

The Great Firewall, Terracotta VPN, and the Social Construction of the Chinese Internet

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i. Introduction

Why does the People's Republic of China treat the Internet the way it does? For most citizens of other high-usage nations, the PRC's Internet regulation seem draconian and impenetrable, something that could have been taken out of a dystopian science fiction novel. An examination of this censorship is incomplete, however, without considering it in the context of the social constructivist nature of technology on both sides of the wall. In the (date) article, *Technology and Society: Building our Sociotechnical Future*, Weibe Bijker, Bernard Carlson and Trevor Pinch describe the "social construction of technology," or SCOTs methodology, as a way of examining technological changes as the result of group and societal outlooks, decisions and priorities, rather than just technology being the main driver¹. By examining the history of internet censorship in the People's Republic of China, a broader, more comprehensive view of Chinese Internet policies can be reached, framing this issue as a relevant, modern, and constantly changing social construction of technology in action. This comprehensive view can be broken up into two sections of Chinese censorship: access blockage and term censorship². First, an overview of material is required to outline what it is that citizens in the PRC are trying to subvert. Once an outline of the Chinese Communist Party's Internet measures and practices has been constructed, we can then examine the actions and motivations of Chinese citizens that combat the Great Firewall, and thus create a complete picture of the unique Chinese internet.

Deng Xiaoping, the leader of the PRC from 1978 to 1989 and one of the most important figures in the development of the PRC as a world power, is credited by many as laying the

¹ Bijker, Wiebe E, et al. "Social Construction of Technology." *A Companion to the Philosophy of Technology*: 88-94. doi:10.1002/9781444310795.ch15.

² Taneja, Harsh and Angela Xiao Wu. 2014. "Does the Great Firewall really Isolate the Chinese? Integrating Access Blockage with Cultural Factors to Explain Web User Behavior." *Information Society* 30 (5): 297-309. doi:<http://dx.doi.org/10.1080/01972243.2014.944728>.<http://search.proquest.com/docview/1629351719?accountid=14696>.

ideological precedents for Internet censorship in the PRC. In the early 80s, as the PRC began transitioning to a more market-based economy willing to accept western influences, Communist leadership in the PRC's ruling party began struggling with ways to allow outside influence and economic gain, but keep the country ideologically homogeneous. As Rebecca MacKinnon points out in her article *Flatter World and Thicker Walls? Blogs, Censorship and Civic Discourse in China*, "One of Deng's favorite sayings was 'If you open the window for fresh air, you have to expect some flies to blow in.' The regime has thus far been successful at fly-swatting[...]"³. Fly-swatting, in the case of the internet, was two-fold: swatting the ideological flies that came from foreign sources, and repressing the ideological flies that were produced within the house itself. The Internet was late in its arrival to the PRC, but in order to adapt to a changing market economy that increasingly relied on the Internet, the PRC began passing regulation to deal with the issues of ideological dissent on the Internet.

Censorship in the PRC comes in many forms, with the largest two being dubbed the Golden Shield project and the Great Firewall. The Golden Shield project, initiated in 2006, describes the PRC's censorship methods for information and providers within its own borders. This censorship includes a range of methods, from altering and regulating search results to removing sensitive topics from social media sites like Weibo or WeChat. In a comparative study between Google, who abandoned China shortly after the study was completed, and Baidu, the PRC-approved search engine, Professor Min Jiang found that "political filtering is often seen as an exception to the otherwise impersonal and impartial operation of search engines", and that the censorship and filtering done on Baidu is more subtle, less noticeable and therefore more

³ MacKinnon, Rebecca. "Flatter World and Thicker Walls? Blogs, Censorship and Civic Discourse in China." *Public Choice* 134, no. 1/2 (2008): 31-46. <http://www.jstor.org/stable/27698209>.

effective in information control than outright blockage of Google results⁴. Chinese censorship within its own borders also involves restricting and removing sensitive topics from social media sites and application. The organization GreatFire, a not-for-profit activist group run by a person alias Charlie Smith, keeps a blog named FreeWeibo that documents the top words and phrases that are being removed by the PRC's censors, as well as displaying messages and threads that have been removed from Weibo that contain controversial content⁵. Blogs like this one, along with the movement in China that uses creative phrasing and wordplay to communicate restricted topics with technically uncensored phrasing, are one way activists combat the PRC's intra-border censorship.

The Great Firewall is what comprises "the other front of the censorship battle", as Eva Dou, writer for The Wall Street Journal, describes it. The Great Firewall, an unofficial name often abbreviated as the GFW, is the massive blocking system the PRC has put in place to prevent access to websites hosted outside of their borders that they don't approve of, including sites like Twitter, Instagram, and Facebook. Subversion techniques are varied: when China blocked Reuters China access within its borders, GreatFire, the organization mentioned before, set up a mirror site hosted through Amazon's cloud that allowed citizens who used Reuters for information in China to access the site post-ban, because GreatFire knew that the PRC blockers wouldn't take down Amazon's cloud service just to stop them⁶. In other instances, like when ultra-nationalist Chinese citizens took to Facebook to demean recently-elected Taiwanese president Tsai Ying-wen and her pro-independence platform, people use Virtual Private

⁴ Jiang, Min. "The business and politics of search engines: A comparative study of Baidu and Google's search results of Internet events in China." *New Media & Society* 16, no. 2 (March 2014): 212-233. SocINDEX with Full Text, EBSCOhost.

⁵ GreatFire.org - Expanding Online Freedom of Speech in China and Beyond. <https://en.greatfire.org/>.

⁶ Rauhala, Emily. "Activists Are Finding New Ways Around China's Great Firewall | TIME.com." *Time*. <http://world.time.com/2013/11/21/activists-are-finding-new-ways-around-chinas-great-firewall/>.

Networks, or VPNs, to scale the firewall. Most cases of VPN uses are benign, occasionally bordering on ironic (Tsai Ying-wen's Facebook page is an example of this, considering the ultra-nationalist promoters of the PRC had to circumvent their beloved PRC's regulations to promote their message), but due to the inherently secretive nature of VPNs, they can become a basing platform for illegal activity both independently and backed by the PRC. The motivations behind these subversive activities are numerous and complex: large majorities of internet users just want access to the connectivity social media can provide⁷ or the wealth of information about China and the world that an unfettered internet can provide⁸, but activist groups like GreatFire and others have a keen interest in allowing access and promoting visibility of controversial material, while more secretive groups like the hacker network Deep_Panda use these techniques to remain relatively untraceable behind the firewall.

The Great Firewall, Golden Shield, and all other regulatory measures imposed upon the internet in China, are attempts to prevent its citizens from developing diverse ideological thought that results from the increased connectivity with the global world via the internet. The internet world at large does not recognize these measures as a natural technological progression; instead, the Chinese internet is unique because it is shaped not by technology, but by government control and citizens trying to subvert said control. This paper, however, does not concern itself with a more comprehensive solution to what the Chinese government considers a problem. Instead, by using the theory of "social construction of technology," the paper attempts to examine the construction itself. This paper will look at methodologies and motivations of Chinese

⁷ Mou, Yi, Kevin Wu, and David Atkin. "Understanding the Use of Circumvention Tools to Bypass Online Censorship." *New Media & Society* 18, no. 5 (2016).

⁸ Jiang, Min. "The business and politics of search engines: A comparative study of Baidu and Google's search results of Internet events in China." *New Media & Society* 16, no. 2 (March 2014): 212-233. SocINDEX with Full Text, EBSCOhost.

“hacktivists,” or those that seek to subvert censorship policies and access blockage, analyze their benign and malicious activities within and without the Chinese internet, and examine the reactions and counter-reactions of the Chinese government and internet users in China. This research will construct a comprehensive picture of the ways in which Chinese internet users interact with the Great Firewall, and the significance that this research adds to the study of technology and society.

ii. The Language of the Internet: Subverting Censorship

A large part of the Chinese internet, often unnoticed or not talked about by laymen in relation to censorship in China, is term-by-term, topic-by-topic filtering and censorship of information. It's often unnoticed or underplayed because it doesn't fall under the domain of the Great Firewall, the most well known aspect. Instead of being a block between outside and inside information, intra-border censorship involves more nuanced control over what it is Chinese citizens can and cannot see. When Min Jiang, professor of UNC Charlotte and University of Pennsylvania, conducted his comprehensive survey of search results between Baidu and Google, he found in his conclusion that “these results suggest that search engines can be architecturally altered to serve political regimes, arbitrary in rendering social realities and biased toward self-interest”⁹.

The PRC has been very adamant about refusing to release the criteria used for blocking terms and topics on a more granular level, but that doesn't prevent activists from being creative about how to get around sensitive material. A well-known example of subversion came in 2009, with the advent of “grass mud horse” (Chinese: 草泥马, cao3 ni2 ma3), a homophone for the

⁹ Jiang, Min. "The business and politics of search engines: A comparative study of Baidu and Google's search results of Internet events in China." *New Media & Society* 16, no. 2 (March 2014): 212-233. SocINDEX with Full Text, EBSCOhost.

phrase “f--- your mother” (Chinese: 禽你妈, cao4 ni3 ma1), written differently and pronounced with different tones but sounding very similar. Originally simply part of a joke article on magical creatures, it was taken up by popular activists like Ai Weiwei, who took a picture of himself wearing nothing but a small plush alpaca entitled “A grass mud horse covering the center”, alternatively interpreted as “f--- your mother, central government”. Music videos were spawned, an official anthem devised, and the PRC’s censorship mechanism went into overdrive dealing with the issue. Wen Yunchao, a specialist in internet issues, said on the subject that “Chinese netizens [...] have started to play the role of social supervisors”¹⁰ as the subtle jab at “soft” censorship and word-filtering by the PRC spread to become one of the most prolific Internet jokes in China.

Phenomena like “grass mud horse” help social and technological researchers better understand how the unique Chinese internet operates. Guobin Yang, scholar of Chinese internet and activism, says in his book *The Power of The Internet in China* that “Power exerts itself through codes, but the codes are designed and implemented by people”¹¹. The censors and the censored develop both technological and linguistic cues in their ongoing battle, and it is social conflicts between the PRC and Internet users that drive these changes, not the technology of the Internet itself. Li Nie, a social blogger and observer of Chinese internet customs, remarked on the incident with this: “Given that the government is enforcing strict censorship on the Internet, Chinese netizens have developed creative ways of online communication to not only escape the censorship, but turn it into a massive anti-government campaign”¹². This demonstrates with

¹⁰ Wen, Yunchao. "The 'grass-mud horses' battling internet censors." The France 24 Observers. October 06, 2010. <http://observers.france24.com/en/20090313-grass-mud-horse-china-internet-censorship-netizens-song>.

¹¹ Yang, Guobin. *The Power of the Internet in China: Citizen Activism Online*. New York: Columbia University Press, 2009.

¹² Nie, Li. “The Phenomenon of ‘Grass-Mud Horse’ on Chinese Internet”, July 13, 2009. <https://blogs.common.georgetown.edu/ln62-netspeak/>

remarkable clarity the theory of the social construction of technology and technological norms in action. Chinese citizens adapt technology to societal desires of communication, and censor technologies then respond accordingly.

iii. Activists and Citizens: Dodging the Great Firewall

The Great Firewall is usually the first thing to come to mind when Chinese internet censorship is mentioned. In fact, a conversation of Chinese internet cannot go by without it being brought up. The Great Firewall is a the informal term for the PRC's restriction on any unapproved websites from outside of China, from Twitter to Google to Facebook and beyond, parts of the internet that seem so inherent and unavoidable in the rest of the world. But, contrary to many strains of popular thought, Internet isolationism in China, comparatively speaking, can be relatively low. In a joint paper between the University of Missouri and the Chinese University of Hong Kong, professors Harsh Taneja and Angela Xiao Wu examined social Internet behaviors and produced a study that “questions the widely held assumption that access blockage results in an isolated Chinese internet from the so-called globalized [world wide web]”¹³. They found that without access blockage, citizens in other countries still tended to congregate in culturally similar markets of expression, even if they were on different platforms. They also “emphasize a sociological approach when examining government control over Internet use in the form of access blockage”¹⁴. While this paper and its conclusion does point in the direction of social construction of technology, it fails to examine the full picture of Chinese internet access

¹³ Taneja, Harsh and Angela Xiao Wu. 2014. "Does the Great Firewall really Isolate the Chinese? Integrating Access Blockage with Cultural Factors to Explain Web User Behavior." *Information Society* 30 (5): 297-309. doi:<http://dx.doi.org/10.1080/01972243.2014.944728>.<http://search.proquest.com/docview/1629351719?accountid=14696>.

¹⁴ Taneja, Harsh and Angela Xiao Wu. 2014. "Does the Great Firewall really Isolate the Chinese? Integrating Access Blockage with Cultural Factors to Explain Web User Behavior." *Information Society* 30 (5): 297-309. doi:<http://dx.doi.org/10.1080/01972243.2014.944728>.<http://search.proquest.com/docview/1629351719?accountid=14696>.

blockage. The market that Chinese users operate within *isn't* a free-access one, and there still are many internet users in China that do willingly reach outside their cultural market and search for access and information elsewhere. The question then becomes why they do it, and what effect it takes on the Chinese internet.

In one of the most comprehensive and innovative studies of censorship circumvention in China, Professors Yi Mou, Kevin Wu and David Atkin examined a multitude of reasons why people would attempt to circumvent regulation. What they found, in their own words, “seems counterintuitive”. The best predictor of ordinary citizens’ use of VPNs or mirror sites was not any particular attitude or activism about censorship: instead, it was best predicted by “such factors as political trust, need to stay in touch with the outside world (and other savvy users), and maintain a smooth information flow”¹⁵. They found that the overwhelming majority of Chinese scientists and researchers used VPNs in their work, not for purposes of political activism but simply to remain connected to the flow of information and the wealth of knowledge that is otherwise restricted behind the Great Firewall. Of the approximately 90 million VPN users in China, about 3% of the internet using population as a whole (which, compared to countries like Iran, is a relatively low number), a large proportion simply use circumvention techniques to stay updated within their own social or professional spheres, as opposed to as a form of political activism or anti-government protest, a striking departure from the kind of “soft” activism that occurs within the bounds of the Great Firewall, on Chinese sites like Weibo or Baidu Baike.

This access blockage, and the reactions of citizens who either do or do not attempt to circumvent it, are some of the largest factors in the social construction of the internet in China. As stated previously, companies like Facebook, Google, and Twitter, all companies that China

¹⁵ Mou, Yi, Kevin Wu, and David Atkin. "Understanding the Use of Circumvention Tools to Bypass Online Censorship." *New Media & Society* 18, no. 5 (2016).

has blocked access to, are practically essential facets of the American internet. But in China, entirely thanks to this access blockage, Tencent, China's domestic Facebook equivalent, has a market share of 185 billion dollars, compared to Facebook 226 billion, entirely thanks to the isolated market that the Great Firewall provides¹⁶. This isolated market, both economic and cultural, isn't entirely technologically driven, however, as both Yi Mou et. all and Harsh Taneja et. all showed in their research. Instead, these technological markets of culture and commerce are driven by the social demands and desires of the citizens of China. Circumvention in China is still a facet of the Chinese internet, but it affects users in much different ways than many people imagine. This, too, contributes to Bijker's assertion that it is social actors and not purely technological ones that drive technological change: in China, the blockages of outside internet and the various measures citizens take to get around that blockage are shaped by the citizenship and society itself.

iv. Terracotta VPN and Malicious Activity

These conclusions, however, still leave big questions unanswered. Chinese usage of the wider internet, from the Facebook comments on Tsai Ying-wen's election to more malicious activities and actions taken against American government agencies and companies, makes news on a regular basis. Chinese internet users repeatedly are involved in "leaping" the Great Firewall in unique and important ways, and exclusively examining citizens participating in non-malicious activity does not create a full understanding of the social construction of the Chinese internet. How do Chinese actors participate maliciously on an international stage, and why do they do it?

An enormous breakthrough to this question, still unanalyzed by social scientists working with technology, came in September of 2015 when the cybersecurity research and consulting

¹⁶ Beech, Hannah, et al. "The Other Side Of the Great Firewall." *Time* 185, no. 23 (June 22, 2015):48-51. Academic Search Complete, EBSCOhost.

firm RSA released a report on what they dubbed “Terracotta Army VPN”, nicknamed after the soldiers buried in the tomb of the Emperor of Qin. Terracotta VPN is an array of network that attacks Windows servers, primarily in Taiwan, South Korea, and America, and recruits them into its own network, allowing users inside of China access to the web outside the Great Firewall with much greater anonymity and secrecy than an average VPN. Enlisted servers have included Universities in Japan, Korea, Taiwan and America, Law firms, a hotel chain, and the department of transportation in a U.S. state. Furthermore, RSA was able to confirm that at least 50 VPN nodes had been utilized by state-backed hackers within China, including some by Shell_Crew, also known as Deep Panda, the group suspected for carrying out espionage against multiple U.S. government targets¹⁷.

Shrouded in secrecy, malicious activity by Chinese internet users can often raise more questions than it answers. Examining these illicit and secretive activities, however, can provide better context and additional information towards the full image of the Chinese internet as something driven by societal pressures instead of by technological developments. Terracotta VPN, one of the most prolific and sophisticated of its kind, is open for use to the public, and its creation was driven by the social market for Great Firewall-“leaping” technology. This self-replicating VPN was not driven into creation by the fact that the technology was there to be used; instead, Kent Backman of the RSA incident response team say that “The Great Firewall makes a market for Great Firewall bypassing technology, so the demand in China for anonymity software blows away everyone else”¹⁸. Examination of the Terracotta VPN also gives clues as to how the PRC itself contributes to the makeup of the Chinese internet: even though using a VPN to bypass

¹⁷ Terracotta VPN Enabler of Advanced Threat Anonymity. Report. RSA Research. August 4, 2015. <http://blogs.rsa.com/wp-content/uploads/2015/08/Terracotta-VPN-Report-Final-8-3.pdf>.

¹⁸ Lemos, Robert. “Chinese VPN Provider Using Malware to Expand Network”. eWeek. August 4, 2015. <http://www.eweek.com/security/chinese-vpn-provider-using-malware-to-expand-network.html>

security and censorship regulation, the PRC sponsors hackers that operate on Terracotta prevent the PRC from placing even heavier restriction on this bypassing technology. Even though they subvert the goals of the PRC to control their own webspace, VPNs like Terracotta are permitted exist because of a desire for espionage exceeds to some extent a desire for absolute control. If the previous section, examining VPN usage by non-malicious citizens, illustrates one actor in the SCOTs theory proposed by Bijker, Terracotta VPN adds another piece to the picture. This technology is shaped and driven by the unique desires of malicious or state backed actors in the Chinese internet.

v. Conclusion

The PRC's relationship with the internet is a complex and multi-faceted one, and has been ever since its introduction to the country in 1997. The treatment of the Internet is not unique: in all aspects of the dissemination of information, the PRC seeks to maintain complete control over what can and cannot be said and on what platform. In her 2008 report on blogging and civic discourse in China, Rebecca MacKinnon found that "What is and isn't possible in Chinese cyberspace mirrors the offline Chinese reality more than most outsiders realize". She also makes the case that the impact of censorship and internet usage in China isn't just about overt political messages, and that "outside observers of Internet and politics and politics in China would do well to focus on the impact of blogs beyond the narrow scope of overt political protest and obvious political change"¹⁹. On the Chinese internet, that the World Internet Project has a more significant political impact than in most other countries, even things that are not overtly political or begin their societal lives as non-political messages, like "grass mud horse", have political effects on the Internet as a whole. Not only that, but transmission of any kind of

¹⁹ MacKinnon, Rebecca. "Flatter World and Thicker Walls? Blogs, Censorship and Civic Discourse in China." *Public Choice* 134, no. 1/2 (2008): 31-46. <http://www.jstor.org/stable/27698209>.

information that the PRC wants removed becomes an inherent political statement, even if the transmitters simply want to pass along news and information, as Mou and Taneja's studies suggested was the case.

Any kind of information dissemination, political or not, has effects on the development of the Chinese internet. Censorship in China turns citizens into activists, or at least blurs the lines between the two. When asked about "grass mud horse" and its impending blockage in 2009, many Chinese internet users lamented its fate, with one user saying that "the issue has been elevated into a political level, overseas media has turned it into a story of netizen and government confrontation"²⁰. There wasn't an explicit desire among the creators of the mythical Grass Mud Horse to fight the government; only the desire, as is seen so often in other parts of the internet, to curse in a funny and demeaning way. In doing so, they brought about huge changes to the Chinese internet environment and, through societal networks spreading the phrase and concept, drove censorship and subversive technology on new paths.

"Soft" censorship isn't the only way that the PRC and internet users dynamically construct their own webspace; the Great Firewall's access blockage forces societal shifts that then in turn create unique and diverse technologies often separately from the global internet, and creates societal needs for better and more diverse circumvention technologies. In many cases, Chinese citizens have driven the creation and success of companies like Tencent, Alibaba and Baidu through a desire for interconnectedness in an environment that is closed off from the rest of the Internet's services. In other cases, when citizens do want access to a more global internet, be it for information, social connectivity, or political activism, Chinese users will drive improvements in mirror technology or VPN access, such as the cases of accessing Reuters China

²⁰ "China: Goodbye Grass Mud Horse · Global Voices." Global Voices Overall RSS 20. 2009. Accessed November 07, 2016. <https://globalvoices.org/2009/03/18/china-goodbye-grass-mud-horse/>.

through GreatFire's mirror sites or using VPNs. The PRC contributes to this unique environment too; sponsoring actors that utilize these tools means that the PRC can't restrict them too much without giving up their chance at espionage.

The theory of the social construction of technology, or SCOTs, put forward in large part by Weibe Bijker, asserts that technological changes are driven not by technology itself but instead by actors within a society. China's internet is one of the largest and most dynamic examples of a technological system being constructed by actors in a society, as users mold their own experiences through their interaction with hard and soft censors controlled by the PRC. There's nothing technologically different about internet behind the Great Firewall; in Time's examination of the technology, Hannah Beech says that "the Internet [...] works just fine, delivering goods, services and cat videos"²¹. Instead, it is the unique demands of the PRC and its citizens that create a distinctly Chinese webspace. It is how Chinese people, from citizens to hackers, activists to censors, interact with the demands of the government that keeps the Chinese internet as one of the most constantly changing examples of the social construction of technology in action.

²¹ Beech, Hannah, et al. "The Other Side Of the Great Firewall." Time 185, no. 23 (June 22, 2015):48-51. Academic Search Complete, EBSCOhost.

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Yang, Guobin. *The Power of the Internet in China: Citizen Activism Online*. New York: Columbia University Press, 2009.