

COPYRIGHT LAW AND KNOWLEDGE CREATION:
A STUDY OF COPYRIGHT TERM LENGTH IMPACT ON KNOWLEDGE CREATION AND
LEARNING

A dissertation presented by
Shahram Haydari

to

The School of Public Policy and Urban Affairs

In partial fulfillment of the requirements for the degree of
Doctor of Philosophy

In the field of

Law and Public Policy

Northeastern University

Boston, Massachusetts

March 2018

ProQuest Number: 10791660

All rights reserved

INFORMATION TO ALL USERS

The quality of this reproduction is dependent upon the quality of the copy submitted.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if material had to be removed, a note will indicate the deletion.



ProQuest 10791660

Published by ProQuest LLC (2018). Copyright of the Dissertation is held by the Author.

All rights reserved.

This work is protected against unauthorized copying under Title 17, United States Code
Microform Edition © ProQuest LLC.

ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 – 1346

COPYRIGHT LAW AND KNOWLEDGE CREATION:
A STUDY OF COPYRIGHT TERM LENGTH IMPACT ON KNOWLEDGE CREATION AND
LEARNING

A dissertation presented by
Shahram Haydari

ABSTRACT OF DISSERTATION

Submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy in Law and Public Policy
in the College of Social Sciences and Humanities of
Northeastern University

March 2018

Abstract

The Constitution of the United States empowers Congress to pass copyright laws to promote knowledge creation in the society. Many economic studies have been conducted on copyright law, but very little research has been done to study the impact of the law on knowledge creation. In this dissertation, I study the length of the copyright term, the rationales and motivations behind extending the length in Copyright Term Extension Act, and how much those rationales and motivations are aligned with knowledge creation and learning. The qualitative analysis of the hearing sessions and floor debates demonstrates that supporters of the extensions offered macro and micro economic rationales that are not necessarily aligned with the promotion of knowledge and learning. Opponents of the extension argued that the extension would stifle the expansion of knowledge. In the second part of this dissertation, I develop and analyze an agent-based model to investigate the impact of different copyright terms on the creation and discovery of new knowledge. The model suggests that, for the most part, the extension of copyright term hinders scholars in producing new knowledge. Furthermore, extending copyright term tends to harm everyone, including scholars who have access to all published articles in the research field.

Keywords: Knowledge Creation, Copyright Law, Copyright Extension, Agent Based Modeling, Division of Labor, Complex Systems, Public Policy Analysis

Acknowledgements

I would like to specially thank my wife, Shima, for her encouragement and support during this project and express my gratitude to my advisor Professor Smead and my wonderful dissertation committee for their guidance and contributions to this dissertation.

PREVIEW

Table of Contents

Abstract	2
Acknowledgements.....	4
Table of Contents	5
Tables of Figures And Tables	6
Chapter 1: Introduction.....	8
Chapter 2: Methods Discussion.....	18
Chapter 3: Copyright Term Extension Act - Discourse Analysis.....	30
Chapter 4: Does Longer Copyright Protection Help or Hurt Scientific Knowledge Creation? A Quantitative Analysis of Copyright Term Extension.....	90
Chapter 5: The Impact of Copyright Term on Knowledge Creation; The Analysis of Self- Citations	108
Chapter 6: Conclusions And Policy Discussions.....	122
References	133

Tables of Figures and Tables

Figure 1-1: The SECI Process	16
Figure 2-1: The Qualitative Process of Data Analysis.....	20
Figure 2-2: Epistemic Plan.....	26
Figure 3-1: Number of Witnesses by Categories at CTEA Hearing	32
Figure 3-2: Number of Witnesses by Interest Group Sector at CTEA Hearings	33
Table 3-1: The summary of congressional hearing sessions related to Copyright Term Extension Act.	45
Figure 3-3: Word cloud visualizing Music Licensing Practices of Performing Rights Societies hearing	47
Figure 3-4: Word cloud visualizing the House debating Copyright Extension Act of 1998	70
Figure 4-1: Knowledge points in Epistemic Plane.....	93
Figure 4-2: Epistemic Plane.....	96
Figure 4-3: Epistemic Plane with Scholars	96
Figure 4-4: Total publications under different copyright cycles	97
Figure 4-5: Average publications made by ALO and AL1 scholars	98
Figure 4-6: The contribution of ALO and AL1 scholars in knowledge production under different copyright cycles	99
Figure 4-7: Number of shifts under different copyright cycles	99
Figure 4-8: Total publications made by various number of scholars.....	101
Figure 4-9: Impact of required citations on knowledge production	102

Figure 4-10: Impact of number of scholars on knowledge creation with low citation requirement103

Figure 4-11: Total publications made by various number of scholars under low citation requirement.....104

Figure 5-1: Knowledge points in Epistemic Plane 111

Table 5-1: Model Parameters 112

Figure 5-2: Citations to other scholars’ research under various copyright terms..... 114

Figure 5-3: The percentage of citations received by ALO scholars..... 115

Figure 5-4: Citation credits received from other scholars in epistemic plane with fewer scholars and low citation requirements 116

Figure 5-5: Citations received by scholars with different publishing habit after excluding self-citations.....117

PREVIEW

Chapter 1: Introduction

Copyright law, like patent law, has its roots in the Article 1 Section 8 (Copyright Clause) of the Constitution. This clause empowers the United States Congress “to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries.”¹ According to Walterscheid, the progress of science and useful arts in the context of the 18th century translates into “the advancement of useful knowledge and discoveries.”² The main purpose of copyright law is not primarily to generate revenue for authors nor prevent illegal distribution of copyrighted materials. Congress is empowered to enact copyright laws, as specified in the Constitution, to advance useful knowledge and learning in society.

It is certainly important to think about the impact of copyright law on the market and freedom of users, and to study the opportunities and the side effects that the law creates in the society. However, as a first step, it is crucial to examine how the law contributes to the very purpose specified in the Constitution, the advancement of knowledge and learning in the society. There is very little published literature addressing this critically important question.

Study Purpose & Significance

The purpose of this dissertation is to study how and to what extent current copyright law contributes to the advancement of knowledge and learning in society, in the context of the 21st century, considering the availability of the Internet and the digital technology. Without measuring the impact of copyright law on knowledge creation and learning, it is impossible to talk about the effectiveness of the law in terms of the purpose set out in the U.S. Constitution. Continuous improvement of copyright law requires measuring the contribution of the law towards the goal specified in the Constitution. The outcome of this research will help lawmakers

¹ U.S. Const., Art. 1, Sec. 8, Cl. 8

² Edward C. Walterscheid, *The Nature of the Intellectual Property Clause: A Study in Historical Perspective* (Buffalo: William S. Hein & Co., Inc., 2002).

to have a better understanding of the impact of copyright law on *knowledge creation and learning* and will enable them to pass new copyright laws that promote creativity more significantly and reduce roadblocks towards learning.

Study Questions

The main topic in my study is how the length of copyright term impacts knowledge creation and learning in the society. To better understand this impact, I will focus on the following questions:

- 1- To what extent was knowledge creation and learning discussed during the floor debates and congressional hearings before the enactment of Copyright Term Extension Act (CTEA)?
- 2- To what extent has the promotion of knowledge creation and learning been formulated into CTEA?
- 3- Does copyright term extension impact knowledge creation positively?
- 4- How can we improve the current copyright law in terms of its length to achieve the goal envisioned in Copyright Clause in the Constitution more effectively?

Copyright Law

Copyright Clause was incorporated into the Constitution on September 17, 1787, which empowers the United States Congress, “to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries.”³ Over the course of the time, copyright law has been expanded to more rights and longer duration to copyright holders.

England’s Statute of Anne,⁴ enacted in 1709, is considered the origin of the first copyright law in

³ U.S. Const., Art. 1, Sec. 8, Cl. 8

⁴ Copyright Act of 1710, U.K. statutes at large (1710)

the United States.⁵ The first copyright law in the U.S. secured fourteen years of rights for authors.⁶ The author could also renew copyright for another fourteen years if she was alive at the point of fourteen years. If she did not renew copyright, the work was passed to the public domain.⁷ The renewal mechanism in the first copyright policy insured only works which were worth renewing would remain protected and the rest of the works would return to public domain. During the first 10 years after passing the first copyright law, only five percent of the works were registered to be protected under the Copyright Act of 1709. The remaining ninety five percent immediately passed to the public domain. Although authors had the right to renew copyright for the second fourteen-year term, only few renewed and the rest allowed the work to be passed to public domain. Even today, most books go out of print a few years after publishing and most creative works have a commercial life of a couple of years.⁸

In 1831, the initial term of copyright increased from 14 years to 28 years.⁹ This change brought the total available years for authors to protect their works to 42 years. In 1909, Congress extended the term of renewal to 28 years, which meant authors could protect their works up to 56 years.¹⁰ Under the 1909 Act, federal statutory copyright protection attached to original works only when those works were published and had a notice of copyright affixed.¹¹ In 1976, Congress extended all existing copyrights by nineteen years. In 1998, in Copyright Term Extension Act (CTEA), Congress extended the terms to life of the author plus 70 years and for works of corporate authorship to 120 years after creation or 95 years after publication, whichever endpoint is earlier.¹² The constitutionality of the act was challenged in the court, and ultimately,

⁵ Robert Merges, Peter Menell and Mark Lemley, *Intellectual Property in the New Technological Age* (New York: Aspen Publishers, 2010), 414.

⁶ Copyright Act of 1790, 1 Stat. 124 (1790)

⁷ Works in public domain are those works that their intellectual property rights have expired.

⁸ Lawrence Lessig, *Free Culture* (New York: the Penguin Press, 2004), 133.

⁹ Copyright Act of 1831, 4 Stat. 436 (1831). §16

¹⁰ Copyright Act of 1909, 35 Stat. 1075 (1909). §24

¹¹ Copyright Act of 1909, 35 Stat. 1075 (1909). §8

¹² Copyright Term Extension Act of 1998, 112 Stat. 2827 (1998). §102

United States Supreme Court held the act constitutional.¹³

Since 1790, copyright term has been expanded, but more importantly in 1976, the system of renewal of copyright was removed from the law and every book and other creative work received the maximum term. Prior to copyright act of 1976, the two-part regime required owners of copyrighted works to renew the license after the initial term, if they preferred not to let the work to be passed to public domain. This system kept only those works which had commercial value under the protection of copyright. In “Free Culture,” Lawrence Lessig demonstrates the impact of extensive increase in copyright term on works released to public domain.

In 1973, more than 85 percent of copyright owners failed to renew their copyright. That meant the average term of copyright in 1973 was just 32.2 years. Because of the elimination of the renewal requirement, the average term of copyright is now the maximum term. In thirty years, then the average term has tripled, from 32.2 years to 95 years.¹⁴

The Act of 1976 also codified the doctrine of fair use, which has been used in courts since 1840.¹⁵ Under section 107, the fair use of a protected work is not copyright infringement, even if such use technically violates copyright protections found in section 106, which gives exclusive rights to the owners of copyrighted materials.. Despite all the benefits of the fair use doctrine for promoting cumulative creativity and free expression, unpredictability continues to lurk around this area of law.¹⁶ Many users and creators do not know what is considered fair use and do not fully utilize the doctrine.

With the commercialization of the Internet and the digitalization of copyrighted materials including music, books, and movies, the government became more concerned about copyright

¹³ Eldred v. Ashcroft, 537 U.S. 186 (2003)

¹⁴ Lawrence Lessig, *Free Culture* (New York: the Penguin Press, 2004), 135.

¹⁵ Copyright Act of 1976, 90 Stat. 2541 (1976). §107

¹⁶ Robert Merges, Peter Menell and Mark Lemley, *Intellectual Property in the New Technological Age* (New York: Aspen Publishers, 2010), 592

infringements. To protect the intellectual property right of American citizens, and more importantly comply with World Intellectual Properties Organization (WIPO) treaties, Congress passed Digital Millennium Copyright Act (DMCA) in 1998. DMCA has substantial impacts on the users of digital technologies and it criminalizes the production and dissemination of technology, devices, or services intended to circumvent measures that control access to copyrighted works.¹⁷ It also criminalizes the act of circumventing an access control, whether or not there is an actual infringement of copyright. In the physical world, copyright law gives copyright owner of a book no legal control over how many times she reads that book. That is because when you read a book in real space, that “reading” does not produce a copy. And because copyright law is not triggered, no one needs any permission to read the book, lend the book, or sell the book.¹⁸ Ordinary uses of the book are free of regulation. Ordinary uses are unregulated. But in the digital world, the same acts are differently regulated.¹⁹

DMCA heightens the penalties for copyright infringement on the Internet.²⁰ Under the current copyright law, downloading copyrighted materials from the Internet without fully paying the rights of the owner is an illegal activity and there are punishments for such actions. The statutory damages for each violation of section 1201 of DMCA can be up to \$2,500 per act of circumvention of copyright protection systems.²¹ For instance, if someone circumvents copyright protection systems as specified in section 1201 and downloads 100 songs, the person can be liable up to \$250,000.

¹⁷ Digital Millennium Copyright Act, 112 Stat. 2860 (1998). § 1201

¹⁸ First Sale Doctrine, 17 U.S.C. § 109

¹⁹ Lawrence Lessig, *Remix: Making Art and Commerce Thrive in the Hybrid Economy* (New York: Penguin Press, 2008).

²⁰ DMCA restricts access to digital contents on the Internet, although scholars like Benkler and Lessig believe networks and the Internet provide many social and economic benefits to citizens and criticize the adverse effect of excessive control of the network by intellectual property laws and specifically copyright law. See Yochai Benkler, *The Wealth of Networks How Social Production Transforms Markets and Freedom* (New Haven Connecticut: Yale University Press, 2006); Lawrence Lessig, *Code: Version 2.0* (New York: Basic Books, 2006); Lawrence Lessig, *The Future of Ideas: The Fate of the Commons in a Connected World* (New York: Random House, 2001).

²¹ Digital Millennium Copyright Act, 112 Stat. 2860 (1998). § 1204

Since its inception, copyright law has gone through many iterations of modifications. The term of copyright protection has been extended significantly. Congress has secured significant rights to owners of copyrighted materials by limiting access to end-users. Using an economic model, Landes and Posner argue that copyright law should balance financial incentive for creators and the cost of expression.²² In another economic analysis of copyright law, it is shown that the supply of work and economic incentive are positively correlated for big screen movies. However, CTEA seems to have insignificant impact on new creative works.²³ This finding is consistent with Tor and Dostan who show the the extension of copyright from lifetime plus fifty years to lifetime plus seventy years provides little additional incentive to create.²⁴ In an empirical study, Landes and Posner compare the current length of copyright law to a short fixed term with the possibility of indefinite renewal right and conclude that the expected economic life of most copyrighted works is short. They argue that the size of the public domain expands under the latter system, and a system of indefinite renewals will separate valuable works from works in which the cost of continuing that protection exceeds the sum of administrative and access costs.²⁵ Although these economic studies of copyright law are very informative, they do not clarify whether the recent amendments to copyright law, CTEA, resulted in the promotion of knowledge creation and learning. In his book “Open Access”, Peter Suber argues authors and scholars are better off in many circumstances to publish open access. Referencing a study conducted by Research Information Network, he adds about 60 percent of surveyed researchers responded that access limitations hindered their research and the concerns are not confined to just institutions with limited financial resources. Even wealthiest academic libraries are suffered by access

²² William Landes, *The Economic Structure of Intellectual Property Law*. (Cambridge, Mass.: Harvard University Press, 2003), 71-85.

²³ I. P. L. Png, "On the Supply of Creative Work: Evidence from the Movies." *The American Economic Review* 92, no. 2 (2002): 217-20.

²⁴ Avishalom Tor and Dotan Oliar, "Incentives to Create under a 'Lifetime-Plus-Years' Copyright Duration: Lessons from a Behavioral Economic Analysis for Eldred V. Ashcroft" *Loyola of Los Angeles Law Review* 36, no. 1, (2002): 437-92.

²⁵ Landes, *The Economic Structure of IP Law*, 234-253

limitation.²⁶

Economic incentives may play an important role in creation of particular copyrighted materials such as music, motion pictures, and photography, but not so significant in creation of scientific journal articles and scholarly books. Rowlands and Nicholas surveyed 5513 senior journal authors to study the behavior and attitude of authors. They found that most authors are indifferent about retaining copyright and emphasize the importance of peer review process.²⁷ In a separate study commissioned by Elsevier, the publishing company, 6344 authors were surveyed with 70 follow-up phone interviews. In this survey, “disseminate the results” was the most important reason for publishing given by those who were surveyed.²⁸ In the following section, I will review the literature in which researchers study knowledge creation process and what encourages researchers to create such works.

Knowledge Creation

Knowledge, as defined in Oxford dictionary, is familiarity with someone or something, which can include information, facts, descriptions, or skills acquired through experience or education. It can refer to the theoretical or practical understanding of a subject. “Knowledge” is an extremely loose word.²⁹ Scholars in different disciplines have tried to explain knowledge from different angles. Jakubik summarizes how different disciplines contribute to learning and knowledge creation.³⁰ The most traditional account of knowledge is the “Justified True” which is derived from Plato’s works.³¹ Philosopher Alvin Goldman defines knowledge as “... true belief

²⁶ Peter Suber, *Open Access* (Cambridge, Mass.: MIT Press, 2012).

²⁷ Ian Rowlands and David Nicholas, "Scholarly Communication in the Digital Environment: The 2005 Survey of Journal Author Behaviour and Attitudes," *Aslib Proceedings* 57, no. 6 (2005): 17.

²⁸ Michael Mabe, "Journal Futures: How Will Researchers Communicate as the Internet Matures?" (presentation, Council of Science Editors Annual conference, Tampa, FL, 2006).

²⁹ Rene Jorna, "Managing knowledge." *Semiotic Review of Books* 9, no. 2 (1998): 5-8.

³⁰ Maria Jakubik, "Becoming to know. Shifting the knowledge creation paradigm." *Journal of Knowledge Management* 15, no. 3 (2011): 374-402.

³¹ Stanford University. "Stanford Encyclopedia of Philosophy."

<https://plato.stanford.edu/entries/knowledge-analysis/#KnowJustTrueBeli> (accessed February 27, 2018).

arrived at via appropriate means, methods, or sources.”³² Nonaka considers knowledge to be “a dynamic human process of justifying personal belief toward the truth.”³³ Polanyi classified human knowledge into two categories. "Explicit" or codified knowledge refers to knowledge that is transmittable in formal, systematic language. On the other hand, "tacit" knowledge has a personal quality, which makes it hard to formalize and communicate. According to Polanyi, we can know more than we can tell. Tacit knowledge is deeply rooted in action, commitment, and involvement in a specific context. In Polanyi's words, it "indwells" in a comprehensive cognizance of the human mind and body.³⁴ Goldman offers a similar concept. He believes knowledge-producing methods or sources can be either internal or external. He counts perception, memory and reasoning as the internal sources of knowledge that is part of human mind; while, testimony such as publishing papers and discourse such as giving a lecture are external sources of knowledge.³⁵

How do we acquire knowledge? Nonaka borrows Polanyi's categorization of knowledge and defines knowledge creation in four steps: Socialization, Externalization, Combination and Internalization (SECI) (see Figure 1.1). He argues in this process, knowledge converts from (1) tacit knowledge to tacit knowledge, (2) from tacit knowledge to explicit knowledge, (3) from explicit knowledge to explicit knowledge and finally (4) from explicit knowledge back to tacit knowledge again. In the first phase, through interaction between people, knowledge is tacitly converted (i.e. Socialization). For instance, apprentices work with their mentors or students learn from their professors. In the Externalization phase, the tacit knowledge is articulated to become explicit. In this phase of the process, knowledge is crystallized which allows it to be

³² Alvin Goldman, "Group knowledge versus group rationality: Two approaches to social epistemology." *Episteme* 1, no. 1 (2004): 11-22.

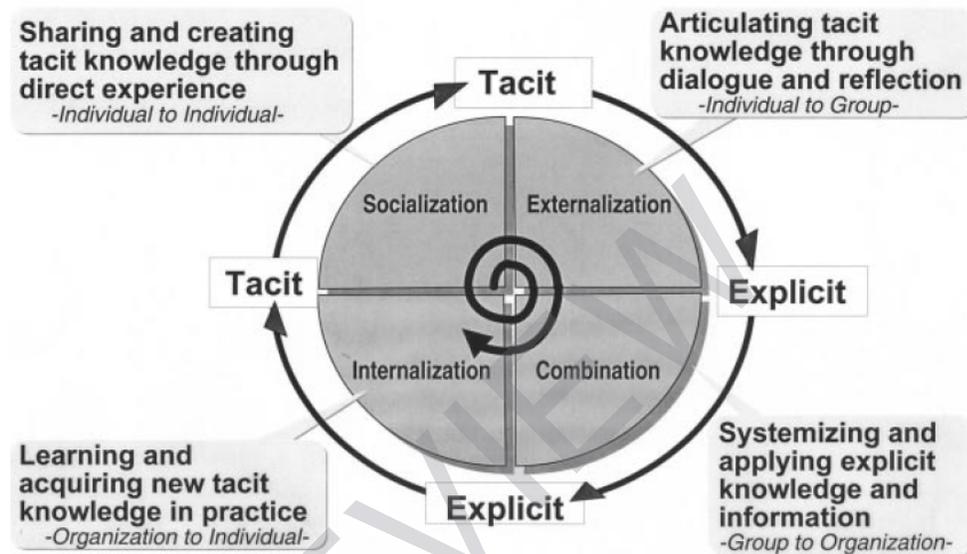
³³ Ikujiro Nonaka, Toyama Ryoko and Byosière Philippe. "A Theory of Organizational Knowledge Creation: Understanding the Dynamic Process of Creating Knowledge." *Handbook of Organizational Learning & Knowledge* (2001): 491-517.

³⁴ Michal Polanyi, *Personal knowledge: Towards a post-critical philosophy* (Chicago: University of Chicago Press, 2015).

³⁵ Goldman, "Group Knowledge Versus Group Rationality", p:1

shared by others. In the third step, explicit knowledge is combined into more complex sets of knowledge. In the last step, the externalized knowledge that has been disseminated in the community becomes internalized.³⁶

Figure 1-1: The SECI Process



Nonaka describes this process as a spiral in which the interaction between tacit knowledge and explicit knowledge will tend to become larger in scale and faster in speed as more actors in and around the community become involved in the process. This is a process that starts in the individual level and gradually more people become involved.³⁷ When performing knowledge intensive tasks, scholars and experts face new problems and they need a circle of individuals to informally interact with to reduce uncertainty and solve problems.³⁸ Communication among scholars allows them to reach an impressive aggregate of knowledge and increase social fund of knowledge by sharing without each scholar being required to independently explore and

³⁶ Ikujiro Nonaka, "A dynamic theory of organizational knowledge creation." *Organization science* 5, no. 1 (1994): 14-37.

³⁷ Ikujiro Nonaka, Ryoko Toyama, and Noboru Konno. "SECI, Ba and leadership: a unified model of dynamic knowledge creation." *Long range planning* 33, no. 1 (2000): 5-34.

³⁸ Jean Lave, and Etienne Wenger. *Situated learning: Legitimate peripheral participation* (Cambridge university press, 1991).

discover the facts.³⁹

What does encourage scientists and scholars to create new knowledge and disseminate it?

Aristotle believes “All men by nature desire to know.”⁴⁰ Does this mean impure non-epistemic

agendas can derail knowledge creation? Epistemologists, social epistemologists, and

philosophers of science have pondered upon this question. Credit, respect, and honor can

motivate scholars and scientists to create new knowledge and publish papers, said Goldman.⁴¹

This system also encourages openness in science.⁴² Bonilla takes this idea even further and

argues that scientists’ main motivation is not the pursuit of truth but the pursuit of

recognition.⁴³ Hull accepts the role of credit seeking in the expansion of knowledge and explains

which sorts of credit are considered most important as well as the effects that this striving for

credit has on science.⁴⁴ Scholars may prefer minimal copyright protection because it increases

the level of access to their scholarly work and result in academic promotions and improve

academic prestige for them.⁴⁵

I will use credit seeking as a motive for scholars to generate more knowledge in my research as

referenced by scholars in philosophy of science and epistemology fields. In the literature, I did

not find references to wealth and profit making as a direct motivation for creating knowledge. In

the second part of the design section, when I describe my Agent Based Model, I will focus on

external and explicit type of knowledge that is reflected in published journal articles.

³⁹ Alvin Goldman, *Knowledge in a social world*. (Oxford: Clarendon Press, 1999).

⁴⁰ Aristotle's metaphysics.

⁴¹ Goldman, *Knowledge in a Social World*, Location 3864 in Kindle Edition.

⁴² Suzanne Scotchmer, *Innovation and incentives*. (Cambridge, MA: MIT press, 2004), 235.

⁴³ Jesús Zamora Bonilla, "Scientific inference and the pursuit of fame: A contractarian approach." *Philosophy of Science* 69, no. 2 (2002): 300-23.

⁴⁴ “Credit comes in a variety of forms from prestigious prizes to citations. Of these, one sort of credit is most fundamental—the use that one scientist makes of the work of another. The success that is central to science is not career advancement but mutual use. Science has the cumulative character it has in part because of this sort of credit. Because scientists must use the work of other scientists, they are forced to cooperate in a metaphorical sense with even their closest competitors, i.e., use their work.” See David Hull, *Science as a Process: An Evolutionary Account of the Social and Conceptual Development of Science* (Chicago: University of Chicago Press, 1988).

⁴⁵ William Landes, *The Economic Structure of Intellectual Property Law*. edited by Richard A. Posner (Cambridge, Mass: Harvard University Press, 2003), 48.

Chapter 2: Methods Discussion

I applied a mixed method to address the research questions of this dissertation. I answered question 1, “To what extent were the phenomena of knowledge creation and learning discussed during the floor debates and congressional hearings before the enactment of Copyright Term Extension Act (CTEA)?”, and question 2, “To what extent has the promotion of knowledge creation and learning been formulated into CTEA?”, using a qualitative study and Discourse Analysis technique. To answer question 3, “Does the current length of copyright term impact knowledge creation positively?”, and question 4, “How can we improve the current copyright law in terms of its length to achieve the goal envisioned in Copyright Clause in the Constitution more effectively?”, I applied a mathematical modeling technique, Agent Based Modeling. I review both techniques in this chapter before share the findings of the research in chapters 3-5.

Discourse Analysis

To understand how much the phenomena of knowledge creation and learning were discussed during the floor debates and congressional hearings and ultimately formulated into the current copyright law, I used discourse analysis.⁴⁶ Discourse analysis is the scrutiny of the language considering the context in which it is used as well as who uses the language. This qualitative technique allowed me to determine the purpose of the law by studying the congressional hearings, floor debates and the reports from committees that happened in Congress during the enactment of the CTEA.

⁴⁶ Discourse Analysis is a proper method to analyze congressional hearings and floor debates. It allows a deep and systemic understanding of the documents. Here are few research examples that applied the same method for analyzing congressional hearings:

- 1- Dave White, "A Discourse Analysis of Stakeholders? Understandings of Science in Salmon Recovery Policy" (PhD diss., Virginia Polytechnic Institute & State University, 2002).
- 2- Minjeong Kim, Chung Joo Chung, and Jang Hyun Kim. "Who shapes network neutrality policy debate? An examination of information subsidizers in the mainstream media and at Congressional and FCC hearings." *Telecommunications Policy* 35, no. 4 (2011): 314-324.
- 3- Hakimeh Saghaye-Biria "American Muslims as radicals? A critical discourse analysis of the US congressional hearing on 'The Extent of Radicalization in the American Muslim Community and That Community's Response'." *Discourse & Society* 23, no. 5 (2012): 508-524.

Discourse analysis let me get into the depth of the discussions and debates and helped me understand the objectives of the provisions of the law. It enabled me to clarify the rationale behind various provisions of the law to ultimately understand to what extent the objectives of the law are in harmony with knowledge creation.

In my discourse analysis, textual documents were my units of analysis. I looked for rationales and objectives of different sections of the law as my main measures. By studying these documents and comparing them to the enacted law, I was able to compare the justifications and objectives for different provisions in CTEA and how much they promote knowledge creation and learning. I was looking for provisions that helped the process of knowledge creation or enabled authors and scholars to earn credits. I also looked for motivations and rationales presented by the members of the Congress and other witnesses who testified during the congressional hearing sessions in support or in opposition to extending copyright term. I explored other issues and topics that did not necessarily promote knowledge creation at the hearing sessions to understand the core topics of the debates. I analyzed the discourse of different interest groups and how they influenced the legislative process and whose argument during congressional hearings became the law.

Data Collection and Analysis

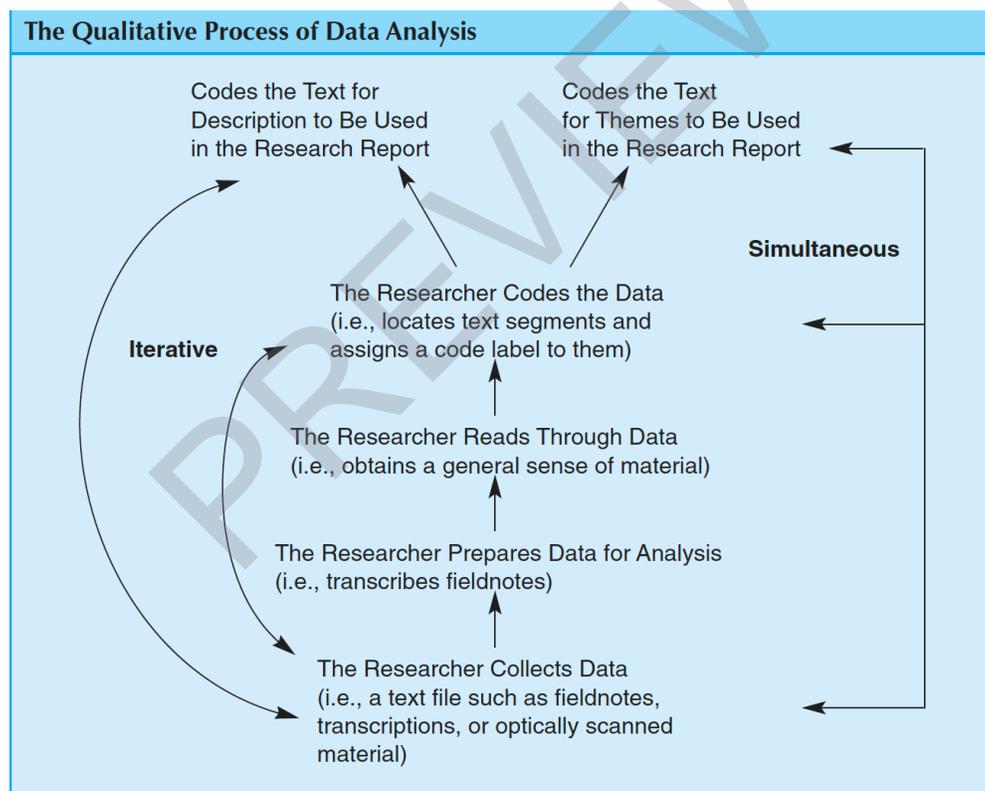
Congressional hearings and floor debates related to this research are public information and accessible through the Library of Congress and Federal Digital System, I accessed and downloaded them to conduct my analysis.⁴⁷ I used qualitative analytical software package QSR NVivo 10 to code and analyze the content of the debates and hearings. I stored and organized the documents in folders for future access, then coded and analyzed the content of the debates and hearings to capture the purpose of the law and the reasoning behind important provisions

⁴⁷ Library of Congress, <http://www.loc.gov/index.html>; Federal Digital System, <http://www.gpo.gov/fdsys/>.

of the law.⁴⁸ In the next step, I imported them into QSR NVIVO for organization. I carefully coded paragraphs and developed memos. Finally, I connected my memos and developed themes to analyze to what extent the phenomena of knowledge creation and learning were discussed during the floor debates and congressional hearings before the enactment of the current copyright law and that was ultimately formulated into the law.

Creswell defines six general steps for analyzing qualitative data. These steps include data collection, preparation, review and reading, coding, description, and developing themes. Figure 1 visualizes these steps.⁴⁹ I followed these steps to develop the themes of my research.

Figure 2-1: The Qualitative Process of Data Analysis



⁴⁸ I used qualitative analytical software packages like QSR NVivo to code and analyze the content of the debates and hearings.

⁴⁹ John Creswell, *Educational Research; Planning, Conducting and Evaluating Quantitative and Qualitative Research* (New Jersey: Pearson Education, 2012), 174.

Agent Based Modeling

Determining the impact of the current copyright law on knowledge creation is a complex problem both conceptually and empirically. It is very challenging to assess its impact in real life and compare it to an alternative copyright law while the current law is the only binding law. Historical comparison is also not very helpful, because the Internet and the information technology revolution in the 21st century have significantly influenced knowledge creation. Research and scholarly work is significantly more collaborative and dependent on shared information. The change makes the comparison of the scholarly work in the 21st century to 20th and 19th centuries very challenging. In this context, using Agent Based Modeling (ABM) to assess this impact becomes quite relevant.

The use of mathematical models to explain phenomena in various disciplines is common. Many early models of complex systems used strong mathematical idealizations that enabled the use of mathematical tools such as differential calculus. However, these idealizations limited the scope of these models. Computer simulations removed some of these barriers and allowed scholars to model more complex problems. ABM often uses computer simulations as a tool to study complex problems.⁵⁰ Using ABM, we can study the behavior of individuals and their interactions with each other and their environment. Individuals, who are defined as "Agents" in ABM, can be institutions, business units, humans, animals, or many other possible objects of study. Using ABM, we can study how change in environment can impact the behavior of agents and how agents' behavior and their relations with other agents can impact the whole system.⁵¹ The interaction of the agents and with the environment makes ABM models even more interesting.⁵²

⁵⁰ Agent based models have been adopted in ecology and especially in modeling foraging behavior of animals. Many interesting and inspiring models have been developed using ABM technique. I have listed key papers that helped me design my model in bibliography section.

⁵¹ Steven Railsback, and Volker Grimm. *Agent-based and individual-based modeling: a practical introduction* (New Jersey: Princeton University Press, 2011).

⁵² The interaction of agents and their environment frequently happens in animal foraging models. Anderson designs the environment as prey, predators and habitats. The interaction of agents with the environment has short-term, mid-term and long-term impact on decision making of the animal.

All these features are quite relevant in modeling the knowledge creation environment and the interaction of scholars in conducting research and publishing papers. Nicholas Payette in an overview of ABM in science compiled the common characteristics of ABM from other studies:⁵³

- *Heterogeneity*: agents in the model are not homogeneous and can differ from each other in many ways. Agents have static characteristics that remain unchanged during the simulation and dynamic ones that are updated. Moreover, external properties control the relation between an agent, its environment and other agents.
- *Autonomy*: Agents have the autonomy to follow policies or not.
- *Space*: Agents are placed in an environment. The environment can be a physical place such as an ecosystem or non-physical environment such as a world of ideas.
- *Local interaction*: Agents usually interact with their neighbors, which is specified by the space, receive information and learn from them. These neighbors can be students or other scholars in an epistemic landscape.
- *Bounded rationality*: This characteristic states that agents do not have global information and do not have infinite computational power. They make use of simple rules based on local information.

Agent Based Modeling gives us the opportunity to analyze what happens in a complex system, by changing variables in the model when financial, time, physical and social constraints prevent conducting real experiments.⁵⁴ It allows us to set up models that are sufficiently close to real

Beauchamp designs his model to study Producer-Scrounger game and Ideal Free Distribution game in which animals forage in different types of habitats:

James Anderson, "AN AGENT-BASED EVENT DRIVEN FORAGING MODEL." *Natural Resource Modeling* 15, no. 1 (2002): 55-82.

G. U. Y. Beauchamp, "Learning rules for social foragers: implications for the producer–scrounger game and ideal free distribution theory." *Journal of Theoretical Biology* 207, no. 1 (2000): 21-35.

⁵³ Nicholas Payette, Andrea Scharnhorst, Katy Borner, and Peter van den Besselaar. *Agent-Based Models of Science*. (New York: Springer, 2012) chap. 4, "In Models of Science Dynamics: Encounters between Complexity Theory and Information Sciences."

⁵⁴ Stephen Guerin, and Daniel Kunkle. "Emergence of constraint in self-organizing systems." *Nonlinear Dynamics, Psychology, and Life Sciences* 8, no. 2 (2004): 131-146. In this paper, Guerin and Kunkle study food foraging in an ant colony using an ABM.

systems, so we can study the system and foresee what scenarios might happen in the real case.⁵⁵ Lazer and Friedman lay out four critical criteria for simulated-based research: First, the model has to be a representation of the real world. Second, the model should be robust and simple enough so we can assess the robustness. Idealizations, despite being useful in modeling, can damage the robustness the model in some cases.⁵⁶ Third, the model should be fully replicable. Fourth, the simulation should produce non-obvious and non-trivial outcomes.⁵⁷

Although the field is still far from maturity, scholars have studied the creation of new science using computer simulations and ABM. In one of the earlier studies in this field, Gilbert designed a fairly simple model to simulate the creation of scientific papers. He introduced the concept of “kene,” synonymous to the concept “genes”, which carries the information of the paper, and each paper represents a new quantum of knowledge. In his model, the kene of a newly produced paper is a function of the cited papers. After running the simulation, Gilbert argued that the generation of new papers happen according to Lotka’s Law in which “for scientists publishing in journals, the number of authors is inversely proportional to the square of the number of papers

Sometimes, researchers take the results of an experiment and study the data further using ABM’s. In these two papers, Goldstone captures the empirical results from several foraging conditions in his previous works and reevaluates findings of the papers:

Michael E. Roberts, and Robert L. Goldstone. "EPICURE: An Agent-Based Foraging Model." In *Artificial life X: proceedings of the Tenth International Conference on the Simulation and Synthesis of Living Systems* (Cambridge Mass.: Mit Press, 2006), 379.

Roberts, Michael E., and Robert L. Goldstone. "Epicure: Spatial and Knowledge Limitations in Group Foraging." *Adaptive Behavior* 14, no. 4 (2006): 291.

⁵⁵ William Sellers, Russell A. Hill, and B. S. Logan. "An agent-based model of group decision making in baboons." *Philosophical Transactions of the Royal Society of London B: Biological Sciences* 362, no. 1485 (2007): 1699-1710. In this paper, Seller, Logan and Hill captured the most important elements of Baboons behaviors of Baboons in group-decision making to build a model that properly reflect the real life of Baboons. In another project, Huston, DeAngelis and Post present an ABM that integrates many different levels in the traditional hierarch of ecological processes. See: Michael Huston, Donald DeAngelis, and Wilfred Post. "New computer models unify ecological theory." *BioScience* 38, no. 10 (1988): 682-691.

⁵⁶ Weisberg and Muldoon examined the robustness of Kitcher and Streven’s Model and argue that the idealization of the model resulted in non-robust conclusion in the model. See: Ryan Muldoon, and Michael Weisberg. "Robustness and idealization in models of cognitive labor." *Synthese* 183, no. 2 (2011): 161-174.

⁵⁷ Lazer, David, and Allan Friedman. "The network structure of exploration and exploitation." *Administrative Science Quarterly* 52, no. 4 (2007): 667-694.