sole remaining social network for the platform. The consolidation allows personal access through an official client while removing data about other users. The website's marketing potential was no longer viable, and the data were too revealing. This extended the removal of most popular highlights in 2014. Unfortunately what remains is only limited preservation of every single note and highlight on the platform, as well as the profiles of fifty million registered Kindle users. The Internet Archive captured almost sixty thousand pages, but the majority of user- and book-related data is now invisible.

The challenges around hardware, content, and services all highlight the highly contested relationship between Amazon control and publisher and reader autonomy within the Kindle platform. Users can either break out of the Amazon platform by rooting their devices and exploring the alternative possibilities of a low-power, slow-refreshing display or choose to face the potential loss of data and content when Amazon changes policy. These tensions also challenge the stable concept of an ebook, which may not exist as a fixed unit or have any form of permanence. The ebook depends on the Kindle, but how much support it will continue to receive from the company is unclear. Every aspect of the Kindle platform must be considered as contingent, and the publishing industry would strongly benefit from considering alternatives to relying on Amazon for ebookish infrastructure.

Four Shades of Gray

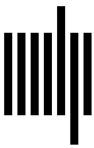
The Amazon Kindle Platform

By: Simon Peter Rowberry

Citation:

Four Shades of Gray: The Amazon Kindle Platform
By: Simon Peter Rowberry
DOI: 10.7551/mitpress/11985.001.0001
ISBN (electronic): 9780262369114
Publisher: The MIT Press
Published: 2022

The open access edition of this book was made possible by generous funding and support from MIT Press Direct to Open



The MIT Press

The MIT Press would like to thank the anonymous peer reviewers who provided comments on drafts of this book. The generous work of academic experts is essential for establishing the authority and quality of our publications. We acknowledge with gratitude the contributions of these otherwise uncredited readers.

This book was set in Filosofia OT by Jen Jackowitz. Printed and bound in the United States of America.

Library of Congress Cataloging-in-Publication Data

Names: Rowberry, Simon Peter, author.
Title: Four shades of gray : the Amazon kindle platform / Simon Peter Rowberry.
Description: Cambridge, Massachusetts : The MIT Press, [2022] | Series: Platform studies | Includes bibliographical references and index.
Identifiers: LCCN 2021013279 | ISBN 9780262543507 (paperback)
Subjects: LCSH: Kindle (Electronic book reader) | Electronic book readers. | Electronic books.
Classification: LCC Z286.E43 R689 2022 | DDC 004.1675—dc23
LC record available at https://lccn.loc.gov/2021013279

10 9 8 7 6 5 4 3 2 1