

# A Survey of E-book Digital Right Management

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## Abstract

In past two decade, with the mobile communication technology rises rapidly and as well as the popularity of smart phones, tablets and mobile devices. Human's daily life and habits had a completely changed. Information comes from with many different ways as before. People read paper books or newspapers to get information in the past. Shift to reading from electronic text files or Internet information. Therefore, making the demand for electronic books greatly increased. In this situation, traditional publishers forced to face huge impact and challenges. How to manage the digital rights of e-books effectively has become a serious issue. In this paper, we propose some key issues of of e-book digital copyright management for interesting researchers.

*Keywords:* Blockchain; Digital Right Management; E-book

## 1 Introduction

Digitization and Internet are the greatest impact on the text and books, that is, making books lose its own physical properties. A permanent solution to the book's issues like heavy weight, difficulty to carry, taking up space, and difficulty to maintain. Before the digital publication appears, the proportion of books that readers bring around is not much. With the advent of the digital age, a variety of traditional publications have been digitized and uploaded to the Internet for sales. Consumers can easily store digital publications in digital devices that they carry with them. Such convenience promotes the thriving digital industry.

However, as same as all digital content products, e-

books can be copied without any loss of quality [5] and be distributed at costs close to zero [1,9]. Like most traditional industries, the book industry generates most of its profit from direct books sales, not from advertising in Internet. Hence, illegal mass-scale low-price duplication and distribution of copied content should constitute serious issues, which are similar to the music, video and other digital content industries [10].

Since e-books can be copied and transmitted by anyone very easily and quickly, for consumers likely without the knowledge of the situation, they may become a victim of piracy and participants inadvertently. That also hurts authors, publishers and distributors. In reality, when consumers buy e-books, there is nothing that can be referred as the basis to confirm whether the purchased goods have legal copyrights. A large number of e-books are stored in mobile devices or home computers, so it also makes it difficult for copyright owners to trace and confirm. This situation also reduces the willingness of publishers and creators to issue e-books. Therefore, a reliable e-book digital rights management mechanism is needed to help the entire e-book industry.

## 2 Current Status of E-Book Publishing Industry

In the past 20 years, the rapid development of the Internet as well as the popularization of digital cloud application system has changed the consumer's reading behavior gradually and offered more different business opportunities and challenges to the publishing industry. E-books market has three aspects: Firstly, the content provider, including authors, publishers, authority, and digital right management. Secondly, the online service platform, in-

cluding online shopping book stores, the pricing mechanisms of e-books. Thirdly, the e-books reading devices, including desktop computers, notebooks, smart phones and tablets.

Sony was the pioneer of the e-book reading device. It has started the development as early as 2004 and announced its first-generation e-book reader device in 2006. In 2007, Amazon introduced a device named Kindle, that enables users to browse, buy, download, and read e-books, newspapers, magazines and other digital media via networking. Amazon becomes a pioneer of reading device with e-books. After that, Apple presented iPad in 2010, selling e-books from his online i-Bookstore. In addition, Google of search engines has opened an online e-book store named e-Bookstore.

From the publishing industry's perspective, digitizing books is an inevitable trend. However, the e-book sales have not grown significantly, which is a fact to be faced. Publishers after years of trying to change and longtime observation of consumers have found that at the beginning publishers worry that e-books will strongly affect the sales of paper books and even accelerate the decline of the paper book, but later, publishers have generally agreed that e-books and paper books have their preferred user groups, respectively, instead of being regarded as two opposing groups. Regardless e-books or paper books, readers never disappear, but reading habits have changed. In diversified reading models which are so dispersed, the readers' reading behaviors can be still seen.

In the U.S. book market, the American Association of Publishers statistics report on 1,209 publishers in the nation pointed out that the overall net revenue from the book industry in the United States grew 4.1% (from 357.1millionsto 371.79 millions) from January to July 2014 compared with the same period in 2013, with "Adult Books" slumped 2.2% and "Religious Publications" increased by 1.9%. The best performing section was "Child and Juvenile Books", substantial increase by 25.8%. The dazzling performance of both categories of e-books grew by 25.8% and 59%, respectively [3].

In the United Kingdom book market, according to the Publishers Association, total revenue from British books and journals amounted to 4.7 billion pounds in 2013, of which 29% (1.5 billion pounds) from digital services (including e-books, e-journals, etc.). Over the past five years, overall book sales (excluding journals) in the United Kingdom alone for physical books and e-books have risen 6% to 3.4 billion pounds, along with physical books sales down 6% while e-books sales Up 305%. Especially in the past two years, e-books sales have doubled to 590 million pounds, of which sales in textbooks and novels are the best, accounting for 42% and 39% of the total, respectively. In terms of periodicals, periodicals have sales of 1.3 billion pounds, of which 850 million pounds come from digital services. Although physical books sales decline, the growth of e-books makes up for the decline in physical books sales [7].

In terms of book publishing format, downloadable au-

dio books are still the fastest growing data format. From January to July 2014 increased by 26.2% over the same period in 2013; followed by e-books, over up 7.5% over the same period of last year. Revenues from paperback books edged up 5.3% over the same period of last year, while hardback books declined 0.3% [3]. Overall, books sales in the United States increased slightly in the first half of this year, while the kinetic energy of growth mainly came from non-paper books such as audio books and e-books.

According to a survey of the U.S. market conducted by Pew Research in January 2014, the ratio of dedicated hand-held reading devices (tablet PC or e-reader) owned by American rose from 7% in 2010 to 43% in 2013, further to 50% by 2014. That means, about half of Americans have iPads Tablet PCs, Kindles, or Nook reader. In reading habits, 69% of the respondents in this survey indicated that they would read paper books, while the proportion of readers reading paper books did not changed much in the past three years. However, readers who read e-books have risen sharply from 17% in 2011 to 28% in 2014. With the popularity of dedicated reading devices, the proportion of readers of the aforementioned devices has also grown. The percentage of readers on e-readers has risen from 41% in 2011 to 57% in 2014; at the same period, reading on the tablet computers increased from 23% to 55% [11]. As of the 2016 survey, the percentage of readings on tablets and smartphones were 15% and 13%, respectively, higher than 8% of dedicated reading devices. The reading rates of all reading devices increased. This means that e-book reading penetration continues to rise [6].

### 3 Digital Right Management Model in E-Books Publish Industry

There are many members to work together in an e-book supply chain, including authors, publishers, online book stores, book distributors, and reading device manufacturers. Although e-books have been around for more than two decades, at the very beginning, publishers do not take the e-book market seriously because there are no appropriate industrial support measures. The overall e-books industry is quite deserted. Until 2007, Amazon introduced its first-generation of Kindle e-book reader, consumers can buy an e-book from the Internet (Amazon.com) and read an e-book on the Kindle. Amazon has integrated the e-book sales platform with consumers' reading devices successfully. The first release of Kindles are sold out just in 5.5 hours [2]. This is not only a successful business model, but also a change in consumers' reading behavior.

Copyright management of the e-book industry includes author authorizations, publisher agreements, e-book formats, digital restrictions management (DRM), pricing, transaction service platforms, reading devices and programs. The overall e-book distribution processes can be

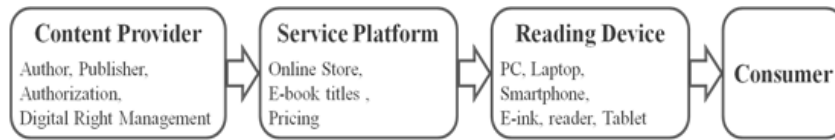


Figure 1: E-book publishing process

classified into three elements: content providers, service platforms, and reading devices (see Figure 1). At the end, consumers buy an e-book from an Internet service platform, and the book file is downloaded into a reader device. Then, e-books are read by reading software from a reader device. These three elements are the key factors influencing the success of e-book industry [4].

However, the above three components of the e-books industry, both in the industrial or technical environments, have been roughly mature. Only the digital rights management of e-books still lacks a mechanism that can be trusted by authors, publishers and distributors altogether. The distribution of e-books is different from that of paper books. Paper books have a specific number of printing, but the e-books only have an e-book digital file released. Each online sales platform holds an e-book copy file for sale. When consumers make purchases through the online sales platform, the e-book digital file is again copied and downloaded to the consumer's storage device. When the original consumers want to transfer their holdings of e-books, the e-book file is just copied again to another user to complete the transaction (see Figure 2). However, it is hard to grasp whether the original consumers have actually deleted the e-book files. Although e-books can be quickly copied and transferred, for the e-book digital rights holders, it has the difficulty to manage copyrights of e-books. From authors to consumers throughout the industry cycle, no matter which one of the roles, it is difficult to control the current circulation of the actual number of e-books on the market. Even online platform providers are difficult to confirm whether the sale of e-books has legal digital rights.

At present, there are mainly two models for the management mechanism of e-books digital right. The first model is online shopping and reading cloud management model. In this model, consumers buy e-books on online sales platform, but will not download e-book files. Consumers obtain access to the online reading of the e-book, and then dealers confirm users' identity and read permission for specific e-books by managing users' accounts. The advantage of this type of management is that the overall number of e-book files does not increase with the number of sales. Consumers can read through any Internet-enabled device. The disadvantage is that consumers can't read e-books offline, so needing technical reference properties of books will cause inconvenience to users. The dealer actually manages the number of accounts rather than the actual number of readers (see Figure 3). It may happen that many people share an account. For the author of e-books, this management model can't effectively

get the actual number of sales, unless the dealer returns the sales data from time to time. For consumers, what they buy is e-books reading authorization rather than actually e-book files. Therefore, consumers will only agree to pay a lower fees rather than actually fees. When consumers no longer use the e-book, but the e-book can't be transferred to another people, this motivates consumers to move their accounts to others.

The second mode is to restrict the user's reading device management mode. In this model, consumers must install specific application software before purchasing or using e-books, and purchase an e-book from the online e-book platform by the application installed. And then e-book's file will be downloaded to the user's reading device (see Figure 4). After the download of the e-book file has been completed, the installed application will encrypt the downloaded e-book file or add some tags to the downloaded e-book file. Users can only read e-books by the installed application on this particular device. When the file is transferred to another device, it cannot be read. The advantage of this mode is that the user can read an e-books offline and obtain the actual e-book digital file, which increases the willingness of the user to purchase and the selling price. The disadvantage is that the user can only read e-books on the particular device. When the consumer's devices is damaged, lost or replaced, it also loses all previously purchased e-books at the same time. For the author of e-books, this management model also can't effectively get the actual number of sales.

Even we do not consider the commercial interests, no matter what kind of choice from the above two management models, it is a challenge for e-books holders, users or consumers to make sure whether those e-books that they are holding, using or purchasing have a legal digital right or not. It is also difficult to help digital right holders (authors or publishers) try to verify whether other people's e-books have legally digital rights.

## 4 Digital Rights Manage Problems in E-Book Industry and Research Purposes

As mentioned in chapter 1.3 of this dissertation, the digital right management model of e-books industry lack a reliable mechanism that can validate the e-books held and used. If the publisher deliberately conceals the information, then the authors or the authorizers can't know the actual number of e-books published. Similarly, if a sales platform distributor deliberately conceals sales figures, it

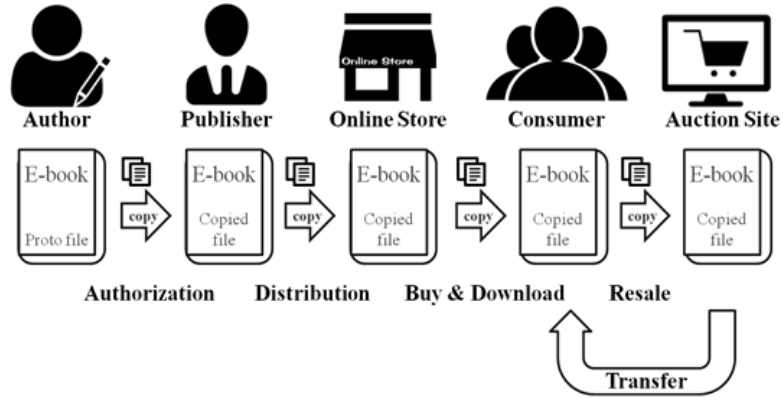


Figure 2: E-book industry product circulation diagram

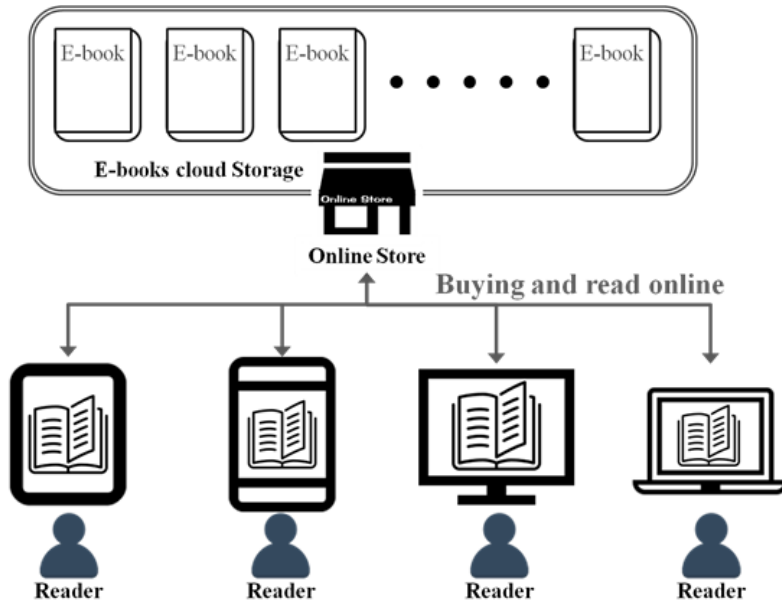


Figure 3: Buying and read online management mode

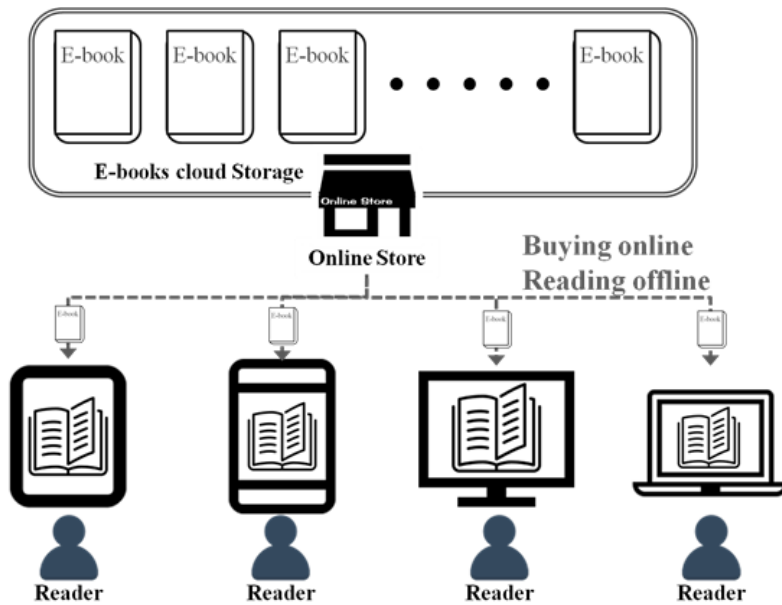


Figure 4: Buying online and read offline management mode

is difficult for the publisher to know the actual number of e-books sold. It is much more difficult for consumers to try identifying an e-book's digital right which they hold and used. The criminals can copy the files of e-books, sell for profit, or illegally distribute by this loophole. This situation has caused considerable economic losses to authors, publishers and sales platforms distributors, and consumers may become victims of piracy without their knowledge.

These problems not only cause economic damage to the e-book industry, but also drag down the growth of the whole industry and impede the dissemination of information. Because of such concerns, it will make authors, authorizers, and publishers reduce the willingness to put out or publish e-books, and create barriers for e-book consumers to access such information. For sales platform distributors as well as consumers, they may violate the law without expectation. Therefore, establishing an open and transparent e-books digital rights management platform is needed to provide e-book holders to confirm whether the e-books purchased or held have legal digital rights, and provide that authors, authorizers, and the publishers can quickly and easily obtain e-books circulation quantity. For the e-book industry, it has become an important project.

The current e-book sales model is: consumers must buy all chapters in a packaged model. In actual demand, consumers may only need some chapters or pages in an e-book. However, such a sales model isn't fair for consumers and would also affect consumers' willingness to buy e-books. At the same time, in the existing e-book management model, a lot number of e-books held by consumers cannot be re-sold or transferred. This has caused consumers' e-book assets to be frozen, and that is a big disadvantage compared with paper books. Therefore, the digital rights of the e-books, need to be refined when an e-book is being sold, so the consumer may only choose to purchase the required chapters or pages so that the consumers no longer need to pay for the unwanted content. Moreover, the consumers could transfer the digital rights of e-books to another consumer when they don't need them anymore. That should reduce the motivation for demand for e-book piracy and accelerate to the e-book industry growth.

In this research, I will base on the blockchain technology and present a model for managing e-book digital rights by creating a blockchain network. All e-books from publishing, sales, purchase to transfer processes, any participating users of this blockchain can use this e-book blockchain network to verify the digital rights of an e-book. To help every participant in the eBook industry, regardless selling, purchasing or holding, you can be guaranteed on the e-books copyright. Digital rights of e-books are also refined, allowing consumers to purchase only the chapters or pages that they actually need, and to permit the transfer of digital rights held in the e-books, reducing the user's motivation to violate the digital rights of the e-book, and making a reference for digital rights manage-

ment of the e-book industry.

## 5 Key Issues of E-book Digital Right Management

In this section, we propose some key issues of of e-book digital right management for interesting researchers.

### 5.1 Establish a Digital Right Blockchain Model of E-books

The blockchain technology has high reliability for the storage, application, transparency, privacy and security of data, which is appropriate [12] for data recording, data verification, data tracking, and anonymity in business activities. There are five main features of blockchain technologies: Decentralization, transparency, independence, immutability and anonymity [8]. In this issue, The researchers need to apply blockchain technologies to establish an e-book digital right management model.

### 5.2 E-Books Digital Right Publishing and Trading

In today's e-book industry, the author completes an e-book writing, and authorizes the publishers to publish the e-book, which is uploaded by the publishers to the online sales platform. After the consumer pays for the purchase of an e-book via the online platform, he/she can download the digital file of the e-book and read it offline through a device installed with the e-book reading software. When the original purchase user is no longer in use, this e-book file may be resold, or copied directly to other people. Therefore, there is no proper way for readers to confirm the legitimacy of digital rights of e-books.

In another type of e-books digital right publishing process, after the consumer pays for the purchase of an e-book via the online platform. The online platform provides online reading permission for consumers to read online through an internet browser. When the original purchase user is no longer in use, due to the reading permission, this e-book can't be resold, resulting an idle asset. Otherwise, the user may tell other people his account and password, so the multiple people use the same account.

In this issue, the researchers need to develop a secure scheme to protect e-books digital right's publishing (generation), trading (transfer), and asset management in the e-book digital right blockchain.

### 5.3 E-Books Digital Right Refinement and Distribution Statistics

In the market of traditional paper-books, a paper-book is completely bound before sales. Therefore, either in a physical bookstore or an online bookstore is sold on the whole book. While consumers are accustomed to such selling patterns, it often happens that consumers only



need some of the information in a book they buy, but they still have to buy a whole book. This sales model forces consumers to buy a lot of unwanted parts. On one hand it will reduce the willingness of consumers to buy, and on the other hand it also virtually increase the intent of piracy.

In this issue, the researchers need to design an efficient scheme to refine the digital right distribution, sale and transfer of e-books digital rights. The scheme also provides authors, authorizers or publishers the statistical data of e-books in the market circulation.

## 6 Conclusion

Digitization has brought many opportunities and shocks to traditional paper books. The tendency of digital publishing has gradually become a mainstream trend. Although there still have many paper-books lovers, the demand for undeniable e-books is constantly growing. How to establish a reliable digital right management mechanism for e-books is precisely the topic of concern to this research. In this paper, we have proposed some key issues of e-book digital right management for interesting researchers.

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