Open and Networked Initiatives and the Digital Transformation of Academic Publishing in China

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ABSTRACT

Many aspects of China’s academic publishing system differ from the systems found in liberal market based economies of the United States, Western Europe and Australia. A high level of government intervention in both the publishing industry and academia and the challenges associated with attempting to make a transition from a centrally controlled towards a more market based publishing industry are two notable differences; however, as in other countries, academic communities and publishers are being transformed by digital technologies. This research explores the complex yet dynamic digital transformation of academic publishing in China, with a specific focus of the open and networked initiatives inspired by Web 2.0 and social media. The thesis draws on two case studies: Science Paper Online, a government-operated online preprint platform and open access mandate; and New Science, a social reference management website operated by a group of young PhD students. Its analysis of the innovations, business models, operating strategies, influences, and difficulties faced by these two initiatives highlights important characteristics and trends in digital publishing experiments in China.

The central argument of this thesis is that the open and collaborative possibilities of Web 2.0 inspired initiatives are emerging outside the established journal and monograph publishing system in China, introducing innovative and somewhat disruptive approaches to the certification, communication and commercial exploitation of knowledge. Moreover, emerging publishing models are enabling and encouraging a new system of practising and communicating science in China, putting
into practice some elements of the Open Science ethos. There is evidence of both disruptive change to old publishing structures and the adaptive modification of emergent replacements in the Chinese practice. As such, the transformation from traditional to digital and interactive modes of publishing, involves both competition and convergence between new and old publishers, as well as dynamics of co-evolution involving new technologies, business models, social norms, and government reform agendas.

One key concern driving this work is whether there are new opportunities and new models for academic publishing in the Web 2.0 age and social media environment, which might allow the basic functions of communication and certification to be achieved more effectively. This thesis enriches existing knowledge of open and networked transformations of scholarly publishing by adding a Chinese story. Although the development of open and networked publishing platforms in China remains in its infancy, the lessons provided by this research are relevant to practitioners and stakeholders interested in understanding the transformative dynamics of networked technologies for publishing and advocating open access in practice, not only in China, but also internationally.
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STATEMENT OF ORIGINAL AUTHORSHIP

The work contained in this thesis has not previously been submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signature

Date: 03/07/2013
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Chapter 1 Introduction

1.1 Digitising Academic Publishing in China

1.1.1 Open and Networked Initiatives
With the rise of Web 2.0 and social media, the media and communication landscape
has changed dramatically. Previously stable relationships between media creators and
consumers are being transformed (Mandiberg, 2012). The media revolution taking
place on platforms such as Wikipedia, Wordpress, Twitter, Youtube, Kindle1 and
delicious makes it difficult to ignore the growing role of user co-creation and social
technologies in the creation, dissemination, consumption, and assessment of culture
and knowledge. The Internet is making it possible for user-generated-content, social
collaboration, collective intelligence, and crowd-sourcing to disrupt established
business models and power structures in the media industries.

This PhD explores the ways in which such open and networked dynamics are
transforming Chinese scholarly communication practices in the Web 2.0 age and
social media environment. It focuses on Chinese language academic publishing in the
mainland of China and research priority is given to emerging models in relation to
scholarly journal publishing, though some discussion also covers common concerns
regarding monograph publishing. This research looks at a variety of disciplines where
scholarly communication is experiencing similar profound transformations in China,

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1 In particular, Kindle Direct Publishing enables authors to self-publish their books and directly sell the digital
versions to readers though KDP platforms, which disrupts publishers’ gatekeeping and mediation in the value
chain of the publishing industry. See: https://kdp.amazon.com/self-publishing/signin
not only in STM (science, technology, and medical), but also social science and the humanities.

Academic publishing in China has a great deal in common with academic publishing in the West. However, there are fundamental differences between the ways in which Chinese universities and publishers operate and the ways in which these institutions function in the United States and Western Europe. China’s Single Party political system has given rise to a government-controlled publishing industry and there is strong government intervention in higher education and scientific research. At the same time, Chinese academia is developing quickly, as is China’s entire publishing sector. Academic publishing in China is changing as it undergoes sweeping processes of modernisation, digitisation, and governmental reform (Liu, 2008; Yan, 2009). China’s academic publishing ecosystem and the case studies in this thesis must therefore be understood on their own terms, although there may be some aspects of China’s experiences that provide insight into broader processes of digital transformation in academic publishing industries beyond China.

Modern Western academic publishing might be traced back at least as far as 1665, when Henry Oldenburg launched Philosophical Transactions of the Royal Society in London and Denis de Sallo published the first volume of Journal des Scavens in France (Nikam & Babu H., 2009). Over the centuries scholarly communication in the West has come to rely heavily on commercial publishers operating subscription-based

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2 This thesis employs the term “West” and “Western” to refer to the countries like the UK, the US, Australia, Canada, Germany, Italy, France, etc. which have similar academic tradition and publishing systems. Chinese academic publishing is trying to imitate the Western system, as a result of which there are a growing number of common characteristics. However, the Chinese counterpart is quite different in a number of fundamental aspects.

3 In this thesis, I will explicitly reference the Chinese or Western system when addressing some different characteristics; however, I will discuss common issues of the two systems without explicit geographic specification.
business models predominantly for institutional and library markets. A complex social system for formal scholarly communication governed by a series of social norms has also emerged (Garvey, 1979; Merton, 1961). Two important aspects of this system are peer review to control the quality of academic content; and evaluation systems characterised by “publish or perish”, which assess academic talent and impact through publication-related metrics. Such systems enable Western academic publishing to assume its basic functions: the communication and certification of knowledge (Cuel, Ponte & Rossi, 2009).

Academic publishing in all markets is now undergoing a digital transition. Print journals and monographs are being converted into digital formats and organised and made available through online repositories and databases. Web 1.0 developments that have seen publishers shift from print to digital publishing technologies have greatly enhanced many aspects of established academic publishing systems. However, Web 2.0 and developments in social media have the potential to revolutionise academic publishing in much deeper and more profound ways. A growing number of digital publishing initiatives are approaching the communication and certification of scholarly content in new ways and incorporating dynamics of user co-creation and social collaboration into their most basic functions, such as online preprints like Nature Proceedings and arXiv, social reference management websites like Menderley and citeUlike, open/social/post publication peer review experiments in Elsevier and PLoSONE, scholarly blog sites such as Chemical Blogspace and ChemBark, scholarly Wikis like WikiProject Physics and OpenWetWare, publishers’ Wikis like WiserWiki and RNA Biology.
This research uses the term “open and networked initiatives” to refer to the new models in academic publishing, which are strongly based on open access and the interactive and collaborative engagement of academics, assuming the functions of communication and certification of scholarship. The word “open” primarily refers to the openness of access that is inherent in these approaches, which provides unrestricted online access to peer reviewed (not necessarily done in traditional ways) scholarly content. The word “open” has also been chosen because it provides a link between the theoretical approach of this thesis and the work that surrounds “Open Science” (Peters, 2010; Schroeder, 2007). The word “networked” highlights the fact that networked communication, which connects participative and creative users and enables collaboration among them is fundamental to the emergent digital publishing initiatives discussed in this research. Though it is difficult to draw a sharp distinction between open and networked initiatives and other digital academic publishing models, the term ‘open and networked’ has been chosen because it emphasizes the specific innovations that are arising as a result of connected and collaborative communication between users. This thesis is interested in the role that these networked communication practices are playing in the digital transformation of the academic publishing industry in China, a different context from the Western countries.

Traditional academic publishing models are “characterized by a process of selection, editing, printing and distribution of an author’s content by an intermediary” (Brown, Griffiths et al. 2007:3). In this thesis, the term “traditional” not only refers to print journal and monograph publishing, but also the Web 1.0 based digital models that simply digitize print content as well as old models of the print age, with little innovations associated with user co-creation and social collaboration. In such a
“traditional” system, commercial publishers play a dominant role as intermediaries in the international publishing landscape. However, the costs charged by commercially motivated academic publishers for the value added services they provide are a source of growing concern for scholarly communities. The proliferation of journal and monograph titles, rapid increases in subscription prices and limited library budgets have produced what is widely regarded as a ‘crisis’ in academic publishing.\(^4\)

It is widely accepted that there are problems with publisher-mediated systems of knowledge certification as well, which involve a commercially motivated organisation overseeing editorial gatekeeping processes, including the assessment of research impact and the coordination of academic peer review processes. Time lags between submission and dissemination, difficulties with minority-based pre-publication peer review (Angell, 1993; Yang, Liang, Gou & Ling, 2008), the misuse of impact factors and citations in assessing research impact (Bollen, Van de Sompel, Smith & Luce, 2005; Hoeffel, 1998), and publication-oriented evaluation within Universities (Hall, 2008; Jiang, 2005) are just some aspects that have been criticised in both the Chinese and Western academic publishing systems.

The open and networked initiatives discussed in this thesis are employing non-traditional approaches to scholarly communication and certification, which aim to facilitate “a dialogue between scientists without mediation or obstacles” (Quirós & Gherab, 2009:63), and possibly outside the “traditional” system defined above. Waldrop (2008b) believes that open and networked communication "fits so perfectly

with the way science works” because scientific knowledge is built up by "crowdsourcing" the contributions of peers and then “refining that knowledge through open debate”. This system thus has potential to truly revolutionize academic publishing. Just as Brown and R. Boulderstone (2008:302) point out:

“The expansion of user generated media (UGM) into scholarly publishing – the grass roots creation and dissemination of information without formal organizations structuring such interaction – could be the next big challenge facing the scholarly publishing community”.

However, in practice much of the disruptive potential of the open and networked architecture of the Internet remains latent in the world of Western academic publishing. At present, open and networked functionality mostly exists as minor technical additions on established digital publishing platforms, or remains at the fringes of formal publishing – on independent sites and niche platforms. The fundamental functions of academic publishing (the review and evaluation process, the precedence of authorship, the academic evaluation, and the dissemination and preservation of scientific knowledge) are less affected by the open and networked initiatives (Campbell & Poppalardo, 2010; Camussone, Cuel & Ponte, 2011; Ponte & Simon, 2011; STM, 2008). Ware (2009) examines a variety of Web 2.0 inspired models, concluding that new technology “offers tremendous potential to enhance scholarly communication”, but the absence of appropriate adoption reduces its suitability and viability.

The slow uptake of open and networked possibilities for scholarly communication in Western countries might also be explained as a result of the fact that publishers,
libraries and academic communities have co-evolved over several centuries. Academics themselves and other stakeholders in the scholarly communication system, including research funders, are familiar with, value and depend upon established academic publishing practices and institutions. However, the nature of open and networked initiatives is decentralised and disruptive. The “disintermediation by authors, editors and libraries” is not only a threat to publishers (Cuel et al., 2009), but also a profound change of academic culture and behaviour regarding scholarly communication. There is limited motivation for stakeholders to disrupt the existing system; questions remain for many academics about the extent to which Web 2.0 approaches to academic publishing address questions of quality control. Ponte (2011:149) examines scholars’ attitudes toward “collaborative and Web 2.0 inspired” models, arguing that though “there is a strong positive attitude” the major challenge resides in the combination of open approaches with “robust and reliable quality control mechanisms”.

In contrast, the Chinese academic publishing system may provide a more dynamic context for the adoption of open and networked digital publishing initiatives. The established system for academic publishing in China is not as developed as in the West, with which academics are not satisfied (Wang, 2005; Yan, Song & Xu, 2002; Zhang, 2003). Furthermore, because China’s mainstream academic publishing system is government-controlled and is not built on values of academic independence or press freedom, the decentralised and democratic nature of Web2.0 and possibility of an open alternative to the dominant system may thus be even more valuable for scholars in China than in other markets in terms of efficient exchange of knowledge and the diversified voices to be heard.
In theory, academic publishing in Western contexts is open to anyone who wants to get involved in the publishing business. In reality of course, it is a complex industry that includes dominant transnational conglomerates. Nonetheless, the possibility that any entrepreneur who wants to be involved in publishing can take up the gauntlet presents a stark contrast to academic publishing in China, where permission from the state is required to engage in publishing activities. Furthermore, in contrast to the high levels of commercial concentration that exist in the Anglophone world of academic publishing, China’s publishing industry is highly fragmented and average publishers have a small scale of journal titles, weak financial capacity, and limited industrial influence. The fact that very few publishing conglomerates gain a foothold in the market is combining with recent commercial reforms of the sector to make it possible for entrepreneurs from other industries to begin playing in publishing spaces. Many of these new players are more willing than their established publishing industry counterparts to engage with the open and networked possibilities of new technologies.

As a rapidly changing aspect of an academic system that is growing and developing with extraordinary speed, it is unsurprising that China’s established academic publishing system contains areas of deep inefficiency and corruption. This is a phenomenon that is not unique to China, but which might be expected within any transitional economic and political system. However, the transitional nature of China’s academic publishing system, the size of its research communities and the very real need for a scholarly communication system that functions more effectively, also means that academic publishing in China may be more open to innovative models and even disruptive initiatives than might be expected within the much more stable publishing ecosystems of established markets. It is entirely possible that open
and networked initiatives may receive greater support from academic communities, policymakers and research funders in China than could be expected in nations where there is general acceptance that existing publishing models, while perhaps less than perfect, are doing a reasonable job.

As this thesis discusses, open and networked Chinese language publishing initiatives are developing very rapidly. A growing number of initiatives known as the Chinese arXiv, the Chinese Academia.edu, and the Chinese CiteUlike have reached an impressively large scale and have gathered a high level of influence within the Chinese scholarly communication landscape. The emergence of these players is resulting in dynamic and transformative interactions with the existing Chinese academic publishing system. Based on Chinese language scholarly communication, these players are separate from the international English-language academic publishing world.

Considering the overall digital transformation of academic publishing in the world, this research focuses on the transformative process from the general digital and Web 1.0 based models to the Web 2.0 inspired open and networked models (as shown in Figure 1.1), and is based on Chinese language academic publishing (either traditional or digital) in the mainland of China.
Understanding how open and networked technologies are being incorporated into the academic publishing landscape in China will enrich existing knowledge about academic publishing experiments in the Web 2.0 environment by adding a Chinese story. Moreover, this research may help provide insight into the dynamics of open and networked scholarly communication systems in a rapidly changing global publishing landscape, particularly those associated with the transformation towards open access.

1.1.2 The Academic Publishing System in China: Transitions and Controversies

“Ge Zhi Hui Bian (格致汇编)” published in 1876, is regarded as the earliest scientific journal in China. The modern academic publishing industry appeared around the foundation of the Republic of China in the early 20th century. The modernization of
Chinese academia was driven by the New Cultural Movement, which aimed to promote Science and Democracy. It deeply shaped the academic publishing system and as a result of which, the overall system was similar to its Western counterparts (Xia, 2008). After the Communist rule in 1949, the Chinese academic world was “revolutionised”. The more than 60 years’ history of the academic publishing system in the People’s Republic of China can be categorised into 2 major periods: in the first 30 years, it was copying the Soviet Union model with centralised governmental administration, highly specialised disciplines, and ideological control, which collapsed during the Cultural Revolution. The latter 30 years saw a Westernisation and commercialisation process, in which university management and the academic publishing business imitated the systems of the US. However, unlike the American system, the strong government control has never been relaxed in the Chinese system.

Today, the Chinese academic publishing industry is operating on a commercial basis under state control, which started since the media reform in the 1990’s (Akhavan-Majid, 2004). It has a unique political economy and business models based on commercialisation and monopoly protected by government. In China, only state-owned and government-approved publishers can engage in editing and publishing businesses. Publishing numbers (ISBN and ISSN) as identification of publications all over the world are completely controlled by the Chinese government and becomes a scarce resource that legitimizes formal publication. In academic publishing, the Chinese government restricts the overall scale of journal and monograph publishing. However, the academic population in China is fast growing and academic research today is increasingly interdisciplinary and specialised, which requires more journals and publishing services. As such, the Chinese academic publishers enjoy a market
where demand is exceeding supply. The government-protected monopoly establishes big market entry barriers and limits competition within the academic publishing industry in China. It is thus not surprising that even the poorly developed journals can survive well in China.

The business models in the Chinese academic publishing industry are different from English language academic publishing. Copyright operation and subscription revenue made in institutional markets only account for a small part of income and profit because of the averagely small scale of individual publishers and the distribution monopoly by third party databases. For most journal and monograph publishers in China, subsidies from the government and sponsoring institutions as well as page fee charges contribute more to financial viability.

In the last couple of decades, the overall quality and credibility of Chinese academic publishing have decreased dramatically. One important reason for this is the emergence of competition from English language international journals. English language international journals that are indexed by SCI are much more valued for career promotion, research funding assessment and reputation building purposes than Chinese journals. SCI indexed foreign journals have thus become the first choice for academic authors in China. In 2011, Chinese authors published 121,500 papers in international SCI journals. Most of these papers arose from state-funded key research projects and were written by elite research academics in China. China has more than 6,000 domestic journal titles. With the exception of the 129 SCI journals, 210 EI

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5 http://www.istic.ac.cn/portals/0/documents/kxpj/20111202-2010%E5%B9%B4%E4%B8%AD%E5%9B%BD%E7%A7%91%E6%8A%80%E8%AE%BA%E6%96%87%E7%BB%9F%E8%AE%A1%E7%BB%93%E6%9E%9C%E5%8F%91%E5%B8%83%E7%A8%BF%201%E6%96%B0%E9%97%BB%E7%A8%BFm.pdf
journals and a very small number of other reputable titles,\textsuperscript{6} Chinese domestic journals have found it increasingly difficult to attract the latest high-quality research outputs (Ren and Montgomery, 2012). This means that there is an oversupply of journal titles in China, and a severe undersupply of high quality content for them to publish.

It has become virtually impossible for the vast majority of Chinese journals to maintain any sort of publication quality. Unsurprisingly, it is not possible for such journals to rely on subscription revenues to support their existence. Instead, commercial vanity publishing has become the mainstay of Chinese journals. A growing number of journals in China now depend on page fee revenues as their primary source of income and have either drastically lowered or removed altogether quality control mechanisms such as academic peer review. Selling ‘publishing credits’ – or certificates of publication – to academics who are able to use them for promotion purposes or to fulfil higher degree requirements within Universities, has become a crucial business model.

Vanity publishing has limited opportunities in countries like the US and UK where publishing is a relatively transparent industry and where markets feature an expectation of high standards of quality control and peer review. In China, however, the legacies of a planned economic model and a controlled print publishing system have resulted in points of artificial scarcity and corruption within the system. The main asset of “junk journals”\textsuperscript{7} in China is their ability to control publishing numbers and issue publishing credits. Similar cases also occur in relation to monograph

\textsuperscript{6} Ibid.
\textsuperscript{7} The term junk journal is widely used to describe the journals that remove or lower peer review standard and thus fail to control quality. See http://openaccess.eprints.org/index.php?/archives/908-Gold-Fever,-Finch-Follies,-and-Junk-Journals.html; http://blogs.the-american-interest.com/wrm/2012/04/28/publish-rubbish-or-perish-and-pay-through-the-nose/
publishing in China. According to a report by Wuhan University, the trade in sham publishing in China was valued at 1 billion RMB yuan in 2009. Complete vanity publishing value chains have now formed, and include ghost writing, page space wholesaling and agencies that connect academics with junk journals and visa versa.\(^8\)

Not only has this had a dramatic impact on the quality of the content being published, but plagiarism and academic misconduct have become widespread. Prof. Shen Yang who led the research team for that report, further points out that, using anti-plagiarism software, 72% of sample publications in 2007 included serious plagiarism.\(^9\)

Quite a number of Chinese academics are deeply dissatisfied with the existing system. These academics have aired their concerns during seminars, public discussions, media interviews, and in formal papers in the field of academic publishing studies (Gao, 2009; Guo, 2007; Huang, 2007). Many also point out that the root of the structural problems in the academic publishing industry is the special academic system in China (Liu, 2007; Wang, 2005; Zhang, 2007; Zhang, 2008c). The most significant difference between the Western and Chinese academic systems lies in the fact that the universities are not governed by faculties or professionals in China, but by government officials. In other words, along with the academic system there is a bureaucratic administration system where universities and departments have a relevant administrative ranking as government institutes and are supervised in bureaucratic ways.

China’s government-controlled academic system has achieved a great deal: it has developed with impressive speed and facilitated the rapid expansion of higher

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\(^9\) See http://news.xinhuanet.com/comments/2010-02/05/content_12935842.htm
education and research capacity. There were only 205 universities in 1949, 598 universities in 1978 after the Cultural Revolution, while in 2006, the figure has increased to 1867\textsuperscript{10}; the number of scholarly publications, in particular the papers indexed by major scientific indexers like SCI, SSCI, and A&HCI increased from 460 in 1979 (Nie, Shi & Du, 2010) to 836,000 in 2011\textsuperscript{11}.

However, increases in “academic GDP” have not been converted into corresponding growth in academic productivity and innovation in China. The absence of Nobel Prize winners from the Chinese domestic research institutions embarrasses a government that has ambitions to see China become a global leader in scientific research. Regarding applied research, according to the Wall Street Journal, in 2010 China had “… 20% of global population, 9% of global GDP, 12% of global R&D investment, but only 1% of overseas-registered-patents, half of which come from transnational corporations.”\textsuperscript{12} On February 21, 2009, a symposium on the problems of the current academic system was held in Tsinghua University and nearly 40 famous scholars, academic journal editors, and government officials attended. There was a consensus that the Chinese university system suffers from the following four major problems: duplication, exclusivity, utilitarianism, and bureaucratism\textsuperscript{13}.

The bureaucratic administration of Chinese universities has given rise to an extreme and simplified academic evaluation system, which is a Chinese version of “publish or perish”. This system over values quantitative indexes and “hard criteria” (Ying

\textsuperscript{11}http://www.cutech.edu.cn/cn/qslt/sgwz/2012/08/1331846157606894.htm
\textsuperscript{12}http://www.21fd.cn/a/yijianzhongguo/2011/0805/31725.html
\textsuperscript{13}See http://www.annian.net/show.aspx?id=23675&cid=24
such as the total number of publications, SCI, and impact factors, which are used to distinguish between academics, establish hierarchy, and justify the increasingly uneven resource allocation within Universities. However, this evaluation system fails to pay attention to the variation in terms of quality and value amongst publications with same hard criteria.

Chinese university staff and researchers are being exhausted by the task of manufacturing and even plagiarising academic papers for evaluation. Prof. Qian Liqun is well known for his criticism of the Chinese higher education system. His recent argument has been widely disseminated: “Pragmatism, Utilitarianism, and nihilism are reshaping the Chinese academic system, in which academics are trained to be elegant, smart, well-educated, but selfish; these individualists lack the spirits of Science and humiliate the titles of intellectuals.”

Moreover, academic misconduct and corruption is becoming increasingly serious. Yang (2008) points out that there is a “corrupt academic atmosphere in China” that deeply affects academia in terms of peer review, evaluation, promotion, and the distribution of scholarly resources. Hong (1997) proposed the term “publishing corruption” to define the inequality and partiality in peer review and editorial process because of the lack of supervisory system preventing publishers from corruption (Li, 2004; Sun, 2006; Yan, Song & Xu, 2002; Huang, 2007). Wang (2008) believes that open and social academic evaluation can effectively prevent and reduce corruption in

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15 This is a quotation from the speech made for the 100th anniversary of Beijing University by Prof. Qian Liqun. See http://news.xinhuanet.com/edu/2008-04/25/content_8046728.htm
the Chinese academic system; in his own words, “appraisal massification is an effective constraint on academic appraisal corruption”.

The transition of Chinese academic publishing from print to digital started in the late 1990’s, much later than was the case for English language academic publishing. This was largely because publishing remained the domain of state-owned enterprises in China, and was one of the last areas for commercial reform and opening up processes to penetrate. As a result, when digitisation did begin to occur, it did so in the context of a poorly developed, commercially inefficient academic publishing system, in which most publishers lacked the economic resources or technical skills to manage digitisation themselves. This created a space within the market for third-party database packagers, who were able to manage aspects of digitisation that publishers themselves could not. Third-party database packagers have now established a monopoly on the distribution of digital scholarship in China and are important players in the academic publishing landscape. Nonetheless, a large number of Chinese journals still depend on print versions to distribute content in addition to third party databases, whilst monograph publishing in China is even more dependent on print formats.

When it comes to the development of open and networked publishing initiatives, traditional journal and monograph publishers in China are just as conservative as they are in other markets. Third party digital database providers have also been cautious about embracing the open and networked potential of Web 2.0. However, non-publishing stakeholders in scholarly communication processes that were excluded from the academic publishing business under the system of government-protected
monopolies that dominated the print publishing industry are actively exploring opportunities in digital spaces. These ‘non-publishers’ are playing an essential role in experimenting with new models and exploring the potential of digital technologies to address scholarly communication challenges. Almost all of the influential, emerging scholarly communication platforms such as online preprints, academic blogs, and social reference management systems are owned and operated by non-publishing stakeholders in scholarly communications, such as governmental institutions, national libraries, IT companies, and even a group of scientists in China. Open and networked academic publishing initiatives in China do not aim to improve established academic publishing models from within. Rather, they aim to transform an increasingly dysfunctional academic publishing landscape by providing innovative, even radical, alternatives.16

Given that the established system has a series of corruption and failure in China, the issues raised in the Chinese digital transformation are different. In Anglophone academic publishing, the open and networked initiatives are competing within a well-developed traditional system with a history of several centuries, and are highly valued and widely approved by academics. In the Chinese counterpart, traditional journal and monograph publishing remains developing and transitional; the emerging system thus has more opportunities in the competition. Meanwhile, the established publishers are more open to radical innovations in China because they are struggling to establish viable models serving Chinese scholarly communication. In short, there might be a

16 In later chapters, I will provide more points and arguments made by practitioners in these initiatives in China, many of which are about completely and radically changing the existing system instead of modifying it from within.
co-evolution instead of simple competition between the emerging and established systems in China.

The development of open and networked initiatives in China is also occurring in the context of the wider transformation of the Chinese academic system. The Chinese government has set a reform agenda for higher education, in which de-bureaucratization is becoming an increasingly important theme. So the digital transformation of China’s academic publishing landscape is occurring as part of a wider process of socio-cultural and policy changes that aim to make the Chinese academic system more open, dynamic and effective. China’s open and networked academic publishing initiatives thus have the potential to act as a catalyst for the wider reinvigoration of scholarly communication in China, and to encourage intellectual innovation and productivity within the Chinese knowledge society.

1.1.4 Research Focus and Major Concerns

In order to explore the tension between innovation and the existing practices and institutions that are informing the digital transformation of Chinese academic publishing, this research examines two specific types of open and networked initiatives in China: online preprints and social reference management. The two case studies discussed in the thesis address two separate areas of inefficiency within the existing academic publishing system in China. The first, an academic pre-prints database called Science Paper Online (Zhongguo Keji Lunwen Zaixian, 中国科技论
addresses the difficulty that the efficient exchange of research outputs is
delayed and sometimes impeded by inappropriate gatekeeping in Chinese academic
publishing, in which scholarly papers are not judged totally on their merits. The
second, New Science (Xin Kexue, 新科学)\(^ {18} \), addresses the difficulty that many
readers face in attempting to locate good quality papers in the context of third-party
databases that are filled with ‘junk’ publications and cannot be relied upon.

**Online Preprints and Science Paper Online**

Online preprints models were originally designed to disseminate peer reviewed papers
that had been accepted by formal journals that could be slow to formally publish work,
and which often only made work available on closed-licenses. However, in the Web
2.0 age, online preprints models are developing further, combining with scholars’
self-archiving, institutional eprints, and other emerging platforms. Some initiatives
look more like academic self-publishing or informal academic publishing, in which a
“publish then filter” mechanism is widely employed. Online preprints not only enable
instant exchange of the latest research outputs, but also provide an alternative to
existing systems of peer review and publisher-mediated gatekeeping.

Nature Proceedings,\(^ {19} \) arXiv\(^ {20} \), and Liquid Publications\(^ {21} \) are typical platforms for
online preprints. There are three major online preprints platforms in China: Chinese
Science Papers Online (CSPO)\(^ {22} \) launched by National Ministry of Education, the

\(^ {17} \) http://www.paper.edu.cn/
\(^ {18} \) http://www.xinkexue.com/
\(^ {19} \) http://precedings.nature.com/
\(^ {20} \) http://arxiv.org/
\(^ {21} \) http://liquidpub.org/
\(^ {22} \) http://www.paper.edu.cn/
Chinese Preprint Server (CPS)\textsuperscript{23} operated by the by National Science and Technology Library, and the independently operated Miracle Repository\textsuperscript{24} owned and operated by a group of scientists. A number of adaptive innovations are evident in the Chinese initiatives. For example, Science Paper Online combines online preprints with post-publication formal peer review in order to balance the benefits of a mechanism for the fast exchange of scholarship with a system of transparent and rigorous quality control. Miracle Repository has expanded its content from preprint papers into monograph drafts, teaching materials, textbooks, and other relevant materials valued by academics but not publishable traditionally.

Because the Chinese academic publishing industry is controlled by state-owned publishers, online preprint and eprints initiatives are significant in terms of challenging monopolies and providing an alternative, open academic publishing service. Chinese online preprints initiatives, either operated by official institutions or grassroots academics, are becoming leading forces in the transformation towards an open and networked future for academic publishing.

**Social reference management and New Science**

Social reference management is an application of Web 2.0 tools like social bookmarking, tagging, and ‘mash-ups’ in academic publishing, which enables participative users to share, recommend, comment on, and remix scholarly publications in collaborative yet customised ways. Based on a specialised social network of research peers with common interests and expertise, social reference management allows individual users to share personal libraries and exchange reviews,

\textsuperscript{23} http://prep.istic.ac.cn/
\textsuperscript{24} http://www.qiji.cn/
notes, and recommendations in order to find the most valuable references through the collective choices of their peers. Social reference management websites aim to build a large-scale user-generated folksonomy of scholarly references by crowdsourcing the inputs of creative readers. Compared with taxonomy and metadata provided by publishers, databases and libraries, social referencing is more human-centric, efficient, and trustworthy in selecting valuable references (Brown & Boulderstone, 2008).

Mendeley, Connotea, and CiteULike are internationally well known platforms for social reference management. Chinese journal databases like CNKI also have similar services. However, the social reference management website discussed in this thesis, “New Science” 25, operated by a group of young PhD students, is more influential in China. Social reference management is sometimes regarded as a library 2.0 application. However, such a description tends to underestimate the impact of this model upon academic publishing. The nature of social reference management is an assessment system that depends on readers, rather than the gatekeeping of academic publishers. It is thus a basis for the re-organization of the certification of scholarship in the Web2.0 environment, in which peer reviewers and editors are no longer gatekeepers of quality and citations are not a dominant indicator of research impact. Rather, readers’ collective choices matter. In other words, scholarly content is assessed by how many readers read it, who the readers are, and how the works influence those readers.

25 http://www.xinkexue.com/
This alternative is more significant in the special Chinese context than other places in the world. As mentioned above, the Chinese academic publishing system is being disrupted by the prevalence of vanity publishing. Readers’ crowdsourcing can thus be expected to play a more important role in filtering the high quality content from the flood of junk journals and trash papers. At the same time, Chinese academia is deeply shaped by government-controlled bureaucratic administration, an increasingly utilitarian academic culture, and corruption. The decentralised and democratic social assessment by academic readers helps to reduce the negative influence from the contexts and to establish a more open and transparent system for scholarly communication.

Unlike some academic publishing research, this work is not discipline-specific. This is because the transformation of academic publishing associated with open and networked models is happening in all disciplines at a variety of levels. The Chinese initiatives in practice are not as discipline-focused as the English counterparts.

Online preprints and social reference management are the basis for the discussion on academic publishing transformation in this work because these two models are very relevant to the essential parts of academic publishing value chain. They are also redefining the communication and certification of scholarship by non-traditional approaches and disruptive innovations. The Chinese initiatives are valuable for their adaptive innovations, which improve the suitability and viability of emerging models. Furthermore, their practice based on a large-scale of users and a different language system also helps to deeply understand the disruptive and evolutionary potential of open and networked initiatives. There will be a number of important issues raised
accordingly, urging stakeholders in the 21st century to reconsider the suitability and reasonableness of established business models, the dominant social norms governing academics’ behaviour, and higher education policies, most of which have been developed in the last century.

1.2 Research Questions and Significance

This research explores the complex interaction between open and networked initiatives and China’s academic publishing system, which is itself in the midst of transformation. The primary question driving this research is:

*What is the role of open and networked initiatives in the digital transformation of Chinese academic publishing?*

In order to answer this driving research question, three sub-questions have been identified:

1. How are viable adaptive models being developed by open and networked initiatives in practice?

2. What are their innovations in terms of communication and certification of scholarship?

3. How are the initiatives improving academic publishing and impacting existing business models and social norms in China?
Studies done in disciplines like information science, library studies, and publishing studies provide valuable insight into new model design, the technical improvement of scholarly communication, and the future scenarios of open and networked academic publishing in the environment of Web 2.0 and social media (Anderson, 2007; Borgman, 2007; Brown & Boulderstone, 2008; Casey & Savastinuk, 2007; Linh, 2008; Ware, 2009). However, not enough academic attention has been paid to adaptive innovations and the process of transformation in practice.

Instead of designing perfect models theoretically, this research looks at the practice of open and networked initiatives, in particular the adaptive innovations of emerging platforms that are applying the socio-technical advances of Web 2.0 and Open Science in the context of academic publishing and China.

Focussing on adaptive innovations, this thesis further analyses the economic and social impacts of open and networked initiatives upon business models and social norms that govern the communication and certification of scholarship. Instead of talking about future scenarios, this thesis critically understands the transformation process of academic publishing by exploring the tension between innovation and context, from which future trends will arise. Inspired by a critical understanding of disruptive changes associated with social media and user co-creation in areas like digital entertainment, pop culture, and self-publishing, this research aims to explore the evolutionary potential of open and networked initiatives in the academic publishing counterpart. This will enrich theoretical understanding of academic publishing in a digital age.
Though China provides a unique context for understanding the role of open and networked initiatives, there may also be lessons that can be taken from its experiences for English language academic publishing industries, which are also undergoing processes of transformation and digital disruption. In July 2012, the UK government announced its decision to accept the recommendations made by Finch Report, delivered by a research team led by British sociologist Dame Janet Finch. The recommendations aim to make publicly funded research outputs publicly accessible and transform existing academic publishing to an open access paradigm in a smooth and controllable way. The Finch report recommended a shift from a “reader pays” to an “author pays” model, which would result in the main source of revenue for commercial publishers being transformed from subscription income paid by libraries on the basis of perceived value, to Article Processing Charges (APC) paid by authors using their research funds. This shift would also ensure that all scholarly content published under the model is made open to any reader that has an interest in accessing it (Finch, 2012).

The shift to ‘gold’ open access advocated by the Finch Report would constitute a fundamental transformation for the UK’s academic publishing system, and would disrupt relatively stable business models based on subscription revenues. The preoccupation with ‘green’ and ‘gold’ models of open access, both of which rely on publishers to manage peer review and quality control processes (Harnad, 2010), has meant that other approaches have tended to be overlooked in policy debates and often...

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by scholarly communities themselves. The possibility that academic communities could move beyond either green or gold models and explore new approaches to managing and funding scholarly communication has scarcely been considered. Systems that rely exclusively on authors’ self-archiving are perceived as being less concerned with and less capable of controlling the quality of content than publisher-mediated gatekeeping process. However, what is happening in China may suggest that something different is possible. China’s experiences thus deserve more attention from open access researchers and practitioners discussing Anglophone publishing developments.

1.3 Research Design

1.3.1 Theoretical Framework

This research employs an interdisciplinary approach. It draws on critical theory to understand the social and economic nature of academic publishing. A great amount of literature explores the complex social system of academic publishing (Garvey, 1979; Garvey & Griffith, 1967) and the influences of existing social norms (Derricourt, 2008; Don, 1994; Fry, Oppenheim, et al., 2009; Harley & Acord, 2011), which provides helpful theoretical frameworks for this thesis in analysing the social aspects.

The economy of the academic publishing industry is structured in terms of crucial publishing resources based on which, value propositions are made and power and interests allocated. Inspired by Thompson’s (2005b) four capitals framework, this thesis identifies four crucial publishing resources: economic resources, human resources, branding resources, and copyright resources, which help to systematically
interrogate the impact of innovative models upon the political economy of academic publishing. Just as Borgman (2007:9) points out, “authors, libraries, universities, and publishers are wrestling with the trade-offs” between traditional forms of publisher-controlled systems and an emerging author or institution-controlled forms of open and networked publishing, which reallocate resources and thus interests and power among stakeholders.

The research on open access, digital scholarship, and other socio-technical changes of scholarly communication is useful for this work in theorizing the transformation happening in the Chinese academic publishing industry. Open access is widely discussed, ranging from the benefits of publicly accessible research outputs, through the politics of being open and the technical facilitation by digital technologies, to the debates over gold and green open access paradigms (Gray, Schalkwyk & Bruns, 2007; Hall, 2008; Harnad, 2010; Harnad et al., 2004; Miller, 2009; Willinsky, 2006). Furthermore, studies on the digital transition of academic publishing in terms of business model (Brown & Boulderstone, 2008; Tian & Martin, 2009), peer review (Harley & Acord), information infrastructure (Borgman, 2007), and emerging social norms (Fry, Schroeder & Besten, 2009; Schroeder, 2007:1) are also fundamental to understand the overall changing landscape of academic publishing. Some research that addresses and explains specific changes associated with Web 2.0 in academic publishing is closely related to this thesis, for example scholarly communication 2.0 (Ponte & Simon, 2011), library 2.0 (Hull, Pettifer & Kell, 2008; Miller, 2005), scientific publishing 2.0 (Cuel, Ponte & Rossi, 2009), scholarly social bookmarking (Olson, Zimmerman & Bos, 2008), alternative peer review and metrics (Bollen et al., 2005), and so forth.
This research draws on both English and Chinese language literatures in its interrogation of Chinese academic publishing. It addresses not only common concerns like open access (Cheng & Ren, 2008; Shao, 2007) and digitisation (Shen, Li, Yang, Shen & Kwong, 2010), but also several crucial differences relating to China, such as the academic administrative system (Hvistendahl, 2011), the unique page fee model (Wang, 2006) and an extreme version of metrics-driven academic evaluation (Wang, 2005). These points are discussed in detail in Chapter 3.

This thesis is also inspired by humanities-based studies of social media and user co-creation, and the work of researchers at the ARC Centre of Excellence for Creative Industries and Innovation, Australia. An evolutionary approach to understanding the creative industries (Potts, Hartley, et al., 2008), processes of co-evolution between markets and non-markets (Banks & Potts, 2010), and “consumer entrepreneurship” (Hartley & Montgomery, 2009) have all influenced the theoretical approach taken in this dissertation. Additionally scholars like Benkler (2006, 2011), Shirky (2008, 2010), and Lanier (2006, 2010) are also inspiring for this research.

These studies understand the impact of social media models as part of an emerging “social network market”. They argue that in the context of uncertainty, risk, and novelty, for example when navigating markets of knowledge innovation such as those of creative content (Hartley, 2008:19) individual choices are often usefully influenced by the choices of peers. As such, technologies that facilitate user co-creation and social functionality are disrupting the value propositions of traditional media as intermediaries and gatekeepers redefined by a new “agent-network-enterprise”
structure. In such a system, “everyone is an active agent” that originates novel ideas; “networks adopt them”; “enterprises retain them” (Hartley, 2008:20).

The open and networked initiatives in academic publishing, such as self-archiving based online preprints and social reference management, are facilitated by the same social and technical dynamics. Just as Peters (2010) argues, open scientific communication is based on “the co-production of knowledge goods and services where the user is increasingly seen as co-designer or co-creator integrated into value creation process”. This theoretical framework thus offers a novel perspective for thinking about the disruption and re-organization of publishers’ intermediary, traditional peer review, and formal certification of scholarship by the dynamics of open and networked initiatives and based on academic user co-creation, social peer review and readers’ crowdsourcing. All these issues are essential in today’s debates over green and gold open access as well as the further transformation of academic publishing with less dependence on commercial publishers. As such, the open and networked models are not regarded as technical improvements of and supplementary to the existing system; instead, it is “a dynamic mechanism driving the search for new models and institutions” (Potts, Hartley, et al., 2008: 10-11).

Traditional publishers are comparatively passive, or even resistant to the transformation of academic publishing that is associated with digital technologies and commercial innovations, both in China and in other countries. New technologies are resulting in a process of Schumpeterian “creative destruction” (Schumpeter, 1942), in which innovations incessantly revolutionize the economic structure from within, destroying the old and creating space for the new to form and emerge.
Combining a critical understanding of academic publishing and the Chinese context with evolutionary thinking on industrial transformation, this research builds a balanced analytical framework. Special attention is given to how new models are adapting to the contexts in which they must operate and how contextual factors are themselves being shaped by the rise of publishing initiatives. As such, this thesis does not attempt to simplify the impact of new models and the resistance from existing systems by applying the frameworks of either technical determinism or social determinism; instead, it analyses the transformation as a complex process of co-evolution that involves digital technology, business innovations, social norms, and governmental policies in China.

1.3.2 Research Methods and Process

This research employs a variety of research methods including case studies, in-depth interviews, participant observation, and document analysis. It draws on two extended fieldwork trips carried out in China: four months in 2011 and two months in 2012 in order to collect useful and up-to-date data. These trips resulted in a total of 27 in-depth interviews with a wide range of stakeholders. Most interviewees were managers, senior officials, and reputable scholars in areas relating to the publishing industry, China’s academic system, and government in China. I also visited a dozen digital and traditional academic publishing companies, attended China’s national book fair, conferences, and seminars in order to widely discuss this research with publishing professionals and stakeholders.
Case Studies

As both a process (method) of inquiry and the outcome of that inquiry (result), case studies can provide insights into particular cases or issues using multiple perspectives (Stake, 2003). In this research, case studies aim to provide insights into the practice of open and networked initiatives and their complex interaction with various contextual determinants, which “plays a secondary, supportive role to facilitate our understanding of” the digital transformation of academic publishing and interpret the relevant “issues identified” in China (Stake 2003:134-164).

As this research focuses on online preprints and social reference management, two Chinese academic websites are selected for case studies accordingly: Science Paper Online, the biggest online preprint platform in China, owned and operated by the Chinese National Ministry of Education; and New Science: a community based academic social reference management website. There are several reasons for the selection of these two case studies. First of all, they are the counterparts of the research focus in China, the significance of which has been discussed above. Moreover, instead of simply copying Western models, these two Chinese initiatives have developed some valuable adaptive innovations, either harnessing administrative power or grassroots dynamics. Some innovations contribute inspiring ideas for the development of open access and digital scholarship in English language academic publishing. Last but not least, governmental institutions and grassroots academics are two important forces involved in pioneering new scholarly communication models in the Chinese academic publishing industry whilst the Chinese commercial publishers and institutional repositories have not contributed as much as the counterparts in the UK and US. There are interesting points of comparison between the two case studies.
However, more importantly, their practices provide important insights into dynamics between the aspects of China’s government and the individual academics involved directly in the open and networked digital transformation of China’s academic publishing industry.

Based on the two Chinese academic websites, this research interrogates the ways these initiatives develop innovative models and make innovations adaptive and viable in the Chinese academic publishing context. Special attention has been given to the founders’ own interpretations of their innovations, the strategies employed to acquire academic publishing resources, and the difficulties they encountered in practice. At the same time, academics’ use of the initiatives as well as relevant stakeholders’ attitudes towards and understanding of the new platforms has also been examined.

Case studies provide a snapshot of how the open and networked models are being employed in publishing practice in China, which is also a starting point for further discussion about the emerging transformation of the Chinese academic publishing industry. They also provide this research with abundant empirical data, which distinguishes it from theoretical analysis and predictions regarding the same issues.

When carrying out the case studies for this project, I visited the organization that operates Science Paper Online and conducted in-depth interviews with the site’s founders and managers. I also interviewed seven authors who have published original papers on this platform, which shares research outputs online prior to formal publication. The interviewees chosen were of a range of ages, at different stages within their academic careers, and came from a number of disciplines. In addition to
interviews, my research involved in-depth analysis of the sites themselves, including analysis of available website statistics. The data provides valuable information about user behaviour and demographics.

Unlike the government-operated Science Paper Online, which employs a real-name system, the grassroots website New Science looks more like a virtual community. As the founder and managing team are in various cities all over the world, I could only contact them with emails and instant messages. In addition to online interviews with experienced users, I had extensive personal contact with users through my participation in this platform. In order to avoid ethical transgressions, the founder of New Science posted the transcript of our interview so that it could be commented on by the user community. This transcript has now been read nearly 2,000 times, as a result of which, my identity as a participant researcher has become well known within the community.

**Interviews**

Interviews with participatory users, managers, and operators involved in the two Chinese platforms of case studies shed light on the significance and impact of new models as well as contextual determinants from an insider’s viewpoint. At the same time, interviews with relevant stakeholders outside case studies, including fellow digital publishers in other initiatives, traditional academic publishers, university managers, library managers, and governmental policy makers provide an understanding of their attitudes to the potential transformation of Chinese academic publishing toward an open and networked future. This helps to objectively assess the

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significance and limitation of innovative alternative models as well as contextual
dynamics and constraints, from which the future trends may be derived.

As I have been working in the Chinese publishing industry for over 13 years, it was
relatively easy for me to recruit my former colleagues in the traditional section of
publishing industry as interview subjects. It is sometimes difficult to explain the
concept of open and networked initiatives to publishing professionals. In order to
avoid unnecessary confusion, I usually introduced the detailed models in real
platforms and provided examples of what is happening in practice before I asked
publishers to talk about their understanding, attitudes, and strategies relating to these
new entrants. Regarding digital publishers in emerging platforms, I mainly reached
them through relevant contact information shown on their websites.

It is worth mentioning that, given this research is about social media and social
networks in academic publishing, I purposefully used academic social media tools to
recruit interviewees, contact publishing companies, and share and discuss findings
with peers. My blog in the biggest Chinese online academic social media site Science
Net has attracted nearly 100,000 visits. It was especially useful for recruiting
famous academics and relevant stakeholders outside the publishing industry. The
effectiveness and efficiency of social media recruitment, as well as the open-
mindedness of Chinese academics using social media is impressive. In later stage,
however, I realised that, this recruitment method risked a recruitment bias towards
open-minded academics. Therefore, I employed a snowball strategy based on existing
social connections to recruit interviewees that rarely use social media and online

28 http://blog.scientist.cn/u/renxiang
communication tools, in order to ensure that I was able to develop a balanced understanding of the questions this research asked.

Most interviews were carried out as face-to-face conversations during my two fieldwork trips to China. They usually lasted for more than one hour. “Focussed” (semi-structured) in-depth interviews (Hopf, 2004) were employed, but interviewees were usually willing to talk more about their professional insights after I had completed my structured questions. Locations varied according to interviewees’ convenience and preference and included their offices, cafés and meeting rooms. I also used telephone and email to interview a few respondents in distant locations. All face-to-face and telephone interviews were recorded and email interviews were archived. For ethical reasons, I have anonymised all of the interviewees when writing up the final thesis, using “Respondent 1, 2, 3 …” to refer to them instead, except for some places in the text when it was necessary to disclose the identities of interviewees in order to provide context for the views that they expressed; for example, the founders of initiatives talking about their understanding of innovations, or senior government officials talking about policy changes. In such cases, interviewees are public figures and provided permission for me to identify them in this thesis.

After the formal interviews, I have remained in contact with a number of interviewees, many of whom have sent me up-to-date information related to my research questions. Further discussion with some helpful interviewees is also important in this research, which provides useful feedback to improve the overall arguments as well as some information they hesitate to give me when we were quite strange to each other. Additionally, a number of narrative (open-ended or unstructured) interviews and
discussions with relevant professionals have also been taken at the convenience of occasional circumstances such as seminars and book fairs.

The interviewees could be categorized into four main groups. I have interviewed quite a few founders and directors in the Chinese emerging platforms for scholarly communication. In addition to the two case studies, the interviewees also include the founder of Miracle Repository (Qiji Wenku,奇迹文库)\(^2\) which is the earliest online preprints platform in China, the managing editor of Science Net (Kexue Wang, 科学网)\(^3\), the biggest academic social media for Chinese scholars, and the founder of Witkey (Weike Wang, 威客网)\(^4\) which is a well-known website where professional users solve problems by crowdsourcing. Interview questions focus on why they launch these alternative platforms, their understanding of open and networked academic publishing, the practice and difficulties in their operation, the constraints, dynamics and future trends. These pioneering professionals provide inspiring and valuable ideas and information on the above aspects. Moreover, they talk frankly about the advancement and limitations of the two case studies from fellows’ or competitors’ perspectives. This part of the interviews gives this research comprehensive information for the two cases as well as the emerging academic publishing sector in China as a whole.

As this research understands open and networked initiatives as user co-creation in an academic publishing context, interviewing users becomes more important than

\(^2\) [http://www.qiji.cn/](http://www.qiji.cn/) When I finalised the thesis, this website was closed down. It is the earliest and an influential online preprint platform in China but has been in difficulty for years. I will analyse the reasons later in this thesis.

\(^3\) [www.sciencenet.cn](http://www.sciencenet.cn)

\(^4\) [www.witkey.com/](http://www.witkey.com/)
common research. Due to the limitation of PhD budget, surveys can hardly be done to collect a large scale of users’ data. Instead, this research deliberately selected representative and diversified users for in-depth interviews, considering their age, disciplines, career status, and attitudes towards emerging models. As such, the interviewees include famous scholars, early-stage academics, PhD students, and even amateur scientists. It is a surprise that users’ understanding of open and networked initiatives is different from operators and founders of these platforms, while also being different from some theoretical arguments. These users suggest quite practical concerns with the innovative models like “publish then social filter”, “social peer review”, “alternative metrics”, and “social reference management”. For example, some researchers share research outputs online before formal publication, sometimes because their work is too radical to be published traditionally, or they are no longer concerned about career promotion based on publication metrics. Likewise, many users in social reference management websites do not understand the innovation of the new model, but use them only because it is helpful for literature review. These findings show a real and practical picture of open and networked academic publishing in China.

I also interviewed many traditional journal and monograph publishers, including the deputy chief editor of the Journal of Chinese Science (Zhongguo Kexue, 中国科学), the oldest and most famous scholarly journal for science in China, the founder and former chief editor of Harbin Institute of Technology Journal, the sales director of CNKI (Zhiwang, 知网), the biggest academic database provider in China, and quite a number of experienced senior editors and managers working for traditional publishers. Since I have been working in the Chinese publishing industry for over a decade, my interviews with these traditional publishers are beyond introductory information,
which focuses more on the traditional publishers’ strategies and attitudes towards a
digital or networked future, as well as their current and potential difficulties in
digitisation. These interviews provide fresh points relating to traditional publishers’
thoughts on digital publishing.

Relevant stakeholders have also been interviewed in this research including the head
of ISTIC (Institute of Scientific and Technical Information of China) in charge of the
official ranking of universities in terms of publishing performance, senior officials in
Chinese national Ministry of Education and Ministry of Industry and Information
Technology, university managers in charge of academic evaluation, and library
managers. Though these stakeholders do not directly influence academic publishing,
their work and attitudes can greatly influence academics’ selection of open and
networked initiatives by university ranks of publications, evaluation policies, funding
criterion, library purchase preferences, and so forth. In-depth interviews with these
powerful stakeholders suggest that the so-called “contextual determinants” are not
always unchangeable or necessarily negative to initiatives; instead, quite a number of
stakeholders admit that they know and admire advancements in emerging
communication infrastructure. Though they do not hold as radical attitudes towards
the transformation as some practitioners involved in initiatives, they are quite open in
terms of changing policies and the administrative system in order to solve existing
problems and adapt to the fast changing scientific environment. Meanwhile, the
interviewees are also invited to assess the initiatives in terms of their advances,
impact, and limitations, in particular the two cases. Their responses are also helpful
for open and networked models to improve their viability and adaptation into special
academic contexts and to be widely accepted and approved.
The interviews in this research provide highly informative and instrumental data that is different from existing understanding on the practice, usage, and social selection of open and networked initiatives. The data lay a solid foundation for further discussion on the complex digital transformation in the Chinese academic publishing industry as well as the emerging convergence between old and new systems.

**Document Analysis**

Document Analysis plays an important role in this research, as it provides valuable secondary materials and data. Secondary materials consulted in this research fall into two major categories: the first is formal reports and official statistics including *Statistical Data of Chinese S&T Papers*[^32], *An Investigative Report on the Chinese Academic Evaluation System*[^33], *Annual Report on Science Communication of China*[^34], *Trends in Global Higher Education: Tracking an Academic Revolution*[^35]. The second major source of documentary material was relevant media coverage and articles. These documents provide authentic and authoritative information and data on the features, problems, and trends in the traditional academic publishing industry, higher education system, and scholarly communication practice in China. Due to the absence of up-to-date and in-depth documents in English literature, this research absorbs instrumental data from many Chinese language publications and documents instead, though priority has been given to English documents as much as possible.

[^32]: http://www.istic.ac.cn/portals/0/documents/kxpj/20111202-2010%E5%B9%B4%E4%B8%AD%E5%91%BD%E7%89%8D%E6%8A%A9%E8%AE%BA%E6%96%87%E7%BB%9F%E5%8F%A1%E7%BB%93%E6%9E%9C%E5%8F%91%E5%B8%83%E7%8A%BF%204%E6%9C%9F%E5%88%8Am.pdf
[^34]: http://www.ssap.com.cn/Shop/BookMainContent.aspx?ProductManager_Id=20120705103909
This research draws on a variety of informal documents and materials because open and networked initiatives and digital publishing are fast changing areas. Professionals and users tend to express themselves more through online media, social media, and other informal channels in addition to formal communication. On the websites of initiatives, particularly the case studies, there are a wide range of documents about functions, histories, statistics, users’ polls, and so forth, which are helpful to understand their innovations and practices. Moreover, this research analyses a number of blog articles in Science Net, the biggest academic social network and blog-sphere in China, in order to understand academics’ attitudes towards traditional and emerging academic publishing on a larger scale. It is worth mentioning that Science Net employs a compulsory real-name system, as a result of which, blog articles and arguments are linked with actual academics in China, making the data valuable for research.

As mentioned above, this research was designed within the confines of a limited PhD budget. As a result, publicly accessible documents become an important and cost-saving method to collect valuable data for this thesis. Additionally some interviewees also kindly offered me access to a small number of useful industry specific reports that would otherwise have fallen outside the scope of the project budget.

**Participant observation**

This research is not ethnographic and participant observation only accounts for a small part of the methodology. Participant observation aims to provide an original picture of the publishing practices in open and networked initiatives. I have registered
as a user in the two emerging platforms of case studies and participated in some online activities such as social referencing, networking, and social peer review. The major purpose of doing this was to experience the innovative functions in publishing communication provided by new models as well as socio-cultural observation on users’ activities and participations. This method is more useful in understanding the case of New Science, which is a grassroots online community where users are mostly anonymous and unwilling to be interviewed formally. Through participant observation, I established trust with some active users and joined some online groups, which enabled me to understand the operation of this social reference management website from an insiders’ perspective.

Ethical Considerations
As required by QUT’s guidelines for ethical research, I prepared a project outline and consent forms in both English and Chinese for my interviewees. The outline not only introduces my research, but also clearly addresses the rights and obligations of interviewees involved in this research, in particular informing them that their involvement will not be compensated monetarily. When I recruited my interviewees, I sent them electronic version of the documents by QUT official email. I also presented them with print version before our face-to-face interview. The interviewees usually signed the consent form after the interview; for those who signed in advance, I also asked them to review the interview again and reconsider their agreement at the end of interviews. Some telephone interviewees sent a scanned signed consent form by from their official email address. Interview questions that had been approved by the ethics committee at QUT were also sent to interviewees a few days before the interviews.
Given Chinese academic research does not have such restrictive requirements in terms of research ethics, my asking interviewees to sign a consent form as well as recording the whole interview sometimes made them uncomfortable, especially for some publishing professionals or people without academic backgrounds. Because I have been working in academic publishing for years and many of these interviewees know me directly or indirectly, they finally agreed to sign the consent form and be recorded during the interview. Comparatively, academics were more comfortable with such a method and were more willing to cooperate. Some even praised the rigor in academic research in Australia.

Participant observation also involves ethical considerations. As mentioned above, I identified myself publicly in New Science in order to avoid ethical controversies in participant observation there. Though I could not do this on Science Paper Online, which is a highly serious and formal mandate operated by the Chinese government, I collected users’ personal information and attitudes mainly through formal interviews and used participant observation mostly to experience new functions as a user there.

1.4 Chapter Outline

Chapter 1 briefly introduced the background of this thesis, research problems, and the process of the three-year PhD project. The next chapter will provide deeper insight into the literature that is relevant to this topic, discussing existing studies relating to open and networked initiatives in academic publishing. Chapter 2 will also highlight a few neglected perspectives, in particular the failure of English literature to discuss what is taking place in relation to digital developments in academic publishing of
China. Chapter 3 introduces the Chinese academic and higher education system and the academic publishing industry in greater detail. It aims to provide a comprehensive and critical introduction to the Chinese academic publishing system for readers who are not familiar with the unique context for digital evolution provided by China. Special attention is given to the crucial difference between Chinese academic publishing and its Western counterparts in terms of business models, social norms, and governmental regulation.

Chapter 4 and Chapter 5 are two case studies that examine the practice of two Chinese academic publishing initiatives: Science Paper Online, a government-operated online preprint platform based on authors’ self-archiving; and New Science, a social reference management website operated by a group of young PhD students. Its analysis of the innovations, business models, operating strategies, influences, and difficulties faced by these two initiatives highlights important distinctions between digital publishing experiments in China and those taking place internationally. Based on abundant empirical evidence, this chapter points out that though open and networked initiatives are introducing somewhat disruptive innovations in academic publishing, they do it through quite hybrid models that integrate both socio-technical advances associated with Web 2.0 and viable and useful measures widely used by traditional journal and monograph publishing. Likewise, the consumption at the moment is less driven by abstract and somewhat idealist Open Science ethos, and more by participant users’ self-interests and self-centric concerns.

Chapter 6 further theorizes the innovation and impact of open and networked initiatives. It starts by addressing the tension between formal and informal, and
between the public and private in scholarly communication. This chapter argues that the emerging system is publicising the previous private scholarly activities like sharing working papers, discussing and recommending references and at the same time formalising some aspects. As such, academic publishing is transforming from a certification-based system, in which content is published after rigorous gatekeeping to a communication-oriented one, in which fast and efficient exchange of knowledge is more valued. Accordingly publishers’ value proposition, as well as the power structure in the academic publishing value chain is being redefined, which will deeply impact the established structure of the Chinese academic publishing industry. Moreover, there is a process of democratizing science within and outside academia driven by open and networked initiatives. Socially, it is the implementation of the open science ethos in China.

Chapter 7 talks about the complex selection of open and networked models by publishing industries, individual academics, institutions, and the Chinese government, from which future trends are derived. Instead of terms like disruption, resistance, elimination and replacement, this chapter understands the future trends by a convergence between emerging and traditional academic publishing and a divergence or separation between open-minded stakeholders and comparatively traditional ones in China. It examines the dynamics and risks in such a transformation of academic publishing in China as well as contextual supports and constraints. This chapter is concluded by a summary of practical and theoretical implication of this research on today’s research on digital scholarship, and the practice of academic publishers facing challenges from digital publishing all over the world.
Chapter 2 Open and Networked Models Meet Academic Publishing: A Literature Review

This chapter starts with a critical review of existing studies on open and networked initiatives in academic publishing, as well as the emerging infrastructures or ethos of conducting and communicating science such as e-Science, Science 2.0, and Open Science. It points out that socio-technical developments relating to open and networked initiatives are parts of a wider transformation of academic publishing and scientific research in the 21st century, in particular, towards open access and collaborative science. In addition to literature on the initiatives, this research also draws on social and economic analysis of the established academic publishing system, in particular, the limitations and controversies. These critical studies help to link the potential of open and networked models with the existing problems of academic publishing. Moreover, this chapter introduces humanities studies on the evolution of media industries associated with user co-creation and social media, arguing that their approach applies to the analysis of the disruptive potential of the open and networked initiatives in the academic publishing industry. The chapter ends by pointing out that relevant studies in English literature lack geographic diversity and China is neglected, where academic publishing has a far different context from the West.
2.2 Open and Networked Initiatives

2.1.1 Internet Innovations and Digital Academic Publishing

In 2004, O’Reilly coined the term “Web 2.0” to define an evolution of Internet communication from read-only to read-write web. The rise of a read-write web shifted the focus of the Internet from technology and information to users, their participation, and the facilitation of their connections (Serantes, 2009). Beer (2007) identifies three possible agendas for the development of a viable sociology of Web 2.0: “the changing relations between the production and consumption of internet content; the mainstreaming of private information posted to the public domain; and, the emergence of a new rhetoric of ‘democratisation’.”

The years following O’Reiley’s pronouncement of Web 2.0 have seen profound changes in the Internet and the ways people use it. These innovations and changes have gone far beyond O’Reilly’s original definition, which has led to discussion of “Web 3.0” or “Web 4.0”. The advent of Cloud technologies and mobile Internet has further upgraded the digital mediation of communication. Peters (2010) employs the term “technologies of openness” to emphasize the capacity of digital technologies to facilitate openness, sharing, and collaboration, particularly in the context of scholarly communication.

Academic publishing is experiencing an ongoing digital transition and is being shaped by these socio-technical advances. As mentioned in Chapter 1, there are a variety of initiatives that could be categorized as “open and networked” in digital academic
publishing, which include user co-creation, crowdsourcing, social collaboration, and peer sharing.

There is some academic research on open and networked initiatives, focusing on the local innovations in specific platforms or models. For instance, Barjak (2006) and Kling (2003) study the increasing importance of online scholarly forums for the potential to “revolutionize scholarly communication, rendering it more efficient and effective”. The academic BBS or forums could be regarded as the earliest fundamental model for open and networked academic publishing and are still quite popular today. Correia (2005:353) examines the model of authors’ self-archiving initiatives like e-print, e-script, which are also touched on in this thesis. Additionally some studies on digital scholarship infrastructure (Borgman, 2007), digital scholarly communication (Ware, 2009), e-learning (Anderson, 2007), and library 2.0 (Casey & Savastinuk, 2007) include detailed research on online preprints, social reference management, and other open and networked models.

However, research priorities in these studies have been given to the improvements or modification of the established academic publishing system by harnessing Web 2.0 and networked dynamics. As such, the sharp distinction between the digital Web 1.0 based models and the Web 2.0 inspired initiatives, as well as the disruptive potential of the latter, tend to be neglected or underestimated.
Nikam and Babu H. (2009) employ the term “Open Access publishing with Web 2.0 tools” to characterise the initiatives and list 8 benefits\textsuperscript{36} of the new models they describe. Likewise, the category of academic publishing initiatives defined by Brown (2008:309) using “User Generated Media (UGM) and collaborative or social publishing” is similar to “open and networked initiatives” in this research. These studies explicitly define the dynamics of Web 2.0 and social media in the academic publishing context, which is a new paradigm instead of trivial technical modification or update. These studies suggest a profound transformation in both the publishing industry and academia, leveraged by open and networked initiatives in which “the rise of a new power” is balancing “traditional commercial, financial, ideological and political powers” (Dalloz & Portnoff, 2001). Furthermore, the incomparable strength of networked communication in terms of mediating the exchange of scholarly knowledge lead scholars like Earl (2008:206) to believe that the digital revolution has “removed the need for the intermediary services provided by publishers.” However, most seem more like optimistic and radical predictions, or the description of a utopian future, with less critical analysis and empirical insight into the tension between innovation and context.

In practice however, as mentioned in Chapter 1, the social and economic adoption of open and networked models lags heavily behind the development of technologies. Quite a number of researchers feel pessimistic or negative about the future of open and networked academic publishing given its complex and special contexts. Ware

\textsuperscript{36} It lists the “positives of Web 2.0 Tools in Open Access Publishing” as follows: OA removes price barriers, instant publishing or live publishing, immediate reach to audience, paradigm change in approach and openness, improves collaboration among authors and readers, improves collaboration activity for publishing/sharing, authors can announce, obtain comments, ratings and still hold copyrights, a huge save in the libraries budget.
(2009)’s examination of a variety of Web 2.0 inspired models suggests a disappointing picture of usage and influence; while Stuart asserts that, “Web 2.0 fails to excite academics” (Stuart, 2009). Though Waldrop (2008b) coins the term “Science 2.0”, he also expresses significant worries about academics’ unwillingness and reluctance in using the innovative models, which can offer little practical reward at the moment.

Moreover, financial viability has become a crucial controversy of open and networked initiatives, compared with mature business models developed by traditional academic publishers. Guthrie (2008) concludes that the “online academic resources” mostly suffer from poor financial sustainability and revenue streams, many of which can be categorized into “open and networked initiatives”. In fact, the Web 2.0 inspired models that rely on monetizing user profiles, people and communities (Beer & Burrows, 2007) instead of creative outputs have been criticized for poor commercial viability. Obviously the initiatives in academic publishing have no monopoly advantages as traditional publishers do to charge readers, authors, and libraries to maintain their sustainability.

Neither optimistic nor pessimistic viewpoints have paid enough attention to the evolving interaction between innovations and contexts, which include the adaptive innovations of the Web 2.0 inspired models into the special context of academic publishing and the evolving changes of the contextual determinants in the wake of socio-technical development. In other words, the transformation is an ongoing and dynamic process instead of a static one, which tends to be neglected.
It is worth mentioning that there is also an interesting absence or simplification of publishers’ role in the transformation associated with open and networked initiatives, which may lead to misleading conclusions. Most studies focus on academics: emphasizing their dissatisfaction and demands, and thus paying much more attention to efforts to build an alternative system operated by non-publishing stakeholders and outside of the control of for-profit publishers (Houghton, Steele & Sheahan, 2006; Thompson, 2005a). As a result, traditional publishers are often stereotyped as the enemy of open knowledge communication and as an obstacle to open initiatives. The essential role of emerging digital publishers that pioneer initiatives has, to a large extent, also been neglected.

In fact, traditional publishers have begun to “re-visit fundamental issues of value and profit and of how these might be modelled” in the digital contexts (Tian & Martin, 2009). Big traditional academic publishers like Nature have also developed and launched quite a number of open and networked models; corporations like Springer own some influential publishing initiatives as well. Regarding the overall digital transformation of academic publishing leveraged by open and networked initiatives, the role of publishers could be more dynamic, open, and constructive. Practically, profound changes in academic publishing could not happen without dynamic and innovative publishers, whether transforming traditional publishers or emerging publishers.
2.1.2 E-Science, Science 2.0, and Open Science

The emerging transformation of academic publishing driven by open and networked initiatives is not only taking place within the academic publishing industry, but involves a series of far-reaching social changes in scholarly communities. At micro levels, this involves changes in academic behaviour relating to academic publishing and general scholarly communication; at macro levels, it is possible that the wide adoption of open and networked initiatives will drive profound shifts in social norms that govern academia as well as the policies governing research. In other words, open and networked initiatives are an integral part of ongoing processes of change within the ways in which scholarly communities carry out research and communicate their findings with each other and wider society.

Researchers and policy makers are endeavouring to develop suitable frameworks for research in the 21st century. The terms “Cyber infrastructure” in the US and e-Science in the UK are widely used to refer to the adoption of advanced computational resources and information services to create and communicate scientific knowledge in more effective and efficient ways. Sir John Taylor’s definition is a widely cited one to describe such an initiative:

E-Science means science increasingly carried out through distributed global collaborations enabled by the Internet, using very large data collections, terascale computing resources and high performance visualization.37

Waldrop (2008b) coined “Science 2.0” to refer to innovative methods of digital scientific communication and e-research, arguing that Web 2.0 has ushered in an age

of “collaborative science” based on academic crowdsourcing and principles like openness, sharing and collaborations with peers from around the world. Some researchers believe that Web 2.0 is a perfect fit with the way science works, making it possible for researchers to share expertise, information and ideas, foster enhanced collaboration, as well as providing access to useful sources of references and information (Nikam & Babu H., 2009). Developments in Science 2.0 are thus providing an “effective and efficient” model for scholarly communication and have the potential to significantly enhance processes of academic collaboration, productivity, and innovation (Waldrop, 2008a).

According to Peters (2010: 125):

> These new communications technologies are based on the economics of file-sharing that promote mass customization and the personalization of services based of the co-production of knowledge goods and services where the user is increasingly seen as as co-designer or co-creator integrated into value creation process.

This suggests that open and networked initiatives are not something unique or special, but a counterpart of the wide social movements associated with user co-creation and social collaboration, which are happening in a range of communication areas. In other words, new approaches to scholarly communication, like online preprints sharing, social peer review, authors’ self-archiving, lab data sharing, and scholarly crowdsourcing have an intrinsic relationship with the media revolution that is being played out through Youtube, Wikipedia, Facebook, and delicious. These phenomena are all based on the empowerment of end users and their creative and collaborative engagement in the value proposition of knowledge communication.
2.1.3 Conflict and Adaptation

As suggested by existing studies, the open and networked initiatives have impacts upon the academic publishing industry as innovative but disruptive models; they also have potential to reshape the social systems that inform scholarly communication practices. This is a process that involves tension and which is presenting new challenges to all of the stakeholders involved in the scholarly communication landscape. Just as CESTMJP (Committee on Electronic Scientific) (2004: 7) argues:

Advances in digital technology are radically changing capabilities to reproduce, distribute, control, and publish information. These advances are increasingly central to scientific activity, but they may conflict with some existing practices and policies that shape traditional publishing.

Opinion about how these tensions will play out in the future varies, with academic researchers and other scholarly communication stakeholders holding quite divergent opinions. However, there is a middle ground to be found in understanding the interaction between the somewhat disruptive Web 2.0 inspired models and the complex and conservative context of academic publishing. It may be useful to regard processes of interaction between changing user behaviours, new technologies and business models, and established institutions and practices as part of a complex evolving system in which both sides are shaping and being shaped by each other. Such an understanding of what is taking place in the world of scholarly communication is valuable for helping to generate meaningful insight into how changing physical and social technologies might be built on to help improve academic publishing practices. However, existing studies tend to overlook the complexity of
interactions between various elements of an evolving scholarly communication landscape. As a result, important questions remain about the differences between traditional scholarly communication practices and those that are being enabled through the read-write web and social communication models, as well as about how stakeholders in the scholarly communication landscape can usefully engage with these differences.

2.2 Academic Publishing as a Social and Economic System

2.2.1 The Social Norms Governing Academic Publishing

Publishing, as Rose (2003:11) defines, includes all “written and printed” documents that “can be used to transmit culture, broadcast information, preserve human memory, distribute wealth, and exert power”. Academic publishing is “publishing that has an academic content”, ranging from scholarly monographs, scholarly journals, textbooks, to academic trade books (Thompson, 2005b:81). Deeply rooted in the academic world, academic publishing is an essential part of formal scholarly communication in terms of disseminating knowledge and legitimising research output (Borgman, 2007).

The dissemination of academic knowledge is the primary function of academic publishing, in which academic publishers play an essential role. Disseminating scholarship means “communication and diffusion” (Guedon, 1994), “awareness,” “platform for communication” (Kircz & Roosendaal, 1996), “transparency,” and “discourse” (Nentwich, 2003). Accordingly, through a series of activities, academic publishing transforms informal scholarly content and private research activities into formal publications and public discourses, bridging divides between authors and
readers. The dissemination function of academic publishing is represented by Thompson (2005b:10) as one of “the key mechanisms for the dissemination of scholarship, one of the key providers of high-quality content and one of the driving forces of intellectual debate” in the academic world.

Being published is also the most effective way to formally declare the outcome of research and register the priority of innovative knowledge contribution within a research community. Legitimization of research claims has also become a crucial communicative function of academic publishing, which works to formally establish a scholars’ claim to their contribution of new knowledge and an intellectual basis for scholarly prestige. In other words, due to the adoption of peer review in the editorial process, the gatekeeping function of academic publishing institutionalises the social process of peer reorganization of research outputs, which makes academic publications certificates of scholarly knowledge. From this point of view, peer review in academic publishing is not only the essential mean to control the quality of publications (Cronin, 2005; King et al., 2006), but also a social mechanism enabling scholars to scrutinize colleagues’ research outputs and evaluate peers’ academic performance in scholarly communication.

Many well-known authors present science as a social process of communication, which makes “research known to the peers for reasons of dissemination, priority, prestige, recognition and visibility” (Garvey, 1979; Garvey & Griffith, 1967; Nagami, 2008; Peset, 2008). Science as communication happens in a complex social community where cooperation and competition coexist while trust and distrust work together, which requires a rigorously controlled social system and social norms to
govern the communication structure (Garvey, 1979; Merton, 1961). In relation to academic publishing, academic society is governed by two crucial social norms: one is rigorous peer review assessing the quality of academic content; another is publication-oriented evaluation system, assessing the quality of the scholars (Borgman, 2007).

In academic publishing peer review, particularly “double blind” peer review, is the most “widely accepted means to assess the quality of scholarly content” (Cronin, 2005; Evans, McNutt, Fletcher & Fletcher, 1993; Fisher, Friedman & Strauss, 1994; King et al., 2006; McNutt, Evans, Fletcher & Fletcher, 1993). The peer review system has operated for nearly 300 years, working to distinguish quality publications from indifferent manuscripts. However, traditional peer review systems are becoming increasingly controversial. A primary key criticism of the current system is that it results in a “time lag in publishing new ideas and delay in sharing knowledge” (Nikam & Babu H., 2009), which creates tension in a communication landscape in which the instant exchange of knowledge is increasingly a communication priority. The qualification of reviewers is also debatable given that research today is increasingly specialized and interdisciplinary. Moreover, the lack of objectivity, impartiality and fairness in subjective minority peer review process, and concern over possible intellectual conflicts of interest and ethical issues involved is also criticized (Angell, 1993; King, McCuire, Longman & Carroll-Johnson, 1997). Some commentators further point out that traditional peer review tends to be conservative, discouraging innovative, novel and challenging ideas in the name of rigor (Whitworth & Friedman, 2009). Academics have no idea how much valuable research may have been eliminated or devaluated through peer review filters, and the readable portion of
research represents “just snapshots of what the authors have done” (Nikam & Babu H., 2009; Waldrop, 2008a). A growing chorus of academics are now calling for alternative peer review models that make it possible to better argue and strongly evaluate ideas before publishing them, though what the “truly appreciate the filter” traditional peer review provides (Hendler, 2009).

The “publish or perish” maxim that has come to play such an important role in the academic system has resulted in publications becoming the primary screening mechanism for academic employment, appointments, grants and promotions (Katerattanakul, Han & Hong, 2003). This situation is the subject of criticism from a range of sources. Savage (2009) argues that today’s abundance of scholarly publications related only to quantity, not quality, and is a result of “forced productivity”. Whitworth and Friedman (2009) observe that:

... for authors, a ground–breaking paper involving years of work that changes the field and a trivial spinoff of a prior work both count as “one”. When what is measured is “hits” not knowledge value, it pays authors to increase hits rather than knowledge value, by publishing in “least–publishable–units”, making overlapping variants of the same work, publishing in groups, and by “milking” breakthroughs rather than going on to explore more — in other words by specializing.

Many commentators have observed that scholars’ publishing practices are increasingly being shaped by “the perceptions of research assessment criteria” because of utilitarian considerations that influence their decisions on what, where, and how to publish (Baggaley, 2007; Derricourt, 2008; Earl, 2008; Fry, Oppenheim, et al.,
Furthermore, given formal publications have almost become the only way to represent original and valuable research outputs, academic content must be tailored to fit the formats and style of particular publishing media (Fry, Oppenheim, et al., 2009), sometimes even at the cost of reducing the value of academic publications. Arguably, the means outweigh the ends. As a result, there are a growing number of voices in academic world calling for new measures for evaluation (Cronin & Barre, 2004).

Academic publishing has two major social functions: the communication and the certification of knowledge (Cuel et al., 2009); these two functions are governed by two fundamental social norms: peer review and “publish or perish”, as shown in Figure 2.1. This system contains logical conflicts: the communication and certification of knowledge cannot always be coincident; moreover, two social norms are also not perfectly coincident with social functions. As such, traditional academic

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38 For example, the preferences on journal articles for more immediate rewards (Derricourt 2008), the decline of monographs written by young scholars (Fry, Oppenheim et al. 2009:6), the over-emphasis on the high impact journals (SQW Consulting & LISU 2009:6), as well as the increases of co-authorship for more funding opportunities or easier acceptance by journals (Kyvik 2003).
publishing is not a perfect social system in terms of the effectiveness and efficiency of social exchange of knowledge.

As discussed earlier in this thesis, open and networked initiatives have the potential to improve the communication and certification of knowledge. Moreover, the new models are impacting and reshaping existing social norms. By harnessing collective intelligence based on an academic public sphere, open and networked initiatives have the potential to revolutionise traditional peer review processes by providing more open, efficient, and objective alternatives that encourage scholars to “communicate more ideas more quickly” (Hendler, 2009). Networked innovations are challenging “scholarly legitimacy through credentialing, peer review, and citation metrics” (Maron & Smith, 2009). Likewise, networked initiatives that adopt an Open Science ethos have the capacity to “move researchers away from an obsessive focus on priority and publication, toward the kind of openness and community that were supposed to be the hallmark of science in the first place” (Waldrop, 2008a). As a result, the new models may help to reduce academic utilitarianism resulting from publication-oriented evaluation by introducing more informal publishing communication and more social assessment systems. Instead of the axiom "publish or perish", it will be "publish and/to flourish" due to the rise of “more effective and highly informal and personalized” scholarly communication patterns (Nikam & Babu H., 2009).

Not all researchers agree with such a radical and somewhat Utopian scenario. Borgman (2007) points out that digital discrimination in academic evaluation is a barrier against the establishment of digital information infrastructure for scholarship,
including the wide adoption of open and networked initiatives. Furthermore, some 
show a certain amount of concern and anxiety over whether digital innovative 
publishing models can maintain academic standards of “quality”, particularly during 
the process of democratizing knowledge (Hall, 2008). Thereby they insist on the 
“preservation of traditional values” and “the established means to ensure the 
authenticity, consistency, and trustworthiness of the research” (Farber, 2007:232).

Both supporters and critics of open and networked developments in the world of 
academic publishing base their opinions largely on theoretical discussions about what 
might be possible and how future scenarios might play out. However, the 
transformation associated with open and networked initiatives is not “a revolution 
waiting to happen” (Brown & Boulderstone, 2008:309); rather, it is happening now. 
As this dissertation discusses, important pioneering experiments have already 
achieved a large scale of usership, scholarship and social influence. Developments in 
open and networked academic publishing in China thus provide an important 
opportunity to see what is actually happening in this area in practice, and to revisit 
existing arguments based on what is happening in reality.

2.3.2 The Political Economy of Academic Publishing

The central concern of economics is the distribution of the “limited scarce resources” 
capable of meeting the “unlimited needs and wants” of human beings (Picard, 1989:8). 
Accordingly, understanding the economy of the publishing industry involves 
exploring how different stakeholders allocate their resources in order to satisfy the 
needs of academics, society and themselves. Following Bourdieu, Thompson (2005b)
lists four key capitals publishing firms rely on: economic capital, human capital, symbolic capital, and intellectual capital. Thompson further points out that an individual publisher’s position in the industry depends on these four kinds of capital, for which publishing firms compete with each other. Thompson’s four capitals provide an analytical structure that is helpful in unpacking the power structures inherent in academic publishing. However, this structure fails to reflect dynamic processes of change that are at the heart of the digital transformation of academic publishing, particularly regarding the changing power structure between the existing and emerging powerhouses. This thesis builds on Thompson’s capitals as 4 publishing resources, expanding their scale and scope, namely: economic resources, human resources, symbolic resources, and copyright resources. The economic impact of open and networked initiatives upon the existing academic publishing industry is thus linked with the re-allocation of and the competition for these resources.

**Economic Resources**

Academic publishing is primarily a for-profit media industry based on institutional markets, particularly library purchases. Historically, in the UK and US, the growth of academic publishing in the 1950’s and 1960’s was fuelled by the expansion of universities as well as the growing budget of libraries (Thompson 2005b). Thompson (2005b) defines “economic capital” primarily as financial capability, particularly as it relates to investments and financing markets. Using the term “economic resources” however, this thesis broadens this term to include innovative business models and the increased profitability that they might provide. Thompson identifies the relationship between the economic capital a publisher owns and the ability to take risks providing a larger number of titles, and thus form comparative competitive advantages. This
thesis places an emphasis on the tension between financial sustainability and business models. Generally, traditional academic publishers often find themselves stuck “between an academic publishing rock and a financial hard place” (Steele 2008) and various cross-subsidy strategies are widely employed such as “crossover phenomenon”39 (Thompson 2005b) and Article Processing Charges (APCs). This provides a basic analytical structure to understand financial sustainability of open and networked initiatives.

**Human Resources**

Human capital generally refers to “the staff employed by the firm and their accumulated knowledge, skills and expertise” (Thompson 2005b:34). For academic publishers, editors are a crucial aspect of human capital whose knowledge and expertise are essential for publishing quality scholarly content. The concept of human capital as it relates to publishing is based on the print publishing system. In a digital and networked age, social network markets and crowdsourcing are challenging traditional publishers’ control over publishing expertise. Digital publishing initiatives need not employ a large team of professional editors. Instead, creative and participative users (authors, reviewers, editors, and readers) and the expertise they provide have become crucial for emerging publishers. Harnessing academics’ voluntary and creative labour as user co-creation is key to the profitability of open and networked digital publishing businesses, which has been used by commercial publishers to generate profits without any economic payment. The competition for human resources between traditional publishers and new platforms is thus now focusing on the whole academic population.

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39 It means blurring the boundary between scholarly publications and trade ones.
Symbolic Resources

According to Thompson (2005b:34):

Symbolic capital, as exemplified by the publisher’s brand, becomes increasingly important as a mechanism of selection and a marker of quality and distinction at a time when the sheer quantity of available content threatens to overwhelm intermediaries and end users.

Through symbolic capital, a publisher’s imprint becomes a “brand” representing a reputation, which helps to attract both authors and readers and thus improve market share. Publishers’ brand is essential for differentiating them from competitors because “the field of academic publishing is hierarchically structured in terms of the distribution of symbolic capital” (branding resource) among publishers (Thompson 2005b:91). By the term “symbolic resources”, this thesis aims to emphasize that the symbolic capitals are not created solely by publishers’ value propositions like gatekeeping, editing, and promotion. Rather, the roots of symbolic capitals are authors’ high quality works, reviewers’ rigorous review, and readers’ approval based on citations. In other words, the symbolic resources accumulated by traditional publishers are made by the whole academic population. However, traditional publishers use such symbolic resources to establish advantages over competitors and to create entry barriers for new entrants. Thereby open and networked initiatives need to better harness the dynamics from social participation of the academic population in order to accumulate symbolic resources in innovative ways.
Copyright Resources

According to Feather (2003:59) copyright resources lie “at the heart of the stability and profitability of the publishing industry”. Almost all of the financial revenues of academic publishers are currently derived from their exploitation of copyright in the scholarship they own, either directly or indirectly. Copyright resources enable publishers as intermediaries (Earl, 2008) to make great profits by buying and licensing copyright content. However, there is now growing dissatisfaction with the extent to which publishers control copyright resources arising from academic work. In contrast to traditional business models, which depend heavily on a publisher’s ability to control copyright, open and networked initiatives are being born Open Access. As Ware (2009 :2) points out, the design philosophy of Web 2.0 inspired initiatives is based on openness and sharing and “the Web 2.0 culture of content purposing and re-use is much harder to realise within a non-open access environment”.

The economy of academic publishing is the allocation of these four resources, which in practice is a combination of a gift economy and a market economy. The content creation of academic publishing is a gift economy where knowledge production is sponsored by universities, government funding, and research institutes; the distribution of academic content is based on market economy, in which publishers enjoy most of the economic benefit by owning and licensing the copyright of scholarship. The dual economies happen because university actually pays twice to acquire publications: once for the salary of their faculty members who do the research and a second time to buy their scholarly publications back from the publishers (Steele, 2008). The incompatible hybrid of gift economy and market gives rise to a structural conflict between commercial publishers and academics in the allocation of resources.
Though other stakeholders like libraries and government are also involved, the conflict between publishers and academics is crucial.

Publishers’ commercial interests and scholars’ academic concerns are increasingly divergent in the allocation of publishing resources. Considering their own interests, stakeholders always differ in their opinions concerning who should hold what rights in what content, over what period of time, and at what price (Borgman 2007:105), for which publishers and academics fight and quarrel. In 2012, nearly 10,000 scientists signed to boycott Elsevier, the largest scientific publisher in the world, which is only a snapshot of the overall conflict40.

The rise of open and networked initiatives operated by non-publisher stakeholders could be regarded as a result of such structural conflict between commercial publishers and academics. Traditional publishers establish their power and interests by their role as necessary intermediaries of communication and certification. However, networked models are threatening the old system. Just as Brown (2008:315) argues, “Without control over peer review, without making money out of taking control of the IPR of publications, they (the publishers) are nothing”.

2.2.3 Open Access and Beyond

Harnad (2004) identifies two structural problems in today’s academic publishing system by the “research journal-affordability problem” and “research article

access/impact problem”. Institutional markets, in particular limited library budgets, are struggling under the weight of the costs associated with ever increasing numbers of journal titles and increases in journal subscription prices. There are about 2.5 million papers published per year in the world; however most of them are accessible only to readers who have access to the titles provided by institutional or individual subscriptions, i.e. the “toll-gated” readership.

The open access movement was primarily stimulated by the coincidence of the capabilities of the web with the ongoing crises in journal affordability, together with a greater interest by both funders and researchers in the greater visibility and impact of more accessible research outputs. Just as Borgman (2007) argues:

> Open science and the open flow of information are essential to the exchange of ideas. Sharing knowledge is the social glue that holds academic communities together, and publication is the coin of the realm.

Open access resonates strongly with the needs of academics, funding agencies, and the public; However, it also presents serious challenges to commercial publishers that have developed highly profitable business models that depend heavily on their ability to control copyright. Academic readers are the primary beneficiaries of open access, which provides them with access to peer reviewed scholarship for free. The authors who submit to peer-refereed journals write in order to secure research impact rather than royalties and their “careers and standing depend largely on the visibility and uptake of their research” (Harnad, 2001:1024). Some research suggests open access impact advantage, arguing that early, free, and easy access is crucial to improve the
download times, citations and overall research impact in the digital age (Laakso et al., 2011). As such, authors benefit from open access as much as readers.

Research funding agencies and policy makers also have open access concerns. On the one hand, open access will greatly improve the impact of research funded by various funding bodies; on the other hand, scholarly content has many of the characteristics of “public goods”, which is non-rivalrous and non-excludable (Dalrymple, 2003). A growing number of countries accept the principle that the publications that arise on publicly funded research must be accessible for all taxpayers. The public’s free access to journal papers as well as scientific monographs benefits the whole learning society, which is also a basis for citizen science (Cope & Phillips, 2009). The adoption of recommendations made in the Finch Report by the British government suggests the approval of open access at the policy or public level, as mentioned in Chapter 1.

Understandably, commercial academic publishers whose business heavily depends on subscription revenue and copyright operation regard open access as crucial disruption. However, a JISC study led by Houghton & Oppenheim (2010) suggests a different point, comparing the economic benefits and costs of subscription publishing, open access publishing, and open access self-archiving. The well-known “Houghton Report” argues that, “more open access would have substantial net benefits in the longer term [for all the three types of academic publishing, including subscription publishing], and while net benefits may be lower during a transitional period” (Houghton & Oppenheim, 2010:51).
There are mainly two ways to achieve open access. Gold open access models involve journals that make their content free to access for all readers, which financially depend on non-subscription revenues such as article process charges (APC) paid by authors, or funding and sponsorship. Green open access is based on authors’ self-archiving via institutional or disciplinary repositories, or other online platforms, which aim to provide peer reviewed scholarship to readers outside publisher-controlled distribution channels. Both gold and green open access systems aim to provide access to peer reviewed scholarship for universal readers in academic publishing. They both value the organization of peer review by commercial publishers and their formal certification of refereed scholarship. However, they have different opinions regarding the role of publishers in distributing scholarship and mediating scholarly communication, as well as the price for publishers’ value added services.

Harnad (2004) believes that green open access is much more cost-effective and viable, sponsored by research institutions or mandated by disciplinary organizations instead of commercial publishing intermediaries. Once green open access reaches a large scale, it will unbundle peer review from other publishers’ value added services and price the publishing services academics really need reasonably. On the contrary, the gold OA mediated by commercial publishers is extremely expensive, particularly in the scenario recommended by Finch report, in which publishers make little subscription revenue but depend mostly on Article Processing Charges (APC).

Open access is questioning and disrupting the copyright that underlies the academic publishers’ business models (David, 2003). Willinsky (2006) observes commercial publishers’ responses and further points out that:
As open access gained momentum, publishers began to experiment with forms that offered new revenue streams such as author fees, dual mode, delayed, partial, and per capita.

Gold open access is a viable strategy of survival for commercial publishers in the aftermath of the policy approval of open access, as has happened in Britain. Though gold open access redefines publishing business models as well as publishers’ profit-generating methods, it has not changed the commercial or for-profit nature of academic publishing. In other words, removing publishers’ restriction over knowledge access is not equal to removing publishers’ profitability and has reduced academics’ financial burden for sustaining the economic system of academic publishing. As such, the conflict of interests between academics and publishers will exist for a long time and the structural problems academic publishing has been suffering from, namely the dominant role of commercial publishers in the overall value chain, has not be solved.

The debate over gold and green open access has lasted for years. However, the focus remains on the transition from subscription-based academic publishing to open access while another socio-technical transformation from Web 1.0 to Web 2.0 is also influential to open access publishing.

The open and networked initiatives, harnessing the Web 2.0 and social media dynamics, have significant potential in facilitating and even leading the next stage of open access innovation. Some changes relating to social peer review, collaborative reference management, advanced online preprints, and alternative metrics for impact assessment have already happened and have been mentioned in declarations such as
the Budapest Open Access Initiative. The voluntary user participation, collaborative innovation, and crowdsourcing in the Web 2.0-inspired models have quite a lot of common ideology with open access (Ware, 2009). Thereby, the initiatives will function better as facilitators or enablers of open access than technical improvements of the commercial publishing system. However, the dynamics associated with the open and networked models have not yet been given a priority in open access practice and research, as a result of which their potential tends to be underestimated.

2.3 Critical Understanding of the Dynamics

2.2.1 User Co-creation and Social Networks

In many cultural areas, the rise and fast growth of user-created content is leading to a profound transition in knowledge communication from an industrial or expert-based system to a decentralised and consumers-centric one, which is deeply impacting on the communication of knowledge and culture, as well as on society more widely. In fact, user-generated-content is nothing new. What is really new is the way in which UGC is disseminated, coordinated and encouraged by networked communication and social media. As such, users and the consumption side of the value chain are empowered to participate in and control the production of knowledge. Population-wide innovation and cultural engagement is transforming earlier “consumption driven” models of innovation into “consumer made” ones (Cunningham, 2004). Consequently

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41 See http://www.soros.org/openaccess/boai-10-recommendations
42 According to OECD (p6), Socio-cultural impacts of user-created content are listed as follows: altered economics of information production; democratization of media production; user autonomy, increased participation and increased diversity; collaborative, sharing information, ideas, opinions and knowledge; more diverse array of cultural content; diversity of opinion, free flow of information and freedom of expression; challenges – inclusion, cultural fragmentation, content quality and security and privacy; digital divide, cultural fragmentation, individualisation of the cultural environment.

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the role of consumers “has become a far more significant aspect of the creation of”
economic and cultural value (Potts, Hartley, et al., 2008:6).

The powerful role of users is also impacting on structure and hierarchy in social
knowledge communication. Consumer-led innovation and self-made media are based
on “decentralised creativity” (OECD, 2007:42) in which “innovation, change and
growth is attributable not to firms alone, but also to socially networked consumers and
to non-market activities or ‘scenes’ that escape traditional economic categories
entirely” (Hartley, 2008:12). In other words, these trends are pushing toward an open
innovation model in consumption (von Hippel, 2005), whereby ordinary creative
people enter the previously elitist system of knowledge production and replace the
central role of professionals and experts. Moreover, such a social innovation must “be
conducted in a rule-governed but open-ended environment”, which is a complex and
“self-organised” social system (Hartley, 2009:11). In other words, this system does
not need to be institutionalised or enterprises-mediated as traditional media and
communication systems do.

The socio-cultural impact of user-generated-content would not be so powerful without
efficient social network markets. According to Hartley (2009:10), social network
markets are a vital enabling technology for the distribution of choice, in which
individual users’ choices are determined and influenced by peers. This argument
coincides with some studies on Web 2.0 enabled knowledge communication,
suggesting that the creation of content might be an individual activity but “selecting
between alternative [content] … is a collective one” (Brown & Boulderstone,
2008:302). Using collective intelligence, social network markets become “a valuable
adaptive mechanism for dealing with uncertainty, risk, and novelty” (Hartley, 2008:19) of knowledge and creative content. Social network markets are dynamic, open, and complex systems, compared with the traditional closed knowledge communication controlled by experts and media industries. This explains how the wisdom of the crowd works in cultural practices and knowledge communication. It is the social evaluation system that disrupts institutional and authoritative criterion for knowledge assessment; likewise, social network market replaces enterprises mediated distribution. As such, the quality of content is no longer assessed by authorities but by the social networks of common users. Such a transformation from minority assessment to public and open assessment is a big challenge to previous cultural industries models, in which editors and professionals function as gatekeepers.

Such disruptive innovation is resulting in far reaching social and economic changes. New media systems have seen “an extraordinary unleashing of content creation by individual citizens” (Carnaby, 2009) and the powerful self-organised adaptive system in the distribution of choices in recent years. Sociological studies employ the terms “democratisation” or “decentralisation” to define the social impact of user co-creation and their social networks, whereby the creative population shares experts’ privilege of creating content, while users’ social networks disrupt authorities’ gatekeeping. In other words, the dynamic new knowledge communication undermines the traditional hierarchy and breaks the equilibrium in the cultural and social ecology. This is an emerging evolution that leads to great knowledge growth, which may have the same historical significance as the invention of printing technology in the Age of Enlightenment (Potts, Hartley, et al., 2008).
The traditional media censorship makes the Web 2.0 revolution more special in China, in which user co-creation and social networks help to break the government control in communication. Chinese blogs become a platform for politically different voices; citizen journalism in Weibo (微博) greatly improving people’s right to knowledge (Zhang & Stening, 2010) and Online Literature written by amateur writers disrupt the dominance of official main-melody literature in the Chinese cultural market (Ren & Montgomery, 2012).

According to Schumpeter (1942), entrepreneurial innovation plays an essential role in disrupting or destroying the value of established companies and labourers that enjoyed a variety of monopoly. Capitalism becomes dynamic because of “industrial mutation” that “incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one” (Schumpeter, 1942: 82-3). As far as the profound social and economic changes driven by open and networked models are concerned, the wisdom of the crowd is challenging the “formal and authoritative knowledge services and systems” (Carnaby, 2009). In cultural industries, emerging media such as Youtube, Facebook, and Wikipedia are threatening “the settled business models” as well as interests “of the big commercial firms” (Cunningham, 2002:6). This is creative destruction in cultural or creative industries along with the disruptive social changes.

Potts (2008) further defines “creative industries” by “social network markets” in order to explain and analyse an emerging powerful networked creative economy enabled by digital and networked technologies in the 21st century. The social network-based definition is as such:
The set of agents in a market characterized by adoption of novel ideas within social networks for production and consumption. (Potts, Cunningham, et al., 2008:171)

This definition suggests a fundamental shift of the role media firms are playing in the overall communication process. The content producers do not have knowledge or power regarding what products will be valuable or bestselling; instead, users’ social network markets as well as their collective choices is determinative in filtering and adopting novel creations. As a result, media enterprises are no longer authoritative content providers, but a service provider or an organizer for such social network markets and a retainer or coordinator of socially selected content. Creative industries are no longer focusing on producing intellectual property outputs by creative inputs; instead their value propositions reply on dealing with the novel and uncertain value of creation in the wider population. The business models of creative industries are transforming into an “agent-network-enterprise” structure, in which “everyone is an active agent” generating novel ideas, “networks adopt them” and “enterprises retain them” (Hartley, 2008:20). Thereby,

The creative industries are the set of economic activities that involve the creation and maintenance of social networks and the generation of value through production and consumption of network-valorized choices in these networks. (Potts, Cunningham, et al., 2008:174)

In today’s media landscape, informal networked communication has been tremendously influential while the traditional media system remains powerful as well. Social network market theory thus has a broad application in connecting the informal social or household activities that seek approval and monetization, with the established formal media businesses that also seek adaptation in the dynamic digital
world outside of the traditional system. In short, the concept of the social network market may be a useful model for understanding the ongoing convergence between content production and consumption, between informal and formal innovations, and between disruptive initiatives and established power-houses.

2.2.2 Inspiration for the Studies on Academic Publishing

Publishing is an important part of “creative industries” and is listed whenever an official definition of “creative industries” is put forward (Flew, 2002)\(^{43}\). As in other areas of the creative industries, academic readers must navigate landscapes in which the quality and usefulness of content can be difficult to judge in advance. Although academic publishing is deemed special for the serious scholarly content it mediates, the humanities works on changing media landscape and possible “creative destruction” by networked dynamics provide inspiring new perspective to understand the digital transformation in the academic publishing industry.

As a result, social network market dynamics in which the collective choices of peers are used to inform selection (Potts, Cunningham, et al., 2008) have an important role to play in theorizing initiatives such as social peer review and social reference management. Moreover, the social disruption associated with the decentralisation of gatekeeping functions also applies to academic publishing contexts (Potts, Cunningham, et al., 2008) and resonates strongly with the ethos of Open Science.

\(^{43}\) Terry Flew’s work reviews a number of definitions for “creative industries”, which all include publishing as an important part.
At the same time, critiques of user co-creation and social networks arising from the humanities are also relevant to investigations of the digital futures of the humanities and social sciences. Critics like Andrew Keen argue that the “democratization” of media is “undermining truth, souring civic discourse and belittling expertise, experience, and talent … it is threatening the very future of our cultural institutions” (Keen, 2007:15). There is also concern that social evaluation tools may not be capable of resisting the stresses of commercial use or political manipulation (Beer & Burrows, 2007:3), as well as the ethical correctness and sustainability of relying on unpaid users to support networked initiatives (Lanier, 2006; 2011) and the extent to which ‘democratic’ digital forums are genuinely representative of scholarly opinion and communities (Waldrop, 2008a).

#### 2.4 What about China?

It seems that existing studies of open and networked initiatives have to some extent been restricted by established models of academic publishing and analogue-era assumptions about what publishing industry business models could or should look like. There is thus a great deal of scope for further work on the ways in which transformative technological change is interacting with the scholarly communication landscape and the emergence of a digital publishing landscape. A stark gap in the English language literature exists in relation to what is happening beyond the Anglophone world of scholarly communication, particularly in relation to the transformations associated with the rise of Web 2.0 and the possibilities of social media technologies. The focus of Chinese language literature remains in the Web 1.0 model and on the comparison between print and digital academic publishing: for
example, the general digital transition of academic publishing (Zhang, 2008b; Wang, 2008), the digitisation of print scholarly content and database services (Fang, 2011), the problems of China’s traditional academic publishing system compared with digital models (Hong, 1997; Zhang, 2003; Yang, Liang et al., 2008), and the development of and debates on Open Access in the digital context (Cheng & Ren, 2008).

This research therefore, addresses important gaps in existing knowledge about both open and networked developments in academic publishing, and the digital transformation of scholarly communication in China. The significance of a Chinese story lies in two major areas. The Chinese academic publishing system has a huge scale and growing influence in terms of the productivity of authors, the impact of publications, and the strength of publishers. For the academic publishing industry as well as academia in the West, the Chinese system is a big potential market, partner, and competitor. So a deep understanding of the established and emerging economy, culture, and regulation of that different system is useful. Significance also comes from the dynamic and complex transformation that is happening in China, in particular the interaction between socio-technical dynamics and the established system that is less developed, more controversial, and highly transitional. This provides a unique context to understand the transformation of academic publishing in the Web 2.0 age. Given academic publishing all over the world is facing some common challenges and opportunities in the 21st century, publishing practices, emerging business models and trends in user behaviour in China may provide valuable lessons for academics, publishers and policymakers in other markets. There may also be broader lessons about the complex ways in which contextual frameworks, new technologies and emerging markets change alongside one another, to be taken from this thesis.
In the following chapter, I will comprehensively review the “unique” contexts of academic publishing and higher education in China, identifying the contextual constraints and dynamics of change within them. This chapter aims to provide an informative review of the Chinese systems in which the emerging transformation of academic publishing driven by open and networked initiatives is happening.
Chapter 3 The Context of Chinese Academic Publishing

In early 2011, the police in Hainan Province investigated the largest case of illegally published academic journals in China to date. A highly organized group had published over 20 fraudulent academic journal titles over a period of 7 years, attracting some 20,000 contributions and over 10 million RMB (roughly AU$ 1.5m) in page fee revenues. The major source of revenue associated with this scam was academics who needed ‘publishing credits’ for promotion or evaluation. None of the fake journals had an official publishing number or permission for publication from the legitimate publisher of the title. Nonetheless, the fake journals operated in a manner that appeared to academics to be as formal and convincing as any of their legal counterparts.

A key aspect of the scam’s success was the fact that the operators of the counterfeit publications had very good cooperative relationships with search engines, legitimate journals, academic websites, databases, and universities. As a result, both their journals and the publications they contained were highly discoverable through the Chinese search engine Baidu; their calls-for-papers were available on various academic websites and appeared in high profile journals; their publications were included in major third-party journal databases; and most importantly for the authors, the publishing certificates issued by the fraudulent journals were accepted by a wide range of academic institutes as evidence of publications that could be counted for promotion purposes.
The members of the group responsible for the exposed counterfeit publications had an average educational level of primary school. In spite of this, they were in charge of both the “editorial control” and “peer review” of the scholarly papers that passed through their network. The fact that no one noticed their lack of education or discipline specific expertise for so long says a great deal about the low standards that currently prevail within much of China’s academic publishing landscape. As one member argues, “we appeared so formal and authoritative that I was almost convinced to accept a position as a staff member at a publishing institute.”44

Examples of “predatory publishers” can also be found in English language academic publishing.45 However, the scale and profitability of this particular operation in China highlights the extent of the wider problems that exist within the Chinese academic system, particularly as they relate to highly bureaucratic processes of supervising and managing academic communities, and the vulnerability of the existing system to exploitation and fraud. This case is also a reminder that in China, where academic publishing remains the subject (at least in theory) of strict state control, engaging in unauthorized publishing activities is a crime. The head of the criminal gang involved in this case was sentenced to five years in prison and a fine of 6 million RMB (roughly AU$ 0.9m) ; other individuals involved were also sentenced to prison.46

This is an extreme example of the problems plaguing the journal and monograph systems in China, as well as the utilitarian attitudes of Chinese academics towards publication-oriented evaluation. This chapter will critically explore the contextual

45 http://metadata.posterous.com/83235355
46 http://365jia.cn/news/2012-07-13/A956BB0A10DFF894.html
factors that contribute to the massive inefficiencies in the scholarly communication system in China. It will also provide a brief overview of the Chinese academic publishing industry and the Chinese academic system. Understanding these systems is key to appreciating the context within which open and networked approaches to scholarly communication are emerging in China. It also sheds light on why the two case studies selected for this thesis, New Science and Science Paper Online are significant and what their perceived value is for different Chinese stakeholders.

3.1 The Chinese Academic System

3.1.1 The Scale and Structure

The Chinese academic system consists of three major subsystems: universities, research institutions, and the R&D departments attached to state owned enterprises. Universities form the mainstay of the Chinese academic system and the centre of its scholarly communication landscape. China has a total of 820 state-owned universities, 1,228 technical or professional academies, 311 private or independent colleges, and 70 university branches.47 There is no official ranking system for Chinese universities, but the official governmental campaign to “build world-class universities” is widely used to distinguish ‘key’ universities, in particular “Project 985”48 and “Project

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47 http://www.edu.cn/jyzl_zhzl_8561/20110429/t20110429_608645.shtml
48 Project 985 (Chinese: 985 工程; pinyin: 985 gōngchéng) is a project first announced by CPC General secretary and Chinese President Jiang Zemin at the 100th anniversary of Peking University on May 4, 1998 to promote the development and reputation of the Chinese higher education system (and codenamed after the date of the announcement, 5/98 or 98/5, according to the Chinese date format). The project involves both the national and local governments allocating large amounts of funding to certain universities in order to build new research centers, improve facilities, hold international conferences, attract world-renowned faculty and visiting scholars, and help Chinese faculty members attend conferences abroad. When first announced in 1998, the project funding was made available to an elite group of nine universities. These nine universities made up the C9 League in 2009, which is referred to as the Chinese equivalent of the US Ivy League. By the end of the first phase of the project, 35 universities were sponsored. In the second phase of the project, four more universities (China Agricultural University, East China Normal University, National University of Defense Technology and Northwest A&F
The former includes 39 universities while the latter had 112 universities by the end of 2011. \(^{50}\) Additionally, imitating the US Ivy league, 9 of what are widely regarded as the best Universities in China have also signed a collaborative agreement to establish the C9 League. In addition to universities, research institutions also play an important role in the Chinese academic system, in particular the Central and Provincial academies. The most influential research intuitions belong to the following 3 systems: the Chinese Academy of Science (CAS), the Chinese Academy of Social Science (CASS) (established in 1977), and the Chinese Academy of Engineering (created in 1994). The former two have regional branches in most provinces around the country. The third part of China’s academic community is made up of professionals and R&D employees located within state owned enterprises and public institutions (Shiye Danwei, 事业单位), whose focus is more on applied research.

The scale of academic population in China is enormous: according to China’s statistical yearbook on science and technology, the number of research staff in the higher education sector in 2009 was 509,366; 323,034 in various R&D Institutions and 2,185,241 located within state owned enterprises.\(^{51}\) Another statistic suggests
that in 2008, there were a total of 1,168,300 people employed in academic and educational roles, mainly in the higher education system, as well as 1,540,000 postgraduate students.

According to official policies intended to encourage the publication of scholarly papers, all of China’s academic and research staff are required to publish papers or monographs for promotion and graduation. Furthermore, in Chinese public service institutes such as hospitals, there are over 20 million professionals that are also required to publish in order to secure promotion, particularly in the areas of medicine and education.

In 2010, there were a total of 121,500 papers by Chinese authors published by international journals, in addition to the 530,600 published by the 1,998 journals surveyed by the Chinese statistical yearbook. Of papers classed as ‘high impact’ Chinese official statistics indicate that 81.6% of these were written by university staff, while 17.5% were produced by research intuitions in 2010.

Between 2001 and 2011, Chinese academic authors published 836,300 papers in international journals - ranking China second in the world in terms of the total number of papers contributed by a single nation’s scholars to international, peer reviewed publications. In spite of this, China ranked as only seventh in the world when it came

52 http://number.cnki.net/tablemeta/Result.aspx?subject=%E6%99%AE%E9%80%9A%E9%AB%98%E7%A D%89%E6%95%99%E8%82%B2%E4%B8%BB%E8%A6%81%E6%8C%87%E6%A0%87&areacode=xj35
55 http://www.istic.ac.cn/portals/0/documents/kxpj/20111202-2010%E5%B9%B4%E4%B8%AD%E5%9B%BD%E7%A7%91%E6%8A%80%E8%AE%BA%E6%96%87%E7 %BB%9F%E8%AE%A1%E7%BB%93%E6%9E%9C%E5%8F%91%E5%B8%83%E7%A8%BF%201%E6%96 %B0%E9%97%BB%E7%A8%BFm.pdf
56 Ibid.
to citations, and as fifth when it came to the highest impact papers (the top 1% of
cited papers). The average citation rate of Chinese papers published in international
journals is 5.87, compared to a global average of 10.71. This suggests that, although
Chinese researchers are prolific in terms of the number of research outputs they are
producing, levels of quality and innovation within the corpus of work that is being
disseminated is not as high as might be hoped. It is worth pointing out that millions of
papers published by vanity publishers in China have not been counted in these
statistics.

3.1.2 Academia and Government

A defining feature of the Chinese academic system, and one that distinguishes it from
counterparts in the West, is the direct role that the party-state plays in the
management of Universities and in the everyday activities of researchers (Yan, 2009).
This is a result of both a long tradition of connection between scholarship and the
state in China, as well as more recent efforts to control science and education by the
Chinese Communist Party.

The history of China’s higher education system has seen a tight relationship between
academia and government, as well as strong governmental interference in the
academic system. The government’s involvement in academia is both ideological and
administrative. During the Imperial era in China, the dominance of Confucianism
encouraged scholars to serve the Emperor and the state without question or criticism.
The adoption of Confucianism as an official philosophy of China, the role of the

57 Ibid.
Emperor in establishing orthodoxy, and the importance of orthodoxy within the wider system of Chinese scholarship and education, made it possible for academia to become an integral part of the Imperial system of governing and controlling a vast and disparate country. Academic activities were sponsored and controlled by the government and academics were honoured and materially rewarded for their service to the emperor. The dominance of Ba Gu Wen (八股文), a style of essay writing that had to be mastered to pass the Imperial examinations during the Ming and Qing Dynasties, and the importance of the Imperial examinations (Keju, 科举) in selecting government officials, discouraged academic creativity. It is also argued that this system discouraged the practice of valuing knowledge, education and critical skills of enquiry for their own sake, instead encouraging a more utilitarian and pragmatic attitude towards scholarship and learning (Xia, 2008: 3).

Taoism served as an important alternative to Confucian approaches and values, particularly amongst Chinese intellectuals who existed outside the official system. Taoism encouraged intellectuals who were not valued by the government to escape from the ‘dirty’ real world and instead to become high-minded recluses. However, higher education institutions independent from the government and the mainstream Confucian ideology have never existed in the Chinese academic history in feudal age, which could be regarded as a counterpart of Western universities. Moreover, some Open Science traditions such as knowledge as public goods, academic freedom, and public critical debates have no counterpart in Chinese history either.

The introduction of Western science and humanities began during The Self-Strengthening Movement (洋务运动) after the 1840s, which aimed to strengthen the
Qing Dynasty by economic and military modernization without social reforms. Accordingly, governed by a principle of “Western learning for practical application; Chinese learning as a base (Xixue Weiyong, Zhongxue Weiti, 西学为用，中学为体)”, the early Chinese higher education system focused more on Western science while still subscribed to a conservative Confucian worldview. The complete western-style university and education system were not established until the Imperial system was overthrown in 1911 (Altbach, 2009). After which, the Chinese academic world experienced an unprecedented period of freedom, prosperity, high productivity and innovation in the regime of the Republic of China (Xia, 2008).

After 1949, the Chinese academic system was characterised by political control and a Soviet model. Under the Communist government, the purpose of academic activity was to build the nation’s productive capacity and to benefit the masses. The extent to which academics fulfilled these goals was “… likely to be evaluated by a political and ideological standard” (Yan, 2009:335). The Chinese government copied the Soviet Union’s approach to structuring the academic system – with an emphasis on specialisation and the integration of institutions and resources in the service of major state-driven projects. With the exception of several military projects, including the development of nuclear weapons, this system has not generally resulted in world-class academic achievement (Brock, 2009). Rather, it has been associated with the persecution of significant numbers of academics during political movements such as the Anti-Rightist Movements and Cultural Revolution. Chinese universities and schools were closed during the Cultural Revolution, which lasted from 1966 until 1976, and did not begin to re-open until 1978. By the end of the 1970s, China’s academic system had almost completely collapsed (Wang, 1980).
After Mao’s death, Deng Xiaoping embarked on a policy of ‘opening and reform’. As a result, China’s academic system has increasingly come to resemble its Western counterparts (Duan, 2003). After the 1980s, China sent a growing number of academics to study in the West. These academics returned to China to become the ruling group within the Chinese academic system today. There is also a push towards more market-driven approaches within the Chinese academic and higher education system (Yin & Gordon, 1994). China has introduced a corporate model to share the costs of funding higher education and research through a combination of government funding, student fees, patents and other social enterprises (Wang, 2001). At the same time, the ways in which academic performance is evaluated and rewarded are changing as the government looks for ways to encourage productivity. As a result, as in other parts of the world, “publish or perish” has become a driving maxim within Chinese academia. The Chinese evaluation system gives a high level of credence to SCI and other international indexes and encourages academics to publish in English, and in internationally influential foreign journals (Yan, 2009). This Westernization process is criticized for neglecting China’s own cultural traditions and thus failing to establish an original and independent academic system (Li, 2008).

Despite the ostensible Westernization of China’s higher education system, Chinese academics do not enjoy the independence and autonomy that is taken for granted by their American and European colleagues; instead, the government directly intervenes in and controls the operation of the academic system in a variety of ways (Hawkins, 2000). The Chinese government remains the nation’s largest research funder, and thus sets the agenda for scientific research. By allocating financial resources, the
government is able to determine the criterion for academic evaluation, how performance and achievements are set, and ultimately exercises an enormous level of control over every aspect of academic activity. Additionally, the Chinese government is able to appoint the presidents and other senior administrators of almost all universities, and issues policies that impact directly on the daily operation of the academic system; for example, very high achieving scholars have been directed to lecture undergraduates, and the government recently ordered the discontinuation of courses that deliver low rates of graduate employment.58

Hawkins (2000:442) argues that the Chinese government is attempting to find a balance between “the need to maintain control while at the same time respond creatively to the needs of the new market economy.” The tight relationship between academia and the government in China provides a financially sustainable academic system, resulting in steady income and employment for individual academics, making academic jobs highly attractive. However, the rapid growth of the academic and higher education system in China, as well as the diversified and dynamic nature of scientific research and academic activities, make administrative control over academic system increasingly difficult and controversial. Calls for de-bureaucratisation and professorial autonomy have become increasingly strong in China, resulting in widespread consensus among academics and experts in higher education management that it is vital to the system’s long term performance (Chen, 2010; Han & Ye, 2010). However, many believe that implementing these goals will be a long, complex and difficult process.

3.1.3 Publication-oriented Evaluation

As in the West, publication-oriented evaluation is widely employed within the Chinese academic system. More unique to China is the evaluation system, which focuses heavily on quantitative indexes and “hard criteria” (Ying Zhibiao, 硬指标), and consequently tends to emphasise the number of publications an author produces while taking an extremely narrow approach to questions of quality and impact.

Approaches to academic evaluation are changing, but progress has been slow. In recent decades Chinese universities have begun to make a gradual shift from simply counting publications to emphasising the role of core journals and SCI papers, and accordingly to increasingly citation-oriented or Impact Factor based evaluation. A number of Chinese academics have questioned the authority and decisive role of core journals (Gao, 2009; Guo, 2007; Liu, 2006; Yang, 2008), arguing that evaluation on this basis is little more than dogmatism, and the current approach to academic evaluation is widely criticised by domestic scholars (Xiong, 2005).

The quantitative focus of China’s academic evaluation system has created pressure for academics to ‘manufacture’ research. It has also been associated with an increasingly strong sense of academic utilitarianism and widespread instances of serious academic misconduct in China. According to a report by Wuhan University, 72% of publications screened using anti-plagiarism software in 2007 contained significant portions of plagiarised material. Vanity publishing services and underground trades in ‘assisted publishing’ were valued by the same study at 1 billion RMB (roughly AUS 154 million).  

59 See http://news.xinhuanet.com/comments/2010-02/05/content_12935842.htm; the vanity publishing and relevant issues will be introduced later in this chapter.
One sign that the current system is failing to encourage high quality academic research is the disconnection between increases in the number of Chinese SCI or SSCI indexed papers, and the rates at which these papers are being cited. As mentioned above, increases in the quantity of published research have been associated with a dramatic decrease in the average citation rate (Zhu, 2007). Furthermore, the over-emphasis on publications has given rise to a situation in which churning out publications rather than engaging in innovative research, has become the focus of academic effort with damaging consequences for the Chinese innovation system. An article in the Wall Street Journal examined patents registered by Chinese scientists and institutions, observing that “in 2010, China accounted for 20% of the world’s population, 9% of its GDP, 12% of its R&D investment, but only 1% of overseas-registered-patents, half of which originated in transnational corporations.”60 In other words, China’s economic growth and the increase in the number of papers being published by Chinese academics, has not been matched by the proportion of world-class scientific and technological innovation originating in China.

3.1.4 Academic Pyramid

The Chinese academic system is deeply hierarchal (Altbach, 2009): fame, academic resources, and economic rewards are allocated according to a pyramid structure. The hierarchy is represented explicitly by titles and career ranks. There are two major systems in terms of academic career promotion in China: one is the university system, which uses titles such as ‘Professor’, ‘Associate Professor’ and ‘Lecturer.’ The other

60 http://www.21fd.cn/a/yjjianzhongguo/2011/0805/31725.html
is the research institute system, which recognises ‘Senior Research Fellows’ and ‘Research Fellows’. Additionally, a variety of other titles are also used to reflect hierarchy, for example, ‘doctoral supervisor’ or ‘recipient of national research funding’, distinguishing academics who enjoy more power, resources, and influence within the academic community from the majority. In particular, the title “a member of National Academy” (Yuanshi, 院士) identifies the nation’s top scholars as enjoying both an honour and a powerful administrative position.

At the same time, the academic hierarchy is linked to the administrative hierarchy in China. Academics with higher academic status usually occupy a relatively senior administrative appointment. The phenomenon of academics who are also Communist Party officials has become increasingly prevalent in China. Generally the most famous scholars are usually also administrative heads. In 2011, 85% of members of National Academies were senior officials in either governments or academic institutes61. Of the scholars recognised as the nation’s 100 most excellent teachers within Chinese universities, 90% of recipients had senior administrative positions and 20% were Vice-Chancellor level or above.62 Academic prestige is combined with and mutually benefits administrative power and privilege, which further gives rise to the concentration of academic resources and even greater scope for corruption (Wu, 2009). Although most famous Chinese scholars deserve their reputations, administrative status and fame are deciding factors for the editors faced with allocating scarce page space in core journals, as well as those responsible for allocating funding, subsidies and other resources even when the quality and

62 http://news.163.com/09/0911/01/S1T3LE990001124J.html
significance of an applicant’s research may be lower than that of less influential competitors.63

China’s deeply ingrained system of academic hierarchy is perceived by many to be a factor in the prevalence of academic corruption, which is becoming an increasingly serious problem in China. Yang (2008) points out that there is a “corrupt academic atmosphere in China” that deeply affects academia in terms of peer review, evaluation, promotion, and the distribution of scholarly resources. In relation to academic publishing, Hong (1997) proposed the term “publishing corruption” to define the increasing inequality and partiality in peer review and editorial process, because of the preferences of senior members of the academic hierarchy and the lack of a supervisory system (Huang, 2007; Liu, 2004; Sun, 2006; Yan et al., 2002).

Elitist arguments are frequently used to justify the perpetuation of strict academic and administrative hierarchies, the uneven allocation of resources, and the policies and social norms that encourage their concentration. As a result, in quite a few disciplines, “academic tyrants” (Xue Ba, 学霸) have come to dominate areas of research and make it difficult for intellectual pluralism to operate effectively, or for emerging scholars to have their voices heard or work taken seriously. According to one Chinese academic blogger:

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63 For example, in the competition for Chinese national funding for monograph publication, it is clearly stated in assessing criteria that “priority should be given to the members of the Chinese Academy of Engineering and the Chinese Academy of Engineering Science”. This has led to a high average age of authors in those publications – more than 50% are over 60 years old. (See Qingqi Gao “A report on the development of National Funding on SMET Academic Publishing from 1995 to 2000” in Science-Technology and Publishing, Issue 3, 2002.) The success rate of submissions by this group is 70.78% (See, (Wang, 2001), compared to the average rate of 39%. (See detail statistics in Gan. Y, Li, M The Reformation of Chinese Universities, Shanghai, Shanghai People’s Press, 2004: 191-325)
The reality is that, very few academics have very few opportunities to publish papers in top journals. The majority are (by definition) doing average research. However, SCI worship and Impact Factor priority in the Chinese evaluation system is completely ridiculous elitism that devalues and despises the majority of research and researchers. Though it is reasonable to invest more in top level research, such an uneven allocation in China is controversial. It is dangerous if China cannot objectively evaluate the majority of research activity and its contribution to society, and continues to invest so heavily in a minority of academic elites.64

The founder of Miracle Repository, Prof. Ji Yanjiang further criticizes the misleading elitist priority as follows:

In China, quite a number of universities are so poor that they even cannot afford access to necessary content while most famous universities have been the subject of over-investment. This approach is not benefiting science. I believe that the expansion of the Chinese academic population and supporting ordinary academics will improve the overall level of Chinese scientific research more. Online initiatives are doing this by democratizing knowledge, which will make them strong enough in the future to replace traditional academic publishing.65

Discrimination exists at the very beginning of the publishing process in China, where pressure to publish in highly prized ‘core journals’ for promotion reasons far outweighs the capacity of these journals to provide space for authors. Journals themselves benefit by publishing the work of well known, highly influential academic-officials, or outputs based on high profile government funded research

64 http://blog.scientific.net/home.php?mod=space&uid=295006&do=blog&id=387657
65 According to an interview with Prof. Ji Yanjiang by author.
projects.\textsuperscript{66} As a result, editors often reject the work of emerging scholars without proper consideration. “Core journals” receive so many submissions from established academics that they have no incentives to publish the work of lesser-known researchers. Conversely, the papers written by famous scholars or based on government-funded projects, are published even without peer review. This situation has resulted in widespread frustration and discontent amongst Chinese academics, as the following quote from a well-known scientific blogger in China highlights:

\begin{quote}
Some of the criteria set by core journals are ridiculous. They are useless from the perspective of quality control and just act as a barrier to entry for the majority of authors. The entrenched academic hierarchy in China has turned journals into snobs that take more notice of an author’s title than the content or quality of what is being submitted.\textsuperscript{67}
\end{quote}

Moreover, in a society in which Guanxi (关系, connections) play such an important role, it is impossible for journals to maintain the independence, objectiveness, and fairness of peer review and editorial gatekeeping systems that are taken for granted in other markets. According to Wang (2008) the concentration effect of authors in core journals is increasingly high. That is, a small number of authors and institutions dominate and the diversity of individuals and institutions represented within them has decreased. This Matthew effect in Science\textsuperscript{68} is having a corrosive impact on morale.

\textsuperscript{66} According to author’s interview with Respondent 24. In the following thesis, the identities of interviewees in this research will be represented in two ways: (a) according to research ethical requirement, most interviewees will be anonymous; their names and identities are listed in Appendix 2, which is open to examiners, but not to public readers; (b) in some cases in which the identities of the interviewees are essential for readers to understand their arguments or make data convincible, their names and identities will be mentioned in the thesis, with the approval of these interviewees.

\textsuperscript{67} http://blog.scientencenow.com/home.php?mod=space&uid=89391&do=blog&id=390665&from=space

\textsuperscript{68} “The Matthew effect may serve to heighten the visibility of contributions to science by scientists of acknowledged standing and to reduce the visibility of contributions by authors who are less well known.” Quoted from “The Matthew Effect in Science” by Robert K. Merton, Science 5 January 1968: 159 (3810), 56-63. [DOI:10.1126/science.159.3810.56]
within emergent scientific communities in China, as well as on the effectiveness of Chinese universities as part of a wider national innovation system.

In addition to discrimination in gatekeeping, certification-centric academic publishing practices, as well as problematic publication-oriented evaluation systems, are adding to the system’s dysfunctionality. Publishing credits have been improperly used as the major criteria for distinguishing scholars and defining their position within a strict hierarchy. Respondent 23 also argues: “I am dissatisfied with the policies that link academics’ self-interests with various papers. As a result, academics write papers for self-interest instead of knowledge dissemination.” In order to better serve certification function, core journals deliberately reject most of the submitted papers to make their certificates more valuable. An extreme example is the 99% rejection rate in *Nature* or *Science*, which is disproportionately high and unreasonable. Chinese core journals are also proud of their high rejection rate. Thereby, papers are valued not by quality, but increasingly by the level of difficulty to get them published.

Obviously, not all academics and research outputs can be published by the scarce core journals; rather, many have to choose non-core journals or even vanity publishing journals. Most Chinese universities accept all kinds of publishing credits for evaluation, even issued by “junk” journals. The “common” publications can hardly distinguish academics in career promotion or qualify them for competitive research

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69 Due to research ethical considerations, I will not mention the name and identities of most respondents in this research, but indicate them as Respondent 1, 2, 3 … However, in some cases, it is necessary to mention the identity of particular respondent in order to make clear communication with readers, I will identify the respondents with their approval.

70 According an interview by author.

funds. However, they still have some value for the majority of Chinese researchers who are required to publish papers as a primary and compulsory task of their jobs.

### 3.1.6 The Dynamic Future

The focus of China’s academic system has transformed from “passively accepting Western Learning” to “catching up with Western Learning and even exceeding it” (Yan, 2009). In the 21st Century, China’s government is endeavouring to develop globally competitive top-tier universities quickly, and is devoting enormous resources to achieving this goal. The growth of research funding in China is arguably the fastest in the world, particularly in the wake of the 2008 global financial crisis, due to its continuing impact on investments in Universities and research in Europe and the United States. This desire to strengthen China’s universities is much more than an expensive piece of political theatre intended to bolster the international image of China. It is also a real requirement of China’s continued economic growth and transition from “Made in China” to “Created in China” (Keane, 2007). Many Chinese researchers and policy makers realise that the existing academic system is failing to function as a dynamic part of the national innovation system for its booming economy. Instead, the problems mentioned above are acting as barriers to productivity and innovation. As a result, calls for higher education reforms are widespread (Duan, 2003; Han & Ye, 2010; Yin & Gordon, 1994).

As the increasing dissatisfaction with existing approaches to publishing and evaluation in China demonstrates, impetus for reform of the academic system and a desire for innovative and more open approaches to academic publishing in China are
significant. However, very few studies have addressed the role of publishing initiatives in the reform or transformation of the Chinese academic system. Instead, the focus of existing research has been on the role of academic reforms on the publishing system. However, many Western scholars argue that open and networked initiatives are capable of driving profound changes in the ways in which knowledge is created and shared, for example, Waldrop (2008a, 2008b), Schroeder (2007). Whether this is true within the unique context of China’s academic system is yet to be fully investigated. The tensions between the disruptive potentials of open and networked models and the tight governmental control, bureaucratic administration, academic hierarchy, and corruption in China provide a unique and valuable research opportunity. At the same time, the tension between the Open Science ethos and the huge creative population inside and outside the Chinese official academic system is also worth further exploration. How to harness the wisdom of the academic crowd in China, how to ensure that the voiceless academic ideas are heard, and how to develop citizen science in China by academic publishing initiatives will also be interesting questions to be answered.

3.2 The Chinese Academic Publishing Industry

3.2.1 The Scale and Structure

The scale of the Chinese academic publishing industry is vast. China has 579 publishing houses. In recent years China’s publishing industry has undergone significant structural change, with widespread merging and concentration resulting in the dominance of the big three “national publishing aircraft carriers.” China’s three largest academic publishing houses are now China Publishing Group, China
Additionally, the 103 university presses are also mainstream academic publishers in China, some of which are quite influential, such as the Chinese People’s University Press. In spite of this, university presses only occupied 16% of the Chinese book market in 2007 (Kaijuan Ltd., 2007). Additionally, most Chinese central and regional publishing houses are also licensed to publish academic monographs. Academic publications usually account for nearly 30% of total book titles. In 2007, about 40,000 academic titles were published and 242,062 academic titles were available in the book market (Zhang, 2008a). Nevertheless, academic monographs have poor market value and are not profitable in China. Most academic publishers’ distribution revenue depends on textbooks and educational references, which accounted for 81.52% of the total number of copies sold by Chinese publishers and 60.97% of total sales in 2007. Comparatively, even in university presses, academic monographs only account for 20% of total publications (Zhang, 2008a), and the percentage for most publishing houses is significantly lower than this.

In China, there are 6,170 academic journals or periodicals, which account for over 70% of the whole Chinese magazine and journal output. The average print-run of each social science journal was 25,200 copies per issue and 6,900 for natural science journals in 2008. Chinese journals are classified according to their credibility and reputation by governmental departments like the national General Bureau of

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73 http://hw.chuban.cc/tjsj/200907/t20090722_51508.html
74 http://edu.163.com/09/0817/08/5GTHU3CJ00293I4V.html
Publishing and Press\textsuperscript{76} and relevant institutions.\textsuperscript{77} According to a report by Wuhan University, there are 1,324 ‘core’ journals in China, accounting for 21.46\% of total academic journals. 311 of these ‘core journals’ enjoy the further distinction of being classed as “authority journals” \textsuperscript{78}.

In order to provide statistics and rankings in relation to the publishing performance of the Chinese academic population, ISTIC (the Institute of Scientific and Technological Information of China) has selected 1,946 Chinese academic journals as source journals. This is also an important indicator of the value and authority of Chinese journals. Publishing resources such as governmental subsidies, high quality papers, the labour of reputed reviewers, etc. are not allocated evenly amongst journals. Instead, they are allocated in a highly hierarchal structure in which so-called core journals are highly valued within the academic evaluation system and enjoy advantageous economic and social status.

The ownership structure of Chinese academic journals is complex and decentralised. According to the Chinese statistical yearbook, Chinese journal publishers owned an average of just 1.6 journals each and most journals were operated by a single editorial team (You, 2008). Chinese journals are mainly owned and supervised by three types of institutions: 25.97\% by research institutions, 25\% by universities (27\% according

\textsuperscript{76} All Chinese journals and magazines including both academic and trade ones are categorised into a pyramid structure: there are 50 “two high” journals (high reputation and high level), about 100 “two awards” famous big magazines, 100 key social science magazines and 100 key natural science ones, and about 1000 “two benefits (social and economic benefits) magazines.

\textsuperscript{77} The most important indicators include Chinese core journals’ list edited by university libraries in Beijing, which includes 2,174 journals and updates every five years; the Institute of Scientific and Technological Information of China issues annual reports on journal citations (CSJCR) and top 100 Chinese journals, which is the most authoritative quantitative assessments; the Chinese Social Science Citation Index (CSSCI) by the Centre of Social Science Research and Assessment in Nanjing University and the List of Chinese Core Social Science and Humanities Journals edited by Chinese Academy of Social Science are the most important assessment on social science and humanities journals.

\textsuperscript{78} \url{http://edu.163.com/09/0817/08/5GTHU3CJ00293I4V.html}
to the statistics of national ministry of education), 24.86% by academic associations and organizations, only 4.75% by publishing companies, and the rest by a variety of governmental departments and state-owned enterprises. Though most academic journals are required to be financially independent from their supervisory institutes, they are classified as public service institutes rather than as state-owned enterprises. The long history of publishing as part of a planned economy, with heavy government protection and state support for publishers, has had a major impact on the economy of Chinese journal publishing. Chinese journals enjoy a market monopoly and abundant subsidies from the government and institutions. Moreover, quite a number of journals enjoy both subscription revenues and page fee income though the subscription revenues account for only a small part in most Chinese journal publishers. This is radically different from the situation in other markets, where journals tend to be run as commercial businesses supported by either subscription revenues or more recently, the fees associated with publishing on a gold open access basis. However, this safe economic situation has diminished the commercial capacity of most Chinese journals and resulted in few incentives for business model innovation or entrepreneurial risk taking amongst academic publishers (Liu, 2012).

As mentioned in Chapter One, academic databases have become an important stakeholder in the Chinese academic publishing industry and act as digital aggregators of academic content. Nowadays, over 90% of market share is occupied by the top four players, Tongfang, Wanfang, Weipu, and Longyuan (Zhang, 2008b). Most of the big academic databases started their businesses with government funding – often through

funding schemes set up to support national information modernization projects, such as Tongfang (also widely known as CNKI) and Wanfang. These publishing corporations integrate a wide range of academic content published by journals, conference proceedings, dissertations, and other non-book materials, and sell the information service or content bundles to libraries and research institutes. Online academic journal databases were the earliest and also the most profitable model in digital academic publishing in China, which has become the dominant channel for the distribution of journal papers today (Tan, zhang & Rao, 2010). The journal databases play an instrumental role in the digitisation of the Chinese academic publishing industry due to its decentralised structure. Just as Respondent 8 argues, “without them, Chinese journals are highly isolated and the Chinese language academic content resources would become useless if they were not integrated, searchable, and indexed. The Chinese model of third party databases is a viable way to realise digitisation at very low cost for individual journals.” Compared with journals, the digitization of monographs is not a trend. The major digital libraries like Fanshu, Chineseall or Chaoxing can hardly achieve the distribution dominance enjoyed by journal databases because Chinese book publishers are very conservative in terms of licensing their titles to digital platforms.

3.2.3 Political Economy of the Chinese Academic Publishing Industry

Academic publishers all over the world are engaged in two kinds of business: selling content and facilitating the certification of academic knowledge. Their dependence on each of these aspects of their product in order to generate income varies widely. Chinese academic publishers operate in a government-controlled system, in which
only authorized publishers are permitted to engage in editing and publishing businesses. Government granted monopolies on publishing and distribution, and government control over a wider range of aspects of the scholarly communication landscape, provide Chinese publishers with a very high level of power within the scholarly communications landscape.

Although governmental censorship is not as crucial or politically sensitive in academic publishing as it is in press and trade publishing, the editorial gatekeeping and decision making of Chinese journal and monograph publishers are different from those in the West. The Chinese publishers employ a so-called “triple reviewing system (Sanshen Zhi, 三审制)” in editorial control, in which the junior and senior editors are in charge of proof editing and processing manuscripts. The managing editors make decisions on whether the papers or monographs are qualified for publishing, while the editors-in-chief review the content and make final decisions, usually with a special attention on political errors in addition to common editorial concerns. In this hierarchal system, the opinions of peer reviewers are only a reference while managing editors or chief editors are the real gatekeepers. Though this system ensures governmental control, it is criticized for administrative intervention irrespective of the nature of scholarly communication (Wu, 2010), which also provides possibilities of gatekeeping corruption of scholarship.

A key point of scarcity within China’s publishing economy is publishing numbers, which are closely connected to the government’s very strict control over the scale of academic publishing and concern with other aspects of publication, including censorship. As a result of publishing control, book numbers (ISBN) and journal
numbers (ISSN) are a scarce resource in the economy of Chinese academic publishing. Unlike in the West, where publishers or even individuals can apply for an ISBN from relevant organizations easily and at very low cost, the Chinese government has chosen to make publishing numbers exclusive to state-owned publishers. It is not legal for private and foreign companies, or unauthorized state-owned companies or organizations to engage in the business of publishing, although in recent years they have been allowed to become involved in distribution.

Compared with the fast growth in journal titles in the West in the recent years (Tenopir & King, 2009), a very small number of new publishing houses or journal titles have been approved by the Chinese government despite the rapid expansion of higher education. In 2008, only 20 new academic journals were approved by regulatory institutes. Today, China has an academic population of over 11.8 million, while the overall output of journal papers is only 2.4 million papers every year, which can hardly meet social demands for scholarly communication nor the publishing certificates required by academic promotion committees. The scarcity of publishing numbers provides the crucial basis for the Chinese academic publishing economy, which not only makes publishers powerful and profitable, but also leads to bottlenecks and structural difficulties in the scholarly communication system, including a lack of incentives to publish high quality content. Just as Prof. Wu Yishan argues, “This is a problematic and outmoded policy, making book numbers and journal numbers the scarcest resource. As a result, publishing numbers have become a commodity, which has changed the nature of academic publishing. Journal publishers

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81 http://media.people.com.cn/GB/40606/8418713.html
have ‘golden bowl’ (Jin Fanwan, 金饭碗)\textsuperscript{83}. Even if they fail to produce a high quality journal, they can still sell publishing numbers.”\textsuperscript{84}

In addition to publishing numbers, there is another scarcity in academic publishing created artificially by publishers and academic evaluation, which is universal rather than China-specific: the scarcity of symbolic capital. Mechanisms like core journals, SCI or SSCI, Impact Factors and so on, all function to define and create the scarcity of symbolic capital. By limiting the number of “good journals” in every discipline, these mechanisms have become the only way to distinguish excellent publishers from average ones. As a result, good journals enjoy a virtuous circle in which symbolic capital and high quality papers mutually enhance each other and finally allow them to establish monopoly over symbolic capital. Unlike copyright-centric Western academic publishing, Chinese publishers can hardly maintain a monopoly over content and benefit from content scarcity due to poor copyright enforcement and various infringements on the one hand, with journal databases’ distribution monopoly on the other. Therefore the profitability and viability of the Chinese academic publishing business nowadays depends on symbolic capital. Possessing scarce symbolic capital makes it easier to occupy high quality content resources, increase impact and capitalise them by page fees, institutional and governmental subsidies.

In the wake of Chinese media reforms which began in the early 1990s, a growing number of academic publishers in China have been forced to find strategies for

\textsuperscript{83} This term is developed from the well-known Chinese word of “iron bowl” (铁饭碗, Tie Fanwan). The “iron bowl” means a stable source of revenue in state-owned enterprises or public institutions; while “gold bowl” also means that, but it additionally suggests high profitability as well.

\textsuperscript{84} According to an interview by author. Prof. Wu Yishan is the general engineer of ISTIC (Institute of Scientific and Technical Information of China, www.istic.ac.cn/) in charge of the official ranking of universities publications and academic journals.
generating profits in order to survive in an environment in which direct governmental subsidies are in decline, but where state control over publishing numbers remains (Akhavan-Majid, 2004). Due to the “market failure” in the academic publishing economy as well as the marginalisation of individual journals in the distribution system by journal databases, the majority of Chinese academic journals are unable to maintain their financial viability through subscription revenues alone (Zhang, 2011). As a result, state-owned publishers have to monetize their publishing numbers by demanding page fees and by charging authors for the publication of books.

According to an official investigation, almost half of the academics surveyed reported that they had paid page-fees to core journals in order to have papers published.85 Another journalist’s report suggests that the page fees of core journals range from 4,500 RMB yuan (roughly AU $ 692) to 18,000 RMB yuan (AU $2,769)86 per paper. Even the lowest price is more than the average monthly salary of most Chinese academics. Page fees are even more prevalent amongst ordinary journals, particularly the smaller and less influential ones, which have become the mainstream of Chinese academic vanity publishing. In marked contrast to Western academic publishing, journal and monograph publishers in China sometimes enjoy both page fees and subscription revenues.

The attitudes of Chinese researchers towards “page fees” are not uniform. Advocates believe that page fees for scholarly journals are the most practical way for the Chinese academic publishing industry to achieve financial viability (You & Chen, 2007). However, more academics oppose page fees and controlled book numbers, arguing

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that page fees are at the root of a decline in quality and the spread of publishing-related corruption in China (Wang, 2006). Academics worry that once page fees or book number charges have been received, publishers reciprocally lower the “entry standards for academic publishing” (Wang, 2005:5), as a result of which, peer review becomes nominal.

Considering academic publishing as a for-profit business in both China and the West, publishers have rarely achieved the genuine financial sustainability that exists in trade publishing, where publishers are able to cover their operating costs and generate profits through purchases made by end consumers. Instead, a complex cross-subsidy system supports the economic viability of traditional academic publishing businesses. The nature of page fees is that research funds or academics’ income are used to cross-subsidize academic publishing due to the lack of governmental subsidy.\(^{87}\) Though quite a number of journals enjoy sponsorship from their supervising institutions in China, page fee incomes have become one of the major financial sources to maintain the operation of the academic publishing business.\(^{88}\)

However, page fees and increasing publishing costs have become a heavy financial burden for individual academics in China. Prof. Gao Jianguo examines the correlation between the overall public funds by the National Natural Science Foundation and the total number of papers produced by the top level funded research projects over the past 15 years. He finds that on average, it now costs about RMB 30,000 (AU $ 4615) in research funds to get one paper published, a figure that has increased by an average


\(^{88}\) According to author’s interview with Respondent 8, 12, 13 etc.
of RMB 1851.7 (AU $ 285) annually. He further points out that public research funds are thus wasted on page fees.\(^{89}\)

Meanwhile, the cross-subsidy by academics’ page fees and a variety of institutional sponsorship has not led to an Open Access academic publishing landscape in China. Unlike a sharp distinction between gold open access and subscription journals in the West, the Chinese journals that charge page fees also make subscription revenues. In most cases, third party journal databases and university libraries digitally package scholarly content, and academic readers have to pay for accessing scholarship. As such, as in the West, Chinese university libraries suffer from limited budgets as well as price increases imposed by immensely powerful journals and databases. The Chinese government was recently forced to intervene in order to decrease the price of domestic databases\(^{90}\).

Chinese academic publishing suggests an economy with low efficiency. This is not only because of China’s unique situation, in particular a government-controlled publishing industry, but also results from structural conflicts between commercial publishing and the not-for-profit nature of academic publishing. Just as Prof. Ji Yanjiang the founder of online preprints initiative Miracle Repository points out, academic publishing is a niche market business. Traditional publishing models depend on large readerships to cover their fixed costs, and this is a conflict that cannot be solved within the traditional system.\(^{91}\)

\(^{89}\) http://blog.sciencecn.net/home.php?mod=space&uid=260340&do=blog&id=480471

\(^{90}\) According to an interview with Respondent 18 by author.

\(^{91}\) According an interview by author.
3.2.4 The Rise of Vanity Academic Publishing

The dominance of page fees has led to another serious problem in Chinese academic publishing. A growing number of small and poorly reputed journals have developed a viable business model by integrating scholars’ demands for publishing credits and publishing-number resources needed to legitimise publications. By removing appropriate gatekeeping and peer review, these journals are transforming their business into purely selling publishing certificates. Unlike Western vanity publishing, this type of paid-for publishing in China is accepted as the same as other types of publication in most academic evaluations.

The rise of vanity academic publishing in recent years may be attributed to the increasingly important role of agencies in the grey value chain. Due to their average small scale and weak strength, individual journals often have to depend on agencies to find customers for vanity publishing. As a result, professional middlemen have expanded the scale of the vanity publishing business and it has become a lucrative business for both journals and agencies. This process has resulted in the complete transformation of some journals into vanity publishers that do little more than sell publishing certificates. The business is not “nominal peer review”, but “publishing for a price”; furthermore, agencies even provide ghostwriting services for customers. Consequently, some academic editors and publishers are failing to play the role of gatekeepers and a hefty number of journals have become what the Chinese press refers to as “trash journals” (Hvistendahl, 2011). This is damaging the overall credibility of China’s academic publishing system.
Commercial journal databases fail to filter out low quality scholarly content. Instead, these databases function as certifiers of vanity publishers, which then sell certificates to academics in China. In other words, being included by databases indicates that the vanity publisher has been socially approved and that its certificates are formal and acceptable. This arises as a result of the requirements of the academic evaluation system, as it provides a feasible and convenient method for checking the veracity of the publishing credits claimed by academics. As a result, vanity publications coexist with peer reviewed papers in most journal databases and the traditional quality indicators for academic publishing have been disrupted. Readers are confused by the large scale of low quality publications submitted to the system by vanity publishers. In such a system, social reference management has instrumental value for the Chinese readers in selecting high quality papers. This is explored in more detail in Chapter 5, which discusses a social reference management initiative New Science - an experiment in facilitating social filtering of references by users who are engaged with specialist areas of content and able to judge the difference between high quality papers and vanity publications.

3.2.4 Reform and Digitisation in Future

The Chinese publishing industry used to be a highly controlled media industry in the print age, but it is subject to an ongoing reform process involving industrialisation and digitalisation. Just as Liu (2008:41), the head of the National Bureau of Publishing and Press argues: the government hopes to undertake both processes of reform “simultaneously so as to shorten the course of modernization”.

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The purpose of reform is to transform the ownership of Chinese publishing companies from public service institutes to corporations in order to reduce the regulatory barriers to corporate merging, financing, and market selection processes. This is a more profound change than the previous policy of “public service institutes, corporation-like management” (shiye danwei, qiye guanli, 事业单位，企业管理) which started about 20 years ago. Compared with trade books and mass-market magazines, the reform in academic publishing is uncertain and slow because it is still difficult for policy makers to balance public benefits and commercial interests in this special domain. So far, at least one direction of the reform process is clear: that China’s policymakers are hoping to stimulate large-scale mergers amongst journal publishers in order to stimulate the formation of influential academic journal publishing groups (He & Liu, 2005).

Another profound transformation is the digitisation of publishing. For the Chinese publishing industry, digitisation is not only a process of updating an approach as a response to new technology. Rather, it is a much more profound economic and social transition. In the print age, the publishing industry was a controlled and protected domain where only state-owned publishers could legally produce content. However, digitisation is providing non-publishing forces with a golden opportunity to formally enter a previously protected but potentially profitable domain. In Chinese digital publishing, IT companies, hardware manufacturers, Internet platforms, and even telecommunication service providers are much more active and capable than traditional publishers, who have already dominated the digital publishing infrastructure. The powerful status of online databases in academic journal publishing is an example of this. Traditional publishers are lagging behind in the digital
revolution. The chief editor of Chinese People’s University Press summarizes the reasons for their failure to take on digital challenges more effectively:

The problems of administration and ownership in the traditional system has led to the absence of mainstream publishing forces in the market; the problems of [low] concentration in the industry makes the integration of resources fail; the poor commercial and technical capability of publishing enterprises results in the lack of viable business model; the problems of copyright protection damages the copyright awareness of the society ... all these factors slow down the digital transition of our traditional publishing... as a result of which, our digital publishing is dominated by technical enterprises... 

92 Advocates in China began to talk about Open Access in 2004. China also has signed the Berlin Declaration on Open Access to Knowledge in the Science and Humanities. Compared with the UK and US, there are fewer commercial obstacles to OA publication because most Chinese journals are subsidized by sponsoring institutions or page fee charges. As a result, they do not solely depend on subscription revenue; instead, they could benefit more from Open Access in improving their visibility and accessibility (Cheng & Ren, 2008). However, there are other special constraints in Chinese open access publishing. Most journal publishers are small and weak in China, owning on average just 1.6 titles, which heavily depend on big third party journal databases like CNKI, Wanfang, and Elsevier in distributing their content digitally. These databases are all subscription based. Another big problem in China’s open access publishing is the poor development of Institutional Repositories. With the

92 According to the official transcription of the lecture by Mr. Zhou Weihua in “The Light of Blue Ocean – The Age of Capitals and Digital Reform” conference, see http://124.42.89.42/xinwenzixun/chuban/2011-01-26/498.html
exception of a few government mandates (like Science Paper Online) and university repositories (like Xiamen University eprints), the self-archiving based green open access is developing quite slowly in China. On the other hand, though over half of journals charge author page fees (Banmian Fei, 版面费, article processing charges), it is hard to find a large-scale counterpart of gold open access in Chinese academic publishing. Gold open access journals are also on a small scale in China, usually based on individual journal websites whose content resources are poorly integrated and discoverable. It is perhaps unique in China that journals charge APCs but distribute their content via the third party commercial databases and print journals subscription.

Compared with open access, digitisation and further commercialisation are major concerns of the Chinese academic publishers, just like their fellow Chinese publishers in other disciplines. Regarding the innovative changes in academic publishing, the Chinese government and academic institutes seem more active than publishers in the processes of digital innovation, particularly when it comes to the use of open and networked approaches. For example, all of China’s three online preprints mandates are operated by non-publishing stakeholders: National Ministry of Education supervises Chinese Science Papers Online (CSPO)\(^93\), the National Science and Technology Library operates Chinese Preprint Server (CPS)\(^94\), and a small group of academics launched Miracle Repository.\(^95\) Online communities of scholars are the most popular social networks in China, providing almost all digital scholarly communication services for Chinese academics such as blogs, wikis, working groups,

\(^93\) http://www.paper.edu.cn/
\(^94\) http://prep.istic.ac.cn/
\(^95\) http://www.qiji.cn/

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forums, newsletters, and instant messaging, exemplified by Science Net\textsuperscript{96} and the Xuewen community.\textsuperscript{97} Millions of academic websites are also important parts of digital academic publishing platforms, particularly those that are blog based or self-archiving. Such websites are usually discipline-oriented, small-scale, and niche. Though these academic websites suffer from poor financial sustainability, low Internet flow and influence, and a lack of high quality original content (Han, 2005), they are playing an increasingly influential role in disseminating and communicating scholarly content in the digital environment.

The active involvement of non-publisher stakeholders in digital academic publishing partially results from academic stakeholders and the government, who are keen to update scholarly communication and national innovation systems in the 21st century. It is also because these big interest groups hope to rebalance or redistribute economic resources and interests amongst stakeholders in an academic publishing system that is a complex cross-subsidy system based on various public funds. In other words, the public subsidy means “Monk Tang’ meat”\textsuperscript{98} to stakeholders in academic publishing, and digital transition provides an opportunity to re-cut the big cake that was previously occupied almost exclusively by publishers.

\textsuperscript{96} http://www.sciencenet.cn/
\textsuperscript{97} http://www.51xuewen.com/
\textsuperscript{98} According to Chinese classic fiction “The Journey to the West (also known as Monkey King)”, if anyone (human, devil, or god) eats Monk Tang’s meat, he or she will never die. This term later means huge interests and benefits that many people would die for.
3.3 The Difference of Chinese Academic Publishing

Very few researchers both in China and elsewhere have systematically explored the differences between the Chinese academic publishing system and the “Western” counterparts (Wu, 2010; Yin, 2007). Yin (2007) preliminarily identifies 11 major aspects in his work for further systematic comparison, which provides a starting point for laying out key differences between the Chinese and Western academic publishing systems. However, the broad scope and complexity of Yin’s work leaves a great deal to be done in articulating points of similarity and difference. This chapter has attempted to address some of the defining differences between the two systems. Table 3.1 briefly lists the points mentioned by this thesis, and is intended to provide a framework through which the context of emerging digital transformations in China can be conceptualised and understood.
Table 3-1: Differences of Chinese Academic Publishing

<table>
<thead>
<tr>
<th>Scientific Tradition</th>
<th>Academic Publishing in China</th>
<th>Academic Publishing in the West</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Confucianism, Taoism, Socialism, partial Westernization …</td>
<td>Enlightenment, Professionalism, Open Science…</td>
</tr>
<tr>
<td>Academic Administration</td>
<td>Bureaucratic, government-controlled…</td>
<td>Independent, governed by professors, but the governance is growingly taken away from academics …</td>
</tr>
<tr>
<td>The Nature of Journals</td>
<td>Scholarly communication medium, self-sustainable, state-owned public institution or corporation, propaganda unit…</td>
<td>Scholarly communication medium, for-profit publishing business, some are not-for-profit…</td>
</tr>
<tr>
<td>Journal Revenue Sources</td>
<td>Subscription, page fee, governmental subsidies, sponsorship, etc.</td>
<td>Subscription, value-added information services, Article Processing Charges for gold open access, sponsorship, etc.</td>
</tr>
<tr>
<td>Editorial Control and Peer Review</td>
<td>Editorial control is more determinative</td>
<td>Peer review is essential</td>
</tr>
<tr>
<td>Journal-governance</td>
<td>State-owned, direct supervision and intervention</td>
<td>Private ownership, little governmental intervention</td>
</tr>
<tr>
<td>Publishing Law</td>
<td>Mostly publishing administration</td>
<td>Freedom of press, copyright law and regulation, corporation and competition laws</td>
</tr>
<tr>
<td>Journal Market</td>
<td>Third-party journal databases, Institutional market, page fees, etc.</td>
<td>Institutional market, APCs, etc.</td>
</tr>
<tr>
<td>Digitisation</td>
<td>Averagely lower level</td>
<td>Averagely higher level</td>
</tr>
<tr>
<td>Distribution of Scholarship</td>
<td>Heavily depending on third party databases</td>
<td>Mostly publishers’ own platforms or green open access repositories</td>
</tr>
<tr>
<td>Sustainability</td>
<td>Protected by policies and more determined by the government</td>
<td>More determined by academic community and institutional market</td>
</tr>
</tbody>
</table>
Academic publishing in China plays multiple roles: it is a scholarly communication medium, whilst some aspects of the system serve propaganda functions. Publishers are both state-owned public institutions, and members of a media industry who are required to be financially independent. As such, many principles and fundamental policies that should be clearly defined are blurred and vague in China. There is no publishing law in China; instead, the whole industry is supervised only by direct governmental intervention and a series of administrative policies issued every year to deal with the latest problems. The Web 2.0 inspired initiatives that are by nature disruptive, decentralised, and democratized will inevitably involve some points of structural conflict with the government-controlled system in China. However, there may also be opportunities for the strong role of the government to positively impact on the development of a more open and networked digital publishing system in China. Open and networked initiatives are seen by policymakers to represent the future of Chinese scholarly communication. As such these initiatives have in recent years enjoyed the approval and financial support of the government, as part of a wider policy agenda intended to secure the nation’s position as a global leader in science and research. Both the positive and negative impacts of the government’s role in the publishing industry in China, provide a context for open and networked publishing initiatives that is different from the Western system.

In the established academic publishing industry in China, the boundaries between public service and commercialisation are unclear. The government is aware that publishers are taking advantages of monopoly and public resources to maximize their own interests, sometimes at the expenses of other stakeholders, particularly academics. The openness of the emerging system is thus expected to better balance public
interests and commercial profits in academic publishing in China. Moreover, the wider Chinese academic publishing system is only around 30 years old and remains transitional - with some aspects remaining as legacies of a planned economic system and others existing within a highly commercial landscape. One result of this is that publishers have not established a position of market dominance that might be understood as equivalent to that of their counterparts in the US or UK. As a result, new business models and open initiatives in China may encounter less resistance from established publishing giants wedded to existing business models than they might in other markets. This may in fact provide opportunities to a more dynamic process of transformation in China than might be found in other markets.

In the following Chapters 4 and 5, I will focus on two case studies of Chinese open and networked initiatives. These case studies will examine the practical realities of new developments as well as the ways in which users are engaging with these innovations, addressing the deep tension between emergent publishing initiatives and complex economic, social and political contexts in China. The case studies will thus provide an empirically rich and qualitatively detailed foundation for further discussion in Chapters 6 and 7, which will focus on innovation, impact and selection of open and networked models in Chinese academic publishing.
Chapter 4 Science Paper Online: A Case Study

4.1 Introduction

In 2001, Li Zhimin started his new job as the deputy director in the Centre for Science and Technology Development of the National Ministry of Education in China. As a senior official supervising the research work of Chinese universities, he was not satisfied with the overall situation of Chinese scholarly communication. In his own words, “papers have been sanctified by our academia and became a major way to realise self-interest, as a result of which, the by-products of research have become the driving focus of academics”.

Controversies also exist in traditional journal and monograph publishing in China, particularly over the editorial control and peer review. According to Li Zhimin, there are two crucial problems. Minority-based subjective peer review cannot completely avoid intellectual bias and conflicts of interests. Moreover, in an increasingly corrupt academic atmosphere in China, a growing number of cases have occurred in which, authors’ novel ideas have been stolen in the processes of peer review and editorial control. In these cases, an author’s original paper was rejected and the ideas plagiarized and later published under the name of another researcher. Sadly authors who are the victims of this form of misconduct have few options for redress.99

99 According to an interview by author.
At that time, Li Zhimin was also the board chairman of CERNET,\(^ {100}\) which is an IT company serving government-funded projects in digitizing educational systems in universities, middle schools, and primary schools all over the country. His involvement in these ICT-based projects inspired him to harness Internet communication to solve the problems facing the traditional academic publishing system in China. Li Zhimin and his colleagues decided to develop an online academic publishing platform on behalf of the government that would make it possible for authors to formally establish their claims to priority of knowledge before submitting papers to traditional publishers. Compared with the time lag in traditional journal publishing, this initiative allows authors to publish their ideas much earlier.

In 2003, Science Paper Online was launched. Science Paper Online publishes academic papers just one week after their submission “without need of traditional publication procedures such as peer review, revisions, editing and printing.”\(^ {101}\) In addition to helping academics to establish the priority of their knowledge claims, the Science Paper Online model enables fast and open exchange of knowledge and in doing so facilitates innovation. Just as its founder Li Zhimin said:

> Our ‘publish first’ policy facilitates the wide dissemination of academic outputs almost one year earlier than the traditional publishing system, which is valuable for scientific development and relevant applications.\(^ {102}\)

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\(^{100}\) The China Education and Research Network (CERNET; simplified Chinese: 中国教育和科研计算机网; pinyin: Zhōngguó jiàoyù hé kē yán jìsuàn jī wǎng) is the first nationwide education and research computer network in China. The CERNET project is funded by the Chinese government and directly managed by the Chinese Ministry of Education. It is constructed and operated by Tsinghua and other leading Chinese universities. (According to Wikipedia)

\(^{101}\) http://www.paper.edu.cn/index.php/default/en_about_us

\(^{102}\) According to an interview with Prof/Dr Li Zhimin, the founder and director of Science Paper Online by author.
Many equate this model with online preprints; however interestingly, Li and his team did not know anything about Western online preprints when they designed the model based on academic social demands in China. Very soon after the launch, they further developed the virtual preprints model by adding peer review function, which has become the distinctive feature of this platform, i.e. “publish first, peer review later.” The introduction of peer review not only helps to control the quality after publication by the experts’ mark on individual papers, but also legitimises excellent papers in the same way that traditional publishers do.

In its first year, very few academics in China knew about this platform and just a couple of papers were submitted each day.\textsuperscript{103} At its early stage, Science Paper Online also tried to recruit drafted or rejected papers from university journals supervised by the same governmental sector: the National Ministry of Education. However, due to the difficulties in dealing with copyright issues and a lack of prestige for authors, Science Paper Online did not attract many preprints from university journals. Submissions took off in 2005 when the platform had become known to a larger number of universities in China. Monthly paper submissions reached about 300 by the end of 2005,\textsuperscript{104} and totalled 3,000 in 2011.\textsuperscript{105}

The papers published by Science Paper Online cover all the 43 first-level disciplines in China and a total of 52,690 papers have been published so far.\textsuperscript{106} The discipline category ‘Electronics, Communication, and Auto-control’ is the most popular, with 7,575 original papers, followed by Computer Science (5,930) and Management Science

\textsuperscript{103} Ibid.
\textsuperscript{104} http://www.paper.edu.cn/index.php/default/info/info_detail/55/
\textsuperscript{105} http://www.paper.edu.cn/index.php/default/info/info_detail/2831
\textsuperscript{106} According to the up-to-date statistics on the home page, see http://www.paper.edu.cn/ (accessed on 2011/05/16). The figure has reached 62,172 on 2012/10/23.
In addition to the innovative online original papers, Science Paper Online is also an integrated open access mandate that provides functionality for self-archiving of papers by academics and a repository of open access journals. Its open access repository has attracted over 400 Chinese journals that signed an O.A. agreement and has collected 452,503 journal papers. In fact, the scale of published open access papers is much more than online original papers. Additionally Science Paper Online invites famous Chinese scholars to self-archive their important publications. As a result, there have been 76,801 publications self-archived by those prominent scholars; some self-recommended common academics have archived 22,335 publications to date as well.

**Figure 4.1: Academic Publishing Content in Science Paper Online**

![Pie chart showing academic publishing content](chart.png)

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107 Ibid.
109 [http://www.paper.edu.cn](http://www.paper.edu.cn) (accessed on 05/05/2011)
According to the web traffic counter on the homepage, the platform had attracted nearly 14 million visits by July 2012. The latest officially released statistics in 2006 suggest that there were over 139,000 registered users. Furthermore, according to the total number of clicks and downloads, the popular born-digital original papers published in Science Paper Online have a large readership. Some are even larger than conventional Chinese journals.

With the growth of papers being submitted, Science Paper Online improved its quality assessment system by recruiting more expert reviewers for post-publication peer review and introduced a system for users’ comments and social peer review. In order to encourage authors to submit papers and to provide them with practical rewards, the platform categorizes original papers by one to five stars, five stars meaning the highest quality. It began issuing certificates for papers ranked as three stars or more by reviewers in 2008. Using an online platform to perform the certification function of academic publishing was at that time, a unique experiment. Science Paper Online is experimenting with new certificates to provide authors with a level of prestige within the Chinese academic system that is equivalent to the credit provided by traditional journal publishers. This created a mechanism for integrating informal literature circulating on the Internet with the processes of formal scholarly

110 http://www.paper.edu.cn/index.php/default/info/info_detail/2839
111 For example, the most popular paper in the most popular discipline has received 7,414 clicks and 8,481 download times, see http://www.paper.edu.cn/index.php/default/releasepaper/content/200404-68 (accessed on 2011/05/16); in some small disciplines like library studies, the most popular one has attracted 2,717 clicks and 1,184 download times, see http://www.paper.edu.cn/index.php/default/releasepaper/content/200701-233 (accessed on 2011/05/16)
112 http://www.paper.edu.cn/index.php/default/info/info_detail/55/
113 http://www.paper.edu.cn/index.php/default/info/info_detail/54/
114 http://www.paper.edu.cn/index.php/default/info/info_detail/2130/
publishing. In their own words, “we are carrying out formal academic publishing in online innovative ways.”

“Elaborating academic views, exchanging innovative ideas, protecting intellectual property, and the fast sharing of scientific papers” is the slogan that appears on the home page of Science Paper Online. It illustrates that the ambition of Science Paper Online is to establish a dynamic and innovative system to assume both communication and certification functions of academic publishing. Nevertheless, Science Paper Online is still well known for its innovative model of “publish first, peer review later” in China, which combines online preprints with rigorous peer review in innovative ways. At the same time, the integration of online original papers, open access journal papers, and scholars’ self-archiving on Science Paper Online also reflects its principle of academic publishing innovation, i.e. the convergence between the formal and the informal, between the innovative and the traditional, and between openness and control. Science Paper Online appears to have found a viable strategy for incorporating the open and networked opportunities of Web 2.0 into the processes of academic publishing in China.

4.2 Innovations of SPO Model

4.2.1 “Publish First, Peer Review Later”

Prof. Chen Weichang is a reputable scholar in biophysics and has a career that involves carrying out government-funded research, publishing papers in core journals,

115 According to the author’s interview with Dr Li, the founder and director of Science Paper Online
working as a peer reviewer, and judging candidates for competitive research funding. He is also an amateur mathematician and spends most of his spare time studying, developing, and even challenging fundamental mathematical principles. As a result of this, he produced a novel paper on Mathematics. However, in contrast to his experiences publishing in his own field, getting his maths paper published in a traditional journal was extraordinarily difficult: it repeatedly involved long waits for peer reviews, rejection and even derision by reviewers.

An editor, also his friend, finally explained the problem to him: “your research is so challenging that I cannot find an expert who is willing to review your work and take responsibility for approving it.” He added: “In the field of mathematics, even Chen Jingrun\(^{116}\) experienced this problem when he was unknown and wanted to publish his breakthrough paper. But he was unusually lucky and was picked up by a reader scouting for new talent.” Prof. Chen Weichang responded that he would submit his work to a wider range of journals, including overseas publications. However, his friends stopped him, warning him of the risks of such an approach: “what if your theorem is correct? You run the risk that it will be stolen by dishonest reviewer. If that happens, you will have very little recourse.” Although fear that dishonest reviewers will steal an idea is not so prominent in other publishing systems, the difficulties associated with trying to get unusual work published is not unique to China.

Science Paper Online was a welcome discovery for Prof. Chen Weichang. It provided him with an opportunity to publish his novel ideas on a government-operated online platform.

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\(^{116}\) Chen Jingrun is widely regarded as a scientific hero in China. In a 1966 paper he proved what is now called Chen's theorem: every sufficiently large even number can be written as the sum of a prime and a semiprime (the product of two primes).
publishing platform and to establish the priority of his knowledge claims, without the barriers posed by pre-publication gatekeeping. Moreover, Prof. Chen Weichang was surprised by the useful and friendly feedback he received through post-publication peer review: “it was so warm and encouraging, which is rare in traditional journals… Though sometimes they marked me low, I feel that the reviewers are trying to help me to improve my papers rather to simply filter them.” The success of publishing and the unexpected size of the readership his work attracted through Science Paper Online encouraged Prof. Chen to devote more time to his mathematical research. So far he has published 4 original papers on the site and one of them has been published by a traditional journal later.

Like many Web 2.0 initiatives, the “publish first” open model of Science Paper Online makes it possible for some challenging and unconventional voices to be heard in academic forums. In the words of Prof. Chen Weichang: “Without Science Paper Online, our work would never see the light of day.” Nonetheless, academic communities are dominated by professional researchers and normal research. Understanding how this kind of platform impacts on their ability to share and access innovative ideas, is perhaps even more important than the impact of open platforms on the role of amateurs in science. Respondent 20 is a senior researcher in mathematics. Unlike Prof. Chen Weichang’s work, though also unconventional, is often highly ranked through conventional reviewing and publication processes. In spite of this, he appreciates the “publish first, peer review later” model of Science Paper Online and uses the platform to publish aspects of his work that might be harder to publish in traditional journals. He argues that:
In traditional system, the publication of novel ideas is usually postponed for long time. This is because expert reviewers are rarely willing to spend much time reading innovative or challenge ideas they are not familiar with and are reluctant to take the social risks of approving them. But the reviewers for Science Paper Online are anonymous and their duty is to assess the academic value and quality of the research itself rather than socially approve it, which makes peer review here more relaxed.117

It is worth pointing out that whilst it is tempting to assume that the Science Paper Online model is dominated by papers that cannot be published through traditional channels, this kind of publication only makes up one part of the site’s total publications. According to Wan Meng, the executive director of Science Paper Online, quite a number of original papers are finally published by formal journals, some of which even come from public funded research projects.118

As discussed previously, traditional academic publishers add value by filtering content and controlling the quality of work that is published. However, this model has been associated with controversies over the time lag between submission and dissemination, and the risks that valuable content will be inappropriately filtered out. Online initiatives usually solve these problems by removing formal quality control mechanisms and facilitating the sharing of online preprints or working papers. By contrast, the “publish first, peer review later” model encourages innovation and enables instant exchanges of knowledge by reducing gatekeeping and time lag while retaining a system for quality assessment.

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117 According to an interview by author.
118 According to author’s interview with Wan Meng.
Many facilitators of open academic platforms believe that it is necessary to have some mechanisms to prevent platforms from being bombarded with low quality work by amateurs. In China, invasion by so-called “pseudoscientists” has damaged the credibility of platforms and as a result, led to the collapse of many Web 2.0 based academic websites. The majority of Western open academic publishing models like arXiv and *Nature Proceedings*, usually require the participants to be professional researchers. Some platforms require an email address at an academic institution when registering, or require submitters to be approved by active users. However, despite that restriction, these initiatives present few further barriers to publication or participation. Science Paper Online does not follow this model; instead, it tries to maintain a high level of rigor in quality control through a series of measures such as preliminary gatekeeping, expert peer review, and post-publication social peer review. The advantage of this model is clear, which maintains an open policy on the identities of content contributors. The platform does not judge a paper by the identity of its author. In the words of Wan Meng, the executive director of Science Paper Online: “We are completely open regarding this issue”.  

The preliminary quality assessment examines the presentation of the paper, as well as the logic and methodology in the research, e.g. whether the paper is written in refined academic language, whether it contains reasonable research methods, data analysis and arguments. Science Paper Online has an editorial team in charge of preliminary quality control. In general, the results of the preliminary assessment are provided to authors within seven working days and accepted papers are published simultaneously.

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119 According to an interview by author.
According to Mr. Meng Wan, almost 40% of the papers submitted are rejected in this round.

The authors can select between “agree to peer review” and “do not agree to peer review” when submitting papers, which does not affect the online dissemination of their papers. For those who select “agree” option, a free peer review service will be provided after preliminary filtering. Science Paper Online tries to make the peer review as formal and credible as traditional academic publishing, which is based on qualified professional reviewers and rigorous quality assessment. The reviewers remain anonymous to authors and readers, but the feedback is accessible to both groups. As post-publication peer review is done without the pressure of filtering content, feedback tends to be practical and encouraging in spite of sometimes pointing out fatal mistakes or providing papers with a low mark.

In addition to expert peer review, social peer review models are also employed here. Users can rank each paper as between one and five stars, just as the expert reviewers do, in terms of three aspects: originality, scientific value, and authenticity, in addition to being able to provide direct comments. Users can also add a paper to their list of personal favourites if it is very useful and valuable. The total number of clicks, number of downloads, and number of times selected as a favourite by users is calculated and appears on the paper’s front page, ensuring that the outcomes of social assessments are visible. When readers search for papers, they are able to sort results according to the total clicks and total numbers of comments in order to identify the papers most valued by other readers. Thereby a mechanism similar to “social network markets” (Potts, Cunningham, et al., 2008) works here, which provides quality
indicators based on peer readers’ collective selection as alternatives to expert peer review.

Mark Patterson the director of Plos One once argues, a new paradigm of publishing gatekeeping is emerging, “whereby articles are subject only to technical assessment (by peer review) before publication, and impact assessment takes place during the post-publication phase”\textsuperscript{120}. Though Science Paper Online does not employ interactive models like online annotation system as Plos One does, the innovation of peer review by this platform goes even further, following the same concern.

Interestingly, in many cases, papers which are poorly ranked by peer reviewers register high numbers of downloads and large numbers of readers’ comments, for example the most popular papers in Computer Science and in Electronics, Communication, Automation has not applied for peer review at all.\textsuperscript{121} In the discipline of Physics, the second most popular paper is only marked 1 star by two expert reviews, on which both readers and authors expressed dissatisfaction in their comments. The author points out that, “peer review in Science Paper Online is totally meaningless and less valuable, which is nothing different from traditional peer review in terms of eliminating scientific innovation.”\textsuperscript{122}

### 4.2.2 An Integrated and Hybrid Model

**Certification**

\textsuperscript{120} See http://river-valley.tv/plos-innovations-in-peer-review/
\textsuperscript{121} See http://www.paper.edu.cn/index.php/default/releasepaper/comment_paper/200402-125 ; http://www.paper.edu.cn/index.php/default/releasepaper/content/200404-68
\textsuperscript{122} See http://www.paper.edu.cn/index.php/default/releasepaper/content/200711-212
In ‘key universities’\textsuperscript{123} in China, every postgraduate student is required to publish at least two formal journal articles in addition to a final dissertation in order to qualify for a master’s degree. This generates a massive volume of academic papers, as more than one million post-graduate students graduate with master’s degrees every year. This policy is regarded by many as one of the most ridiculous examples of the current system for encouraging research productivity. As an old Chinese saying puts it, it is like “pulling up seedlings to help them grow (bamiao zhuzhang, 拔苗助长).” Except for a small proportion of students, most postgraduates regard this requirement as a hassle and pay vanity publishers to accomplish this task without producing high quality papers. As a result, commercial vanity publishing journals and agencies make a fortune by selling certificates with nominal peer review, which results in a flood of low quality papers and plagiarism.

However, master’s students at the Beijing University of Post and Telecommunication and the Chinese University of Mining and Technology, have an alternative option: publishing their papers in Science Paper Online.\textsuperscript{124} The open online publishing model enables postgraduates to publish their work without the need to pay vanity publishers. Furthermore, online publishing practice is more like training for future formal scholarly communication by publishing papers, providing students with feedback and helping them to improve their work, rather than interacting with the publishing system in a utilitarian manner. A growing number of Chinese universities have begun issuing similar policies in recent years.

\textsuperscript{123} This term refers to the universities included in two national projects for building world-class universities, namely 211, and 985 projects.
\textsuperscript{124} \url{http://www.paper.edu.cn/index.php/default/info/info_detail/833}; \url{http://www.paper.edu.cn/index.php/default/info/info_detail/1830}
Central to the acceptance of Science Paper Online as a legitimate channel for the publication of academic work, is the fact that this platform is operated by a governmental institute, which creates a sense of authority and trustworthiness for Chinese academics. Many respondents mentioned that its official background is a key competitive advantage over other platforms and enables it to formally approve a paper. Secondly, Science Paper Online employs rigorous post-publication peer review and marks online papers for their quality and value. According to Wan Meng, Science Paper Online has established a marking system in which the quality of three star papers is considered equal to that of publications in common scholarly journals, four star papers are of a quality that would be expected in core journals, and five star papers equal those published in top journals. Last but not least, the content of papers as well as reviewers’ marks and feedback are visible to the academic public. In traditional academic publishing, the comments made by peer reviewers are not visible and public access to content is often restricted. As a result, instances of plagiarism, the publication of low-quality research, and the activities of peer reviewers are all hidden from public scrutiny, allowing wider scope for corruption and sharp practice by academics. Nevertheless, the acceptance of online certification for university evaluation in China is not satisfactory at the moment. There have been only 37 Chinese universities that accept the certificates issued by Science Paper Online for evaluation and mostly at postgraduates’ level, including very few famous universities125.

Protecting claims of priority

125 http://www.paper.edu.cn/index.php/default/heightschool/
Science Paper Online has only been accepted as equivalent to traditional publication at a postgraduate level in Chinese universities. In other words, other researchers who publish papers online cannot claim these publications as research outputs for the purposes of performance evaluation or promotion. However, Chinese academics value the protection that publishing in Science Paper Online offers them in terms of their ability to claim knowledge priority in relation to their work. This is an important practical incentive for authors as it reduces the risk that their work will be plagiarised.

Traditional academic publishing in China combines the protection of priority with a certification function. In other words, knowledge claims made within scientific communities are not recognised and cannot be effectively protected until they are peer reviewed and published. Ironically during pre-publication processes in China, work is sometimes stolen or rejected so that a reviewer can secure a competing interest. Online preprints operators often claim that sharing working papers on public websites is the best way to protect priority claims because evidence of the date of publication is clearly recorded and established. However, many Chinese academics remain sceptical of these claims, because they would be forced to rely on a common private firm or individually operated website to provide evidence of a publication date. It is felt that this form of evidence lacks credibility and would not carry the requisite authority in intellectual properties lawsuits in China.

Because Science Paper Online exists under the umbrella of a formal government agency, it is able to function as a de facto registration system for knowledge priority for online papers. Science Paper Online issues formal proof of publication time. Proof of publication is linked to a specific PDF file that cannot be edited. Revised papers
are recorded as “second drafts” and so on with a new publishing time. This function not only reduces the worries of authors regarding publishing preliminary research output online, but also provides the protection of priority and intellectual property in advance, if the authors hope to publish their papers in traditional journals after online sharing.

**Extended Integration**

Science Paper Online has an open access digital repository of published papers, as well as two print journals, in addition to its online original academic publishing platform. The further integration with traditional publishing not only enlarges the scale and scope of its content and business, but also improves its influence and reputation within Chinese academic communities.

It is smart for Science Paper Online, and meaningful for Chinese academic publishing, to integrate previously isolated open access resources. As most Chinese journals achieve financial sustainability through page fees and sponsorship rather than subscription or distribution revenues, there are few financial obstacles to shifting to open access models. This represents a significant contrast to western counterparts. Furthermore, the ownership of Chinese journals is varied and decentralised, as a result of which individual journals are too small and weak to effectively disseminate content to a wide readership. By integrating isolated open access resources, Science Paper Online has established a large-scale, indexed, and full-text searchable digital repository of over 400 journals and 450,000 articles. This is extremely attractive to readers.
The open access repository can also act as a scholars’ self-archiving platform that collects representative publications for individual academics. This part is similar to green open access models in the West; however, it is operated by the government and crosses the boundaries of disciplines and institutions. Science Paper Online categorises scholars into two types: outstanding scholars and self-recommended scholars. For the former group, this platform offers a variety of assistances and rewards. The outstanding scholars are invited by the platform to establish personal space for scholarly social networking, of which self-archived publications are an important part. Moreover, Science Paper Online spent much time and effort inviting and helping famous Chinese scholar to archive their publications in its repository. In order to avoid technical inconvenience, famous scholars only need to send their papers to the editors who will digitise and archive the publications on their behalf. As for self-recommended scholars, their identities and qualifications need to be approved by the platform before they are able to establish personal space for self-archiving and social networking. For readers, these two types of scholars are separated in the user’s interface in order to prioritise the communication of famous scholars.

Science Paper Online has integrated the databases of original papers, O.A. journals, and scholars’ self-archives, resulting in integration effects. Famous authors know its innovative publishing model of “publish first, peer review later” through self-archiving or O.A. services. Readers find more publications or original papers relating to interesting topics or authors by cross-database searches. Just as Wan Meng argues, “most readers found us via search engine and realised it is a very useful website for them.” As a whole, the visibility and influence of Science Paper Online in China’s academia has improved.
In addition to online publishing, Science Paper Online also publishes off-line printed academic journals. The monthly journal titled “The Journal of Science Paper Online” was first published in 2006, which focuses on four STM disciplines\textsuperscript{126}. The overall model of this journal is the same as other traditional print journals and it even charges authors a page fee of 100 RMB per paper – this is very low compared to average price of 500 at equivalent journals. The only difference is that accepted papers in this journal must be published in the online original publishing platform in Science Paper Online first. The Impact Factor of this journal is 0.929\textsuperscript{127}.

The managers aim to build a high Impact Factor core journal in engineering in order to improve the credibility and influence of the overall brand of Science Paper Online, harnessing the huge content and human resources gathered through its online initiatives. Although this journal has been indexed and archived by major Chinese databases like Wanfang and CNKI, as well as some international repositories like Cambridge Scientific Abstracts (CSA) and University of the Philippines (U.P.) Diliman Journals Online (UPD),\textsuperscript{128} there is still long way to go before it can be upgraded to be considered a core journal in China. In 2008, using an electronic publishing number issued by the Chinese National Ministry of Publishing and Press, Science Paper Online began to publish a series of printed collections of what they called “outstanding online original papers” submitted to their platform, which collected papers ranked as three stars or more. 24 issues are published every year and

\textsuperscript{126} They are namely, (1) electrics, communication and auto-control technology, (2) computer and information science, (3) chemistry, and (4) civil and architectural engineering, and transportation engineering.
\textsuperscript{127} http://www.paper.edu.cn/index.php/default/info/info_detail/3196/
\textsuperscript{128} http://journal.paper.edu.cn/
each issue focuses on one particular discipline. This process also provides another mechanism for rewarding authors with evaluation credits and in doing so, encouraging them to submit to the online repository. The certificate issued by Science Paper Online in recognition of high-quality papers published online, is not accepted for the purposes of performance evaluation by most Chinese universities. The publication of the printed collection does satisfy the requirements of University evaluation processes. As such, this is a practical way to reward the authors, which is a compromise with the existing dominance of traditional publishing in the academic world. It is worth mentioning that the authors can choose not to publish their articles in this collection and submit them to other more reputable journals.

The extended integration of Science Paper Online has resulted in the expansion of the scale and scope of its content, and ensures that each aspect of the platform benefits the system as a whole. Science Paper Online also operates two sister websites: Science Meeting Online whereby conferences can archive their digital proceedings and even stream their meetings live over the Internet; and a publishing system for multimedia papers whereby authors can use video, audio, and other rich-media resources to represent their research outputs. Although the multimedia publishing service is not yet particularly popular or influential, extended integration is allowing Science Paper Online to move towards a ‘one stop shop’ for scholarly communication.

**Openness and control**

The integrated pattern of Science Paper Online comes from the social demands of scholarly communication in China and the strong capacity of governmental

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129 http://www.paper.edu.cn/index.php/default/info/info_detail/3128/
130 http://www.meeting.edu.cn/meeting/
institutions to realise them. This is an important difference between Science Paper Online and the kinds of models that have existed elsewhere in the world. This root also results in its hybrid model between openness and control, and between empowering and restricting users, instead of the complete Web 2.0 based self-organization and users’ autonomy.

With regard to user-generated-content created by academic communities, the communication flow in Science Paper Online is not completely open and free. Rather, it incorporates gatekeeping and quality control functions. Preliminary quality control implemented by the editorial team is the first round of filtering users-submitted-papers, with expert peer review further marking each paper - providing an indicator for readers, which guides the consumption of content. However, control is never without controversy. Some authors are not satisfied with the reviewers’ mark and express their anger through user comments or personal blog articles. As to users’ comments, there is also editorial control to ensure quality. Posts like “I like it!”, “Good!”, “Trash!” as well as more radical criticisms are filtered. As a scientific website, content filtering tends not to be concerned with politics or ideology and its major purpose is to maintain an atmosphere of high-quality discussion on scientific issues. As a result, user feedback can lack certain vibrancy, but usually makes sense academically.

In fact, as a Web 2.0 inspired platform, Science Paper Online is in a dilemma regarding the balance between openness and control. On the one hand, the managers hope to encourage high-quality interactivity among authors, readers, and reviewers

131 This is an example “strongly ask Science Paper Online to publicize the name of the baleful reviewer”: http://blog.hsw.cn/104098/viewspace-400460.html
and thus a climate of academic discussion and criticism. On the other hand, they worry that empowering users too much may lead to a loss of control over published content. As a serious, government-operated academic website, it would be damaging for some kinds of content to be published. The current system is almost completely controlled by the platform, as a result of which users are more like traditional authors and readers rather than online activists of open and collaborative websites.

This tension between openness and control also exists in the role of editorial teams in online communication. Previously, the managers believed that for an open/Web 2.0 publishing platform, editors should play an invisible role that serves the users without being noticed. Moreover, as operated by a powerful administrative institute, Science Paper Online deliberately avoided a compulsory image to the users and Chinese academia. Just as Wan Meng argues, “we provide a platform and academics and universities decide how to use it.” However, online open publishing is also operating in a space in which publishers have traditionally added value by acting as quality filters. There is currently no editorial recommendation system on the website and the readers know nothing about editors’ preferences. Science Paper Online faces pressure, or perhaps an opportunity, to make the opinions and activities of its editors more explicit. As Science Paper Online aims to encourage innovative research in conservative areas of Chinese academia, editorial recommendation may be necessary to promote really valuable scientific innovations.

Science Paper Online is developing a controlled open paradigm, behind which the idea of encouraging innovation remains central. When compared to traditional journals, the innovation and scientific value of papers counts for much more than
other criteria in the Science Paper Online peer review system. Given increasing conservatism within both academic publishing and Chinese universities, this platform’s deliberate emphasis of innovation is a defining feature. Just as Wan Meng stated:

We value innovative papers and hope that experts and readers pay more attention to them... we oppose backward looking essays and stereotyped academic writing. Instead, we value original and meaningful ideas.

### 4.2.3 Publications-based Scholarly Communication

There have been two comprehensive technical updates of the web-system since Science Paper Online was launched in 2003. The technical updates focus mainly on two aspects: (a) improving the user-friendliness of the interface, particularly in terms of reaction speed and full-text cross-database searching, which is a common concern of all websites; (b) enhancing interactive communication between users, in particular social media functions like personal space, tagging, instant message, forums, groups and in the future, blogs. Science Paper Online is trying to establish a viable model of what it calls ‘publication-based scholarly communication’, harnessing Web 2.0 tools.

The ultimate ambition of this platform is to become an online scientific community enabling active and valuable academic participation and collaboration. Using the term

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132 At the end of 2006, Science Paper Online made the first overall update of its web system. The submission system of online preprints was greatly improved and the papers submitted were no longer isolated, but existed in a searchable digital repository, with full-text search becoming available one year later (in Dec. 2007). In 2010, the second overall technical update is based on SOA (Service-Oriented Architecture) system that dramatically improved the speed, interactivity, and users’ interface. See http://www.paper.edu.cn/index.php/default/info/info_detail/1550/
‘publication-based scholarly communication’, managers express their willingness to revert to the original ‘communication’ function of academic publishing, harnessing online open and collaborative initiatives. Primarily, it hopes to build a mechanism of effective scholarly discussion and criticism based on users’ critical comments and high-quality feedback. Its founder, Li Zhimin believes that a critical academic atmosphere is necessary for Chinese academia but has been absent for years. He has argued:

An atmosphere of academic discussion, debate, and criticism is essential for the healthy development of science in any country. However, ours is mainly praise. Before the 1990s, academic journals had columns for readers’ commentary, which have all disappeared as a result of page fees. As a result, academic discussion and criticism cannot be published. All public comments on scientific research praise work as being ‘first level’, ‘internationally advanced’ and so forth. ...This atmosphere is harmful to scientific development and progress.133

Harnessing Web 2.0 advances, Science Paper Online aims to bring back a more productive culture of academic discussion by empowering users to comment on and criticize the papers published online. Popular original papers usually attract large numbers of user comments, most of which point out logical problems or limitations. Some authors interviewed also mentioned users’ comments and respondents were even involved in some continual discussions with readers by emails or face-to-face134. However, neither found this particularly valuable. Users’ comments are also useful for academic surveillance, helping the website to identify instances of plagiarism and...

133 See [http://www.paper.edu.cn/index.php/default/info/info_detail/2831/](http://www.paper.edu.cn/index.php/default/info/info_detail/2831/) He also mentioned the same arguments in the interview by author.
134 According to authors’ interview with Respondent 20 and Prof. Chen Weichang
academic misconduct. So far, Science Paper Online has punished 4 authors and 6 papers by withdrawing publishing certificates, deleting online documents, and informing the authors’ employee universities, as a result of the exposure of plagiarism by other users.135

One aspect of publication-based scholarly communication is contacting and cooperating with research peers through the intermediary of academic publishing. Science Paper Online particularly hopes to provide a channel for young academics to meet senior and reputable scholars through academic social media functions. Instead of trivial chat and scholarly gossip, Science Paper Online values discussions based on papers. In other words, this website does not want to function like a ‘water cooler’ of a discipline, but like a conference where young academics can publicise their work, express themselves, and get feedback or advice from experts.

Science Paper Online is trying to connect isolated authors and readers using technological and social tools. In 2011, a radial diagram appeared on the web page of every original paper and every key word, which illustrated the connection between knowledge elements amongst papers and cooperative relationships among authors. This is technically helpful for users to find their research peers through publications. Moreover of course, this platform also provides common social media functions based on scholars’ personal space whereby users can upload an academic CV, introduce others to their research interests, self-archive publications, use private instant

135 http://www.paper.edu.cn/index.php/default/info/info_detail/97
messages, and join relevant groups.\textsuperscript{136} The personal spaces provide a virtual platform for online scholarly communication.

Its managers hope that on Science Paper Online, the focus of communication, interactivity, and cooperation among users is research: authors will get to know each other through their publications, will talk about papers, and work together to improve the quality of their academic publications and research. This differentiates the website from other Web 2.0 based sites that employ self-organised user-generated-content models, for example, the academic BBS Xiaomuchong or scholarly blog site Science Net. The common problems of these free academic social media sites is a lack of valuable scientific discussion in spite of tremendous volumes of user-generated-content and the very high clicks and web traffic.

Science Paper Online claims to value the quality of online communication more than popularity. According to Wan Meng:

\begin{quote}
We prefer the serious communication of mature ideas relating to papers ... we don’t like attracting eyeballs [by some hot topics], we favour the scientific contribution of users’ participation... we encourage such an online academic activism that academics can express their innovative ideas on science rather than everyday chat...\textsuperscript{137}
\end{quote}

As such, Science Paper Online controls and censors user-generated-content and gives priority to serious academic discussion at the expense of other forms of users.

\textsuperscript{136} In early 2011, the scientific group functions were added, see http://www.paper.edu.cn/index.php/default/info/info_detail/3387/

\textsuperscript{137} According to authors’ interview with Mr. Wan
participation and associated web traffic. This policy is a double-edged sword and for a
Web 2.0 platform, a risky experiment. At the moment, Science Paper Online looks
like, and is regarded by many as, an online innovative version of traditional academic
publishing. It is far from an online scientific community of practice, through which
the ‘publications-based scholarly communication’ ideals can be realised.

4.3 Operating Strategies

4.3.1 Economic Sustainability

Science Paper Online effectively employs an open access model, in which neither
authors nor readers are charged. Authors enjoy an online publishing service and
expert peer review without any monetary cost. If authors require printed certificates of
publication, the documents are produced and posted for free. Readers can access all
online content for free without the need to register. Science Paper Online does not
operate advertising business and public relation services, though this platform is
valuable for businesses relating to academia. Furthermore, Science Paper Online also
provides free technical support to a number of Chinese open access journals in order
to integrate them into one open access database.

Unlike traditional academic publishers, Science Paper Online does not own the
copyright of the papers it publishes. Instead, the authors retain their copyright and can
publish their papers in traditional academic journals after sharing them online,
maximising their credit for academic evaluation. In other words, authors surrender
none of their intellectual property rights to Science Paper Online unless they choose
to publish in its print journals. In this case, Science Paper Online requires the copyright on the same basis as traditional journals.

The economic sustainability of Science Paper Online depends entirely on government funding rather than commercial revenue. The costs of operating such a big platform and digital repository are high. Hardware expenses, Internet Service Provider (ISP) charges, technical maintenance and updates, and personnel costs must all be met through government funding. There are no exact financial figures of government investment in this platform, but it is clear that a platform like Science Paper Online is an expensive undertaking. Government investment on this scale is not without controversy.

The government-funded and government-operated model of Science Paper Online has clear advantages. First of all, most Chinese traditional academic publishers are unwilling and incapable of operating online open initiatives due to their for-profit nature, lack of technical capability, low economies of scale, and the fragmented ownership pattern. Secondly, as online open publishing is challenging the habits of academics and reshaping academic culture in China, publishers find it difficult to navigate resistance from the somewhat conservative and hierarchical academic communities. Furthermore, the institute that runs Science Paper Online - the Centre for Science and Technology Development of the National Ministry of Education in China, also has its own advantages. This institute is in charge of many large-scale national digitization projects and has been responsible for ensuring that digital affordance is integrated into the Chinese educational system. It is also responsible for supervising the research work and competitive research funding of Chinese
universities. It is thus both authoritative and has access to relevant human resources and academic expertise.

Given the widely acknowledged problems within Chinese scholarly communication and the unwillingness and incapability of other bodies to address these, Science Paper Online is a timely and meaningful initiative. Discussing on this issue, Li Zhimin argues that, “China does not need concepts; China needs action.” Wan Meng the executive director, also quoted some scholars’ praises, saying: “many famous scholars said that what we are doing is, in a Chinese old saying, ‘Increasing variety, benefaction immeasurable community’”\textsuperscript{138}. Undeniably, however, the nature of Science Paper Online is more like government intervention than market innovation.

The business model of Science Paper Online is still developing and the managers hope to find ways for the platform to generate revenue in the longer term, perhaps through value-added customised information services. As Respondent1 suggests: “some research institutes do need very specialized information services, we may develop some models providing up-to-date specific information in future, which will be subscriptive.” There is a precondition of the future business model – that the platform is a public service and a serious academic medium. Consequently neither charging authors and readers nor adding distracting online advertisements on web pages is considered acceptable.

Powerful tensions exist between a desire to foster not-for-profit academic publishing and the need to ensure that the sector is commercially sustainable. Academic

\textsuperscript{138} The Chinese original saying is “惠泽社群，功德无量”, which means the utmost level of meaningfulness.
publishing suffers from these tensions all over the world. Commercial publishers
become the centre for traditional journal and monograph publishing, which maintains
financial viability by selling content and charging page fees. The Chinese government
also encourages domestic publishers to survive by such an academic publishing
“market”. The financial model of Science Paper Online provides a different case, in
which the platform provides free publishing content for authors and open access
scholarship for readers while achieving financial sustainability by direct governmental
funding. Considering the economic efficiency of academic publishing as a whole,
based on financial inputs and outputs, the managers of Science Paper Online believe
that their model is more efficient economically than a traditional system.139

4.3.2 Recruiting Creative Academic Human Resources

As in traditional academic publishing, Science Paper Online depends on the
engagement of the academic communities that form the source of the platform’s
authors, readers and reviewers. As Science Paper Online covers all disciplines rather
than focus on a few, it requires a huge scale of supporting human resources. Its
strategies for recruiting such support focus on: (a) providing practical rewards for
participants; and (b) harnessing governmental and administrative capabilities. The
open and collaborative paradigm usually values self-organization, but in this platform,
human resources are controlled to some extent and the platform as a whole works
more like a traditional publisher, i.e. as an intermediary among academics.

139 According to author’s interview with Li Zhimin (Respondent 1)
Authors

Science Paper Online depends on academic-user-generated content and the platform does not produce content itself; so recruiting capable authors is crucial. The free nature of the service and the convenience of publishing online are primary attractions for authors. The authors enjoy free publishing services, free expert peer review, free legal protection of knowledge priority, free printed certificates services, and so forth. The platform has a user-friendly interface whereby scholars with lower levels of digital literacy can use online publishing functions easily. The platform also provides a special service for famous scholars in order to help them to publish online.

With regard to online publishing, authors usually worry about knowledge priority and copyright issues. As mentioned above, by harnessing its governmental authority and emphasising openness and transparency in its reviewing processes, Science Paper Online is able to reduce these concerns amongst authors. Benefits to authors might be summarised as follows:

(a) Science Paper Online provides an effective way to disseminate ideas widely. This was valued by most of the authors interviewed for this research.

(b) The “publish first, peer review later” model also opens a door for innovative research and challenging ideas that can be difficult to publish in traditional journals.

(c) Some early-stage scholars find the open and collaborative approach of the platform helpful, as tool for improving their skills as prospective authors. Access to communities of expert peer reviewers helps young scholars and beginners in academic publishing practices.

(d) Science Paper Online provides certificates recognising high-quality online papers, providing authors with academic kudos.
Since the managers hope to attract people who really understand and appreciate their ideas and purposes, they hesitate to use administrative power in recruiting authors and papers, though they do have such power. However, the correlation between the perception of the administrative influences of Science Paper Online by universities and authors and the growth of papers does exist. There is an up-to-date rank of universities on the website of Science Paper Online, in terms of the total numbers of online original papers and that of three-stars-plus papers. Although these ranks have nothing to do with university assessment and fund allocation, Chinese universities do care about it and try to improve their ranks. Just as Respondent 16 argues, “Our university does not force faculties to publish via Science Paper Online, but we do encourage. We usually persuade them like that, ‘Come on, you got their money to do research, just support their work’.”

This explains the reason for the relatively high number of papers relating to government funded research projects. Respondent 24 also pointed out that publishing a paper via Science Paper Online is regarded as an acceptable and sometimes compulsory research output by quite a number of national research funds. As a result, though some participants are obligated to publish online without a deep understanding of the value of such a model, the content they contribute which is based on high-level government-sponsored research, greatly improves the overall quality of online papers. Some possess the same level as core journals or even higher. Administrative power is used here to recruit authors and high quality papers.

140 According to author’s interview with Dr. Wu
Reviewers

For most online open academic publishing websites, like arXiv, the lack of formal peer review or trustworthy mechanism to assess and certify content is a major difficulty. Harnessing governmental resources, Science Paper Online has a viable model of peer review for large-scale multi-disciplinary original papers. The institute that operates Science Paper Online is also in charge of the allocation of competitive research funding, whereby it owns a big database of experts in various disciplines. Science Paper Online makes full use of this database by inviting experts in a wide range of disciplines for peer review.

Nevertheless, as most experts in this database are top scholars in their fields, they are too busy to review many original papers. Consequently, Science Paper Online also publicly recruits senior academics with titles of Associate Professor and above for reviewing work. To reward them, Science Paper Online pays 40 RMB (about AUS 6) for each paper reviewed. In fact, the peer review here is easier than traditional journals because the reviewers need not worry about the issues of either rejecting or approving a paper, instead only assessing the paper itself and providing feedback. However, many authors’ and readers’ comments suggest that peer review is not serious and satisfactory in this platform. This is partially because most reviewers cannot perfectly keep the balance between encouraging innovation and relaxing academic rigors. It is also undeniable that some reviewers do not review online papers as carefully as traditional journals (according to Respondent 20, 21, 22).

Readers

141 There are about 57,000 experts in the database and 95% of them are professors. http://www.paper.edu.cn/index.php/default/info/gxrk/1
Unlike traditional academic publishers whose customers are institutes like libraries, Science Paper Online targets individual readers. As the executive director suggests, according to surveys by the platform, most readers of Science Paper Online visit the website via search engines like Google and Baidu. In other words, individual readers are interested in specific content directly and closely related to their academic concerns. Understandably, open access and large-scale digital repositories are strong attractions for Chinese readers and their further addition is natural. In order to attract readers, Science Paper Online deliberately improves the visibility of online original papers in search engines. Furthermore, it exchanges links with many academic websites and university libraries in order to be known by more academic readers.

As a Web 2.0 based collaborative platform, the readers are required to be participative as well. Science Paper Online also values “publication-based scholarly communication” where readers’ criticism and discussion play an important role. However at the moment, there are no rewarding mechanisms for active readers such as high ranks, privileges resulting from points, etc. This could be a reason that interactivity and users’ activism in Science Paper Online remain at very low level.

4.3.3 Building and Promoting Credibility

Symbolic capital is always crucial for academic publishers as intermediaries in formal scholarly communication. It takes time to establish the reputation and credibility of a publisher. As a result, powerful barriers to entry exist for online initiatives in
academic publishing. By trading on its association with government, Science Paper Online has been able to establish its credibility within a relatively short period. In spite of this, it takes time for academics to recognise, use, like, trust, and finally respect a new academic publisher.

The quality of content is the basis for academic publishers’ credibility and reputation. As mentioned above, Science Paper Online employs a series of models to control and assess the quality of original online papers. In addition to this, Science Paper Online has invited top academics in each discipline to form an expert consultancy committee to guide its academic publishing practices. Currently this committee consists of 35 CAS (Chinese Academy of Science) or CAE (Chinese Academy of Engineering) members. To some extent, it is a Chinese academic dream-team. Additionally, the scholars’ self-archiving platform has attracted 75 members of Chinese Academies of Science and Engineering, 304 top scholars in Chinese national academic research projects of 873 and 863, and 118 Changjiang scholars\textsuperscript{143}. The large scale of famous scholars’ self-archives greatly improves the credibility of Science Paper Online. The meaning of top scholars’ participation not only lies in the content they contribute or the advice they give, but also more importantly, is an example of using online academic publishing initiatives in their own research fields. This works as an approval of online open models.

\textsuperscript{143} The Changjiang Scholars program is a higher education development program in the People's Republic of China provided by the Ministry of Education (中华人民共和国教育部) and Li Ka Shing Foundation (李嘉诚基金会). It was started in August 1998, and provides scholarship funding to allow well-known professors from China and other countries to work in China. The number of Changjiang Scholars in a university's faculty is one of the indicators used in the Netbig (网大教育) Chinese university ranking. Quoted from Wikipedia at http://en.wikipedia.org/wiki/Changjiang_Scholars_Program
As an ambitious new entrant in academic publishing, Science Paper Online clearly understands that it is impossible to build credibility and reputation in traditional ways based on Impact Factors, total citations, and publishers’ symbolic and copyright capitals, which requires a lengthy period of time. Rather, Science Paper Online harnesses its governmental background to build credibility in a much shorter period and further improves its reputation by continuous interaction with academic community. The government-operated platforms are more trustworthy for authors and readers because they are more formal, serious, and can usually exist much longer, compared with millions of non-official academic websites. However, this is a long-term strategy, as administrative resources cannot solely secure the reputation of an academic publishing initiative. The approval and acceptance by academics is essential. Science Paper Online values the approval of the academic community in developing and promoting its reputation as an advanced alternative to traditional journal publishing.

Li Zhimin (Respondent 1) and his team have presented many lectures and speeches in Chinese universities across the country, fulfilling their governmental duty of supervising university research work, in addition to operating a publishing initiative. Being both platform operators and governmental officials, this poses the perfect opportunity to promote Science Paper Online and developments in scholarly publishing, to target end users. The promotional introduction includes both explanation and persuasion, as they are not only telling audiences something new, but also trying to change their habits of publishing and distracting them from the traditional system. With regards to reshaping Chinese academic culture and changing
academics’ habits, Li Zhimin admitted that it is a big challenge but the speed of accepting new things by Chinese academics is faster than they imagine\textsuperscript{144}.

Nevertheless, common Chinese academics are not familiar with, and thus willing to embrace, open and collaborative paradigms in academic publishing and scientific research, which requires widespread reach and justification in Chinese academia. For Science Paper Online, promoting its academic publishing initiative is equal to promoting new social norms and an infrastructure of open and networked scholarly communication in the digital age. The Centre for Science and Technology Development of the Educational Ministry that operates this platform organises an annual competitive research fund sponsoring studies on online academic publishing. There are about 30 research projects funded every year examining online initiatives in academic publishing from various disciplinary perspectives. In addition to practical research outputs, the research justifies the role of the emerging open models in academic publishing in Chinese academia, which helps to accelerate the acceptance of Science Paper Online by the wider academic population.

As a government-operated and public service platform, the promotion of Science Paper Online cannot be as active or even sensational as commercial websites. However, it has not found a suitable way to market a serious academic publishing initiative that employs innovative models and enables new ways of practicing science. As a result, its promotion is not as developed as it should be. As Wan Meng, the executive director argues,

\textsuperscript{144} According to author’s interview with Li Zhimin
Actually we hope to produce wonderful products before promotion. Otherwise, people are attracted but they find that it is a trash... However, admittedly we should improve promotion and marketing because we've for long time, had a very low voice in academic publishing industry.145

4.3.4 Comparative Competitive Advantages

Science Paper Online is a competitor to a variety of traditional journal publishers and databases, competing for a wide range of resources in the Chinese academic publishing industry. It has both advantages and disadvantages in this competition. The crucial comparative competitive advantages of Science Paper Online come from the combination of innovative publishing models and governmental background and supports. As an integrated model between initiatives like “publish first, peer review later” and traditional peer review and certification, Science Paper Online is providing a more efficient, cost-saving, and dynamic alternative to existing journal publishing, and at the same time maintaining quality-certified features of academic publishing. Even compared with digital journal databases, it has unique advantages as well. Just as Wan Meng argues,

We have different ideas and strategies from CNKI, the largest digital academic database in China. They are based on published papers and try to build an integrated all-in-one knowledge database, which is great. However, we prefer new ideas, the latest research outputs, and the knowledge to be published. To some extent, both models are complementary to each other146.

145 According to author’s interview with Wan Meng

146 According to an interview by author.
Moreover, sponsored by the Chinese government, this platform provides complete free service to authors and open access scholarship to readers, which is another crucial comparative advantage over competitors depending on subscriptive incomes and page fee charges. Its official background also helps to build strong credibility and capacity that common grassroots academic websites can hardly imagine. The sharp contrast between Science Paper Online and another individual-operated online preprints initiative Miracle Repository, illustrates this difference147.

Science Paper Online also has strong nationalistic concerns and aims to compete with international reputable journals for the right of publishing the latest Chinese research outputs. As Chinese academics value the credits rewarded by SCI publications - “SCI” is also ironically translated as “Stupid Chinese Ideas” - authors prefer English language journals. As a result, Chinese readers have to wait for at least one year to read the new research and have to buy research outputs funded by the Chinese government back from international publishers. The National Ministry of Education forces research projects it funds to publish preprints in Science Paper Online to ensure that “Chinese academic fruits serve China first”148, which is similar to the Western policy of “publicly funded research must be publicly accessible”. Though authors are reluctant to submit original papers online before publishing them in a SCI journal, the administrative resource becomes strong competitive advantage of Science Paper Online over internationally reputed journals.

147 According to an interview with the founder of Miracle Repository, Prof. Ji Yanjiang by author. Miracle Repository is the earliest online preprints platform in China, but due to the lack of funding and appropriate social and official supports, its development is in quite difficult situation. In the interview, the founder began by stating: “what I am talking about is mostly why it fails”. According to him, the direct competition from a strong government-supported Science Paper Online is a crucial reason. This will damage the dynamics from grassroots in developing innovative initiatives in the Chinese academic publishing system.

148 As Respondent 24 proved: “we are told that the online publications in Science Paper Online are regarded as an important output of our state-funded research”. 156
4.4 Influences and Constraints

4.4.1 The Users of Science Paper Online

According to interviews with authors and managers, there are several features regarding the usage of Science Paper Online. Compared with a number of ambitions in design, users use the platform for diversified self-centred reasons. As partially mentioned above, some postgraduate students publish via Science Paper Online in order to qualify for a master’s degree more easily, as government-funded research is obligated to submit preprints, and some authors harness “publish first, peer review later” policy to publish innovative and challenging ideas that cannot be published in traditional journals. Additionally, some regard peer reviewed online preprints as a good preparation or exercise for formal publishing, which is especially useful for early-stage academics and university students. Just as Respondent 25 argues:

When we publish in traditional journals, if our papers are rejected, we cannot get any useful feedbacks though we usually pay for peer review. But in Science Paper Online, without any charges, we enjoy very helpful feedbacks from reviewers as well as readers sometimes, which is very helpful to improve articles... I use this platform to learn academic writing and publishing, as a beginner. \(^{149}\)

Admittedly there are some authors like Respondent 23 who value the dissemination of their knowledge rather than academic credits. However, the usage of Science Paper Online by authors has not suggested a profound change in academic publishing

\(^{149}\) According to an interview by author.
behaviour and culture so far. In other words, authors still understand and use the open and networked initiative from quite traditional perspectives.

There is a strong correlation between the total numbers of online publications by a university, and the extent of evaluative acceptance in the university. The up-to-date ranks of universities in terms of total online papers submitted and total three stars plus papers suggest that the top ten universities are all those who accept Science Paper Online certificates for evaluation\textsuperscript{150}. This suggests that the overall use of online original publishing is still very utilitarian in China. It is worth pointing out that the highly ranked universities here are not the commonly believed top universities in China like Peking University (ranked 33 here) or Tsinghua University (ranked 26 here). It suggests that online open platform allow the voices of average universities to be heard, but famous universities do not pay much attention to it.

Furthermore, some respondents worry that the middle-aged and capable academics remain absent from the active users in academic publishing initiatives (Respondent 14, 20, 22) because they prefer to devote more time to formal publications or research practice that can offer better rewards than the new publishing models. With regard to the overall users or Internet visitors, the statistics by Alexa prove the respondents’ arguments\textsuperscript{151}, in which the users between 35-44 years old occupy a very small percentage. See Figure 4.2.

\textsuperscript{150} http://www.paper.edu.cn/index.php/default/info/info_detail/1690
\textsuperscript{151} See http://www.alexa.com/siteinfo/paper.edu.cn (accessed on 2011/05/24)
Regarding readers, most respondents publishing online papers are not satisfied with the readers’ academic capacity of providing critical and valuable feedback. Just as Respondent 20 argues:

They are mostly young people and usually ask me questions about something they do not understand very well rather than point out the errors... I do hope that my work could be read by real experts and capable peers. It is important for the new models that these people could spend some time reading online papers carefully.\footnote{According to an interview by author.}

\textbf{Figure 4.2: Audience Demographics for Science Paper Online}

<table>
<thead>
<tr>
<th>Age</th>
<th>Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-24</td>
<td>Some College</td>
</tr>
<tr>
<td>25-34</td>
<td>College</td>
</tr>
<tr>
<td>35-44</td>
<td>Graduate School</td>
</tr>
</tbody>
</table>

\textbf{Gender}  
- Male  
- Female

\textbf{Has Children}  
- Yes  
- No

\textbf{Browsing Location}  
- home  
- work

\textbf{4.4.2 Limitations and difficulties}  
Science Paper Online harnesses administrative resources and governmental support in addition to its innovative models, which helps to successfully differentiate it from various competitors. Its fast growth and great influence so far is unique in online
academic publishing initiatives in China, perhaps also in the West. However, even with the help of administrative power, it is difficult to change Chinese academics’ habits and the culture relating to academic publishing. In particular, the current publications-oriented evaluation system is a crucial obstacle, which forces academics to slavishly publish within the formal publishing system and refuse or neglect online open alternatives. Just as Li Zhimin pointed out: “papers are sanctified”, as a result of which quite a number of academics in China have little idea that an alternative method of publishing exists, as well as a series of alternative rules and cultures.153

Though many are dissatisfied with the existing system, they regard it as a necessary evil and try to fix it from within the system. Many Chinese scholars still regard online content as something naïve, ridiculous, and trash154. Just as Respondent 17 argues, “anyone can publish online, when I want to seek useful knowledge, I look for them via books and core journals.” The fact that the peer reviewed online original papers cannot be accepted for higher-level evaluation illustrates the dominance of these biases in Chinese academia at the moment. It is worse that the dominance of these biases leads to a vicious circle that pushes capable authors and high-quality papers further and further towards online academic publishing. Therefore, changing academic culture and habits relating to publishing requires a long period of time.

Secondly, administrative support seemingly leads to the prosperity of online publishing, but in fact encounters difficulty in encouraging active academic participation and collaboration. Though it does not explicitly define the model as an

153 In addition to the formal interviews with online publishers and users who know new publishing systems well, I have had discussions with academics concerning the online initiatives and most of them know little about anything outside the traditional publishing system.
154 There are many online discourses based on blog articles in Science Net, the biggest Chinese online scholarly community, this is a consensus.
open and collaborative paradigm or Science 2.0 initiatives, Science Paper Online is
designed following these ideas. The “publications-based scholarly communication”
that the managers favour is based on effective interactivity, collaboration, and
academic crowdsourcing. Science Paper Online employs many Web 2.0 applications,
but the online participation of authors, readers, and expert reviewers remains at very
low level.

An embarrassing fact is that most authors I interviewed understand this platform in
very different ways and used it for self-centred reasons without a deep understanding
of the innovative open paradigm. The administrative support attracts some high-level
papers and capable scholars, but they sometimes submit papers for the purpose of
achieving credits - the same as publishing a printed-paper, and as a result of which
few continue to further participate in online scholarly communication. It is still a big
challenge for the managers to try and attract people who really understand and
advocate the ideas of open and collaborative academic publishing and consequently
activate publication-based social networking amongst academics, which cannot be
accomplished by administrative means.

Thirdly, there is resistance from traditional publishers. Undeniably, the Science Paper
Online model is a threat to traditional journals and resistance is inevitable, which
happens mainly in terms of the rejection of online preprints by traditional publishers.
Though most Chinese domestic journals do not want to directly offend and challenge
the government-operated preprint platform through explicit resistant policies, original
papers published in Science Paper Online face the risk of being rejected by traditional
journals due to having been previously accessible online.
Another resistance comes from the increasingly large and profitable commercial vanity publishing. A large number of Chinese language journals belong to research institutions and universities, which are regarded as valuable academic resources and assets given the scarcity of publishing numbers as a result of government control, and the Chinese “publish or perish” system. Whilst many vanity publishing journals have connections with academic institutions; others are usually supplements of some reputable journals the faculty must please. Thereby, the research institutions and universities are unwilling to threaten their survival by issuing policies to encourage online alternatives; instead, they mostly use local policies to force academic employees to publish on the journals with relevant interests, even vanity journals\(^\text{155}\). It is such self-interest and group interest that resist the development of online initiatives, particularly in terms of evaluative acceptance.

\(^{155}\) The following blog article written by an influential expert in information science and library studies in China exposes a case in which a Chinese university rewards its staffs for publishing in the university’s own journals and to cite from these journals in their work. This is only one example with supportive evidence. See http://blog.sciencenet.cn/blog-1557-420556.html
Chapter 5 New Science: A Case Study

5.1 Introduction

A growing number of scientists have begun to realise that the digital libraries they are using are “cold, impersonal, isolated, and inaccessible places” where human users are interacting with machines and search programs as they seek, recommend, and access information. Hull et al. (2008) further point out that what academics look forward to is “personal, sociable, integrated, and accessible places”, i.e. a “warmer” library instead. In the Western academic publishing industry, major conglomerates like Elsevier or Springer are experimenting with social reference management systems with the goal of defrosting digital libraries and databases through personalised tools and social media. These experiments inspired a Chinese doctoral student who was passionately engaged in developing a scientific social media platform New Gene in his spare time, whilst carrying out a PhD in Cell and Molecular Biology at a Belgian University.

As a Science2.0 advocate, Qian Junbin hoped to implement its ambitious yet somewhat utopian principles through discipline-oriented social networking software specific to the field of biology. However, he later realised that the social and collaborative model of reference management might be more practical, and could even constitute a breakthrough for the implementation of Science 2.0’s goals. Referencing is essential for research and can be improved significantly through online sharing and collaboration. Social software for managing references represented an ideal opportunity to introduce large numbers of academics to the benefits of Web 2.0.
and to encourage them to use digital technologies to enable collaborative science.

2009 was an important year for Qian’s website - it started with both good and bad news: two new colleagues joined the New Gen team; but the website was summarily shut down by Chinese Internet regulators.\footnote{See http://www.xinkexue.com/thread-798-1-3.html} The team then decided to launch a new website, using a new WWW address and a larger Internet server, covering all disciplines rather than just biology and focusing on collective referencing rather than Facebook-like academic social network functionality. They named their new platform “New Science” (Xin Kexue, 新科学).

Qian and his team also designed and programmed the online platform, representing the key idea of connecting people through science. The social reference management service that New Science provided was at that time, rare in China. Unlike their Western counterparts, Chinese academic publishers had done nothing to develop either desktop reference management tools like Endnote or an online equivalent. Very few Chinese academic publishers had the capacity, willingness or awareness necessary to do so, because most publishers did not own large-scale content resources capable of supporting and also benefiting from a reference management system. Chinese academics were not aware of the benefits of reference management systems, having never been exposed to them. As a result, this was an area of the market that had been neglected.

New Science faced (and continues to face) competition from Western counterparts. Endnote, for example, has developed a Chinese version in the hope that it may be able to capture the market there. However, the translation of interfaces designed for Latin
based scripts is notoriously difficult. It also ignores differences in the conventions surrounding reference management between China and the West. Just as Qian, the founder of New Science wrote in his blog:

> Although software like Endnote is popular in the West, it only has an English interface (he did not know of the Chinese version of Endnotes) and is based on Western approaches to managing references. It does not support Chinese reference databases like CNKI or Weipu (维普). Chinese scholars find it very difficult to use this software and, as a result, very few really use it. Because of this, I am developing New Science in my spare time to offer Chinese academics an alternative. ¹⁵⁷

Furthermore, the development team realized that Western online references management services like CiteUlike were not paying much attention to social functionality or networked applications, which should be the natural advantage of online reference management systems. Their original social network software model gave the developers of New Science a good basis on which to develop more social functions, which further differentiated their product from Western competitors ¹⁵⁸. These ideas are similar to Mendeley ¹⁵⁹, a popular initiative in the West in recent years, which defines itself as a “free reference management and academic social network” model, and Zotero ¹⁶⁰, “a free, easy-to-use tool to help you collect, organize, cite, and share your research sources.” New Science aimed to establish a Science 2.0-oriented scientific community connected by collaborative reference management, rather than simply providing software-like functions online:

¹⁵⁷ http://blog.scienet.cn/home.php?mod=space&uid=74774&do=blog&id=45221
¹⁵⁸ http://blog.scienet.cn/home.php?mod=space&uid=74774&do=blog&id=257697
¹⁵⁹ http://www.mendeley.com/
¹⁶⁰
We aim to build a more open, interactive, and collaborative scientific platform where all researchers and science lovers can gather together, sharing resources, learning from each other, and enjoying science. Our long term purpose is to improve the implementation of Science 2.0, or in short, “to change the way people do science”.

The developers of New Science might be viewed as idealistic, innovative and ambitious, exploring a new market and introducing new ways of practicing and communicating science. However, in contrast to Science Paper Online, New Science is a small, grassroots-based start-up, operated by a handful of post-graduate students, without access to support from the state. Although, to a large extent New Science has entered into a ‘blue ocean’ market, it faces many challenges. The biggest of these is evoking the enormous, so far untapped demand for Chinese reference management tools. This involves helping to create new reference management habits amongst Chinese academics and encouraging a shift towards greater collaboration within Chinese academia. However, as a small, poorly resourced website does New Science have ability to successfully tackle such a large potential market? Can it capitalise on its pioneering advantages and establish a dominant position before better-resourced competitors begin competing in the space?

5.2 Innovations

5.2.1 Social Reference Management Online

The primary function of online reference management is to link desktop software with online discovery, storage and retrieval of references. Academics are nowadays finding scholarly content and accessing references via various channels and at various places. They need to store references and notes found in university libraries, Internet Cafés, labs, home, or on mobile reading devices and to be able to retrieve them at those places. This requires an online space that can act as a personal digital library, accessible whenever and wherever needed. New Science satisfies such academic demand by providing easy-to-use online reference management services.

With the help of New Science, Chinese researchers can use a multi-functional digital library provided by an independent website, enjoying almost all convenience including automatically storing and retrieving a reference, adding tag, and taking notes. New Science is compatible with both Chinese language digital repositories and international databases and is able to incorporate important bibliographic information provided by them. This cross-platform interoperability helps to improve Chinese academics’ efficiency in research work.

All the references stored by individual users can be shared by others unless specifically restricted. There are various ways of “sharing” in New Science. Through the folksonomy indexed by user-created-tags, users can organize and search all stored references; user notes and reviews are useful for peers regarding the value and quality of a reference; by keeping an eye on what research peers are reading, users can keep track of the latest developments in their own discipline. In this way, the self-centred task of personal reference management has been transformed into collaborative social
bookmarking exercise; the value of work being carried out by individuals is being leveraged to build a communal resource.

Information is essential for academics. However, identifying and managing these resources is time-consuming and labour intensive. This is becoming even more so as a “data deluge” (Hey & Trefethen, 2003) of academic content in almost every discipline increases the workload associated with filtering and managing information. Social/collaborative reference management systems help academics to find the essence of sought after knowledge, reducing the cost of time and effort by eliminating repetitive work done by peers beforehand, providing that they share their results online. This is because, in a particular research area people have common core references, whilst the least useful content frequently lacks value for the majority of readers. Just as the website suggests, by storing valuable reference in New Science, your work will “… benefit your peers and lessen the frustration that they face in dealing with the deluge of possible references.”

In addition to sharing, New Science also has enabling mechanisms for collaboration amongst users. The website encourages users to engage in online discussions and collaborative learning: “Once you have read a reference, if you find any points of confusion, point them out; if you find something awesome, please tell everyone and we can learn together.” Online discussions about particular references are popular. Social reference management also allows users to seek help from others regarding a specific reference. The users in New Science, particularly early stage young academics, often help each other to find references that they need. The designers of

162 http://www.xinkexue.com/thread-7472-1-1.html
163 See http://www.xinkexue.com/thread-7472-1-1.html
New Science have borrowed the idea of a virtual currency that enables users to reward people who have helped them, building “New Science Coin” into the platform.

New Science used to be a completely self-organized and autonomous website and did not organize its folksonomies and user-generated-content. Recently however, New Science launched a new column of “academic archives”, which aims to establish various collections of references through crowdsourcing. These collections include a variety of scholarly content. Such collections of references make collaboration more purposeful, and are beginning to transform academic social bookmarking into a sort of Wiki-like online publishing which collect and edit content by crowdsourcing.

There are many literatures discussing the comparative advantages of academic social bookmarking or folksonomies, compared with digital library or even library 2.0 (Abbattista et al., 2007; Alhoori et al.). New Science definitely has these advantages, which makes the consumption side of academic publishing more active and social. The fundamental principle is that if a reference is useful for you, it may be useful for your peers as well. Just as a on the website argues, “With New Science, in the battlefield of reference management, you are not fighting alone anymore.”

5.2.2 Social Distribution and Assessments for Academic Publications

Consider the process of finding a reference traditionally: it usually starts with search engine or library search service, then thousands of results appear; so what you have to
do is subjectively filter the results, according to various criteria like quality and relevance. However, how can you know such things before reading a reference? Key words, abstracts, publisher Impact Factors and the authors’ H-index have all been designed to help you to do so. In reality however, these rarely help much. If you are lucky, you get advice from your supervisors, colleagues, and classmates. Many academics find that these recommendations are their most helpful resource in attempting to identify material relevant to their field and specific area of research. Nonetheless, this approach is limited, because it draws on the knowledge and experience of the small numbers of people individual researchers may be in contact with.

Imagine if it were possible to draw on this kind of experience and information from a much larger population. Academic social bookmarking or folksonomies realise such a dream by gathering advice on references from the whole academic world, rather than the small group most academics have access to. Networked technology is making it possible for peers’ recommendations regarding valuable scholarship that operates within academia to be extended and amplified. Within New Science, social network market dynamics act as an enabling mechanism within a system that is managing the storage and coordination of resources. This happens not only in the cases that user-created-tags and folksonomies make it easier to find specific content, but also because users’ reviews and comments provide indicators regarding the value and quality of content to other research peers. Most importantly, the consumption behaviour or decision made by one reader itself is the best indicator for other readers. To ensure the effectiveness and relevance of such a crowdsourcing system, users can define research peers as “friends” or joining special disciplinary groups, as a result of which, the most
relevant and specialized information is shared amongst peers with common interests and expertise automatically.

As such, what have previously been closed, private processes of sharing and recommending useful scholarly content to peers, now happens publically in a wider online virtual world. Academic publications are thus distributed efficiently in a new channel rather than through online databases, search engines, and digital libraries. More importantly, such a social referencing system in academic publishing functions as a social assessment system, just as “social network markets” do in the areas of entertainment and popular culture (Potts, Cunningham, et al., 2008).

Traditionally indicators based on citation rates reflect the quality of academic papers: total citations, the Impact Factor of the journal that publishes the paper, H-index of the author, etc. This system, though dominant, is not free of controversy. The key criticism of this system is that citation rates are not a sensible way of judging the quality or value of a paper. The founders of New Science argue that the technological difficulty of accurately calculating readerships or keeping track of reader comments during past decades has resulted in the neglect of readers. According to an interview by author. They claim that in contrast, the social network approach of New Science enables large-scale statistics on readership as well as readers’ direct comments on particular academic content to be made visible. Provided that the scale of the network is large enough, such statistics make it possible to more accurately assess the value of academic content. This mechanism involves a democratic approach, emphasizing user experiences and
valuing the usefulness of content to users rather than the opinions of authorities or experts. According to the founder:

Readers are not necessarily experts and their viewpoints might be different from those of authorities in the field. The most popular papers selected by readers might be more grassroots-favoured than the papers preferred by established authorities. But please remember, just because something bubbles up from the bottom doesn’t mean that it is not valuable; to me, grassroots’ choices are more attractive.167

Academic content should be assessed by various metrics including popularity, prestige, consensus, etc., but above all, their usefulness for readers. Admittedly social network mechanisms are not much more than a different approach to measuring popularity. Many argue that popularity should not be the basis for assessing academic content. However, ironically the basis for measuring citation rates and journal Impact Factors is not much more than popularity. Furthermore, existing systems for rating research provide only an imprecise measure of popularity because citations are not able to accurately capture the consumption of academic publications.

From this point of view, focussing on the extent to which publications are considered useful to readers may help to shift the criterion for academic publishing certification, which is not free of controversies. One crucial difference between these approaches is whether authors write to please expert peer reviewers or to serve academic readers. In order to increase the impact of publically funded research, creating a certification system that encourages researchers to communicate effectively with a wide range of readers rather than an elite group of experts is important.

167 http://blog.scienecnet.cn/home.php?mod=space&uid=74774&do=blog&id=229549
The emergence of social network approaches to assessing the value of scholarly content in New Science is particularly important for Chinese academic publishing. In China, academic vanity publishing results in a huge number of poor quality academic outputs that co-exist alongside high quality publications. It is impossible to distinguish between high quality outputs and vanity publications through the searching services provided by libraries. Social network dynamics thus play a vital role in helping researchers to distinguish between key publications and junk. Furthermore, academic misconduct and corruption in relation to publishing is becoming an increasingly serious problem in China. As a result of this, publications that are highly-ranked through traditional impact metrics may not deserve their reputation. Social network approaches thus provide a more democratic and objective assessment system than mainstream alternatives though a great amount of effort is required to improve the credibility and reliability of such a mechanism. This will be explored further in Chapter 6.

5.2.3 Scientific Community Starting from Collective Referencing

Chinese intellectuals use the term “zhiyin” (知音) to refer to an intellectual soul mate who shares their beliefs and interests. According to Chinese cultural tradition, communicating with such a friend is the happiest experience possible for educated people. “Making friends via reading (Yi Wen Hui You, 以文会友)” has been a standard method for connecting with “Zhiyin” for thousands of years. This process is being brought into a digital age by websites like New Science which help users to
identify researchers with similar interests and maximises their opportunities to connect socially, by integrating user accounts with popular social media tools like Chinese QQ or Micro blog (Weibo). This makes it possible for users to contact one another directly. The designers hope that a wider sense of community and friendship amongst academics will form the basis of the virtual scientific community that powers New Science.

As with any social network software, a user’s personal profile provides the basis for further social media functions in New Science, which is an overall portrait of an individual user.168 Like other popular academic SNS websites in China, New Science depends on an old model of BBS to organise content and discussion more than more up-to-date initiatives like blogs or instant messengers, because most Chinese academics still favour the familiar older web applications. New Science has a total of 6 BBS forums relating to major aspects of academic social networking as well as reference management.169 Online discussion based on a social community aims to satisfy multi-dimensional communicative demands in participant users’ everyday life.170 “Home-world” is an innovation in New Science, which is primarily an all-in-one user-friendly interface whereby individual users can access all functions by only

168 There are five main components: (1) “profile” introduces users’ personal information and research interests; (2) “recent activities” records the users’ latest reference sharing, blog articles, BBS forums, interactivity with others and all other online actions; (3) “academic tags cloud” collects all tags the users have marked and sorts them by frequencies; (4) “groups” suggests the specialised online groups the user has joined; and (5) “list of references” records the references the user has stored, commented, and browsed. Through such a multi-angled description, a user is introduced to the whole community, See http://blog.sciencenet.cn/home.php?mod=space&uid=74774&do=blog&id=398542

169 There are six forums in total: three are related to the services and feedbacks of New Science itself, such as “how-to” guides, public notices, and promotions; three forums focus on general issues. The latter three are much more popular. “Scientific news” is potentially the most attractive because it is hosted by two beautiful young girls. “Research experience sharing” is also popular because almost all users are interested in exchanging ideas and skills regarding issues like funding competition, PhD candidature, academic writing, job hunting, and so forth. “Reference resources and management” is closely related to the theme of New Science, in which users usually share some information regarding free academic resources, unsilenced ways to access commercial databases, and so on. 170 http://www.xinkexue.com/thread-1632-1-3.html
one click. Moreover, it functions as an integrated centre of various social media functions and reference management activities, which is a news reporter for the online community, providing up-to-date personalised information and the most interesting news and updates on the overall website. By these technical and communicative models, New Science realises its fundamental principle, connecting and grouping research peers by common interests. Just as the founder Qian argues:

New Science is not Facebook that is based on common friendship, the relationship in our website is between research peers. Our purpose is to enable academics to know other peers, to maintain connections, and ideally to establish online or even offline scientific collaboration finally. 171

5.3 Operating Strategies

5.3.1 Economic Sustainability

Unlike Science Paper Online, which is funded by the Chinese government, New Science is an independent academic website, operated by a few individuals. As a not-for-profit website devoted to improving scholarly communication, New Science’s founders claim not to be interested in developing a market-based commercial model. According to the founder, Qian Junbin,

New Science, for the moment, is purely an academic project for public welfare. To date we have not developed any commercial activities and thus have not made any revenue. All the money required to operate this website is raised by the members of our core team.172

171 According to an interview by author.
172 According to an interview by author.
As with sites like Wikipedia, it is the voluntary work of the managing team as well as thousands of users that build a large-scale folksonomy of academic reference, a repository of original content, and a lively online community. The voluntary creative labour, as an advantage of open and collaborative paradigm, greatly reduces the operating cost of New Science. Nevertheless financial difficulty remains a crucial obstacle. As happened in many small academic websites, financial problems lead to a vicious circle in development: due to a lack of money, the website cannot recruit a strong team required and develop enough technical functionality. As a result, the site struggles to attract new users; this further reduces the website’s attractiveness to sponsors, investors and advertisers. As the management team put it:

> It is our biggest worry that, though we have quite a number of innovative ideas to improve users’ experiences and add more useful functions, we will be unable to realise them due to poor financial capacity. Moreover, we have to admit that, our ambition of changing Chinese scientific model by Science 2.0 implementations is suffering from monetary issues as well.173

As far as New Science is concerned, a lack of financial resources and staff with the skills necessary to improve the site constrains the development of software that integrates online and desktop reference management in New Science and facilitates communication between both platforms - just as Mendeley and Endnote’s Web do. Moreover, financial constraints make it hard for New Science to promote itself to Chinese academics. The possible solution for economic difficulty lies in cooperation with big firms, public subsidy or venture capitals. Owning an innovative model, an

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almost blue ocean market, and a large group of potential users, New Science has its attraction and big platforms in China have already expressed merge intentions. At the moment however, independence and insistence on original Science 2.0 ambition make managers hesitate to be merged or controlled by big co-operators or investors.

5.3.2 Recruiting and Stimulating Participative Users

Users are crucial for collaborative and networked websites because they are both contributors and beneficiaries - producers and consumers. New Science implements a snow-ball strategy based on word of mouth recruitment of new users. The website encourages existing users to invite their friends to join the online community, which is the most popular way to attract new users. New Science is developing a viable promotion strategy based on a very limited budget. Social media is the primary channel for promotion. New Science also has its own profiles in the Chinese twitters – Sina Weibo and Tecent weibo; active users also promote this website in their own social media practices. Meanwhile, it also organizes several competitions on reference management, which helps to introduce the functions and value of the website to wider potential Internet users.

New Science includes a user ranking system that measures and rewards user activities. This approach makes it possible to distinguish between the most active

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174 According to interviews with Qian Junbin and Respondent 5 by author.
175 According to an interview with Qian Junbin, the founder of New Science by author.
176 http://weibo.com/xinkexue
177 http://t.qq.com/newsci
contributors and more passive users and ensures that users who contribute more enjoy higher levels of access and functionality.\(^{179}\)

By prioritising different kinds of contribution and thus rewarding users with different points and Science Coins, New Science is able to guide user behaviour towards the kinds of contribution that the platform’s designers believe is needed. Three kinds of activity are particularly valued:\(^{180}\)

(1) Promotion. New Science is keen to expand its user base. As such, it provides generous rewards for users that secure the website’s promotion across various media platforms and invite others to join the community.

(2) Original content: New content remains valuable, even on sites for which social network dynamics play an important role. New Science values reader reviews and critiques of references, as well as user-created-content like posts and blog articles. This kind of content helps to attract and interest users and is more engaging than a site composed exclusively of folksonomies, tags, and bibliographic information. The managing team frequently awards extra points or Science Coins for work deemed to be particularly original or interesting.

(3) Accomplishing tasks: New Science sets users tasks that range from filling out their personal profiles to reporting technical bugs. It rewards users for their

\(^{179}\) Interestingly, the website uses an academic hierarchy to rank users within the system. Depending on the number of points that a given user has earned by contributing to the website, they will be ranked as ‘undergraduate’, ‘postgraduate’, ‘professor’, ‘member of the national academy’ etc. In addition to this vertical hierarchy, there is also a horizontal system that reflects a user’s personal status within the community. This takes into account their total number of earned points and Science Coins, number of friends, references shared and blog posts, as well as more traditional esteem measures such as Impact Factor and H-index. The virtual currency Science Coin facilitates trades of time and expertise between users; a user’s Impact Factor indicates the overall contribution of a user; H-index reflects the extent to which a users’ references, articles, and posts influence others by counting total comments, recommendations, and likes received. See http://www.xinkexue.com/home.php?mod=spacecp&ac=usergroup; http://www.xinkexue.com/thread-6131-1-1.html

\(^{180}\) http://www.xinkexue.com/thread-7328-1-1.html
accomplishments. These tasks not only encourage users to become familiar with key functions but they also allow the site’s developers to direct user activity and coordinate their involvement in development processes.

In addition to the contribution-reward relationship between users and the platform, New Science also encourages collaborative relationships among users, particularly virtual trade mediated by Science Coins. The most popular virtual trade in New Science is rare reference discovery. Science Coins are also useful in various circumstances where users hope to reward co-operators for any reason. To some extent, the exchange of virtual currency activates the online community and leads to more collaborations.

As a platform dominated by the Chinese Google generation of academics, the ranking and rewarding system of New Science is designed to replicate many of the features of electronic games. The developers of New Science have built on the innovations made in gaming in relation to encouraging community participation, setting goals, rewarding engagement and adding an element of entertainment and fun to scholarly activities.

It is worth pointing out that the distinction between users and managers in New Science is blurred. The platform invites active users to act as moderators for discussion forums and other kinds of activity. The recruitment post suggests: “There are no special requirements except that you have passion, enthusiasm, consistency, and patience.” The rewards for users willing to contribute their time in the capacity of organisers or moderators are almost exclusively intangible: a sense of achievement,
friendship, privileges in a virtual world and Science Coins. New Science also recruits moderators and members of its management team from highly ranked community members.

However, the core members of the New Science management team, including the founder Qian Junbin himself, have dual roles in New Science: as invisible builders behind the platform and the visible users and community members. In other words, New Science has a participative management team. They have a special title “core team members” to distinguish them from common users. Just like other users the core team stores, tags, and shares references online, participates in discussion and social activities; meanwhile, as managers, they programme, maintain, and update the computing system. Additionally, the core team members also function as a human help system, whereby users’ specific questions regarding the functions and uses will be answered very quickly and effectively. Thanks to Internet technology, the members of the managing team who live in various places around the world can co-work via online communication, building an academic virtual community where they are also users.

New Science has a distinctive grassroots identity, as most users as well as managers are postgraduate students and early-stage academics. Compared with Science Paper Online, with its official background and administrative authority, the credibility of New Science comes from representing academic grassroots or the majority, which is also the value of social networks in general knowledge communication today. As the

181 http://www.xinkexue.com/thread-6894-1-1.html
founder argues, they are driving changes in communicating and doing science in bottom-up ways and without support from government or academic authorities.\footnote{According to an interview by author.}

### 5.3.3 Copyright: Threats and Opportunities

Chinese websites containing services like users’ social networking and social bookmarking are usually channels for online distribution of pirated content. For instance, quite a number of movie fans’ online communities are places whereby Internet users upload and share unauthorized movies. In academic publishing, the major academic SNS websites usually have special columns of sharing resources, which aim to enable users to share legal or authorized content. But in practice, most use this function to share the password or “backdoors” to access commercial databases like CNKI and to upload unauthorized PDF files of books or journal papers. The free content sources are an important attraction of these academic social media websites and the managers are thus unwilling to severely restrict the illegal sharing – preferring to turn a blind eye to content that infringes copyright.

New Science does not want to follow this model as it aims to establish a reputable and serious academic website by providing instrumental reference services for Chinese academics. The crucial attraction should be effective and efficient reference management services rather than pirated content, which are collaborative and customized. The managing team assumes that most users are professional academics and thus can access the content via authorized and legal channels like university
libraries. As a result, New Science provides a reference-related service based on the bibliographic information of references only.

However, the scale of the repositories in Chinese university libraries is not as satisfactory as the managing team imagines due to budget limits, particularly in terms of wide access to foreign academic databases183. In other words, the users in New Science as mainly Chinese researchers, cannot access enough latest foreign references by legal methods, and as a result of which, online mutual assistance or virtual trade is widely used for sharing the unlicensed references online. Moreover, Chinese users still prefer to access the content directly rather than to only store and retrieve bibliographic information, which makes the uses of social reference management in China quite different from other countries where copyright is well protected. Thereby the existence and requirement of unlicensed references sharing and storing place the managing team in a dilemma: copyright law vs. users’ demands.

New Science is willing to protect copyright and even hopes to cooperate with academic publishers as academic social bookmarking can help them to effectively distribute academic content, particularly to niche markets. However, to date New Science has not developed any cooperative relationship with Chinese publishers or commercial databases partially due to its limited scale and influence, and partially because of Chinese publishers’ blindness to initiatives. The lack of support by copyright owners and the average poor copyright awareness of Chinese users make

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183 According to interview with a university library manager, Respondent 18 by author.
the copyright problem “a potential threat” of New Science, as identified by its founder.\textsuperscript{184}

**5.3.4 Comparative Competitive Advantages and Disadvantages**

New Science used to be in a “blue ocean” market where few competitors existed and the crucial concern was exploring the market, informing and attracting consumers, and competing with possible alternatives. To some extent, the biggest enemy of New Science at that time was (and still is today) Chinese academics’ habits, because Chinese academics rarely manage references systematically and store them on their computers to be retrieved later; instead, they are in the habit of reading references and creating bibliographies manually. New Science thus had to create demand for its product by convincing academics of the benefits of online reference management. Admittedly, at that stage New Science also faced competition from a few alternatives. The big commercial databases in China like CNKI provide an all-in-one reference service for its subscribers, including a personal library. Of course, commercial databases have structural limitations in terms of exclusivity and neglect open access resources. Many of these aggregators in China have realised such limitations and established cross-databases\textsuperscript{185} or open access search platforms in order to compensate.\textsuperscript{186} Based on open and collaborative references management, New Science covers a much wider range of references compared with any commercial database, which forms cross-databases competitive advantages over them.

\textsuperscript{184} According to interview with the founder Respondent 3 by author.

\textsuperscript{185} See http://www.ilib.cn/

\textsuperscript{186} See http://www.oalib.com/
In recent years, New Science began to face direct competition. A growing number of online platforms realise that social reference management might be essential in the future consumption of academic publishing, and have entered the market since the entry barriers are not high at all. It is natural that a pioneering model will be imitated and followed sooner or later, just as the founder argues in his blog: “this proves that ours is valuable”. However, due to its limited financial resources, New Science has not established a dominant position within an increasingly competitive emerging market. As a result, it has lost many of the advantages it might have been able to secure as a pioneer over its competitors. Even worse, its competitors are combining online reference management with their own existing advantages to develop more mature and viable models. Some of these aspects are exactly the shortcomings of New Science.

There are several examples. The managing team found that a medical website called “Xinglin (杏林)” almost completely copied New Science in terms of model, functionality, and even interfaces. Both New Science and “Xinglin” are small academic websites. However, “Xinglin” is discipline-centred, providing a wide range of information, services, and community functions for people within a specific discipline of medical research.

The development of New Science in China, as well as the more developed model of Medeley in the West, inspired a Chinese IT firm called “Zhixian (知先)”. Zhixian has

187 http://blog.scienecenet.cn/home.php?mod=space&uid=74774&do=blog&id=357466
188 Ibid.
begun to develop desktop reference management software and is also going online. This bridging software fulfils a gap in the New Science model, providing a channel that connects online and desktop reference management tools syncing bibliographic data. This is something that the New Science team have not had the resources to develop. Interestingly, this potentially threatening competitor has even advertised itself to potential users through New Science’s online forums.¹⁸⁹

Science Net - the biggest online scholarly community in China - also launched a similar online reference management service in 2011. The manager of Science Net mentioned that a merger with New Science had been considered, but had not gone ahead for various reasons.¹⁹⁰ Based on the largest and the most active Chinese academic SNS so far, the online reference management system provided by Science Net has many advantages. Science Net enjoys a much larger scale of participative users than New Science, which provides a stronger basis for online collaborative reference management. Furthermore, Science Net has many well-known academics as participants, which add greatly to the credibility of its emerging online reference management. Contributions from recognised authorities are a strong attraction for users and have some advantages over the grassroots democracy that operates in New Science. Both of these aspects are the disadvantages of New Science at the moment.

Nevertheless, New Science still has competitive advantages. As technological pioneers, the managing team has been awarded patents for the technique of analysing and automatically storing bibliographic data. Its model regarding both personal reference management and social collaboration remains the most mature one amongst

¹⁹⁰ According to the interview with a manager (Respondent 5) in Science Net by author.
their competitors. With regard to ownership, New Science is owned by several individuals and has flexibility regarding further mergers and cooperation with big publishers, ventures, and even official institutes, which may improve its strengths and competitive advantages in various ways.

Moreover, the overall model of New Science is following the principles of Science 2.0 and open science, which is open, networked, self-organized and based on user co-creation, crowdsourcing and social collaboration. All these defining features represent the future of collaborative scientific research, whilst a variety of competitors are still following comparatively traditional ideas. In the Chinese academic publishing industry, the significance of social reference management lies in its capacity as a social assessment system for scholarly publications. Due to the flood of low quality scholarship published by vanity publishers as well as the corruption of traditional certification in China, such a social assessment system based on user crowdsourcing is a meaningful alternative and provides a source of surveillance outside the established system, which helps to filter and certify the high quality content for readers. Regarding this function, the open DNA of New Science mentioned above is an incomparable advantage.

5.4 Usage, Influence, and Constraints

New Science has so far attracted over 6,000 registered users, most of whom are postgraduate or PhD students¹⁹¹. Users find New Science via various introductory

¹⁹¹ See http://www.xinkexue.com/thread-7038-1-1.html; also according to the interview with the founder Qian Junbin by author.
articles posted on the Internet, as well as through friends’ recommendations. New Science is open to academic users from all disciplines, but most users come from academic backgrounds of science, technology and medicine. As the founders and some members in the founding team come from biology and medicine, a large number of users also come from these disciplines because social networks play an important role in recruiting new users.

Though users initially started to use New Science as an online personal library or an alternative to desktop software like Endnote, most later realised the strong social functionality and began to delve into collaborative reference management and social networking. Additionally, the practice of New Science has suggested its potential as an alternative to existing assessment of the quality and impact of scholarship based on citations. According to a poll asking why users store a reference on New Science, 25% do it for innovative ideas and research outputs contained in scholarship; colleagues’ recommendation and relevance to current research also account for 21.43% each; while traditional criterion like Impact Factor, the so-called Chinese “core journal” highly valued in academic evaluation attracted very few votes, accounting for 3.57% and 0% respectively.

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192 According to a users’ poll on this website, 21.42% are attracted by relevant articles just like Huang, 14.29% by blog articles, 10.71% by promotion emails. Another popular way to find New Science is through friends and 25% of users join New Science through friends’ recommendation or invitation. See http://www.xinkexue.com/thread-6602-1-1.html

193 According to an online poll in New Science, 81.82% of users need online reference management “because it enables them to retrieve the stored references no matter where they are”. See http://www.xinkexue.com/thread-6606-1-4.html

194 Another poll suggests that 25% of users value online sharing of references, 21.74% hope to find research peers and make friends, 17.39% believe online reference management helps to form scientific circles, see http://www.xinkexue.com/thread-6590-1-6.html

195 http://www.xinkexue.com/thread-9027-1-1.html
However, there is a gap between the intentions of the site’s designers and the ways in which it is used in practice. There have been over 140,000 references stored by users in the database of New Science, most of which however, have not been shared with peers. In other words, most references are stored for personal uses and users do not care about others’ references, as a result of which online sharing only exists more in users’ perception than actions. Furthermore, New Science hopes to build a system for social assessments of academic publications based on users’ reviews and critical comments. However, users have written only 2,800 reviews of references and scientific reports to date. In other words, only 2 reviews are written every 100 references stored. An online poll conducted by the managing team regarding why users do not write reviews online, suggested that 22.58% of users do not write references; 25.81% save reviews in their own computers; 19.35% write reviews and comments as footnotes on printed references, and 9.68% write reviews only for their theses or papers. In other words, users have not formed the habits of writing reviews or notes and sharing them online.

New Science aims to differentiate itself from its Western counterparts by a special focus on supporting Chinese-language references. However, interestingly the common attitudes of users towards Chinese language references are quite negative. According to an online poll, 51.51% of users do not trust domestic references and mainly read foreign ones; 29.03% occasionally read Chinese references; and surprisingly nobody regards Chinese language scholarship as a valuable source of references. Readers’ attitudes here have reflected the decline in the attraction of Chinese academic publications due to averagely low quality. Just as a user comments on this poll:

“Domestic journals are a place where good references are killed while bad ones are cultivated. Nevertheless, there should be high-quality or valuable domestic references, but not in major databases [whereby readers access traditional journal and monograph published by the established system]. Instead we should find them online, particularly via online preprints.” 198

Although a few users explicitly identify the potential of emerging open and networked initiatives in publishing high quality papers that otherwise cannot be published traditionally, there are very few references stored in New Science from open repositories like Science Paper Online. Interestingly, the average attitudes of young users here toward online preprints or open publishing models are surprisingly conservative, as a result of which the social assessment outside traditional academic publishing system here is not well linked with original content published by other alternative initiatives. The disconnection amongst emerging platforms is partially because most regard themselves as complements to the traditional system or add on improvements, rather than alternatives to the established system. Traditional publishers still control most resources in academic publishing and Chinese academics overwhelmingly depend on the traditional system. As such, it is easier and more viable for online initiatives like New Science to converge with the established publishers than to work with other disruptive initiatives.

Resulting from, and perhaps also resulting in the above problem, is the crucial limitation of New Science’s lack of users and average low levels of participation amongst the users it does attract. An online poll in this website suggests that 62.5% of

198 Quoted from user “xiangwude” at http://www.xinkexue.com/thread-6596-1-6.html
users believe that low participation is its crucial problem – in Chinese words, “renqi” (popularity) is too low\textsuperscript{199}. New Science needs to become more popular if it is to survive and flourish. What they need to deal with in promoting social reference management in China includes the lack of relevant habits and collaborative culture within academic communities. At this stage, social and cultural issues have become more important than technology.

This requires marketing and communication skills instead of technical expertise, which the managing team is capable of and confident about. Regarding the big challenges of changing the old habit and forming the new one, by which it can create a growing market and demand in China, the managing team must consider from the users’ perspective how to make this transition happen, how to make the transition necessary and convenient, and by what means.

Linking collaboration in reference management with further scientific communication or collaborative culture in China, is a much bigger challenge for New Science than changing individual academics’ habits. Just as one user commented: “I hoped to use New Science to advertise myself to academic people. But it seems to serve reference management only. Everyone here is not interested in others’ content and many do not introduce themselves to us at all. Perhaps there are too few people and we cannot find real colleagues.” \textsuperscript{200} This is partially because most users are only postgraduates or early-stage academics, working in the lowest layer of scientific research, and as a

\textsuperscript{199} http://www.xinkexue.com/thread-6600-1-6.html

\textsuperscript{200} http://www.xinkexue.com/thread-6600-1-6.html
result of which do not have the power to nominate collaborators in research projects. Moreover, it requires a long period of time to cultivate an open and collaborative atmosphere or culture in Chinese academia, as required by Open Science or Science 2.0 implementations.

In short, New Science needs to create or to evoke market demands by changing Chinese academics’ habits of consuming and managing references, or to find ways of better fitting itself to the existing practices of the academic communities it aims to serve. This will be essential to its ability to achieve the lofty ambitions of Science2.0. Just as the founder argues:

Science 2.0 drives such great changes that a wide range of interests will be reallocated. It is a revolution. It is impossible to finish it overnight; instead, we need patiently look for a breakthrough in the changing process... It takes time for publishing stakeholders to restructure the value chain and the allocation of academic interests; it also takes time for academics to adapt to new ways of doing science and assessing research201.

At the moment, open and networked initiatives remain at an experimental stage in China and both Science Paper Online and New Science are pioneers of these experiments. However, they represent different aspects of the emerging transformation in academic publishing. First of all, the practice of Science Paper Online is focusing more on the production of scholarly content, harnessing Web 2.0 dynamics. New Science is based on the consumption side of scholarship, in which

201 According to an interview with Qian Junbin by author.
readers are connected and empowered more than ever before and readers’
crowdsourcing and social tagging are reshaping the academic publishing system.

Science Paper Online is very much an innovative model based on and aims to further
traditional journal publishing, though it employs a radical post-publication peer
review model. Moreover, the institutionalised organization, formalisation of scholarly
communication, the role of authorities, and the governmental control are by nature the
same as traditional academic publishing in China. New Science, in contrast, is a
decentralised and democratized innovation in the open and Web 2.0 environment,
redefining the communication and certification of scholarship. It is self-organized,
operated by young academics, based on grassroots crowdsourcing, and with little
governmental support or intervention.

This is bottom-up dynamic is helping to drive the transformation of Chinese academic
publishing, including a huge number of similar grassroots websites and millions of
voluntary participants. These grassroots initiatives including New Science are
struggling between current difficulties and a brilliant future, led by ambitious and
idealistic individuals. Unsurprisingly, they are not as impressive and influential as
government-operated websites like Science Paper Online and many may die before
the future their founders’ dream of is realised. However, New Science and other
grassroots practices are a powerful source of publishing innovation in China. Based
on idealism, creativity, and passion, they may be helping to shift China’s complex
publishing landscape towards a more open and dynamic future.
Chapter 6 Innovations and Impact

Chapters 4 and 5 presented two case studies that provide insights into the practices of open and networked academic publishing initiatives in China. These chapters explored the new models that are developing, the strategies alternative publishers employ, and the academic users’ perceptions and use of these initiatives. This chapter will critically discuss the social and economic innovations arising from Science Paper Online, New Science, and some similar initiatives in China, and theorize their impact upon the wider academic publishing ecosystem in China. It starts by pointing out that the key innovations of open and networked initiatives are that they are blurring the boundaries between formal and informal scholarly communication, and between public and private social activities amongst academics harnessing Web 2.0 and social media dynamics. By publicizing previously private activities like sharing working papers and recommending valuable references, as well as formalizing these kinds of previously informal communication, the emerging system gives priority to communication efficacy, rather than the certification of knowledge through the act of publishing. The emergence of communication-oriented open and networked academic publishing models is thus driving profound economic and social changes in the wider Chinese academic publishing system. This chapter examines these changes in terms of publishers’ value proposition, the power structure in the value chain, and the democratization of science in the Chinese academia as well as the Chinese learning society.
6.1 Formal and Informal, Public and Private

6.1.1 Publicizing the Private and Formalising the Informal

The two case studies discussed in this thesis highlight the inspiring potential of open and networked initiatives as an alternative to established systems for facilitating communication and certification through academic publishing. By harnessing networked digital technologies, these initiatives are leading to a convergence between the narrow scope of academic publishing and wider scholarly communication. As a result, the boundaries between informal and formal and between private and public are being blurred.

The traditional “filter then publish” model of academic publishing emerged in the context of the limited communication resources of the print age. It made sense for only high quality, certified content to use the scarce publishing resources necessary to facilitate widespread dissemination. Other forms of content were only shared between colleagues in small and private circles. As a result, the distinction between private and public, formal and informal in print publishing was sharp. In the digital age, Web 2.0 and digital technologies are making the widespread dissemination of content and the interaction amongst large scale of academics easy, cheap, and convenient. The restrictions associated with limited physical communication resources no longer exist.

Unsurprisingly, the priorities of published communication are shifting from the authority, quality, and longevity of publications, towards fast exchange, interactive communication, and continuous updating and remixing. Furthermore, social collaboration and crowdsourcing enabled and facilitated by networked digital
technology are giving rise to unprecedented priorities in academic publishing. These developments are challenging paradigms of scholarly communication based on print technologies and publishing models by transforming previously private and informal communication into public activities and formal dissemination.

There have been analogue counterparts to online preprints, academic blogs and social reference management, data repositories and self-archiving for centuries. Academics have long shared drafts, experimental data, preprints and even preliminary ideas with their colleagues, supervisors and friends. They have also been inspired by discussion, debate, and even criticism of their work and ideas.

What open and networked initiatives are doing in reality is publicizing these private social activities, and at the same time formalising some aspects of them. As such, open and networked publishing has many of the features of both formal and informal aspects of scholarly communication. Informal scholarly content published in the form of online preprints, working papers, or blog articles are usually better written than drafts shared privately and some are of publishable quality. Likewise, the feedback from readers in social media spheres, though perhaps not as formally provided as in traditional peer review contexts, can have a much greater impact than private discussion.

The social nature of open and networked innovation is making academic publishing more communication-oriented by harnessing and expanding the dynamics and advantages of informal, private communication. As Respondent 15 summarises:
E-science is a completely new scientific system, which is leading to a convergence in digital academic publishing. One aspect is the convergence of academics’ identities in academic publishing communication, including authors, readers, editors, and reviewers, which enable academics to quickly and conveniently shift their identity in networked communication. The other is the convergence of a lot of previously isolated activities such as writing, publishing, reviewing, commenting, reading, recommending, collaborating, and networking. All happen on the same platform.202

Li Zhimin, the founder of Science Paper Online, also argues that:

There are many types of scholarly communication and traditional journal publishing is only one of them. However, evaluative priority is given to formal papers and publications, which makes formal academic publishing dominate scholarly communication. In the digital and networked environment today, we should not and cannot distinguish between formal and informal communication anymore.203

Obviously such convergence speeds up the overall communication of scholarly knowledge, in particular original research outputs. New papers are being published just one week after submission to Science Paper Online. Such a short time delay would have been unimaginable in traditional academic publishing. Moreover, the inclusion of informal and private communication greatly expands the scale and scope of scholarly content published online. Quite a number of papers that would have been considered unpublishable by traditional journals are not only being made available, but the information that they contain is being used and built upon. For example,

202 According to an interview by author.
203 According to an interview by author.
Science Paper Online encourages authors to submit negative results of research; bloggers on Science Net share a variety of knowledge from teaching materials to academic life experience; some authors who are unwilling or unable to pay expensive fees for vanity publishing choose Miracle Repository to distribute their monographs digitally; Scientific Squirrel (Kexue Songshu Hui, 科学松鼠会) invites scientists to popularise knowledge relating to hot scientific issues like nuclear radiation during the Japanese nuclear leak in 2011. The emerging lab data sharing and collective data mining in some Western countries are also an important exemplification of this trend.

Along with the expansion of content and authorship is the change in knowledge representation. The format of academic publications is being diversified and knowledge is being communicated through a variety of informal contexts. Blogs, BBS, audio-video materials, working papers, and instant messaging are all becoming part of the mix. Changes in format are also disrupting the dominance of linear narratives in communicating knowledge. Experimentation with rich media papers in Science Paper Online and the knowledge Wiki in New Science are examples of this. Academic writing styles are also changing, as the focus of authors who publish on forums like Science Paper Online shifts from trying to please expert reviewers to attempting to communicate with a wider readership. Just as Respondent 23 argues, “My papers are very straightforward. Even undergraduate students can understand them and engage with the ideas. Given that it is so convenient and cost-effective to publish digitally, we can write more freely rather than torture readers with a boring ‘academic style’. Regarding online papers, I prefer interesting and reader-friendly
styles. The easier to read, the better!” According to Cope (2009:17), “… the medium is not the whole message but … the textual and social processes of representation nevertheless give modern knowledge its peculiar shape and form”.

Open and networked models are not only changing the communication system, but also the content being communicated, and the language of communication.

Such convergence in Web 2.0 environments enhances the nature of science as communication, making a significant portion of previously private knowledge exchanges visible to a wider academic public (Garvey & Griffith, 1967). For example, reviewer feedback as well as the author’s responses, which were previously invisible to readers of a final published paper, is now visible on platforms like Science Paper Online. It has become possible for aspiring authors to see and learn from the experiences of others in this process. Open and networked initiatives also expand readerships beyond the academic world and are attracting a growing number of students, professionals, and public readers.

At the same time, barriers to participation are being lowered and more people are becoming involved in academic debates. In China, postgraduate students, early career academics and even amateur scientists are exchanging ideas, engaging in discussions, and even entering into debates with established scholars. The interaction between fresh perspectives and established expertise is greatly enriching scholarly debate. According to the managers at Science Paper Online and Science Net, these two initiatives attract and benefit a huge number of university students and postgraduates

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205 According to an interview by author.
206 According to author’s interview with Respondent 25.
by providing free-access to the latest scholarship, as well as opportunities to interact and communicate with mature academics regarding serious scientific discussion.207

6.1.2 Social Peer Review and Alternative Metrics

Traditional certification of academic publishing includes two assessment systems: one is pre-publication assessment and gatekeeping, i.e. editorial control and peer review; the other is post-publication assessment of research impact, in practice mainly based on numbers of citations. Traditional peer review is generally criticized for time lag (Nikam & Babu H., 2009), subjectivity and bias (Angell, 1993; King et al., 1997), discouraging innovation (Whitworth & Friedman, 2009), and inappropriate filtering (Hendler, 2009). Citation-based research impact assessment is controversial for its dependence on a single indicator to measure impact, equating the overall quality of journal title with that of individual papers, and the failure to distinguish between positive and negative citations (Bollen et al., 2005; Nentwich, 2005).

Moreover, existing certification is an institutionalized “on behalf” system, in which editors, peer reviewers, experts, and even government officials make decisions on behalf of the academic masses. They do it based on individual knowledge, subjective judgement of quality, and subjective prediction of the possible future impact of papers. However, given that the Chinese academic publishing system is controlled by the government and supervised in hierarchal, bureaucratic, and somewhat corrupt ways, the “on-behalf” system for scholarly certification in China is inevitably controversial. As academic blogger Professor Qian Jianli argues: “the majority of assessment should

207 Interviews with Respondent 4, and 5 by author.
be by readers rather than various institutions that only connect authors and readers…
All these institutions only have limited understanding of readers’ demands and their
assessments cannot be free of controversy.  
Ease of publishing does not mean that open and networked initiatives necessarily
neglect quality control or fail to value quality. Rather, working with a “publish then
filter” model allows these initiatives to identify and reward quality in innovative new
ways. Potts et.al, (2008) suggests a social selection mechanism as the basis of a
“social network market”, in which users’ choices are influenced by the choices of
their peers. In other words, users’ collective intelligence determines the best and most
valuable content. Likewise, academic social certification removes institutional proxies
by empowering the consumption side of academic publishing in certifying scholarly
knowledge. A variety of initiatives are emerging such as social peer review,
alternative metrics, and social registration of knowledge priority, which disrupts
traditional certification.

Initiatives like Science Paper Online, arXive, and Plos, employ a variety of light-
touch gatekeeping before publication, e.g. preliminary editorial filtering, real name
verification, or light peer review with only less than 30% rejection rate. Light-touch
gatekeeping improves the quality of publish-then-filter academic publishing by
blocking unacceptably low quality content. However, the “social peer review” process

[208] Quoted from a real-name Chinese scientific blog, the blogger Prof. Qian Jianli is an experienced senior editor
and academic, working for a scientific journal in China, see
http://bbs.sciencenet.cn/home.php?mod=space&uid=65283&do=blog&id=353183
[209] Western readers might be interested in how Science Paper Online deals with politically sensitive content. In the
guidance for authors, as all other Chinese websites, there are terms regarding being politically correct. Moreover,
Science Paper Online has preliminary gatekeeping which will sensor some problematic content. In practice,
however, most scientific papers do not involve political issues and authors also have self-censorship even at the
very beginning of the research. As such, no relevant news has been heard yet.
that is a hallmark of these sites is carried out after content has been published and all readers and their social networks play an essential role in it. Open science inspired publishing initiatives believe that diversity of scholarship and an equal opportunity for every academic voice to be heard, are more important than filtering and restricting the content available for communication in advance and through controversial gatekeeping processes. These emerging academic platforms trust their readers’ capacity to judge the quality and value of academic content and draw on what James Surowiecki has called “the wisdom of crowds” to decide on what is the best work.

Academic social certification can also assume the functions of social registration of knowledge priority, which is as an extension of social peer review. Registration of knowledge priority is one of the most important social functions of formal academic publishing. However, Waldrop (2008b) as well as a number of respondents in this research (e.g. Respondent 15, 21, etc.) believes that establishing knowledge priority through online platforms such as Science Paper Online can be faster and safer than traditional publishing routes because of the communication efficiency and transparency that digital platforms can offer. A core purpose of Science Paper Online is to protect authors’ knowledge priority by providing them with an online registration mechanism before they submit papers to publishers. Traditional publishers provided incomparable communication capacities in the print age and played a key role in allowing authors to communicate their knowledge claims to the scientific community as quickly and widely as possible. However, open and networked initiatives have higher efficiency regarding publicly claiming priority in the digital age.
Based on networked technologies and big data on consumption, a growing number of alter-metrics initiatives like reader meter, citedin.org., total impact, altmetric, etc. are emerging in the West, which assess total research impact through non-citation-related methods. The traditional impact assessment based on a single indicator of citation has obvious problems. In addition to common limitations addressed earlier in this chapter, the seemingly objective statistical assessment has proved to be easily controlled or manipulated by journal editors, journal self-citation policies, and mutual citations by ally journals in China. Instead of simply counting citations, the emerging alternative metrics system assesses research impact using three measures: the number of readers, the level of influence a text has on readers, and the identity of readers. Users’ subjective comments are also being used to assess research impact. Users are being asked to answer the question: do you think this text is worth reading and useful?

As such, a dynamic, transparent, and democratic social peer review system is being established, which empowers and enables end readers to directly assess scholarship with little institutional mediation. The “structural” and “reader-defined” social network metrics provide “striking differences” from the traditional IF (Impact Factor) systems, by which a specific community of readers accesses documents induces a different, local, perspective of journal impact (Bollen et al., 2005). As the case of New Science illustrates, the data generated through social reference management

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211 Wu (2010) argues: “In order to improve Impact Factors, some academic journals employ strategies like self-citation or mutual citation, as a result of which the "should-be" objective post-publication assessment is losing credibility and has transformed into a game of maximizing journals' self-interests.” Another journal editor also exposed in a blog article: “Chinese professionals are so smart that they have hacked the citation-based assessment system...I heard for many times that, it is not difficult to be a SCI journal and improve Impact Factor only if your fellow journals ‘take care of’ you.”. See http://blog.science.net.cn/home.php?mod=space&uid=71721&do=blog&id=390380&from=space

websites provides a useful, practical system for assessing research impact.\textsuperscript{213} Compared with citations, alternative metrics redefine “impact” by emphasizing the relevance, value and usefulness for specialised users. The potential implications of this technologically enabled shift for authors and journals are profound: as social referencing sites become more popular, it seems likely that the focus of authors as well as journals will shift from pleasing gatekeepers to serving end readers.

Naturally some may question the relationship between popularity, quality and value in relation to academic content. However, the academic “social network market” is not the same as its counterparts in the areas of pop culture and entertainment. Academic readerships are highly specialised and based on a small group of research peers with common interests and expertise. As a result, the popularity of academic content reflects the tastes of specialised readers who are well placed to select and assess works that best serve them within a specific academic context. In fact, academic social certification is not only a quality assessment system, but also a gatekeeping or filtering system and a distribution system. The open and networked opportunities of digital technologies allow digital platforms to assume all three of these functions at the same time.

Emerging open and networked social certification mechanisms, such as the system operated by Science Paper Online are not a complete break from the traditional system. Impact Factors as well as other citation-based assessments are also reflections of collective selection processes informed by readers. Even publisher mediated peer review processes aim to select the best scholarship by drawing on the opinions of a

\textsuperscript{213} According to interview with Qian Junbin, the founder of New Science by author.
couple of peers making decisions on behalf of wider academic readerships. Open and networked approaches to social certification are not denying or undermining peer review, but re-organizing or decentralizing it in order to make it more democratic and representative. The technical limitations of the print age gave rise to a minority-based certification system, while the digital and networked technologies are enabling a large scale of global peers to review and certify scholarly knowledge together: this is the crucial difference.

6.1.3 Restructuring Communication and Certification

In the print age, commercial publishers stand at the crossing between formal and informal, and between private and public, functioning as gatekeepers, certifiers, distributors, and copyright owners of scholarly knowledge. In China, the government’s role in the publishing industry further reinforces the power of publishers as the only legitimate intermediary in communicating scholarship. This structure greatly empowers publishers and has made them central in the academic publishing value chain, as well as key players in processes of resource allocation within academic communities. The authority of academic publishers is borrowed by the academic system as a convenient mechanism for evaluating academic performance. As a result, being published has become the most valuable form of certification of an academic’s productivity and credibility as a researcher.

214 According to the presentation given by Tracy Brown entitled: “Web 2.0 technologies and post-publication peer review will supplant ‘traditional’ peer review” in The ALPSP International Conference 2010 held at Bedfordshire, United Kingdom. Video can be accessed at http://river-valley.tv/web-2-0-technologies-and-post-publication-peer-review-will-supplant-traditional-peer-review/
Publishing business models reflect the growing demand for the research certification services they offer. For example, top journals like *Nature* and *Science* have a rejection rate of over 90%. As a result, being published by either of these journals provides authors with a level of prestige that is not necessarily equivalent to the value of a paper itself. At the other end of the spectrum, low quality Chinese journals have removed all mechanisms of quality assurance and are simply selling publication certificates to academics; very few readers are interested in reading the “junk” papers that they contain. Both overly restrictive gatekeeping and the absence of quality assurance mechanisms result in wasted time, money, and creative resources within academic communities.

In contrast, open and networked initiatives are reverting back to the original communication functions of academic publishing, harnessing Web 2.0 advances, social collaboration, and other socio-technical dynamics. Unlike certification-oriented traditional journal and monograph publishing, being published by an open and networked initiative does not signify the final approval of a paper or certification of its value as an academic output. Instead, publication on these platforms is the starting point in a process of communication that is facilitated and enabled by a publishing intermediary, that involves a process of social review, alternative impact assessment and social certification. The emerging academic publishing system thus has incomparable strength in the communication of digital scholarship.

However, as Respondent 20 points out, the strength of this emergent system is yet to be recognised by official approaches to academic evaluation:
Nowadays, academics can enjoy fast, cheap, and efficient communication in online initiatives. There are no problems for wide dissemination of research outputs and online discussion and collaboration in relation to academic publishing. But the crucial problem is, perhaps, online publication is almost never accepted for academic evaluation.215

Respondent 20’s comments highlight a crucial tension between the traditional and emergent academic publishing systems: the value of the certification function within academic assessment and promotion systems has overshadowed the need for efficient communication within scholarly communities. In contrast, while the emerging system is giving priority to communication, the fact that it is not widely accepted by research funders and university decision makers means that its impact is limited.

The tension between communication and certification highlights the uneasy fit between intense competition between academics who need prestigious publications in order to get ahead, and the benefits to a wider research system that encourages more open communication practices.

Academic social networks enabled by open and networked publishing initiatives are nonetheless providing opportunities for better alignment between the interests of individual researchers and those of wider scientific communities. As the two case studies discussed in this thesis demonstrate, shared interests and shared creative labour are being drawn on to sustain and support open, collaborative and networked publishing communication. Just as Shirky (2008:258) observes “…communal interest

215 According to an interview by author.
turned out to be a better predictor of longevity than commercial structure… This is the secret of …all the large-scale and long-lived forms of sharing, collaborative work, and collective action now being tried…”

6.2 The Potential of Creative Destruction

6.2.1 Redefining Publishers’ Value Proposition

The basis of open and networked initiatives is direct connection between academics within a networked landscape. Academic social networks are supplanting publishers as intermediaries in academic communication processes. The monopoly of publishers over gatekeeping and quality control processes, as well as the ability to disseminate knowledge across relevant communities is being undermined. As a result, the emerging academic communication landscape is one in which resources such as content, creative academic labour, attention and prestige are distributed in radically different ways.

Open and networked initiatives are introducing a self-organized social system to mediate, supervise, and control academic publishing as an alternative to the highly problematic traditional publishing system in China. These new approaches place academics in active rather than passive positions within the communication landscape and provide academic communities with a level of autonomy that was previously unimaginable. As Science Paper Online and New Science demonstrate, open and networked platforms are providing Chinese academics with opportunities to interact directly with one another, share and collaborate, form collective opinions and take collective action, with little institutional supervision.
The self-organized social networks in academic publishing require communal interests rather than self-interests, sharing culture rather than exclusive priorities, and collaboration rather than competition. The teams behind the two open and networked initiatives studied in this thesis believe that instead of designing a system to stimulate, maximize, and also control self-interest, academic publishing businesses can also operate on the basis of trust, collaboration, and the common interests of a large number of people. Arguably, a system based on communal interests is more suitable for academic publishing than the commercially driven models that have proliferated over the last hundred years. Scholarly knowledge is by its nature a public good and its value is increased through sharing and use. Science itself is also moving towards ever more collaborative research models, and many scientists both welcome and require tools that will facilitate cooperation and maximise their access to information and data.

As Shirky (2008:235) argues, social-network-based media do their “best not by trying to do things on behalf of its users, but by providing a platform for them to do things for one another”. This suggests a fundamental shift in value propositions of academic publishing businesses. In the two case studies explored in this thesis both public and community interests are served: all participants contribute to the community and at the same time, benefit from contributions made by others. The architecture of these systems is being built on the premise that everyone who engages with the platform is both a contributor to and a beneficiary of effective scholarly communication.

Academic publishing business models are shifting from content-centric, through service-oriented, and finally to community-based, which has been seen as a trend in a
number of areas in the networked age (Benkler, 2006). It seems likely that when this shift settles, the final products of new business models will no longer be scholarly content, integrated online databases, or even various information services. Accordingly the value proposition presented by publishers will not be gatekeeping, quality improvement, print or digital distribution, or even monetizing copyrighted content. Instead, publishers will add value by establishing and operating active academic social networks in relation to academic publishing. As Sun Wei, the technical director of Science Publishing House and Senior Research Consultant at the Chinese Research Institute of Science and Technology argues: “[The future of our business] is a research platform for publishers, editors, authors, and users. This must be a community. The crucial challenge for publishers is how to define your role to best serve the community.”

As such, the value proposition of publishers is being fundamentally changed. New publishers are faced with the challenges of developing both hardware and software solutions to challenges very different from those that faced their analogue predecessors. They also need to develop technical support systems that enable crowdsourcing and collaboration, administrative structures that stimulate and reward social engagement and down-stream business operations that allow them to monetize all of these resources. In both of the case studies chosen for this thesis, the website operators invested heavily in improving their user interfaces and experiences and by providing easy-to-use, cost and time-saving functions for social networking and creative participation. In order to improve self-organized social innovation in the

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216 According to Sun Wei, the technical director of Science Publishing House and senior consultant of the Chinese Information Research Institute of Science and Technology at the conference of Publishers and Libraries Cooperation during the 2011 Beijing Book Fair, see official transcript at http://www.fici.org.cn/eighth/aspect/speech/5310.html (accessed on 2011-08-11)
academic world, new publishers have to develop viable strategies for attracting key resources in the academic publishing landscape, and rewarding users for their engagement. The resources that emergent open and networked digital publishing platforms need to attract include investments of time by the right participants, high quality content, symbolic and brand-related capital, as well as the funding and investment required to help them to grow. This new brand of publishing business is not simply engaged in the business of producing scholarly content, but in the business of enabling a dynamic and productive social academic publishing system.

Though user co-creation and social networking are autonomous and self-organized, operating a networked publishing platform and maximizing its social, cultural and economic value require capable professionals and a significant corporate investment. Editors and managers are still necessary, functioning not as gatekeepers but as supporters and enablers of self-organized scholarly communication. So the future is not academic publishing without publishers, but new publishing forms enabled by new publishers. Along with the decline of existing publisher-centred and institution-controlled intermediaries, is the rise of publishing initiatives that provide new value proposition. In China, governmental institutes like Science Paper Online, grassroots websites like New Science, and perhaps some transitional traditional publishers, will come into play as digital intermediaries.

The key question for researchers and entrepreneurs seeking to understand the future of academic publishing is not whether or not publishers will disappear, but how the publishers of the future will add value to scholarly communications processes. Traditional publishers understand their value as facilitating the certification of
scholarship. In contrast, the emerging publishing businesses discussed in this thesis are focused on increasing the communication efficacy of academic publishing by drawing on Web2.0 opportunities. This new value proposition is valued for better compatibility with the academic context in the 21st century when fast exchange of knowledge, collaborative research, and open/citizen science become key social demands for academic publishing.

6.2.2 Openness and a Redefined “Market”

Unlike traditional academic publishing in China which generates revenue by charging for access to content or charging academics for the service of publishing (page fees), the open and networked initiatives discussed in chapters four and five are trying to establish businesses that provides free content and free publishing services. The two case studies as well as a number of other initiatives like Science Net and Miracle Repositories employ a completely free-to-use system for academics. These businesses operate on an open access basis and include a wide range of additional free services.

Open and networked initiatives have an intrinsic relationship with open access. The large-scale user co-creation, crowdsourcing and social networking in relation to academic publishing cannot exist without open access scholarship. At the same time, networked communication provides a useful mechanism for enabling open access academic landscapes to function, building on and stimulating the desire of academic authors to share original papers and to self-archive their works published elsewhere. This may provide a useful adjunct to institution-based green open access models, or publisher-oriented gold open access, although understanding the context within these models being applied in markets beyond China is outside the scope of this thesis.
Copyright is a key challenge for emerging networked academic communication initiatives. In practice, Chinese initiatives deal with copyright challenges in three principle ways. Science Paper Online and other official websites employ a hybrid model that integrates content distributed with publishers’ authorisation alongside content that is self-archived by authors (who own the copyright in it), and explicitly open access content. Grassroots websites like New Science and Miracle Repository favour the use of Creative Commons licenses. However, these strategies are not sufficient to provide the volume of content required by either of the sites discussed in chapters 4 and 5. As a result both sites have a high level of tolerance in relation to the sharing of content without the copyright owners’ permission amongst users. The platforms rely on the ‘safe harbor’ principle to avoid legal trouble. The following paragraph is quoted from Miracle Repository, which illustrates such a strategy:

Some active users upload valuable learning materials without appropriate copyright permissions. This is not the mission of this platform, but considering the convenience of our users in learning knowledge, we have not forbidden it. Our attitude is, if the copyright owners protest, we will delete it, which is in the basic spirit of copyright regulation on the Internet in China.217

Chinese copyright owners are not blind to digital copyright infringement in academic publishing; there are strategic benefits for them associated with remaining silent on the issue of the unauthorised sharing of works. Authors benefit from the wide dissemination of publications, rather than from royalties that might be associated with restrictions on public access. Chinese journals do not depend on subscription revenues

217 http://qxg.com.cn/n/?cid=42&nid=776&fc=nd
as much as Western publishers because of their abundant income from page fees and the fact that many continue to access government subsidies. Database providers that do depend on subscription revenues paid by University libraries enjoy distribution dominance within their established markets. As such, a controllable and acceptable scale of copyright infringement in open and networked initiatives can exist in a grey legal zone without threatening the interests of established market players. In the longer term, open and networked publishing initiatives in China will need to formalise their copyright and licensing arrangements. For now, innovation is being enabled by more liberal approaches to IP within the academic publishing system.

In addition to open access, the initiatives also provide a series of free publishing services to users. But the free models must be cross subsidized by other revenues, which is as costly as many other types of subscription business models. The financial sustainability of the case studies described in this research depends heavily on governmental or institutional sponsorship and other commercial revenues. Science Paper Online is fully funded by the Chinese government, allowing it to maintain a not-for-profit nature. The commitment of the Chinese government to supporting innovative open and networked academic publishing models is impressive and provides an inspiring case for public funds to invest academic publishing initiatives and may prove to be inspiring to governments and research funders searching for ways to develop more effective approaches to scholarly communication in other markets.

Although Science Paper Online is well funded for the moment, this platform and other Chinese open initiatives are attempting to develop viable models for generating
commercial revenue, mainly by offering value-added information services and developing advertising aspects of their businesses. Scientific Squirrel has successfully developed a business model in which the revenues from bestselling books and copyright operation subsidize open online publishing on popular science, while Witkey is experimenting with a B2B model relating to scientific communication, in which capable academics provide customized knowledge service to individual clients\textsuperscript{218}. Science Net, the biggest Chinese online academic community, defines itself as a “social corporation”\textsuperscript{219}, which could be a common identity of most open and networked initiatives in China. In other words, they hope to balance public interests, economic efficiency, and corporative organization.

Finding financially viable business models capable of supporting free content and free publishing services is a key challenge for emergent digital publishers. The commodity that these publishers are trading in is not scholarly content, but services that enable academic social networks and peer-to-peer scholarly communication. Rather than depending on purchases made by libraries, reader subscriptions and page fees paid by authors, these initiatives rely on a combination of public and private investments in their activities. New publishers must attempt to “sell” their platforms to sponsors, collaborate with established content businesses, collect donations from individual users, and apply for subsidies from universities. Some are even exploring the possibilities of raising capital through joint adventure and an IPO. A key aspect of all of these strategies is the need to ensure that platforms are influential within and useful

\textsuperscript{218} According to interviews with Respondent 6 and 7 by author.
\textsuperscript{219} According to an interview with Respondent 5 by author.
to academics, and perceived as valuable to both funding agencies and commercially motivated investors.

6.2.3 Restructuring the Value Chain

6.2.3.1 New Value Added

The evolution of computer and Internet industries pioneered by Microsoft, Yahoo, Google, Facebook and Apple indicates an interesting trend: the emerging initiatives of these industries defeated the existing dominant players not by repeating what they were doing, but on the basis of new value propositions that restructured the value chain. As a result, previous dominators are generally marginalized rather than replaced or eliminated, while emerging forces occupy more essential and profitable parts of the value chain. In the digital transition of the academic publishing industry, the open and networked initiatives have similar potential for creative destruction.

220 Microsoft has not been defeated by any other operating systems like Linux; however, Yahoo marginalized Microsoft by value-added services for Internet usage instead of isolated personal computers. Similarly, Google marginalized Yahoo by changing Internet consumers’ habits from all-in-one portal websites to customized search engines. Today, Facebook is challenging Google’s power by providing value proposition of social media, whilst Apple’s success depends on the disruption of desktop PC by mobile Internet and various “smart” devices.
Figure 6.1 suggests the ways open and networked initiatives, particularly online preprints and social reference management, restructure the value chain of academic publishing and enrich value-adding flows. The value chain of traditional academic publishing is a one-way linear structure, in which publishers play an indispensable role in the central elements. The open and networked initiatives, either online preprints or social reference management websites however, add much more flows of information and value adding activities. Some are linked with the traditional value chain while others are disruptive. All these processes add value to academic publishing in innovative ways, which the traditional models have never tried before.
Harnessing a virtual self-publishing model, online preprints provide more channels for scholarship to be publicized. Initiatives like sharing working papers, academic blogs, self-archiving, and scholarly BBS also have such a function. They enable authors to publish content directly in various informal ways and without being involved in the formal publishing process to, or at least without, publishers’ final certification like a print or digital format. Meanwhile online preprints can also provide authors with feedback on their publications such as readers’ comments and ratings. The crucial value added here is analogous to the dynamics of user-generated-content in terms of democratization and decentralisation of communication. Just as Respondent 23 argues: “I hope that academic publishers will never reject papers in future so that every academic has voices in academic public sphere. We would let history instead of reviewers to make judgements.” This is especially valuable in China given its controversial gatekeeping in journal and monograph publishing and strong governmental intervention. As such, new publishers like online preprints establish incomparable new value over existing publishers.

Likewise, social reference management initiatives establish a close interactive relationship with end readers, enabling them to collectively select the most valuable scholarship. Social reference management can collect scholarly content from a variety of stages in the academic publishing value chain, as shown in Figure 6.1. The value of social reference management is not only a system for distribution and assessment of scholarship based on readers’ crowdsourcing; more importantly, it has the potential of being a primary interface for academic readers, just like Google for Internet users. Social reference management integrates a wide range of necessary functions for the

221 According an interview by author.
readers in consuming scholarly publications including a folksonomy of valuable references, personal library, and social media. As such, academics will find it more convenient and efficient to start their reference seeking from social reference management websites and through global peers’ collective recommendations than digital libraries or search engines. Once a large proportion of the academic population has established habits of using social reference management, it will become the most powerful part in the value chain of digital academic publishing. Their distribution dominance will marginalize traditional agencies in distribution like journal databases, libraries, or even Google Scholar.

Regarding the potential of creative destruction, it is worth pointing out that online preprints and social reference management should not be separate to each other, as they are at the moment. Uncertified scholarship cannot be influential without social certification; likewise, without the diversity of informal publications, social reference management websites cannot maximize their potential values. Considering the restructured value chain of academic publishing, converging with traditional systems will make initiatives supplementary, while integrating with each other will form a complete alternative value chain.

In some disciplines like High-Energy Physics, where informal academic publishing has developed very quickly, another emerging trend is clear, which further restructures the value chain. Academics’ first choice for publishing their original research outputs has transformed into online alternative platforms within that discipline. Accordingly, the scale and scope of scholarly publications in initiatives has been dramatically expanded. After wide dissemination, peers’ feedback and
discussion, as well as collaborative revision and improvements, some papers are published in formal journals for final certification or archiving purposes. Respondent 20 believes that such a model is perfect for his discipline Mathematics, as well as a wide range of others. He argues:

    All research outputs should be publicized first and assessed by the scientific community as a whole. Any individual reviewer or editor does not and should not have the ability and power to make judgement on behalf of the whole academic population. In the digital age, it is especially unnecessary and ridiculous. Once the original paper is disseminated and widely discussed enough and has been approved socially, the formal publishers can publish the final version as a kind of formal approval. This is the perfect digital academic publishing model in my mind.222

Figure 6.2 The Further Restructured Value Chain of Future Academic Publishing

6.2.3.2 The Power of Initiatives

The open and networked initiatives locate themselves in closer places to authors and end users, and provide them with more options to publish and consume scholarship. The authors and readers are the final source of academic publishing resources, as well as the power and interests of publishers. Empowering the consumption side of

222 According to an interview by the author.
academic publishing as well as being empowered by it, these initiatives have strong potential to restructure the value chain, power structure, and resource allocation between the traditional and emerging publishers. It is thus not surprising if the initiatives like online preprints, social reference management, and alter-metrics will play an essential role in the communication and certification of scholarship in the near future. In practice, Chinese initiatives like Science Paper Online, New Science, and Science Net are integrating emerging academic publishing models with their own platforms in order to occupy an advantageous place in the future value chain.223

Traditional publishers and agencies risk being marginalized because of their structural problems on the one hand and the disruption of their monopoly on the other. Their distance from consumers in the value chain will further reduce their capacity to add value in open and networked contexts. Though traditional academic publishing still occupies most resources at the moment while initiatives remain at a very early stage, “the disruptive changes driven by new models are happening surprisingly quickly”224. As a result, it seems likely that traditional publishers will find themselves providing certification services that continue to be valued by a number of disciplines and institutions, and selling content to readerships with low levels of digital literacy. It is dangerous for the established academic publishers to ignore the potential creative destruction by open and networked publishing models.

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223 According to interviews with Respondent 1, 2, 3, and 4 by author, who are managers or founders in the three platforms.
224 According to interviews with Li Zhimin, the founder of Science Paper Online, by author.
6.3 The Democratization of Science

6.3.1 Open Social Norms

In the context of Web 2.0 and the emergence of social media, scientific communities are being digitized. Digital potential is making it possible for scientific communities to operate in ever more connected ways. In contrast to the institutionalized, bureaucratic, hierarchal, and utilitarian system that dominates in the world of offline academic publishing in China, the online community connected by open and networked initiatives are embracing the ideals of Open Science, which as Peters (2010) summarises, include openness to ‘experience’, openness to criticism, openness to interpretation, openness to the Other, open science communication technologies, openness as freedom, and open governance. These ideas are expanding authorship and readership of scholarly knowledge, diversifying certification of research and scholars, and blurring distinctions between academic ivory towers and an innovative public in China, which are impacting the social norms that govern academics’ publishing practice in the following ways:

First of all, open publishing models provide more opportunities for research beyond the governmental research agenda and encourage the development of “unofficial” academic innovations. Such changes will impact on a research landscape that has been heavily affected by government intervention and bureaucratic administration, and are enhancing academic freedom and independence in China. Just as Respondent 24 points out:

Online publishing frees academic authors by creating an environment of independence and freedom. In the traditional system, Chinese academics prefer
funding and publishing opportunities over the importance and meaning of research, which is ironic and ridiculous. Thanks to open initiatives, academics do not need to please reviewers, editors, funders and the government. This allows them to save time and energy for really valuable research and will benefit scientific research as a whole in China.225

Open Science also encourages openness to criticism, which helps to establish a critical atmosphere within Chinese academia. The founder of Science Paper Online, Li Zhimin points out that a mutual praise culture dominates the Chinese scientific community, encouraging academics to over-value their peers’ work in reciprocal ways. The existing certification-based academic publishing system is reducing the space for scholarly debates as well as an academic public sphere. There are only reviews and evaluations left to decide the quality, impact and thus researchers’ self-interests while open and friendly discussion regarding academic ideas is increasingly rare. Open and networked initiatives that emphasise communication are introducing a more democratic and open culture to debate scientific knowledge, which will reduce Chinese academics’ cautiousness and utilitarianism in criticizing others’ work, especially that of established authorities in a particular field.

Open Science implementations will further create a democratic atmosphere in the scientific community of China. The traditional academic publishing system as a beneficiary and enabler of China’s hierarchal academia is incapable of changing or disrupting the dominant paradigm from within. Open and networked models in contrast, are establishing an alternative system for both the communication and

225 According to an interview by author.
certification of scholarship, which is democratising science for Chinese academics. The democratization of science is primarily the democratization of resources allocation within academia. Social certification is more dynamic in terms of disrupting hierarchal structure, giving more opportunities to voiceless academics and balancing the power structure between bureaucratic institutions and academics’ self-organization, as discussed in detail above. Open initiatives also provide more opportunities for young academics, who will benefit from the dynamic online social system and build a reputation much more quickly and easily than in the traditional hierarchal system. Moreover, even at the moment when initiatives have not become dominant, they can improve democracy and openness within Chinese academia as a consummated supervisory or scrutinizing system over the existing system.226

Open Science values openness and encourages scholarly collaboration in co-creating, sharing, remixing, and reusing academic publications. Based on academic social networks, open and networked initiatives enable and encourage such collaboration by connecting individual academics and bridging academic authorities with average scholars. The large-scale social networking amongst academics with common interests and expertise enables effective and dynamic online discussion and cooperation, and further transforms them into offline friendship and collaboration in research. Research in the 21st century is increasingly collaborative, due to the popularity of E-science and the requirements of interdisciplinary research agendas.

226 For instance, networked platforms like Science Net and Science Paper Online have functions of disclosing plagiarism or academic corruption in China. A number of reputable academics have been discredited through online initiatives to date, having been officially punished afterwards. As such, academic social certification is becoming as an alternative mechanism for scrutinizing academics in China. The following is the webpage for real-name muckraking in Science Net, the biggest academic social network and blog sphere for Chinese language academics. There have been quite a number of cases. See http://blog.scienccenet.cn/blog.php?mod=impeach
In short, open and networked initiatives are changing the academic landscape in China by translating the Open Science ethos into tangible new publishing models. Just as the founder of Science Paper Online, Li Zhimin argues: “abstract ideas cannot change the academic system. Instead, a real platform or application that illustrates advanced ideas and provides users with useful and convenient functions is the best way to promote emerging ethos like Open Science. The existing dominant system will be changed in that way.” Their role in the transformation of social norms in the academic world starts from providing an alternative for open-minded academics, institutions, policy makers, and other stakeholders that have been dissatisfied with the existing system and are trying to change it. This combination might be the single spark that starts a prairie fire.

6.3.2 Open Science and the Chinese Learning Public

The impact of the democratization of science in China is not limited to Universities. As happened in cases of citizen journalism, literary self-publishing, and Wikipedia, democratization of knowledge production, distribution, and evaluation have become an irresistible trend. The communication of knowledge is shifting from a pattern of a few writing and many reading to a new system of many writing and many reading (Hartley, 2005); meanwhile, the certification is also changing from authorities’ approval to the assessment by the wisdom of the crowd. It suggests a shift of power structure from elitists’ domination to population-wide innovation.

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227 According to author’s interview with Li Zhimin.
228 The rise of citizen journalism is challenging the dominance of professional-made news as well as the influence of news agencies. This is especially true in China given journalism censorship. Amateurs’ online writing and self-publishing is also replacing traditional literature publishing, as well as professional writers in China, along with the emergence of the Online Literature Industry. Wikipedia created by users’ crowdsourcing forced Britannica Encyclopedia produced by experts and editors to halt print publication after 244 years.
As Cope (2009:6) argues: “we are moving away from a world in which a few producers generate content to transmit to a set of users”. A similar trend is happening in science all over the world. Along with the expansion of higher education, academic publishing has already been a system of “many writing”; however, it has also been one in which there have been “few reading”. As Universities have expanded and the pressure to publish has increased, the number of authors and publications has increased disproportionately to readerships. In China this is even more so. The crucial reason is that the existing academic publishing system has been too certification-centric, as a result of which, people are busy producing publications with little concern for either the dissemination of their knowledge or the readers that might value it. Academic publishing today is facing information-rich problems in communication: the supply of scholarship exceeds demand.

Academic publishing needs to find ways of re-balancing this ecosystem, connecting with larger readerships as well as allowing new authors and ideas to enter the system. Democratizing communication and certification, and harnessing open and networked dynamics through digital networks, will play a key role in this process.

Educated and professional people outside academia are both potential authors and readers of academic publications. An educated engineer is interested in research papers relating to his or her field of practice; likewise, an experienced journalist or editor can understand and even review a paper on journalism or communication science. These capable and educated people could contribute to academic publishing as authors as well. Unlike the certification oriented system, the focus on
communication as well as the dynamic interaction within academia, industry, and education will force academic publishing to become more open to readers and authors, rather than a game of credit gathering within academic institutions.

Furthermore, the democratization of science is going beyond the specialised academic or professional world, attracting the general learning public. In countries like Britain, the term “Citizen Science” is frequently used to define such social changes driven by the participation of creative citizens in scientific domains. Given most research is funded by government and thus public money, academic publishers that publish these research outputs have no reason to be exclusive. The learning public needs to access individual research outputs and publications. The research communities that rely on public money also require public scrutiny and assessments of their value to society as a whole.

In China, academia is losing its credibility and public trust. Ironic homonyms like “zhuan jia (砖家, homonymic for experts, but means academics whose ideas are widely criticized by the public)” and “jiaoshou (叫兽, homonymic for professor, but means a beast that can speak)” have become popular in the Chinese public sphere and reflect growing scepticism of academics who are financially supported and administratively controlled by the government. There is a widespread sense that many academics are reluctant to explore scientific truth but only speak for their bosses. The wider Chinese public is not satisfied with academic publishing, in
In 2011, a debate was raised by criticism over a scholar in law, Prof. He Weifang who continuously appealed for political reform and human rights protection in the Chinese legal system. Some criticized him for his poor formal publication list as an academic. Surprisingly the public opinions overwhelmingly supported Prof. He Weifang. Sohu, the influential portal website in China summarises public opinions as below:

The criticism of poor formal scholarly publications is based on misleading value system. The publication-oriented evaluation is highly controversial. Prof. He Weifang has published academically accepted works before and his teaching is welcomed by students. More importantly, he is actively assuming his duty as an intellectual for the public and the society. What we need most is responsible academics instead of paper producers in China. 230

Open and networked academic publishing provides great opportunities for Open Science in the wider society of China. These platforms are providing academics that want to conduct valuable research to have an impact on the world, with opportunities to realize their ambitions. As Prof. Liu Xinling argues: “science is a way to understand the world and solve problems by using existing knowledge to analyse the facts and to propose solutions. Science is simple and should be certified by its

229 The following new reports suggest “strong public dissatisfaction” from a variety of perspectives: the National Bureau of Publishing and Press issued new measures to regulate vanity publishing in 2011, which has caused wide social dissatisfaction, see http://news.xinhuanet.com/edu/2011-02/24/c_121115803.htm; a forum on academic corruption, http://news.cyol.com/content/2010-03/08/content_3120832_3.htm; the Chinese influential web portal QQ published an in-depth investigation on plagiarism of the Chinese intellectuals and academic corruption, which uses the term “academic prostitutes” to define the role of vanity journals. This report on popular online media reflects the growing public dissatisfaction over the problems in academic publishing, see http://news.qq.com/a/20090702/000204_7.htm

contribution to the society and the public instead of by experts or journals within the small circle of academia.”

A deeper disruption by Open Science implementations is the removal of the aura of exclusivity from science. In China, the aura that surrounds science justifies elitist social norms, uneven allocation of resources, bureaucratic institutionalisation, and exclusive policies. The aura makes a large number of academics believe that science and academic publishing is special and unique, particularly that science cannot be democratized as other knowledge is. This has become a strong obstacle against the open publishing initiatives. However, Li Zhimin the founder of Science Paper Online argues: “open Science is challenging traditional perceptions of science. Our culture and traditions used to sanctify science, but it is not that sacred. It is just a job now and has nothing more than other professions.” This is especially true after the expansion of higher education: having received academic training, common young people are simply qualified to do research. China has a huge educated population and abundant creative human resource for academic publishing. Many respondents in this work believe that an open, democratic, and transparent system for communication and certification of science is likely to encourage genuinely productive academics and an innovation culture in China, and that the benefits of such a model far outweigh those of existing exclusive and elitist approaches that isolate science from the larger population.

231 According to author’s interview with Liu Xinling whose story will be told in next chapter.
Chapter 7 The Networked Future of Academic Publishing

In 2010 Associate Prof. Xinlin Liu received a great deal of attention from the Chinese press for his 20-year boycott of formal academic journals. Liu believes that it is unacceptable for journals, which also generate subscription revenue to demand page fees from authors. According to Liu: “page fees and publication-oriented evaluation are at the root of a number of problems in Chinese academia: academic misconduct; corruption; and increasing utilitarianism… I will not surrender to this dysfunctional system for the sake of an extra couple of hundred RMB in my salary each month.” 232

Although he refuses to publish in journals, Liu continues to engage in research and scholarly communication in the area of Confucianism and Chinese traditional culture. Liu has a blog-like personal website and publishes all of his academic findings and papers online.233 The name of Liu’s website Qiyuan (漆园), a classical place in Taoism, suggests his intention of escaping from a dirty world and refusing to be contaminated by it. Liu enjoys the open, dynamic model of scholarly communication that he has developed outside the formal publishing system. He has self-published over 20 million words and attracted more than 285,000 visitors to his site to date. Liu has found that his work has been taken up, not only by academic communities, but also by a wider readership. However, his online utopia has cost him a lot in the offline world. An absence of formal publications means that he has failed to win promotion to professor, in spite of his work and its impact.

232 According to interview with Liu by author, he means that once published a lot, he could be promoted to the position of Professor and as a result of which, see an increase in his salary. In his opinion, this is perhaps the only advantage of publishing formally in the existing system.
233 http://liuxinglin2010.blog.163.com/
Liu’s story highlights the fundamental tension in academic publishing between communication and certification as well as the major issues involved for academics who engage with open and networked publishing initiatives. All over the world, two aspects of academic publishing that should complement one another are increasingly in conflict in today’s “publish or perish” climate. Academic publications play a decisive role in career advancement, and publishing businesses have been transformed into certification services. As a result, the communication functions of academic publishing are suffering. The Chinese traditional academic publishing system has become overly certification-centric, resulting in the host of problems discussed in this thesis. In this context, open and networked publishing initiatives are attempting to develop an alternative, communication-oriented system, based on a series of innovations such as “publish then filter”, social peer review, and alter-metrics.

The tension between communication and certification is being rebalanced in the digital transformation of academic publishing, by the competition between the established certification-centric system and the emerging communication-oriented alternative. The future of academic publishing heavily depends on stakeholders’ selection of the two paradigms for scholarly communication. The selection is complex, involving both supportive dynamics for the initiatives and the contextual constraints against them. After exploring the social and economic innovations of open and networked models, this chapter further critically discusses how innovations are being selected by the Chinese academic publishing industry, the Chinese academic community, and the Chinese government.
7.1 The Emerging and Traditional Publishers

7.1.1 from Innovative Niches to Viable Models
Innovative open and networked academic publishing initiatives are being driven forward in China by dissatisfaction with existing academic publishing models, and a growing demand for more effective communication tools capable of serving the needs of the collaborative, data-intensive and interdisciplinary research communities of the 21st century. As the case studies chosen for this thesis highlight, open and networked publishing initiatives in China are engaged in the radical and “comprehensive reorganization of scholarly communication” (Borgman, 2007:31, 75) in order to better meet these demands.

China’s networked digital publishing experiments have drawn extensively on the innovations developed by pioneering Western platforms, for example the developers of Miracle Repository were inspired by Plos One, Science Net began by imitating Nature Network, and New Science was encouraged by the success of CiteUlike. Nevertheless, China’s platforms are just as ambitious as their Western counterparts and are consciously attempting to disrupt the controversial, conservative, bureaucratic, and somewhat corrupt traditional academic publishing system in China. However, the wider transformations that the developers of open and networked publishing models in China hope for take time. Furthermore, simply transplanting Western platforms into Chinese contexts is unlikely to bring this change about. Experiences of open and networked publishing in China suggests that the transformation of the scholarly communications landscapes is a long and complex process, which demands constant innovation from platform developers to ensure that the scholarly

234 According to author’s interviews with managers in major initiatives in China.
communications tools they are providing are appropriate for the needs of all stakeholders in the system.

Both Science Paper Online and New Science have invested a great deal of time and resources in upgrading technical platforms, improving social functionality and experimenting with funding models. There have been countless updates of the platforms, improving their compatibility, convenience, and functions. Other Chinese platforms, like Science Net, also highlight the necessity of continuous investment in innovation. Applying digital and networked technologies to academic contexts and identifying models that will support communication and ensure financial sustainability is profoundly challenging. It is impossible to design a perfect model in advance; rather, the development of transformative new approaches to scholarly communication demands purposeful, deductive-tinkering and will inevitably involve a real risk of failure for individual platforms.

Deductive tinkering is central to processes of innovation for open and networked initiatives because technical advances are a primary source of comparative competitive advantage over older systems. The hardware and software systems for Science Paper Online have undergone three comprehensive technical overhauls to date, supported by the Information Service Department of the National Ministry of Education. Likewise, there are a large number of posts found on the BBS of New Science reporting technical bugs, incompatibility, and other problems, as well as responses by the managing team, which suggests frequent technical deductive tinkering on that platform as well. Applying general digital and networked

235 According to author’s interview with Respondent 5.
technologies to academic publishing requires specialised IT and software solutions. In addition to technical viability within the platform, initiatives also need to consider the discoverability of their content through search engines like Google Scholar and Chinese Baidu, as well as on various academic websites. This plays a crucial role in maximising the impact of scholarship published on emerging platforms. Moreover, as initiatives are always updating their functionality and adding new applications, technical deductive-tinkering is also necessary to ensure the viability of new publishing services on offer.

Deductive tinkering in relation to social and communicative models is more complex. Web 2.0 inspired platforms depend on their ability to attract and engage academics to the maximum extent possible. This can only be achieved with a deep understanding of the needs and demands of users, which inform decisions to add, modify or remove specific points of functionality.

Science Paper Online and New Science both struggled to attract adequate numbers of users in their early stages and had to experiment with various models in order to identify and meet the unique demands of academics. Online preprints with simple additional functionality are not enough to attract Chinese academics. As a result, Science Paper Online gradually established an integrated model that assumed some certification functions, which has proven popular. Likewise, New Science has struggled to resolve tension between the relative advantages of strong community-based “social” functions and simple metadata-centric models that resemble a digital library. The development team is still building its understanding of user preferences,

236 According to author’s interview with Wan Meng, the executive director of Science Paper Online.
for example do they like social activities or are they just looking for a convenient reference management tool, or both? Additionally, other initiatives in China have also experienced similar processes of social deductive tinkering, for example Science Net developed from an academic blog platform, through a social web-portal for Chinese scholars, finally to a multi-functional academic social network, which has been experimenting with a variety of social models as well.237

The practice of social and communicative deductive-tinkering suggests an interesting and important trend: the initiatives are converging with the “traditional models” that have been widely used by journal publishers, databases, and libraries. The “publish first, peer review later” model of Science Paper Online is quite typical, employing a number of traditional methods for peer review and certification. Likewise, though New Science aims to upgrade the established digital library models by being more social, collaborative, and human-like, the platform pays much attention to the computational aspects like building databases for folksonomies, customized personal libraries, and advanced searching, which are essential parts of general digital library. Other initiatives like Science Net employ a compulsory real-name system and strict identity verification for scientific bloggers, just as traditional media platforms do. International initiatives like Plos One use Impact Factors to indicate the value of scholarly publications, previously used for traditional journals.

Similar trends are evident in relation to the business model tinkering undertaken by open and networked initiatives. Most initiatives employ open and free models at no charge to either authors or readers, funding their experiments in a completely new,

237 According to an interview with Respondent 5 by author.
little understood market space through cross-subsidy. However, this is not indefinitely sustainable. It seems that a growing number of initiatives are falling back on more traditional business models in order to generate revenue. In the West, Plos One is increasingly operating like a gold open access platform and has even been criticized for degenerating into an academic vanity publisher.\textsuperscript{238} In China, though Science Paper Online defines itself as an open access initiative, it is planning to launch some value-added information services and to begin charging research institutions for online content resources. This is not dissimilar from the business models of subscription journal databases.

The practices of open and networked initiatives all over the world suggest disruption, adaptation, differentiation and convergence between emerging and existing models of academic publishing. The future of open and networked initiatives depends on their capacity to balance these tensions.

Academic publishing exists in a very special and perhaps unique context due to the features of scholarly knowledge (Cope & Phillips, 2009:15), the institutionalized power structures of academic institutions and the established dominance of commercial interests. Revolutionising this system and building a more inclusive, efficient and democratic scholarly communication landscape is not an easy task. The idealistic and utopian ideals of open science demand realistic models and entrepreneurial innovations to transform them into reality. As such, open and networked platforms have little choice but to adapt in order to survive. China has an

\textsuperscript{238} http://poynder.blogspot.com.au/2011/03/plos-one-open-access-and-future-of.html
old saying that relates to revolution and competition: “winners are crowned and losers vilified (成王败寇).” That is, the ultimate proof of an idea is in its success.

The emphasis on being adaptive does not mean abandoning crucial differentiations. Instead, the future of open and networked initiatives lies in its incomparable strength in fast, open and efficient communication, as well as the potential of driving open, democratized, and decentralized changes in the academic world. Open and networked publishing models are a valuable source of “creative destruction” for the academic publishing industry, which is also the source of their comparative competitive advantages. In other words, there is very little chance that the dominance of established publishers will be successfully challenged through the simple application of digital technology to traditional models; instead, new players are most likely to succeed by building new markets, establishing new models and exploiting evolutionary niches that print-era businesses are poorly suited to.

7.1.2 Traditional Publishers’ Adoption of New Models
Traditional publishers are also feeling the pressure of changing demands of scientific communication in the 21st century. The established academic publishers in the West have experimented with some open and networked models, for example Nature launched Nature Networks and Nature proceedings, Springer owns CiteUlike, Elsevier has experimentations of post-publication peer review.

In China, the digitisation of the publishing industry remains at a very early stage, and remains largely Web 1.0 based rather than Web 2.0 driven. Furthermore, average
Chinese academic publishers have limited technical, financial, and human resources available to pursue digital strategies. Just as Respondent 11 argues, “as a result of the administrative system, many journals are not owned and operated by publishing corporations. Their commercial capacity is thus very weak. Operating a digital platform requires a high level of investment and technical resources, which is out of reach of common journals at the moment.” Respondent 10 also points out that most university presses are unable to make large investments in digital publishing because of the lack of viable revenue-making models in the Chinese academic publishing market.

Furthermore, Chinese traditional academic publishers lack incentives to embrace the possibilities of digital innovations because policy protection, publishing number and page fee incomes, and governmental subsidy ensure a financially safe situation for most of them. Compared with enjoying and maintaining the existing system, traditional journal and monograph publishers are not interested in radical digital experiments. One critical blog article puts it this way: “Chinese journals are too shortsighted. Is it ok for you if you have abundant papers submitted and enough page fee revenues today?”

Unsurprisingly, publishers protected within the current landscape are not rushing to embrace the revolutionary potential of Web 2.0. In most cases, they hope to harness interactive and networked initiatives to improve their established systems. A number of Chinese journal and monograph publishers have added some Web 2.0 applications

239 According to an interview by authors, Respondent 11 works for one of the biggest Chinese academic journal databases as a middle layer manager.
240 According to an interview by author, Respondent 10 is a sales director of a Chinese university press.
241 http://blog.sciencenet.cn/home.php?mod=space&uid=281238&do=blog&id=408156&from=space
to their websites, for example readers’ forums, readers’ comments on published content, authors’ blogs, etc. However, these applications are not resulting in dynamic interaction amongst publishers, authors, and readers as well as between people and content. As Respondent 9, the founder and former chief editor of a reputed university journal argues, the users of social media applications did not use such functions for serious academic discussion. Instead they are mostly talking about trivial issues, such as asking about page fees or how long it will take to get a paper published.242

Open and networked initiatives are primarily competitors to traditional publishers in a fast-evolving market for academic publishing, which push traditional publishers to move forward; meanwhile, their innovations can also help to improve the established publishing business. Some ideas represented by open and networked initiatives are being taken up by traditional publishers in China. An example of this is fast and instant publishing: traditional journal publishers realise that time lag is a major weakness of the existing system when compared with open initiatives.243 Efforts are being made by traditional publishers to reduce unnecessary delays in publication and digital technologies are playing a key role in this process. A new “fast publishing service” is being employed by a growing number of individual journals and databases. There are about 1,000 journals that have joined the plan of fast publishing, in which the digital version of journals is available online a few months earlier than the print one.244 Additionally individual journals are trying to shorten the processes of peer review and editorial work in order to compete with online alternatives. The process of refereed journal publishing can, in the best cases, involve just a couple of months

242 According to author’s interview with Prof. Jiang, the former chief editor of Harbin Institute of Technology Journal.
243 According to author’s interview with Respondent 13, a senior editor in a scholarly journal.
244 According to author’s interview with Respondent 11, a middle layer manager of third part journal database.
from authors’ submission to online publication in China. The idea of open and
democratic certification promoted by social peer review is also impacting on
traditional publishers. Respondent 13 argues: “the opinion of peer review is only one
part of our decision making system. Sometimes, in light of conflicts of intellectual
interests between reviewers and authors, we even publish papers that reviewers have
rejected.” In Chinese Optics Journal there are also some improvements in the peer
review model, especially in relation to the objective selection of reviewers.

Compared with individual academic publishers who tend to be small and weak in
China, Chinese journal databases have been pioneers in the digitisation of academic
publishing. Databases also have distribution dominance of scholarly content, which
makes their adoption of new models important in the transformation. Though many
regard digital journal databases as relative newcomers to the publishing scene, this
research still categorises them as part of the established ‘traditional’ academic
publishing system because they share very few characteristics with open and
networked initiatives. To date, Chinese journal databases have not included any
scholarship published by online preprints and similar initiatives like Science Paper
Online. Respondent 11 explains the reason: “as our service is based on the credibility
of knowledge, we have not collected any non-peer-reviewed content so far.” This
concern also suggests that it would be hard for third party databases to launch
“publish then filter” models in the near future.

\[^{245}\text{According to author’s interview with Respondent 12 and 13, both are senior editors in traditional journals.}\]
\[^{246}\text{According to author’s interview with Respondent 13.}\]
\[^{247}\text{According to author’s interview with Respondent 12.}\]
\[^{248}\text{According to an interview by author.}\]
Surprisingly, CNKI had a form of social reference management service about 5 years ago, which is offered as part of its personal library. Another dominant journal database provider Wanfang launched an academic SNS (social network system) in 2012 to link papers with individual authors and enable social networking based on journal databases. This SNS even included blog articles posted by academics via other informal online publishing initiatives. All of these changes suggest that database providers are paying attention to networked models in China. However, user uptake of this social functionality proved extremely poor and most academics have continued to use databases in order to gain access to individual papers, rather than for managing personal libraries. This also highlights the fact that without an active social network and online community, social functions struggle to attract satisfactory levels of user participation. Understandably, Chinese databases depend on institutional markets instead of individual academics, as a result of which integrating large scale content resources and selling big bundles to libraries remain their key concerns.249

Open and networked functions based on reader co-creation seem not to be compatible with the established systems of either individual journal and monograph publishers or journal databases. This is because on the one hand, established publishers use disruptive new models as supplementary to their major journal or monograph publishing system for better promotion, instant feedback from readers, solving trivial problems, and attracting attention from academics. The dynamics and innovation associated with an open, decentralised, and self-organized scholarly communication system are not being encouraged. On the other hand, traditional publishers do not regard readers’ opinions as being of equivalent value to those of peer reviewers or

249 According to author’s interview with Respondent 18.
editors. In other words the ideas and comments of readers are treated as little more than Web 2.0 decoration, rather than as core to the certification of knowledge in a digital context.

Traditional publishers’ selection of open and networked models suggests a strong insistence on established principles and value propositions, such as pre-publication gatekeeping, the dominant role of professionals and experts in publishing communication, passive readers and one-way communication, and institutionalised, formal certification. As Respondent 10 argues, outputs published by formal publishers are still the most trustworthy and valued form of scholarly content, compared with the flood of online content.250 Moreover, traditional academic publishing is an integral part of today’s “publish or perish” academic system. As a result it is all but impossible for traditional publishers’ understanding of academics to move beyond their certification-centric demands. Dr. Ren, the chief editor of a top scholarly journal in China, explains the reason that traditional journals rarely run online preprints as follows: “authors worry about two things: plagiarism and the delay in claiming publishing credits from formal publications.”251 Both reasons are rooted in certification concerns rather than communication. As such, the adoption of open and networked advancements by the established system tends to neglect or reshape the disruptive dynamics associated with the emerging models.

250 According to author’s interview with Respondent 10, a sales director of a university press in China.
251 According to an interview by author.
7.1.3 Competition, convergence, and co-evolution

Stakeholders interviewed for this research held widely divergent views on the future of open and networked academic publishing. Unsurprisingly, people involved in open and networked publishing initiatives are optimistic. According to Li Zhimin, the founder and director of Science Paper Online:

I am very optimistic. I know changing academic habits and culture requires a long time, but according to my work, the changes are happening faster than people imagine. Chinese academics accept new ideas very quickly because they do benefit from open and networked initiatives. The Internet is great and will change everything including academic publishing... Although the old and new publishing systems will co-exist for a couple of decades, I am sure online original papers will have replaced the traditional journals and become the mainstream in the future.\(^{252}\)

Prof. Ji Yanjiang, the founder of another influential preprints platform Miracle Repository, also argues:

The initiatives are much more economically efficient, which speeds the communication of knowledge and improves the pace and efficacy of scientific research. We do not deny the problems of new models, but their benefits far outweigh their limitations. I believe future scientific communication will be fundamentally changed by networked initiatives.\(^{253}\)

The respondents from the traditional publishing section were not resistant to the possibility of disruptive changes arising from open and networked innovation.

\(^{252}\) According to author’s interview with Li Zhimin.

\(^{253}\) http://cn.creativecommons.org/2008/02/27/jiyanjiang/
Nevertheless, their predictions of the future are still based on a few fundamentals, in particular the dominance of big publishers in the value chain\textsuperscript{254} and the value of the publisher-certified content for knowledge communication\textsuperscript{255}.

Apart from these two opposite arguments, Prof. Chen Weichang suggested another trend: “The relationship between the old and new models is not replacement but co-existence or convergence.” Respondent 13 on the other hand, talks about ‘competitive cooperation’, a popular concept amongst Chinese publishers thinking about digital transformation:

The future of academic publishing will be around the core function of scholarly communication and various publishers, technical providers, and packagers provide different information services for the same system. In other words, the wider and deeper division of labour and service between traditional and digital publishers will be a trend in future. It happens by competition, as a result of which, firms with the best expertise dominate their own specialized areas. This is what is sometimes called “competitive cooperation.”\textsuperscript{256}

It is natural that a variety of views exist. The transformation of the academic publishing industry associated with open and networked models is a complex process involving competition, convergence, and co-evolution between the old and new systems. The different perspectives provided by stakeholders interviewed in this research are not in conflict. Rather, they might be understood as addressing different aspects of a continuing process of transformation.

\textsuperscript{254} According to author’s interview with Respondent 12.
\textsuperscript{255} According to author’s interview with Respondent 10.
\textsuperscript{256} According to author’s interview with Respondent 13.
New digital players are challenging the monopolies enjoyed by established publishers within the traditional system and employing open and networked models in order to do so. For traditional publishers, it is foreseeable that neither the copyright protection that ensures Western publishers’ control over access to scholarship, nor the governmental protection that ensures the profitability of traditional publishers in China, will be enough to guarantee survival in a changing world. Competition is increasingly fierce and if traditional publishers hesitate to provide instant, open, and collaborative scholarly communication, new players are willing and able to do so.

What is happening at the moment is the separation between the communication and certification aspects of academic publishing, which are increasingly being provided by different players within the sector. The emerging system is playing a more important role in the communication of scholarship, but still struggles to provide authors with the publishing credits they need for career advancement purposes. Traditional journal and monograph publishing is assuming more certification functions, but its role in disseminating scholarship and mediating academic discussion is being marginalized. The growing separation of communication and certification results from the fact that the credibility of social certification mechanisms has not yet been fully established. Just as Prof. Wu Yishan argues:

Social assessment is capable of assessing popularity; But expert opinion remains the most trustworthy method for assessing the value and quality of academic publications. This is the reason that in a digital age, traditional journals are focusing
more on certification than before, and informal approaches are becoming even more essential in communication.  

In the competition between emerging and existing publishers, both sides are learning from each other and re-configuring a variety of old and new models in order to develop a viable and efficient publishing system. They are willing to adopt suitable technical, communicative, and commercial models, even widely used in the opposite system but with an insistence of their own value, culture, and preference. This is a process of convergence between emerging and traditional publishers. Meanwhile, a variety of academic publishing models including open and networked ones are competing with each other. As a result the most viable and adaptive models will be amplified by both emerging and traditional publishers, whilst others are eliminated.

7.2 The Selection by Academic “Market”

Markets “provide a means of shifting resources toward fit modules and away from unfit ones, thus amplifying the fit modules’ influence.” (Beinhocker, 2006:294). The future of open and networked approaches to academic publishing in China heavily depends on their ability to command a variety of academic publishing resources, such as creative human capital, funding, symbolic capital, and intellectual property assets. The emerging system is competing for these resources with the established system. The selection is not happening in institutional markets as in the traditional academic publishing system; rather, emerging publishing models are being selected by a wider academic market through consumption. The decisions of individual academics,  

257 According to an interview by author.
academic institutions, disciplinary communities, and the Chinese government are all playing a role in these selection processes.

7.2.2 Being Selected by Academic Population

7.2.1.1 Individual Academics’ Concerns

The concerns of the academics using open and networked publishing initiatives reflect their need for scholarly communication tools, publishing credits and the symbolic capital that will help them to secure promotion within academic institutions. It is thus not a question of whether academics like or dislike a particular method of publishing, but whether a platform on offer is an efficient mechanism for helping them to secure the tools and resources they need. As many of the academics and publishers interviewed for this thesis pointed out, the scarcest resource for academics is time. When it comes to open and networked initiatives, most academics welcome and value their innovations but hesitate to invest precious time and energy engaging with them because they are not able to provide the publishing credits and symbolic capital that would make doing so worthwhile.

Academics have multiple identities within academic publishing and scholarly communication systems. As authors, academics care about both the communication and certification of their works. Widely disseminating research outputs helps researchers to maximise their influence within scientific communities and increases with the number of times their work is cited, a key measure of performance within the formal evaluation system. Academics in China are willing to share their publications via open platforms like blogs, open access repositories, self-archiving, and other
social media. However, existing certification models restrict wider uptake of emerging publishing platforms and online preprints. Chinese academic authors value the registration of priority and publishing credits more than dissemination, as a result of which formal publications remain the first choice of most academics in publishing original knowledge. Dr. Ren Shengli is a researcher in information science as well as deputy chief editor of a reputed journal. He argues that: “personally, I don’t submit my works in informal online media like blogs before they are formally published by a reputed journal. If you share the original ideas online before formal publication, aren’t you afraid of being plagiarised?”

Open and networked publishing platforms thus find it difficult to provide authors with the practical outcomes that they need in a highly competitive, metrics oriented academic system in China. Respondent 21 points to his University’s evaluation system as a key impediment to using open and networked initiatives: “they don’t accept online original papers for evaluation, no matter how highly assessed your work is and how widely it disseminated.”

As readers, academics welcome free content regardless of whether it comes through open access platforms or unauthorized online sharing. Time-reward efficiency also applies to readers’ selection of open and networked models. Most users on the social reference management website of New Science indicated that the key motivation for their use is the convenience and efficiency this model provides in terms of seeking and managing literature. With regard to the online papers with light peer review or without peer review, the attitudes of Chinese readers interviewed for this research varied. Traditional publishers’ gatekeeping is valued because it saves readers time. This is why quite a number of academics prefer formal publications and hesitate to

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258 According to author’s interview with Dr. Ren
259 According to an interview by author.
“waste” time reading or citing papers that are of uncertain quality. However, highly specialised academics are interested in reading uncertified literature in order to see the latest research and to find inspiring or novel ideas.

Optimistic commentators discussing the value of open and networked technologies tend to take for granted that readers possess surpluses of time, attention and creativity (Shirky, 2010). However, in reality these resources remain precious for the Chinese academics required for social peer review, collective filtering, and crowdsourcing scholarly content through emergent publishing platforms. Though academic readers have the ability to judge the quality and value of academic content, they also have concerns about time-reward efficiency, in particular whether they are willing to write a review or comments in as serious and informative a manner as traditional peer reviewers. This is a crucial obstacle for social peer review systems in China. The two case studies chosen for this thesis suggest that high quality critical reviews of the work of other academics remain scarce in open and networked environments. Readers appear to be more willing to spend time social networking. Just as Dr. Ren Shengli points out: “most users do not regard online initiatives as a place to conduct serious and in-depth scientific communication, but a platform to expand social networks.”

As David (2003:58) argues: “‘open science’ depends upon a specific nonmarket reward system to solve a number of resource allocation problems.”

Professionalization has transformed scientific research into a job and linked science with formal demands for publication metrics. The Chinese academics who currently

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260 According to author’s interview with Dr. Ren, Prof. Chen Weichang, and Respondent 17.
261 According to author’s interview with Respondent 20 and 21.
262 According to author’s interview with Dr. Ren Shengli
share original research outputs via open and networked online initiatives tend to be idealistic in their visions of science and the role of their research, rather than pragmatic and promotion focussed. Just as Respondent 23 argues: “I don’t want any promotion in my career… so publishing papers for me is only disseminating my ideas to society”. Additionally, Respondent 22 says: “at my age, fame and economic rewards are nothing to me.” However, most academics in China have little choice but to conform with the demands of university evaluation systems. Just as Respondent 24 points out: “without the pressure of material rewards and academic evaluation, scientific research would be free, open, and enjoyable. However, most academics around me are working just to make a living rather than because they are enjoying science, just as freelance writers might churn out words in order to generate royalties.”

7.2.3.2 Institutions, Disciplines, and Communities

The attitudes towards open and networked models vary widely among research institutions and universities in China depending on discipline-specific issues, academic culture, and managers’ personal preferences. In an effort to establish a fair and objective evaluation system and to encourage productivity with a huge academic population, China’s academic evaluation system has increasingly come to depend on simplistic publication metrics. As Respondent 9 points out: “the evaluation system is closely related to personal interests and competition among academics. There is consensus that it is much more difficult to publish in print journals than online. How

263 According to an interview by author.
can an evaluation system accept online publications if 90% can be easily published?"\textsuperscript{264}

The dominance of publication-oriented evaluation approaches has also created pressure for individual institutions in China to compete with one another on the basis of the number of publications and citations their academics are able to produce. This is a crucial determinant in assessing the rank of Universities and plays a decisive role in access to funding. Even if an individual institution is aware of the problems of the existing system, changing their approach to academic evaluation would come at the expense of their institution’s reputation, ranking and income. Respondent 16, as a manager of academic evaluation, talks about such a dilemma: “We know that these initiatives are valuable and represent the future. We also encourage our staff to use these new models. Regarding publication-oriented evaluation, we clearly understand its limitations, but at the moment, it is hard for university evaluation to make radical changes. That is the business of policy makers at higher levels in the academic system.”\textsuperscript{265}

Some specific disciplines have been faster to adopt open and networked models. High energy physics and biology are two examples of this. This is partially because some disciplines value the fast exchange of knowledge more than the certification of research outputs. Another reason is that successful initiatives like arXiv and Plos One originated in and focus on specific disciplines. In the Chinese academic system, each discipline is more like an independent domain in terms of setting up unique social norms, allocating research funding, and so on. As such, in Chinese universities

\textsuperscript{264} According to an interview by author.
\textsuperscript{265} According to an interview by author.
detailed evaluation policies are usually made at the level of departments, i.e. by a disciplinary community instead of university managers. In each discipline, leading academics become the most powerful and influential people in nominating high impact journals or open initiatives for communication and certification. The original success of Plos One was closely linked to support from a few Nobel Prize winning biologists. Science Paper Online has learned from this model and invites almost all famous scholars in a wide range of disciplines to support and endorse its publishing initiative. This is helping the platform to be taken seriously and encouraging its inclusion within the scholarly communication landscape. Nonetheless, even in the most open and dynamic disciplines in China, such as high-energy physics in which sharing original research outputs before formal publication has become mainstream, it remains the case that only formally published papers are considered acceptable by University administrators for evaluation purposes.

The dominance of the established academic publishing system in China has resulted in a high level of path dependency. Many academics believe that although the existing system is not perfect, “there is nothing better and it has the advantage of already being in existence” (Hoeffel, 1998: 1225). Many interviewees regarded traditional peer review and publication-oriented evaluation as a “necessary evil” and were not especially interested in alternatives.

Compared with offline institutions, an open and collaborative atmosphere is emerging in online virtual scientific communities in China. To some extent, a variety of online communities based on open and networked initiatives have attracted a large number of open minded academics who are willing to share ideas, communicate with peers,
and are less conscious of evaluation and certification issues. Trust and collaboration is more easily established there. Informal online communities are disrupting offline administrative and disciplinary organizations, and organizing social communication of scholarly knowledge in different ways. This is creating an enabling mechanism for a more open and networked future for academic publishing in China.

Within China’s wider scientific community collaboration and competition, trust and distrust co-exist amongst academics. These tensions are crucial in the selection of open and networked initiatives by various scientific communities. The traditional publishing and academic evaluation system in China, which includes formal peer review and certification by publishers and emphasises the ‘publish or perish’ maxim, is a competition-oriented system that focuses on distinguishing scholars and rewarding winners. Such a system is highly institutionalised and has resulted in trust of institutional authority replacing trust in peers. The absence of peer-to-peer trust in scientific communities is an important obstacle against collaboration in academic publishing and thus the positive selection of open and networked initiatives. Trust amongst academics has been further eroded in China as a result of a growing sense of utilitarianism, as well as widespread academic misconduct and plagiarism. In such a context, even open-minded academics worry about negative results of sharing valuable ideas with strangers. Respondent 9 argues: “because the Chinese academic atmosphere is not normal, it is very important for the legal system to protect the knowledge priority of online publications. Otherwise nobody will dare to publish
original ideas because research outputs or valuable ideas will immediately be stolen by others.”

The open and networked publishing alternatives discussed in this thesis are introducing a collaboration-centric academic publishing system in China and helping to build trust within academic communities through a series of technical, communicative, economic, and cultural models. Nonetheless, cultivating trust within Chinese academia will take time and also depends on changes in policy and evaluation frameworks, as well as shifts in the social norms that govern academic communities. However, a growing number of academics are beginning to understand, try out, and choose new models of academic publishing.

7.2.3.3 Division of Academics

Unlike convergence and co-evolution between old and new business models in the academic publishing industry, the social selection of open and networked initiatives by academics in China suggests a divergence of academia between open minded academics and their more conservative peers, and between optimists and pessimists regarding the open and networked future of academic publishing.

This divergence happens at three levels, namely: individuals, organizations, and disciplines. Like evolutionary competition between emerging and traditional publishers, there is also competition between open-minded academics and their traditional peers in exploiting and embracing open and networked communication for academic publishing. Prof. Wu Yishan argues that open and networked initiatives

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266 According to author’s interview with Respondent 9, the founder and former chief editor of a reputed university journal.
have only made already open-minded people more open, while failing to change the attitudes of more conservative scholars. Rather than being won-over, conservative academics are becoming even more cautious about and resistant to collaborative online scholarly communication.267 Open and networked initiatives provide a practical communication-oriented system, as a result of which open-minded scholars are able to do things differently and to avoid confronting the prejudices of their more traditional peers. This is intensifying pre-existing divisions within academic communities.

Though to date most Chinese research institutions have adopted conservative policies in relation to informal publications and social assessment competition amongst institutions remains powerful. If institutions that employ more open evaluation policies benefit from higher levels of academic productivity and innovation their competitors are likely to follow their lead. A growing number of top research institutions in China are beginning to experiment with new approaches, including the encouragement on open and collaborative communication.268

Divergence at a disciplinary level is more complex. Disciplinary differences in academic practice have existed for a long time in China. Open and networked initiatives as a communication system should not be expected to fundamentally change social norms in all disciplines; rather, new models are amplifying existing dynamics that may drive greater change within specific disciplines. What has happened in high-energy physics and mathematics in China, suggests that the advancement of open and networked models fits well with disciplinary preferences

267 According to author’s interview with Prof. Wu Yishan
268 According to interviews with Respondent 8, 14, 15, 16 by author.
for the fast exchange of ideas and open debates about new developments, as it does in other markets.

7.3 The Influence of Policy

7.3.1 Bottom up or Top Down?
The selection of open and networked models by academic “markets” is by nature a bottom-up social transformation. However, academic publishing in China is a complex system, in which consumer demand is shaped by a variety of policies and regulations; while publishers are cross-subsidized, endorsed, and protected by institutions and government. The overall selection of open and networked initiatives in Chinese academic publishing is thus heavily influenced by governmental intervention and policy frameworks relating to scientific research, higher education regulation, and academic publishing. Although this may be true to some extent in all systems, it is especially true in China where government control is very strong.

As Respondent 9 puts it: “The Chinese decision making system is hierarchal. The managers of institutions play a more decisive role in determining which initiatives are adopted than individual academics. But government policy can determine managers’ opinions.” Many respondents believe that government policy will be crucial for the meaningful transformation of the Chinese academic publishing system. Respondent 16 argues: “Government policy is a big stick and academics and institutions can only obey and adapt to it.”

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269 According to an interview by author.
270 According to an interview by author.
is a very effective way to implement new ethos and models, and drive changes in the Chinese academic system.\textsuperscript{271}

In addition to general regulation, the Chinese government is also the nation’s biggest funder for scientific research and the owner of both universities and academic publishing companies. The Chinese government can influence the academic publishing system in a number of ways: it has the power to set or change the regulation frameworks that shape the academic publishing industry, as well as to determine the academic policies that create demand for different aspects of academic publishing.

\section*{7.3.2 Regulating Digital Academic Publishing}

The Chinese publishing industry is regulated mainly by the Chinese National Bureau of Press and Publishing. According to this bureau, government control of the academic publishing system in China is intended to ensure the “sustainable and healthy development” of the sector, rather than to effect censorship and control over the ideas of the academic community.\textsuperscript{272} In an effort to ensure quality and credibility, the Chinese government has attempted to restrict the overall scale of academic publishing, limiting the number of scholarly journals and monographs by controlling the availability of publishing numbers. However, this system also helps to protect the monopolies enjoyed by state-owned publishers who may be poorly suited to

\textsuperscript{271} According to an interview by author.

\textsuperscript{272} See a speech given by the deputy head of the Chinese National Bureau of Press and Publishing, Mr. Li Dongdong at \url{http://sygl.alljournal.ac.cn/ch/reader/view_news.aspx?id=20100914140444001}
competing on a commercial basis but who have access to a significant volume of publishing numbers.

Digital publishing is disrupting this administrative structure because Internet publishing exists in a blurred regulatory area and does not require publishing numbers. The National Bureau of Press and Publishing cannot regulate online academic publishing in the same way as it has regulated traditional counterparts, although it is trying to control digital publishing by introducing new regulations, formalising big digital publishers, and setting higher market entry barriers for corporate registration. Meanwhile, other regulatory departments such as the Ministry of Industry and Information Technologies, the Ministry of Culture, and the Ministry of Education also have administrative power in online academic publishing areas. The blurry nature of the regulation system that relates to online publishing in China is making it possible for non-publisher stakeholders to engage in the academic publishing business, and allowing open and networked initiatives space to grow. There are analogous trends in other media industries in which the emerging Internet players challenge the existing regulation and power structure, for example, the rise of YouTube, Netflix, and its impact over the TV industry, the growth of Chinese online literature portals like Shengda that marginalized traditional literary publishing (Ren and Montgomery, 2012).

7.3.3 The Influence of Higher Education Policy
Changing higher education and scientific research policies in China are having a profound impact on the transformation of the academic publishing landscape. The Chinese government has not yet issued any policies that specifically target the
emergence of more open and networked publishing initiatives. However, policy makers in China are acutely aware of the problems of the traditional system, the socio-technical dynamics in the Web 2.0 environment, and changing academic demands within 21st century scientific communities. At the same time, the insistence on governmental control and the essential role of “Big Men” in driving social change in China remains unchanged.

Chinese policy makers have realised the limitations of the publication-oriented evaluation systems and have issued numerous policies to discourage the adoption of simplistic evaluative indicators. For example in 2011, China’s National Ministry of Education issued a policy that “it is unreasonable and undesirable to use a single indicator to rank and evaluate universities … International indexes like SCI, SSCI etc. only capture some aspects of research quality and should not be used as sole criteria for evaluation.”273 Policy makers are trying to establish a comprehensive, objective, and widely accepted evaluation system to replace highly controversial existing approaches. A senior official in the Chinese National Ministry of Education expressed the principles of ideal evaluation as follows:

Evaluation should be based on three aspects: research; education; and industrial application. According to the Chinese environment, assessments of academics and universities should examine contributions to social and economic development, which is the application of research outputs, the cultivation of creative talent, internationally approved patents, and wider collaborations with industries. 274

273 http://edu.cn.yahoo.com/ypen/20111108/685102.html
274 http://www.paper.edu.cn/index.php/default/info/info_detail/3020
Concerns over the damaging impacts of an overly elitist academic system are also producing policy initiatives that favour more open and networked approaches to academic publishing. The Chinese government has ambitions of becoming a global leader in science and technology, and building internationally respected universities. Through publication-oriented evaluation, the Chinese government hopes to establish a system of competition and to stimulate academic innovation and productivity. Accordingly, the government is able to allocate more resources to high performing universities, research institutions and academics. It is hoped that this approach will shorten processes of scientific development and help the nation to realise its research and higher education ambitions quickly.

However, this approach has produced a backlash from academics concerned that elitism and administrative intervention in the allocation of academic resources is damaging the majority within the academic community, reinforcing dysfunctional hierarchies and bureaucracies, and creating conditions that foster corruption. Moreover, the social transition in China towards a society based on creative citizenship and a knowledge economy is also challenging centrally planned, elitist models for scientific development and the “publish or perish” numbers games played within academic institutions. Open and collaborative ideas are being taken up and promoted widely in China. In 2011, the Chinese government issued an official annual report of scientific communication. This report placed particular emphasis on the importance of communication between scientists and the public, as well as the public “trust” of the academic community, which the report identified as a major area of weakness in China.  

as an exclusive system and a growing number of the concerns of citizen scientists are being heard by policy makers.

Associate Prof. Liu Xinlin’s story earlier in this chapter highlights the deeply problematic nature of existing publication-oriented criteria for academic evaluation in China. It also raises a fundamental issue regarding scholarly research and publishing: “what is science for?” Just as Liu himself argues:

At least in my area - social science and the humanities, I can’t really see the capacity of the established academic publishing system to disseminate my thoughts and ideas widely in society and to help make social changes. However, most of my academic colleagues are devoted into producing a great number of useless papers, just for academic credits and career promotion. The sad truth is very few read these co-called scholarly publications in China. So what is your research for? If your ideas cannot enlighten people or make our world better, what is the value of your research?276

The third aspect regarding policy change in China is the role of government in the transformation of the scholarly communication landscape. In the practice of open and networked initiatives, the Chinese story provides an interesting case in which government intervention and administrative power are being used to facilitate the adoption of more open approaches, as well as the digital transformation of academic publishing. The Chinese government here is not only an administrative regulator but also a sponsor and supporter of the services of a more innovative open publishing system. The investment of government resources makes the not-for-profit nature of

276 According to author’s interview with Associate Prof. Liu Xinling.
academic publishing initiatives like Science Paper Online possible. At the same time, official support helps to establish the credibility of emerging digital publishing platforms and helps to smooth the way for new approaches.

The Chinese academic publishing landscape is very different from academic publishing landscapes found elsewhere in the world. Nonetheless, the case studies discussed in this thesis highlight the challenges that new approaches to scholarly communication face and the positive role that governments can play in facilitating innovation and evolution.

Nevertheless, the involvement of government in the transition to open and networked digital publishing futures also carries risks. There is a danger that government-operated mandates will threaten the positive aspects of market dynamics amongst emerging publishers and lock non-government players out of emerging commercial spaces. Grassroots initiatives like New Science and Miracle Repository suffer greatly from a lack of either financial sustainability or official support, making it difficult for the promising innovations being developed by smaller players to compete with the existing publishing system. It seems likely that the benefits of democratized knowledge and an inclusive innovation system will be secured through bottom-up rather than top-down processes of experimentation and changes in academic practice and attitudes. This is not to say that the Chinese government does not have an important role to play, particularly in terms of relaxing the regulatory environment that governs academic publishing. Strategies intended to encourage innovative platforms and the acceptance of new models of knowledge certification are likely to

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277 According to interview with Prof. Ji Yanjiang by author.
be as important as direct government involvement for the future development of the Chinese academic publishing system.

7.4 Conclusions and Implications

7.4.1 Answering Research Questions
This thesis has not approached open and networked initiatives only as technical updates or supplementary to the established academic publishing models; instead, they have been approached as an emerging alternative to the traditional system. A central concern driving this research has been whether there are new models or new systems capable of assuming the basic functions of academic publishing, i.e. communication and certification of scholarship in the Web 2.0 age and social media environment. It has also asked how such disruptive innovations might be made more adaptive and viable, and more likely to meet the social demands of formal scholarly communication in the twenty-first century.

China provides a valuable case study for researchers interested in emerging models. The academic publishing system in China is less developed and more problematic than is the case in many Western systems; However, it is also evolving quickly at technical, economic and social levels, creating an environment which is ripe for innovation and digital disruption. In Chapter 1, this research asked what the role of open and networked initiatives are playing in the digital transformation of academic publishing in China. It also set out three sub-questions to be addressed in the thesis. The answers to these questions are summarised as follows:
Research Sub-Question 1: How are viable adaptive models being developed by open and networked initiatives?

Open and networked initiatives in China are developing viable models for academic publishing through deductive tinkering: continuously experimenting with innovative models and modifying them according to feedback from the users and other stakeholders. Emerging digital publishing models in China are not being designed in advance. Neither are they simply being copied from Western counterparts. Rather, they are arising as a result of interactions between the socio-technical dynamics of Web 2.0, open science, and the contexts of Chinese academic publishing. Adaptive innovation is the outcome as well as the defining feature of such a process.

Research Sub-Question 2: What are their innovations in terms of communication and certification of scholarship?

The fundamental innovation of open and networked digital publishing initiatives in China is the blurring of boundaries between formal and informal, and between public and private aspects of scholarly communication. This innovation is reshaping the value proposition being made by Chinese publishers. As a result, gatekeeping, distribution, certification and copyright are becoming less valuable, while the capacity to effectively enable and mediate a self-organized open publishing community, in which academic participation, value co-creation, and social collaboration are essential is becoming more valuable. Close relationships with end users are helping open and networked academic publishing initiatives in China to begin restructuring publishing value chains. Compared with traditional journal and monograph publishing operating within academic ivory tower, the open and networked initiatives help to improve the
communication between academics and the wide public and thus promote ethos like open science or citizen science in the Chinese learning society.

Research Sub-Question 3: How are the initiatives improving academic publishing and impacting existing business models and social norms in China?

Open and networked digital publishing platforms are translating abstract ideals relating to more open and collaborative scientific communities into academic publishing business models. These initiatives are attempting to address the weaknesses of China’s traditional academic publishing system, to discourage academic misconduct and to enhance processes of innovation and discovery.

However, the transformation of complex communication landscapes rarely happens overnight. It is also rare that the transformation of an entire industry occurs without resistance from the dominant system and the stakeholders that profit from it. The future influence of the emerging digital publishing system will depend on how many academics use it, who these academics are, and what they use it for. This research explored the impact of open and networked digital publishing initiatives in China by examining stakeholder selection processes.

In China’s academic publishing industry, there is competition between the emerging open and networked system and the established system mediated by traditional publishers. As a result, the former is playing an increasingly important role in the efficient communication of scholarship, while the latter continues to be valued for its authoritative certification functions. At the moment, the traditional academic publishing system remains dominant and powerful. However, convergence is also evident. Both emerging and existing publishers are learning from each other and
reconfiguring radical innovations and traditional models in order to better serve their own purposes.

The scientific community in China is divided in attitudes towards and selection of open and networked initiatives. There are a range of perceptions of and attitudes towards open and networked alternatives to the traditional publishing system at individual, disciplinary, institutional, and national levels. Academic perceptions of the time-reward efficiency of using emerging platforms, their information literacy, as well as a variety of cultural and social factors that favour the old system remain strong constraints. A large proportion of China’s academic population prefers traditional journals and monographs to open and networked initiatives for both the publication and consumption of scholarly content. It is still very difficult for an academic community to find widely accepted ways to approve and reward research outputs published on open and networked digital publishing platforms in China.

Nevertheless, the emerging models have powerful advantages in meeting the social demands of academics in a collaborative environment of e-science and open science in the 21st century, which many Chinese academics believe is the future of science and academic publishing. In China, open and networked publishing initiatives are providing alternatives outside the established system, which is enabling pioneering academics to communicate science and engage in research in different ways. This research also found that a growing number of academics and stakeholders are holding positive attitudes and behaviour regarding the initiatives. As such, the social norms evaluation policies, and higher education regulation that shape academic publishing practices are co-evolving along with technical dynamics and business innovations.
7.4.2 Implications of this Research
This research surveys the innovations, impact and emergence of open and networked initiatives in Chinese academic publishing as if they were alternatives to the traditional publishing system. In reality, there are a variety of integrated and hybrid models of publishing and the boundaries between traditional and open, and between the mainstream and the alternative are blurring. Nevertheless, open and networked digital publishing models that are emerging in China tell us a lot about how innovation within academic publishing systems occurs, the role that users, entrepreneurs and policymakers play in these processes and the ways in which evaluation frameworks, academic practices and business models co-evolve. This research therefore tells us a lot about the changing academic and publishing landscape in China. However, it also provides lessons for policymakers and practitioners interested in the potential of open and networked digital affordance to supplement or even supplant established academic publishing models in other markets.

A key issue identified in this research has been the tension between systems for communicating and certifying scholarship. Demands for each of these functions of academic publishing are increasingly in conflict, as new technologies are changing the ways in which content can be published and shared and systems for certifying academic knowledge claims struggle to catch up. Certification of scholarly content remains an important source of power for academic publishers, both in China and elsewhere. It also remains important for academic communities, research institutions and funders in all academic systems. Understanding the role of emergent technologies in shifting boundaries between formal and informal, and between public and private
scholarly communication thus has important implications for publishers and scholars in all markets, not just in China.

**Open Access**

In the wake of the UK government’s 2012 announcement of its decision to implement the open access publication of all publicly funded research highlights the importance of understanding processes of publishing industry transformation and the impact of open and networked digital technologies throughout the academic world. In the context of debates about ‘green’ and ‘gold’ models for achieving public access to publicly funded research, the integrated open access model developed by Science Paper Online deserves more attention. Science Paper Online has established a huge database of open access journals, self-archived publications, online preprints with post-publication peer review. This Chinese open access model does not represent either a typical green or gold approach; Science Paper Online is an ambitious and thoughtful example of the ways in which green and gold funding models can be used together. Science Paper Online’s government backed ambition to establish an interactive and collaborative scholarly communication system and to provide an alternative to deeply problematic traditional publishing channels may provide a valuable model for reformers in the UK, Europe and the United States. Although the specific conditions that are giving rise to Science Paper Online may be unique to China, it would be foolish of those interested in possible alternatives to existing publishing models to ignore the lessons that might be taken from such a large scale experiment.

**Innovation in Certification**
Although problems of corruption and tensions between communication and certification within China’s traditional academic publishing system may be more acute in China than in other markets, important parallels exist between what is happening in China and the challenges facing scholarly communication globally. Established systems of knowledge certification including publisher-organized peer review, impact factors and citation-based impact assessments are also the subject of scrutiny and criticism in other markets (Angell, 1993; Hoeffel, 1998; King et al., 1997; Nentwich, 2005; Spier, 2002). Moreover, the corruption that plagues commercially driven vanity academic publishing in China provides a stark warning to Western systems about the dangers of unrestricted gold models of open access. The danger that some publishers will be tempted to exploit gold models to their own advantage and that predatory publishers may “… unprofessionally exploit the gold open-access model for their own profit” is not imaginary. Encouraging open and transparent peer review processes must be a vital part of any effort to increase access or to change the way that the costs of publishing are funded.

Chinese experiments are also interesting because they allow us to see how open and networked models originally developed in the West are being adapted to address this very problem of supervision, transparency and publishing industry corruption. Systems that increase the transparency of peer review and knowledge certification processes through the use of digital platforms and Web2.0 affordances are providing a mechanism through which the authority and power of publishers in certifying scholarship can be made subject to surveillance and community based auditing. In the context of debates about green and gold models of open access, appreciating the value

278 See http://metadata.posterous.com/83235355
of new models of knowledge certification and open and networked publishing innovations has important potential to help policymakers and academics to design more effective scholarly communication frameworks and policies.

**Redefining publishers’ role in open and networked environment**

In a Western context, although policy shifts in favour of open access publishing are important, they are not able to simply legislate away tensions between the interests of commercial publishers and academic communities that have existed for decades. Gold open access policies are encouraging publishers to develop business models that do not depend on subscription revenues. Moreover, green open access mandates are challenging the distribution dominance of publishers by encouraging authors to self-archive their work in publically accessible repositories. As such, publishing business models are changing being pushed towards facilitating peer review and control over the physical production and distribution of academic papers is moving elsewhere. It is unlikely that publishers will be able to maintain high article processing charges as the role of publishers in the academic communication landscapes is narrowed (Harnad, 2010). Publishing industry unease at the loss of control associated with more open models of academic publishing are common to both the Chinese and Western academic publishing systems. Given the growing role of Chinese authors within wider global scholarly communications landscapes, understanding how these tensions are playing out within China is important for academics interested in the dynamics of a changing publishing landscape is prudent.

This research has found that although new technology is an important factor in the redefinition of publishers roles in the emerging digital landscapes, they must be
viewed in a wider context of shifting power relationships between publishers and academic communities. This tension is more obvious in China than may be the case in other markets due as a result of government-protected publishing monopolies and a politically controlled academic system. Nonetheless, the shifts in power that are being made possible by open and networked initiatives involve the reallocation of resources and interests among stakeholders. It seems unlikely that this can occur without casualties in any market.

It has not been the intention of this research to simply laud emerging initiatives or criticise more traditional publishing models. Examining the complex practices of open and networked digital publishing experiments in China has identified a continuing process of co-evolution not only between new and old approaches to publishing, but also amongst technology, business models, social norms, and policy. Pressure to compete effectively within a changing market are pushing all of the stakeholders within the Chinese academic publishing system towards more efficient and dynamic models of scholarly communication and certification and more democratic mechanisms of regulation and supervision. Innovations being made by both existing and emerging publishers, and both the academic and publishing communities are drivers in this process.

7.4.3 Limitations and Future Research

This research explored a rapidly evolving area of academic publishing in China. Networked technologies, social norms of open science, digital publishing business models, and higher education reforms in China are all changing quickly. As such,
keeping pace with the latest developments has been a key challenge. This challenge has been compounded by the difficulties of documenting what remain highly experimental publishing models that are at a very early stage of development. Although these experiments are occurring on a vast scale and having a remarkable impact within China, how the processes described in this research will evolve in the future remains uncertain. As a result, this work raises a number of important and interesting questions that cannot be definitively answered at this moment in time; This research is, therefore, intended as a starting point for further practical and theoretical exploration.

Research that could follow on from this PhD includes:

(1) Exploring how cloud computing, big data and mobile Internet affordances are being taken up within academic publishing. These technical innovations are making it possible for social collaboration and crowdsourcing to occur on a new scale and to be applied to areas that have not previously been considered. For example, the large-scale sharing of lab data via cloud platforms, alter-metrics with precise and comprehensive counting of usage facilitated by big data technologies, and social collaboration and sharing enabled by mobile Internet. All these dynamics are closely related to the academic concerns of this work and worth exploring in more detail.

(2) Many of the arguments made in this thesis could be fruitfully revisited in the future, when change has had more time to occur. For example, the redefined value proposition of academic publishers as an enabler and organizer of academics’ self-organized publishing communication, the creative destruction by
the initiatives in academic publishing industry, and the influence of open science in the transformation of social norms governing scholarly communication. It is still early for this research to make conclusions on these fast evolving issues, but they will be areas worth pursuing in the next few years.

(3) The usage of open and networked initiatives by academics deserves more quantitatively informed scrutiny. This research mainly relied on interviews to interrogate academic usage patterns and attitudes towards new communication models. However, larger-scale surveys of academics in China would provide valuable insights into broader trends and behaviours. It would also be interesting to employ computational methods to gather information about how a large number of academics are using digital technologies in practice. The ability to combine critical and qualitative perspectives with empirical data would powerfully strengthen insight into the dynamics of changing academic publishing landscapes.

(4) This thesis is based on Chinese academic publishing and has made minimal comparisons between what is occurring within China and what may be happening in English language publishing markets. However, there are important parallel developments and debates in countries like Germany, France, Italy, Japan and India. A greater comparative focus for research on changing academic publishing landscapes would be valuable.
Appendix 1: Sample of Interview Questions

Interview questions for participatory users of online publishing platforms

(1) What academic content do you contribute to digital pre-prints platforms? Why?
(2) How do you use academic social bookmarking services to search and share references with research peers?
(3) Can you compare digital preprints platforms and online reference management with traditional academic publishing?
(4) As a consumer, do you trust the quality of informal scholarly content or academic crowdsourcing?
(5) Why do you read informal publications rather than published scholarship?
(6) Are you satisfied with the current situation of academic publishing in China? What are the major problems?
(7) What do you think of peer review, publication-oriented evaluation and the commercialisation of academic publishing?
(8) Do you think “Science 2.0” helps to deal with the problems of traditional academic publishing and Chinese academia?
(9) Do you think academic publishing 2.0 based on open access and Web 2.0 models is the future of digital academic publishing in China?
(10) What potential contextual determinants can you identify?

Interview questions for digital publishers

(1) As editors of online publishing platforms, how do you encourage and organise academic user co-creation and participation?
(2) As managers, what is the mission of your platform? Is it related to Science 2.0?
(3) What is your business model and revenue source?
(4) What is your key human resource? How and by what rewarding system do you attract them?
(5) Do you think a lack of credibility disadvantages digital academic publishers? How do you build and maintain you brands and profile in academic contexts?
(6) What are your strategies for dealing with copyright issues? Do you have copyright cooperation with traditional publishers?

(7) What role do you think you will and should play in the digital academic publishing industry in China?

(8) What contextual constraints and dynamics can you identify relating to the development of your platforms in China?

(9) How do you define academic publishing 2.0?

**Interview questions for traditional publishers**

(1) What do you think of the current situation of the Chinese academic publishing industry? (Is it in crisis? Does it need reform?)

(2) What are the major problems?

(3) How will you adopt Web 2.0 and Science 2.0 paradigm in your digital publishing business?

(4) What do you think of the influence of alternative academic publishing platforms in China (especially informal publications and collective referencing)?

(5) What do you think of their impact on the commercial models and the publishing resources distribution in the Chinese academic publishing industry?

(6) What do you think of your competitive and cooperative relationship with alternative platforms?

(7) What do you think of the future trends in academic publishing in China relating to Science2.0 or “academic publishing 2.0”?

**Interview questions for university managers**

(1) What do you think of “Science 2.0” (explain the concept first)?

(2) What do you think the positive and negative influence of informal academic publications and online reference management?

(3) What do you think of the reformation in higher education relating to academic publishing? (Particularly peer review and academic evaluation)

(4) What role do you think of the future impact of alternative platforms based on Science2.0 on Chinese scholarly communication?
Appendix 2: List of Interviewees

According to the ethic clearance, the information of interviewees should not be publicized.
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