Theory and Practice Towards A Decentralized Internet

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Abstract

Why is it the case that Web 2.0 ideals have been reestablished and taken over by centralized apps? What is the root cause behind privacy breaches, data ownership problems, and surveillance capitalism? It is the lack of data interoperability on today's Internet that has led to the deprivation of netizen participation and representation in the data economy. What methodology could we use to analyze these problems? What new paradigms of online interactions and technological developments are changing the status quo and moving the Internet toward a decentralized web?

This thesis scrutinizes the evolution of Internet technologies, the changing paradigms of netizens' online interactions, and the socioeconomic structures of Internet platforms in the larger context of the proposed shift from a centralized web to a decentralized one. I propose a three capital model as the fundamental framework to help analyze problems faced by today's Internet. I illustrate the emerging social video and social e-commerce platforms' production paradigms that have won them the comparative advantages against big platforms.

I argue that data interoperability is the key to change the siloed app ecosystem toward a more decentralized direction. The third chapter examines the different attempts made by the industry to increase interoperability at different levels—software level, platform level, and infrastructure level. If Web 1.0 granted netizens the right to view online content, and Web 2.0 has given netizens the right to publish in a participatory manner, I envision that Web 3.0 will enable netizens to access personal storage and computation. I propose a breakthrough test and show how projects like SoLid can help to realize data interoperability, and how new ?? technological and marketing infrastructures can recuperate netizens' right for data ownership and representation in the data economy and online content market.

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Chapter I Introduction: Forms of Capital on the Internet

The Internet is an ever-expanding universe of information and the systematic collections of which are valuable. With the rapid development of internet technologies backed by the rise of Internet companies, the Internet today can be modeled as a system where netizens generate information, and Internet platforms provide tools to manage them. Since netizens are no longer the only agent that can act and exert power on the Internet, the conflicts of interests between platforms and netizens have led to various problems like data ownership, privacy issues, surveillance capitalism, etc.[2] Sir Tim Berners-Lee's original design of the World Wide Web is a decentralized virtual sphere of information weaved by hyperlinks, where every netizen possesses the right to access, share, and publish information, and every online resource has a unique identifier public to everyone. With the rise of Internet companies, Internet platforms have become more centralized in terms of data storage and operations. Unsatisfied with the status quo, innovators nowadays are developing Internet technologies with better interoperability to re-decentralize the infrastructure, protocols, applications and governance for netizens on the Internet.[3] To better understand and analyze the development of the Internet, I would like to theorize the Internet by defining the fundamental forms of capital on the Internet and proposing a

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[2] Shoshana Zuboff, "Big Other: Surveillance Capitalism and the Prospects of an Information Civilization.", 1.

[3] "What Is the Decentralized Web? 25 Experts Break It Down." *What Is the Decentralized Web? 25 Experts Break It Down - Blog | ISchool@Syracuse*, 22 July 2016, ischoolonline.syr.edu/blog/what-is-the-decentralized-web/.

framework that serves as the core methodology of my analysis on the development of Internet technologies, services, and activities of netizens.

Inspired by Bourdieu's social theories and Coarse's economic theories, I'd propose a three-capital model intrinsic to the political economy of today's Internet. Netizens' interactions on Internet platforms primarily involve the production and conversion of three types of capital: social capital, information capital, economic capital, and Internet platforms can facilitate netizens to better generate and do exchanges between those three different forms of capital by lowering the "transaction fees".[45] Quantification measures of the social capital and information capital provided by Internet platforms have bolstered the conversions. However, the privatization of production tools, users data and monopolization on certain services have turned apps into silos and thwarted the potential of data interoperability between platforms, which further affected the flow and conversions of different capital.

Conversions of Social Capital and Information Capital on Internet Platforms

In the early 1990s, the World Wide Web as the first open platform on the Internet has provided tools for netizens to generate information that can be woven together as public accessible web pages, and Uniform Resource Identifier (URI) provided names for all resources on the Internet to get unambiguously identified. In this stage, netizens can freely browse the Internet to gain information capital, yet the obstacles for accomplishing complex tasks are high—sharing funny cat videos with your friends or getting pizza online deliveries in the early days of the web were not easy, if not impossible.

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[4] Ronald Coase. "The Nature of the Firm." The Economic Nature of the Firm., 79-95.
[5] Pierre Bourdieu. "The Forms of Capital." The Forms of Capital by Pierre Bourdieu 1986. https://www.marxists.org/reference/subject/philosophy/works/fr/bourdieu-forms-capital.htm.

The rise of Web 2.0 had ushered in an era of participatory culture involved producing content sharing and sharing with friends. Moreover, with the introduction and popularity of smartphones, the Internet's penetration rate is constantly waxing to nearly half of the global population.[6] Netizens' activities are no longer restricted to surfing the web for information, but also involve social networking, entertainment, and online shopping, etc. Internet platforms like Facebook, Amazon, YouTube have provided features that static web cannot support. For example, YouTube provides the server space to store and present videos, the medium of information capital, and YouTubers can attract followers to subscribe to their channel, which is the medium for digital conservation of social capital. YouTube and YouTubers make money mainly through the revenues generated from advertising and subscription, which involves economic capital.

In the example above, YouTube as the platform provides tools of production for YouTubers to generate information capital and preserve social capital. YouTubers produce contents to attract subscribers and accumulate social capital. Viewers use economic capital to gain information capital. This process shows the paradigm of the conversions among information capital, social capital, and economic capitals on YouTube.

Social Capital, Information Capital, Economic Capital

To analyze the relationship between netizens and platforms, it is important to clarify where the synergies or conflicts of interests come from. i.e., what constitutes "capital" on the Internet.

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[6] Kleiner Perkins, "Internet Trends Report 2018.". May 30, 2018.
https://www.kleinerperkins.com/perspectives/internet-trends-report-2018.

First, how do we define capital? Sociologist Nan Lin summarized Marx's classic theory

and defined capital as a kind of abstracted resource that can be accumulated with labor input and

re-invested for the production of utilities.[7] Therefore, if netizens can accumulate certain

resources from online activities that can later be plowed back to gain more utilities, then

netizen's activities online can be modelled as processes involving productions and conversions

of capital. Pierre Bourdieu argued that capital in the real world existed as cultural capital, social

capital and economic capital.[8] I would also categorise capital on the Internet into three

fundamental forms: social capital, information capital, and economic capital. Each of the three

capitals corresponds to the major services from the three most famous Internet

companies—Facebook, Google, and Amazon. Netizens can produce capital online, and different

forms of capital are convertible to each other, yet the production barrier and transaction fees are

highly dependent on the structure of the Internet.

Social Capital

The first and foremost capital of significance in the Internet era is social capital, which

had been studied by many scholars since the very first emergence of social media. Social capital,

as described by Pierre Bourdieu, is essentially the "aggregate of the actual or potential resources

which are linked to possession of a durable network of more or less institutionalized

relationships of mutual acquaintance and recognition."[9] This definition of social capital still

applies well in the Internet era, while the institutionalized relationships have become more

long-standing and even digitally tangible with the help of social media. In the wake of the

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[7] Nan Lin. Social Capital: A Theory of Social Structure and Action., 4-18.
[8] Pierre Bourdieu. "The Forms of Capital." The Forms of Capital by Pierre Bourdieu 1986.
https://www.marxists.org/reference/subject/philosophy/works/fr/bourdieu-forms-capital.htm.
[9] Ibid.

de-anonymization process of the Internet, netizens are leaning more towards employing

real-world identities online rather than separating the two identities. Social media platforms

provided the tool for netizens to make new connections and preserve old ones. With more and

more users joining, social media platforms have become the new portals where netizens conduct

social activities and gain social capital. Researchers have demonstrated a robust connection

between Facebook usage and indicators of social capital.[10]

Moreover, subjects related to virtual communities can also be scrutinized in the context

of the social capital theory. Henry Jenkin's research on participatory culture and fan

communities involves studies on various communities, all of which share the common patterns

that members in the same community can get a sense of affiliation, co-create expressions,

circulate contents, conduct collaborative problem-solving, etc.[11] If we deem communities an

aggregation of social relationships, then the actions mentioned above are all payoffs of the

"multiplier effect of social capital". However, apart from a lower barrier to form and preserve

virtual communities, what else is special for social capital in the Internet era?

Social capital has become quantifiable with its digital embodiment in the Internet era.

Novel user interface features have provided affordances to mediate interactions that emulate

real-world social activities. Meanwhile, social media also embody the virtual "relationships and

recognition" with friendlists, chat groups, followers and likes, etc., all of which have made social

interactions of netizens traceable and quantifiable. The volume of social capital can be quantified

by the number of followers, the total views of posts, the amount of likes and comments, behind

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[10] Nicole B. Ellison, Charles Steinfield, Cliff Lampe. "Negotiating Privacy Concerns and Social Capital Needs in a Social Media Environment." Privacy Online., 19-32

[11] Jenkins, Henry. Confronting the Challenges of Participatory Culture: Media Education for the 21st Century.

which is the labour and resources invested by netizens. These quantification criteria also mediate the conversion processes among social capital, information capital and economic capital. For example, data-driven qualification indicators can determine the influence and economic revenue of Internet celebrities or Internet influencers.[12] Internet celebrities grow their social capital by producing media contents to attract followers, and then use their social media account to gain economic capital by doing inbounding marketing. Ideally, the quality and credit of contents should not strongly correlate with the social influence of the content producer. Yet in reality the revenue of content producers is positively correlated with the followers of the account, i.e. the volume of the social capital of an account is proportional to the economic capital it can generate online.

The most significant issue for social capital on the Internet is the check of "foreign platform exchange" by social media platforms. One example would be the "transmedia storytelling" model that requires the storyteller "telling a single story or story experience across multiple platforms"[13] is no longer practical nowadays, because netizen's social capital is locked within certain platforms. The circulation of most social capital is restricted by platforms because it is lucrative to collect user data footprint and construct user persona profiles, which can be used for social recommendations. But this also limited netizen's use of their social capital. On the surface, by collecting user data and feeding them into the social recommendation algorithms like collaborative filtering, platforms can predict the patterns of user's social interactions to further help users generate more social capital or information capital. Yet the trade off would be netizens refraining themselves from developing good ways to control their personal data and the lack of

[12] Crystal Abidin. Internet Celebrity: Understanding Fame Online. Emerald Publishing, 2018., 71-98.
[13] Henry Jenkins. Confronting the Challenges of Participatory Culture: Media Education for the 21st Century.

unification of social capital on different social media platforms degraded the potential of netizens' social capital--a great opportunity cost. Tim Berners-lee, the inventor of the World Wide Web, pointed out that "our data is held in proprietary silos, out of sight to us, we lose out on the benefits we could realise if we had direct control over this data, and chose when and with whom to share it."[14]

Social capital has become tangible and quantifiable in the Internet era, yet today's quantification of social capital is scrutinized by platforms who finagled the alienation of personal data from netizens, which makes social connections the assets of the platform, and results in keeping netizens from making full use of their social connections out of the platform according to their own wills. This will inevitably lead to data ownership issues and conflicts of interest between platforms and users.

Information Capital

The second type of capital is information capital. From an epistemological perspective, if we deem human acquisition of knowledge as an embedding process of symbolic representation, then the process of absorbing information and internalising the information to embedded symbolic representations is a value accumulation process. Information capital a person can gain from a piece of media content, in this sense, is the knowledge the person gained from consuming it. There are two questions worth exploring about information capital on the Internet. Firstly, the way to evaluate the value of information has changed. In the Internet era, social media platforms have established an industrial way to evaluate how valuable a piece of content is. The metrics Internet platforms have been using--daily active users (DAU), time in app, screen flow, views

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[14] Tim Berners-Lee, "Three Challenges for the Web, According to Its Inventor." World Wide Web Foundation. https://webfoundation.org/2017/03/web-turns-28-letter/.

count, etc, is not about information but user's attention, which may result in clickbaits and fake news--the information populism. Secondly, the production and circulation of information has changed--the rise of the Internet has fundamentally changed the way we generate and exchange information. According to the Internet Trend 2019 Report, Internet sources take up 51% of the total time people spend in media.[15] In the Internet era, digital information can be transmitted efficiently with high fidelity through TCP/IP protocols, and netizens can get access to information in various media forms—text, image, video, animation, live streaming, etc. Therefore, the most critical questions on information capital are about the information itself: who generates the information, who gains access to the information, and who owns the information.

The most prevailing Internet platforms today are mostly C2C (customer-to-customer) platforms—Facebook, Wikipedia, YouTube, Tik Tok, where users play the main role of content producer who generates the information. Nonetheless, compared with traditional publishing methods, content producers on Internet platforms are facing greater challenges on copyright issues and on making economic gains. Though there are mechanisms that aim to protect the rights and give credit to content producers, the sharable, and hence public nature of information capital contradicts the market economy rationales of internet companies who run the platforms. The most prevalent licensing mechanism targeted at information capital is Creative Commons (CC). Instead of the traditional "all rights reserved" statement, CC provides licenses allied better with the nature of the Internet—let the author have "some rights reserved", yet the underlying logic of CC is that information capital is a sort of common that can be distributed freely. CC failed to provide tools for converting the content to the economic profits for the creators, which

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[15] Megan Hernbroth. "MARY MEEKER'S TECH STATE OF THE UNION: Everything Happening on the Internet in 2019." Business Insider. June 11, 2019.
https://www.businessinsider.com/mary-meeker-2019-internet-trends-report-2019-6.

is outweighed by products like Google Ads in the context of market economy and global information economy.

The participation of netizens is critical to the generation of information capital, as participation brings new authorship and viewership, and information capital can be generated in both producing and consuming content. Emerging ways of netizen participation are fuelling the Internet transformations. In the nascent stage of the Web, only a small number of websites exist and most netizens are passive consumers of information. With the increasing penetration of the Internet and the rise of personal blog, Web 2.0 drew a picture of participative and social web fuelled by data and collective intelligence had become a hit. O'Reilly thought highly of the blogging model where netizens generate information themselves—what Dan Gillmor called "we, the media". As O'Reilly wrote, "one of the most highly touted features of the Web 2.0 era is the rise of blogging."[16], and he described RSS as the most significant advance in the fundamental architecture of the web for RSS can enable netizens to track updates of websites or blogs—turning static information into dynamic feeds. Clay Shirky echoed this observation in his book *Here Comes Everybody: The Power of Organizing Without Organizations*. Shirky used the concept Coasean Floor, the point below which there isn't enough profit from transactions for a particular type of activity to meet the overhead costs of setting up a traditional institution.[17] Shirky argued that the emerging Internet technologies and platforms drastically reduced transaction costs and organizing overhead, allowing loosely structured groups with limited managerial oversight to operate under the Coasean Floor. However, the reality of social media is

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[16] Tim O'Reilly, "What Is Web 2.0." November 02, 2019. https://www.oreilly.com/pub/a/web2/archive/what-is-web-20.html.
[17] Clay Shirky, "Here Comes Everybody: How Change Happens When People Come Together.", 45-48.

not anarchism, and the data economy has favored big Internet companies while leaving netizens out of the loop.

Though netizens are the main force of producing information capital on social media, the institutions that manage the information has become the center of power--Alphabet and Facebook have become the 4th and 6th richest companies in the world. O'Reilly overestimated netizens' technology literacy on overcoming the thresholds of using technologies like RSS. Shirky underestimated the economic value of information and failed to foresee the inevitable capitalist rationalization on the production and distribution of information. Internet companies take over the control of Internet platforms and the distribution of information capital from netizens.

Web 1.0		Web 2.0		App
DoubleClick	=>	Google AdSense	=>	Algorithm Curated Ads
Ofoto	=>	Flickr	=>	Instagram
Akamai	=>	BitTorrent	=>	App Stores
Mp3.com	=>	Napster	=>	Spotify
Britannica Online	=>	Wikipedia	=>	Wikipedia
Personal Websites	=>	Blogging	=>	Facebook
Evite	=>	upcoming.org and EVDB	=>	Eventbrite

Chart 1. The changes of popular Internet platforms in different eras.

Before long when Web 2.0 platforms and technologies like RSS hit their strides, various platforms backed by Internet companies started trickling in with better scalability and operation

efficiencies. O'Reilly provided several examples when comparing Web 1.0 with Web 2.0

platforms, and I appended a column of Internet companies today. The idealist user-owned,

decentralized vision of Web 2.0 pales in comparison with current popular platforms powered by

Internet companies. Among the platforms shown in Chart 1, Wikipedia is the only non-profit

platform that still exists as the major site in its realm. Sites like Napster and blogging had been

replaced by social media platforms like Instagram and Facebook. Though contents on today's

platforms are still generated by netizens and for netizens, the tools of production and rules of

distribution are designed by the platforms.

Data is the new oil in the 21st century. I would argue that the transaction costs of online

activities do not need to surpass a certain level for Internet companies to exist, i.e. the Coasean

Floor is no longer valid nowadays. As Meeker pointed, "Internet companies continue to make

low-priced services better, in part, from user data."[18] Internet companies have generally adopted

business models that harness profit from the data collected from users. As is often the case,

Internet companies control the distribution of information and use advertising as the conversion

engine to monetise information capital.

While social platforms are perceived by users as free tools to produce and circulate media

content, in the context of market economy, platforms are actually profit-seeking "attention

merchants"[19] whose business model is based on advertising. The externality for netizens to rely

on platforms is the loss of data ownership, which curbs netizens' potential to maximise the value

of information. The primary goals of social media platforms is to increase the qualifications like

[18] Megan Hernbroth. "MARY MEEKER'S TECH STATE OF THE UNION: Everything Happening on the Internet in 2019." Business Insider. June 11, 2019.
https://www.businessinsider.com/mary-meeker-2019-internet-trends-report-2019-6.
[19] Tim Wu, The Attention Merchants: From the Daily Newspaper to Social Media, How Our Time and Attention Is Harvested and Sold. Atlantic Books, 2017.

retention rates, number of active users, length of session time. The policy relying on numerical

qualifications may lead to the trap of local maxima and will not help users gain valuable

information in the end. For example, TikTok, a mobile app with more than one billion

downloads collectively worldwide, has standardized content in the form of short videos limited

to 15 seconds with beautifying filters and rhythmic music in the background. The design of the

app is meant to be immersive, which is conducive to catching user attention. The popular

contents are also regulated in a top-down macro controlling manner--that is, the platform

strategically coins cultural symbols by promoting a specific dance move or music in the same

period. What users need to do is simply imitate the moves and choose the filter and music they

like. The sensory stimulus brought by TikTok will not lead to accumulation of information

capital. Neil Postman's amusing-us-to- death claim seems more and more real today.

The Internet has made the production and circulation of media content much easier than

before, but the market of information capital--how content got accessed by users and distributed

by platforms, worth a further analysis. Why do Internet based content-sharing platforms have so

many forms, e.g., video platforms, live streaming platforms, massive open online courses

(MOOC), and why are some more popular than others? The Internet has provided tools for

people to access, produce and share information. It is the first time in human history that the

exchange of information is possible from "many to many"[20]. Yet information capital in the

Internet era also faces challenges of deflation and centralization. Neil Postman preempted the

potential jeopardy that information in the age of show business tends to favor eye-catching and

entertaining content, which will lead to the dystopian state where a public addicted to

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[20] Clay Shirky, "Here Comes Everybody: How Change Happens When People Come Together.", 45-48.

entertaining content will amuse themselves to death.[21] Tim Wu has a similar argument that

"firms in the attention economy 'compete for eyeballs'."[22] Scholars have also studied how

businesses take advantage of personal information to manipulate their users' behavior to serve

their own purposes, which is known as "surveillance capitalism".[23] TikTok was banned in

Indonesia July 2018 and in India April 2019 for reasons of "encouraging pornography" and

"wasting youth's time".[24] The algorithms adopted by platforms are based purely on teleological

efficiency, and this iron cage of money making has prioritized the importance of attracting user

attention. Internet companies as the central power can "carry out continual experiments on its

users and consumers."[25] and form the way users produce information and even the form of

information itself. Ebates, a browser extension that gives its users cashback in order to

interchange the permissions for tracking users online shopping information, has gained 10

million users at the end of 2018. There are many more Internet companies doing business by

capitalising on netizens' information capital in the era when data became the new oil in the

Internet era.

Economic Capital

The third kind of capital on the Internet is economic capital—digital currencies that

allows for instantaneous transactions for economic activities. Economic capital on the Internet

[21] Neil Postman. Amusing Ourselves to Death. Penguin, 1986.

[22] Tim Wu, The Attention Merchants: From the Daily Newspaper to Social Media, How Our Time and Attention Is Harvested and Sold. Atlantic Books, 2017.

[23] Shoshana Zuboff, "Big Other: Surveillance Capitalism and the Prospects of an Information Civilization."

[24] Marcia Sekhose TikTok ban: Five things you need to know about the viral app https://www.hindustantimes.com/tech/tiktok-ban-five-things-you-need-to-know-about-the-viral-app/story-J5qgER3UNyOI1UWL5czEhI.html.

[25] Shoshana Zuboff, "Big Other: Surveillance Capitalism and the Prospects of an Information Civilization.", 78.

today mainly exists in three forms: digital cash on online payment platforms that functions equally with money in the real world; virtual currency issued by private companies and only circulated within certain platforms; cryptocurrencies designed to work as a virtual medium of exchange that uses decentralized control, typically blockchains, as opposed to central banking systems.

Online payment is essential for the rise of e-commerce. According to statistics data, retail e-commerce sales have taken around 16 percent of total retail sales in 2019 in the US, and Total Transaction Value in the Digital Payments segment amounts to US$4,137,523m in 2019.[26] Third party payment platforms like Paypal, Stripe, Venmo, Alipay have brought real world money to the digital sphere. Most online trading platforms are currently integrated and are operating under the rules of market economy. However, these payment gateways apps are the Internet version of debit cards rather than applications originated from the Internet. Paypal's funds are kept in commercial interest-bearing checking accounts[27]. Alipay and WeChat pay is required by Chinese law to connect to CNUCC (China Nets Union Clearing Corporation), an intermediate platform between third-party payment gateways and banks. Online payment platforms, rather than changing the current system of market economy, have provided services to enhance the efficiency of user-driven economic activities by reducing the geological and operational barriers. The Internet plays the role of an efficient medium for online transactions that include authentication, verification, encryption and tokenization, clearing and settlements. However,

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[26] "Digital Payments - worldwide." Accessed November 04, 2019.
https://www.statista.com/outlook/296/100/digital-payments/worldwide
[27] Chu, Lenora (February 26, 2008). "What PayPal does with your money". CNNMoney. Retrieved Oct 24, 2019.

economic capital in the Internet era has more potential by utilizing decentralized means to establish and secure consensus.

Money as a universal equivalent for economic value requires universal consensus. In the Internet era, netizens no longer have to rely on a centralized authority to secure consensus. Money as an exchangeable universal equivalent of value has its decentralized counterpart in the Internet era—cryptocurrency. As is often the case, the central bank is a centralized institute that secures the credibility of the official currency in the nation-state system. Cryptocurrency takes advantage of blockchain, a growing list of permanent and verifiable records held by multiple parties in a distributed network, to validate transactions and guarantee credibility. As concluded by Narayanan on the strengths of Bitcoin, people now "can use scripts, miners, and transaction validation to realize the escrow protocol or the micropayment protocol without resorting to a centralized authority."[28] However, the shared challenge is that most cryptocurrencies have relatively low penetration rates. A survey conducted by bitcoinmarkets journal estimated that there are around 25 million users globally for Bitcoin--less than 0.3% of the whole population[29] (Lielacher). Compared with Paypal's 235 million active users and Alipay's 320 million active users, cryptocurrencies are still non-mainstream digital cash adopted by a niche group of users. Economic capital on the Internet has revolutionized the way people conduct economic activities and has contributed to the popularity of e-commerce. Moreover, economic capital in the Internet era is experiencing a revolution itself, a revolution that will fundamentally shift the source of power and establishment of consensus. The internet has become a comprehensive all-round

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[28] Narayanan, Arvind. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction. Princeton University Press, 2016., 64.

[29] Lielacher, Alex, Alex LielacherAlex Lielacher, and Cass Business School. "How Many People Use Bitcoin in 2019?" Bitcoin Market Journal. April 19, 2019. https://www.bitcoinmarketjournal.com/how-many-people-use-bitcoin/.

environment where netizens can generate social capital, information capital, and economic capital, and do conversions according to their needs.

The Internet Market of Social Capital, Information Capital and Economic Capital

Not only has the Internet lowered the barrier to generate the three types of capital aforementioned, new affordances enabled by Internet technologies have also enabled exchanges and conversions among social capital, information capital and economic capital. Instead of just a more efficient means of exchange, the Internet has evolved into a market for social, informational, and economic activities. Nonetheless, the Internet is not a free market, at least for social capital and information capital--the conversion conducted by netizens is under the surveillance of the platforms that controls the platforms and tools of production.

The conversion of capital occurs at the same time as data exchange, which gives rise to data economy. Internet platforms are providing functions that could lower the barrier for netizens to conduct various activities online. The crux of the matter is that most functions and databases are controlled by the platforms. As a result, platforms may argue it is reasonable to keep a record of the data generated with blackbox technologies. Though functionalities provided by platforms can help netizens better conduct activities online, the privatization of technologies and data may introduce new restrictions that hinder the flow of data, which further thwart netizens' attempt to generate more values from the data. From the perspective of opportunity cost, data ownership issues are not a matter of technology, but a matter of monopoly. The future is not too bleak on the legislation side, the EU General Data Protection Regulation (GDPR) and California Consumer Privacy Act (CCPA) have provided good protections on personal data that requires

third party platforms asking for user consent to the further processing of users' personal data.[30] [31] Moreover, apart from legislative protection, netizens also need means to participate in the data economy. In the 3rd chapter, I will delve into the recent explorations like Mini Programs and SoLid that are trying to establish new paradigms of personal data management and partially endow netizens with the rights to control their own data with a universal identity with which they can log on to different mini programs or Solid apps.[32]

Classic economic theories are based on the scarcity of resource assumption--that is, there is only a limited supply of certain goods. In the Internet era, the new scarcity has become netizens' cognitive capability: the time one can spend, the number of people one is able to meet, and the amount of information one is able to consume. Based on the three capital framework, problems of today's Internet can be broken down to the conflicts of interests in the production and conversion of social capital, information capital, and economic capital and the limitation of user attention or mental force. Furthermore, by conceptualizing the Internet as a market for the three forms of capital, we can also see the current challenges and future directions of the Internet. In the last section of the third chapter, I will introduce an assumptive information payment model to link user attention to online content.

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[30] "The EU General Data Protection Regulation (GDPR) Is the Most Important Change in Data Privacy Regulation in 20 Years." EUGDPR Home Comments. https://eugdpr.org/.
[31] "California Consumer Privacy Act (CCPA)." State of California - Department of Justice - Office of the Attorney General. November 01, 2019. https://www.oag.ca.gov/privacy/ccpa.
[32] "How It Works." Solid. https://solid.inrupt.com/how-it-works.

Chapter II New Paradigms for Conversions: Social Video and Social E-commerce Platforms

In this chapter, I will examine the productions and conversions paradigm of social capital, information capital, and economic capital on emerging social video and social e-commerce platforms. I will analyze how fledgling platforms compete with giant platforms and argue that advertising and membership subscription are no longer the only two options that Internet platforms have to rely on. By providing services to lower the transaction fee between social capital, information capital, and economic capital, it is possible for Internet platforms to produce a profitable synergy that meet both user needs and the platform's market goals.

In the last 30 years of the Internet, two interesting media trends have been evolving almost step by step. The first trend is that the right to publish has been gradually decentralized. Every citizen with a smartphone can function as a publisher. With the advancement of publishing tools, everyone in the world with a device connected to the internet can publish easily--the writerly Web 2.0 almost became a reality, except the medium of publishing moved from public forums and blogs websites to mobile/web apps backed by Internet companies. The second trend is that the control of the publishing tools are getting more and more centralized due to the "winner taking all" syndrome in market competitions. Facebook, WhatsApp, and Instagram--the three most famous social media apps with more than one billion monthly active users respectively, are all owned by Facebook, Inc. These two trends marked, on the one hand, the take-off and proliferation of user-generated content production online. On the other hand, the

increasing monopoly of data, the decline of the interoperability between platforms, and the

deterioration of the Open Internet. The question I want to raise is why some platforms flourish,

like Facebook, Bilibili and TikTok, while others, like SixDegrees.com, AcFan, Musical.ly, got

either acquired or vanished in the process. What features have social media platforms provided

to users to produce to better conduct social, informational, or commercial activities? What are

the business models that can generate revenue for the platforms while providing convenience for

users? What has changed in the netizens' pursuit of online social, economic, and information

capital?

  I would argue that from the perspective of information capital, social capital, and

economic capital, the booming social media platforms in the last decade marked the

transformation of the Internet--that is, the leading platforms set the paradigms of capital

production and conversion between social capital, information capital, and economic capital.

Platforms accumulated profits through the surplus of their users' online activities, and the surplus

is generated through the process of producing and consuming digital data--making new social

links (social), consuming digital content (informational), and conducting e-commerce activities

(economic). In this process, the free labor of users also fuelled the digital economy, as criticized

by Tiziana Terranova.[33] Platforms play multiple roles in the process--landlords, who provide and

control the data storage space; vendors, who sell services or digital contents; brokers, who

provide algorithmic or social recommendation; investors, who encourage users to better produce

contents or conduct activities on the platform. Yet emerging platforms cannot directly copy the

success of those giant platforms by providing services targeting a specific form of capital. For

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[33] Terranova, Tiziana (2000). "Free Labor: Producing Culture for the Digital Economy". Social Text, 63 (Volume 18, Number 2), Summer 2000, pp. 33-58 (Article).

example, YouTube plays the landlord role by providing storage spaces to serve videos online, and makes profits with in-stream advertisements. This is not replicable for a new video platform, because there is little advantage for a new video-sharing platform to compete against YouTube by providing the same functions. Yet landlords are bound to be replaced by operational models more favorable to netizens. New platforms have to start differently by exploring users' needs for different forms of capital and provide more welcoming paradigms of operation regarding the three capitals under discussion.

Let us see some examples from the platforms mentioned above. The first platform is Bilibili, an online video platform focusing on anime, comics and games, i.e. ACG content. The second platform is Tik Tok, a social media platform renowned for its immersive short videos. And the third platform is Little Red Book, a social e-commerce platform. Because all actions on the platforms are conducted by an interconnected group of people, I will also draw on existing research on network studies and participatory culture to explore how the platforms shape aggregate behavior of netizens, and how collective actions of netizens give rise to new forms of online practices. I argue that the design of the paradigms for users to produce and do exchanges of social capital, information capital, and economic capital differentiates platforms from each other, which gives rise to comparative advantages for new platforms with novel paradigms to compete with giant platforms.

Bilibili--An Online Video Platform Built on Social Capital

Bilibili is an online video platform known for its anime, comic and games content, i.e. ACG content.[34] Bilibili started as a Japanese anime fandom community and later transformed into a video sharing platform. It went public on the NASDAQ on March 28th, 2018. As one of the most representative brands of online entertainment for young generations in China, Bilibili emphasizes strong emotional connections of users to the content and communities.[35] The user group of Bilibili is stunningly young--92.8 percent of the users are under 30 and 82 percent from Generation Z (born in 1990-2009).[36] Moreover, Bilibili is "No.1 in terms of monthly average time spent per device and monthly average visits per device among China's online video platforms."[37] Yet there have been dozens of online video platforms once very popular in the history of the Chinese Internet. Bilibili is neither a player who joined the game in an early stage nor the only ACG themed video sharing platform. How did Bilibili develop into the platform with the most vibrant community and how did it make its way to NASDAQ? With those questions in mind, let us explore how Bilibili achieved the success and how it coordinates the relations between user needs and the platform's business goals.

UGC, PGC, and the War of Copyright

Video platforms can be categorized by the source of the content--whether it is 's users or professionals who produce the contents. On one end of the spectrum is UGC, i.e., user-generated content, which is posted by users on online platforms. On the other end is PGC, i.e.,

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[34] Yin, Yiyi, and Anthony Fung. "Youth Online Cultural Participation and Bilibili." Advances in Electronic Government, Digital Divide, and Regional Development Digital Media Integration for Participatory Democracy: 130-54. doi:10.4018/978-1-5225-2463-2.ch007, 4.

[35] "SEC Form F-1 REGISTRATION STATEMENT Bilibili Inc." COSTCO WHOLESALE CORP /NEW (Form: 10-K, Received: 10/18/2017 06:02:27). Accessed Feb 19, 2020. http://secfilings.nasdaq.com/edgar_conv_html/2018/03/23/0001047469-18-002074.html#FIS_BUSINESS., 1

[36] Ibid., 3.

[37] Ibid., 1.

professionals-generated content, which is generated by professional content producers. YouTube, mainly relied on UGC, and Netflix, explicitly provides PGC services. Since 2005, dozens of video platforms have gained popularity in China--56.com, Ku6.com, Youku.com, Tudou.com, Letv, Sohu TV, PPS.tv, PPTV, Tencent Video. Most of them support both UGC and PGC, yet almost all of them were facing similar problems--professionally generated content had been uploaded by users due to lack of regulation on copyright. In 2011, the two leading online video platforms Youku and Tudou waged a war on copyright. On Dec 15th, Tudou publicly accused Youku for pirating its exclusively purchased variety show "Kangsi Coming" without authorization. The Vice President of Tudou asked for 150 million RMB (23.5 million USD) compensation from Youku. Interestingly, instead of providing an explanation or negotiating with Tudou, Youku immediately fought back on the same day by posting an article online accusing Tudou for pirating hundreds of variety shows from Youku.[38] The battle was fierce yet no major law legal suit was filed as neither video platform was innocent.

图 2：2019 年 1-11月各平台剧集和综艺有效播放量
Jan-Nov 2019, TV series and variety shows valid views count by platforms
■剧集有效播放量（亿）　■综艺有效播放量（亿）
TV series valid views count (100million) Variety shows valid views count (100million)
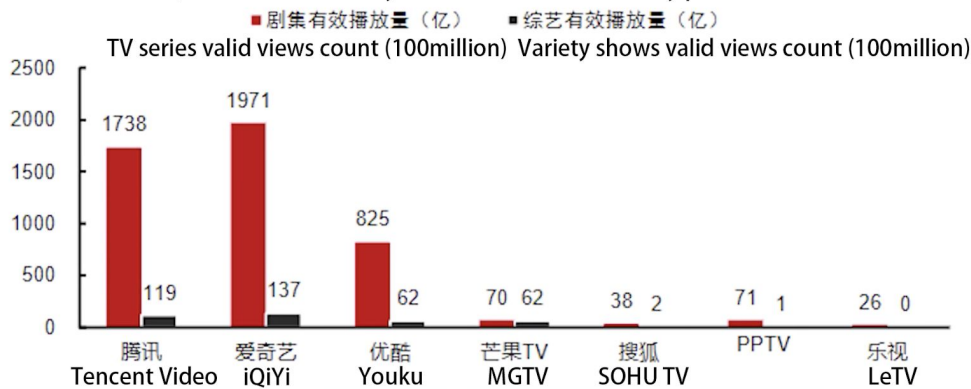
资料来源：云合数据四象分析系统（EVA），中信证券研究部

[38] 冲浪普拉斯. "从《庆余年》看中国视频平台混战史：200家网站倒闭、上千亿人民币亏损，复盘腾讯、爱奇艺、优酷、b站行业寡头崛起背后的资本真相【中国商业史003】." YouTube. December 29, 2019. https://www.youtube.com/watch?v=sT5G0xtzlj0.

Figure 1. TV series and variety shows valid views count by platforms from Jan 2019 to Nov 2019.[39]

As copyright laws get implemented more extensively in China, Chinese online video platforms have also become better regulated. China requires that video-sharing sites get permits and be controlled by the state or owned by the state. Those permits last for three years and will need renewals after they expire. Websites that violate the law will be subject to a 5-year ban from providing videos online.[40] The grey zone of pirating or unauthorized file sharing was eliminated. For instance, one of the country's most used file sharing programs, BTChina got shut down in December 2009. It was shut down by the State Administration of Radio Film and Television for not obtaining a license to legally distribute audio and video files.[41] With the stronger protection of the copyright of PGC in place, the competition of video platforms evolved into the competition of money. As a result, the leading platforms were pared down to a small number, iQiYi powered by Baidu, Tencent Video powered by Tencent, Youku powered by Alibaba. As shown in Figure 1, only three platforms focusing on PGC are at the top today. The major income sources for those platforms focusing on PGC are VIP membership subscriptions and in-stream advertising.

What about platforms focusing on UGC--user generated content? User generated content was once in a dilemma due to the ban of pirating and restrictions on illegal file sharing. On online video platforms like Youku, original and high quality user generated content was rare, which makes UGC pale in comparison to PGU in terms of view counts. Thus, it is not profitable

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[39] Ibid.
[40] "Legal Aspects of File Sharing." Wikipedia. February 08, 2020. https://en.wikipedia.org/wiki/Legal_aspects_of_file_sharing#cite_ref-6.
[41] Ibid.

for platforms to champion UGC in their front pages. So what has Bilibili done differently that distinguished itself from the other platforms? The answer lies in the professionalism of the source of production--content producer.

Uplord--the Professional Producer of *Information Capital*

Instead of conforming to the dichotomy of PGC or UGC platform, Bilibili made its own exploration on PUGC--professional users generated content. On Bilibili, the person who uploads the video on Bilibili is known as up-zhu (up主), where "up" represents the uploader and "zhu" means "lord" in Chinese. Therefore, I would translate "up主" as uplord, i.e., the uploader/producer who owns the contents. Uplords play the key role of not only content producing, but also community building, which is a role with the double functions of users and institutions. Uplord usually produces original content or remixes media contents related to anime, game, food, and travel, etc. Fans with similar interests can easily gather together to form a cohesive community.
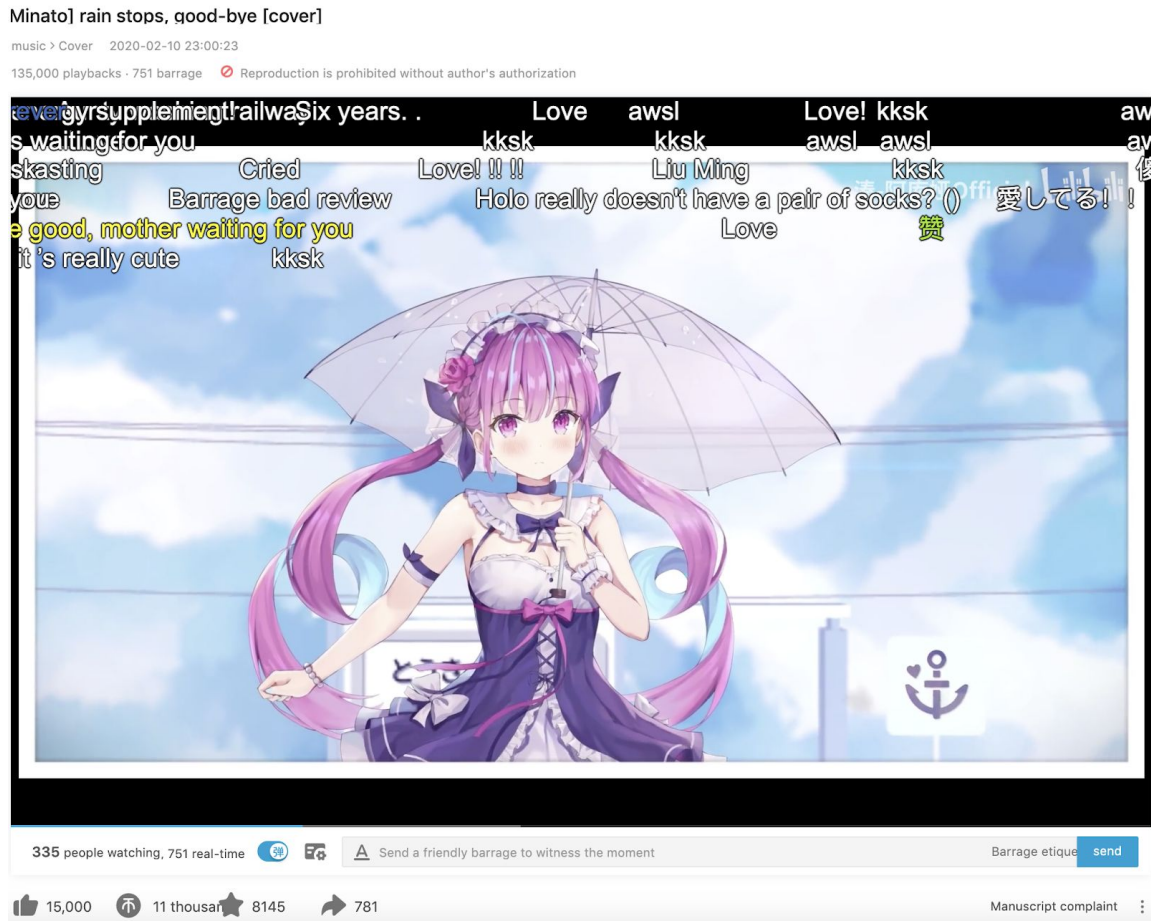
Figure 2. Screenshot showing the bullet comments on a random Bilibili video.

Fans can also interact with each other and with the uplords in novel ways on Bilibili. Of the many features that differ Bilibili from traditional PGU platforms, the function of sending bullet comments (danmaku, 弹幕) is the most interesting feature. Though Bilibili is not the inventor of danmaku, it has played a significant role in introducing bullet comments to Chinese netizens. Danmaku is so emblematic of Bilibili that people would call Bilibili the platform for danmaku. As shown in Figure 2, numerous bullet comments had been sent by viewers who are either watching or have watched the video. By sending a bullet comment, the audience has become a participant who adds information to the original content as well, i.e. a prosumer of

information capital. And the original content combined with the comments have formed a new holistic piece with a collective authorship.

However, bullet comments are not sent randomly by users. To be able to send bullet comments, users need to pass an entrance exam--the first section of which covers lengthy knowledge of intellectual property law, and the following section is made up of a trivia game based on the user's preferences. Only after passing both sections could a user get access to all the platform functions--sending bullet comments, uploading videos, live streaming and managing personal channels. Though seemingly trivial, the tests could filter out users with the goal of building a coherent community made up of fans with high user stickiness and high participation rate. Bilibili users on average spend 76 minutes on the site every day and the site has a 79% retention rate of its official members.[42]

The robust participatory culture of Bilibili makes it stand out as a platform that has fulfilled two of the most important Web 2.0 features--participatory culture and social networking. Bilibili's bullet comments connect the audience with the uplord in the Bilibili context, who are the main content contributors on Bilibili. The uplords either remix existing videos or shooting materials themselves. According to Bilibili's official report, a large number of Generation Z are actively involved in the content generation and promotion process, rather than passively view and consume content.[13] Furthermore, the function of "follow" and "direct message" strengthens the capability of socializing through the platform, and the comments area underneath every video is also a popular arena full of sparks of subculture and idea-exchange.

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[42] "SEC Form F-1 REGISTRATION STATEMENT Bilibili Inc." COSTCO WHOLESALE CORP /NEW (Form: 10-K, Received: 10/18/2017 06:02:27). Accessed Feb 19, 2019. http://secfilings.nasdaq.com/edgar_conv_html/2018/03/23/0001047469-18-002074.html#FIS_BUSINESS., 1

As a highly interactive platform, Bilibili is also an incubator for subcultures. For example, "*guichu* 鬼畜", literally meaning "evil being", also refers to the genre of funny remix music videos, and is one of the most popular sections on Bilibili. One essential feature of *guichu* music videos is that all videos are produced or remixed by community members of Bilibili. Though the production quality might seem a little bit cruddy, the selections of the contents and the use of expressions can represent the information capital of the producer--the more a insider the uplord is, the more followers, views, and gifts he/she can gain. Moreover, the information capital accumulated by a user would further consolidate his/her status as the insider or the professional of a topic, which will serve as the cornerstone to attract followers and build communities. Furthermore, the community formed around the uplord will encourage the uplord's participation in the community--producing new contents, sharing resources and interacting with the fans. In this way, the uplord becomes a professional user step by step, which can exemplify the professional user generated content model on Bilibili.

To be a popular uplord on Bilibili, one has to know the broader context of the ongoing discussions in the online sphere. What are the hot topics? Who are the controversial figures? What are the mainstream/non-mainstream ideologies? A good accumulation of information capital is the premise to be a content producer, yet the capability to include as much information capital as possible within the limited forms of expression and length of the video will decide how successful an uplord is. Uplords are the composers of the Bilibili culture, and community members are the bearers of the culture. Once a novel expression coined by an uplord grabbed attention, usually there is a tipping point when a group of insiders start to adopt and circulate the expression. If more people begin to adopt the expression, that expression will become a

buzzword. For example, when searching "Are You Ok" on Google, the top video result is a remix video from Bilibili featuring Lei Jun, the CEO of Xiaomi Inc, who is an engineer type of leader who tends to be serious. In the "Are You Ok" *guichu* video, one of Lei's speeches was remixed with the track of an English song "Angelina". When people interested in Xiaomi see the video, they will be astonished:Wow, Lei Jun is singing an English song! The "Are You Ok" remix has gained more than 25 million views, and Lei Jun himself has watched the video and started using the expression in his Weibo. To people's surprise, the uplord of "Are You Ok" is a high school student who has no professional video editing experience at all. His creativity and discernment on what type of content could gain popularity is the key reason why the video has gone viral.

Moreover, a frequently seen expression among the bullet comments is "three clicks in a row 素质三连", which means the commenter loved the video and has done the three clicks--like the video, send coins to the uplord, save the video. Bilibli has provided the affordance to do the three actions at once with a long press, which favors the content producers, for more "likes" and "saves" will increase the potential views of the video; and coins is the economic capital of Bilibili that can be converted to real money.

Platform as an Incubator

The relatively low bar to produce content on Bilibili encourages a good number of users to become content producers with the tools provided by Bilibili--remix, vlog, live streaming, etc. By producing content, the uplord can gain followers and coins, which are essentially social capital and economic capital, and this positive feedback loop can favor the gifted uplords with more incentives to become better professional content producers. However, not all gifted

producers can gain fame overnight, and it requires great devotion of time and resources to accumulate followers and rise to fame, which is a challenging process.
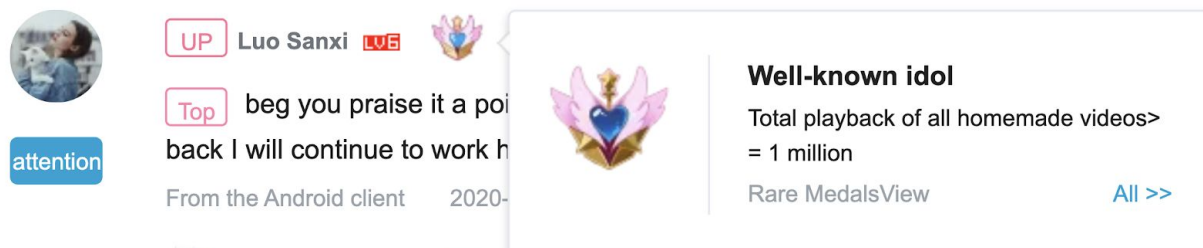

Figure 3. Screenshot showing the achievement made by a content producer.

The interest of the content producers aligns well with the interest of Bilibili whose goal is to incentivize content producers to play a vital role in generating information capital for the platform. To support content producers, each uplord has a "Production Portal" to track the statistics of their contents, and Bilibili has provided various ways for uplords to monetize content in a non-advertising way. For example, the "Uplord Incentive Program",[43] a program aimed to encourage new uplords to produce content, will reward around 3 RMB (0.5 USD) per thousand views. Moreover, *batteries* (电池) and coins sent by the fans can also be converted to real money--10 *batteries* worth 1 RMB (0.14 USD). To help new content producers to learn editing and branding skills, Bilibili set up the "Online Boot Camp for Content Producing", a series of online courses on content productions, account operations, and brand building with free access to the Production Portal. In the Production Portal, the uplords can also see their "electromagnetic power,", a quantification representing the influence of the uplord calculated by Bilibili's algorithm. I interviewed a content producer named Victoria, who self-identifies herself as a

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[43] "BiliBili如何运作UP主群体." *爱盈利-丨关注APP推广,APP运营,出海,ASO优化,抖音运营【官网】*, www.aiyingli.com/65957.html.

part-time Bilibili uplord. "I remixed 8 short videos during the winter break of 2020 and have earned around 250 RMB (36 USD), which is quite a good amount for I only got one or two thousands views per video. Most professional uplords can get ten thousand views on average, with the virtual coins sent by the followers they can easily make a good living." To help part-time content producers to gain fame and become full-time ones, Bilibili initiated the "Rising Star Program,", which recruits uplords with less than 10,000 followers and assigns them certain tasks on content production, and awards them economic incentives if they meet certain goals. As shown in figure 3, Bilibili also awards uplords with medals similar to the military hierarchy, and uplords can show the medal next to the profile picture as decorations, which serves as an embodiment of cultural capital for uplords to show their influence, meanwhile it also helps Bilibili to maintain the loyalty of uplords.
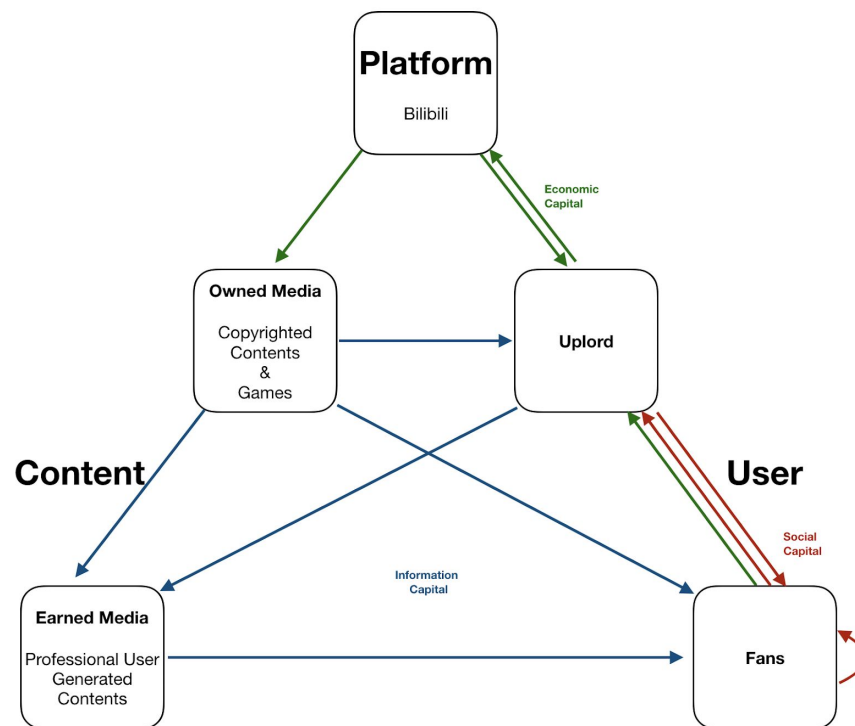

Figure 4. The content producing paradigm of Bilibili

In the graph above, we can see the relationship of the productions and conversions among different forms of capital and the ties between different agents. Bilibili as a platform invests in two major realms to gain information capital. First, Bilibili directly makes purchase of animes exclusive on Bilibili, games and movies as owned media.; Second, Bilibili gains earned media through supporting professional content producers, as aforementioned. In most PUGC platforms, e.g. Netflix, iQiYi, the major conversion taking place on the platform is between information capital and economic capital -- users purchase VIP membership or watch ads to get access to the contents. For Bilibili, its most prominent comparative advantage is the double identity of content producers, who are members in the community like users and content producers that serve the community. On Bilibili, contents would not only serve as a means for uplords to make profits, but also as a means of personal storytelling for them to connect to their fans. Either way, the social ties between the uplord and their followers are reinforced. As network studies scholars David Easley and Jon Kleinberg claim, "strong ties, representing close and frequent social contacts, tend to be embedded in tightly-linked regions of the network." [44] Since the uplord of Bilibili is also in the network, not only will the flow of information get smoother with social multiplier effect, the contents shared in the network will reinforce the social ties as well--a benign synergetic loop of information capital and social capital.

Exploitation v. Expansion--When Community Can't Quench the thirst of the Market

Innovations are costly--not only for the resources required to invest, but also because every action of the platform has externalities that will affect the dynamics of the platform. A devil has

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[44] David Easley, Jon Kleinberg - Networks, Crowds, and Markets_ Reasoning About a Highly Connected World (Draft 2010-06-10)-Cambridge University Press (2010).pdf. P 9

thrown two bombs, one in a populous city and the other in a small county that is your hometown. As a superman, which will you save first? Bilibili has been facing the dilemma between meeting old users' preference and exploring new territories. ACG fans have formed a niche and cohesive community in Bilibili focusing on ACG related topics. Yet the potential markets in the non-ACG community is also an alluring piece of cake. As Shirky points out, communities face a tradeoff between size and focus.[45] The incubations of new professional users have generated non-ACG contents, which might change the dynamics of Bilibili and affect the community.

In another interview I conducted with an uplord who would like to remain anonymous, she mentioned that "although the social capital of community--fans' interactions, bullet comments--makes up an important part of the platform, yet it does not bring as much money as expected. Most fans are free-riders, they do not want to pay." As Bilibili grows steadily and gains more users, could Bilibili still maintain the paradigm of PUGC with the slackened social ties in a fast expanding user base? Or will social capital remain the principal component for Bilibili to keep a user community cohesive? The answer lies in the future of Bilibili.
From the above analysis, we can notice that the new paradigm of content production Bilibili relies on is to incubate content producers to produce information capital and take advantage of a highly participative community to enlarge the influence of producers with the multiplier effect of social capital. Fans in a robust community are more willing to participate, and Bilibili has provided fans channels to participate, express, and interact. Sending bullet comments has become a prominent means of participation, which at the same time has increased the information capital of the original content. Moreover, the batteries and coins sent by fans to the

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[45] Shirky, Clay. Here Comes Everybody: How Change Happens When People Come Together. Penguin Press, 2009., 45-48.

uplords as economic capital have formed a positive loop that encourages the production of content, which also consolidates fans' support to the content producer. As Henry Jenkins concluded in his categorization of participatory cultures, both "affiliation" and "expression" are elementary forms of participatory culture,[46] and Bilibili has grasped the essence of both.

Content, Network, E-Commerce--TikTok, the All-In-One Paradigm

Online video platforms have been around for more than a decade, and the paradigms have been mostly settled--professionally produced contents distribution platforms represented by Netflix, and user generated content platforms represented by YouTube. Three business models or the combination of them constitute the major operating principles of most platforms: subscription, advertising, and direct payment (including virtual gifts or tips from fans). Since the inception of mobile internet, various attempts have been tried out to enhance the production and conversion rates of information capital. Yet most attempts cannot break the paradigm of the PC era--little was improved by designing a mobile phone version of YouTube. However, the revolution finally came when the form of the content, rather than the production or distribution paradigms of the content, has changed to cater to the mobile phone. TikTok, Kwai, and other mobile native video sharing platforms have been telling their stories and notifying the world that it is not yet the end of the history for the video sharing platforms.

TikTok, a video-sharing social networking service featuring short clips, nifty music, and immersive user interface design, was declared the 7th most downloaded mobile app of the decade (from 2010 to 2019) and it just started operating in 2016.[47] Kwai is a predecessor of

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[46] Jenkins, Henry. Confronting the Challenges of Participatory Culture Media Education for the 21st Century. An Occasional Paper on Digital Media and Learning. Distributed by ERIC Clearinghouse, 2006., 3.

[47] "TikTok." Wikipedia, Wikimedia Foundation, 1 Mar. 2020, en.wikipedia.org/wiki/TikTok.

TikTok also featuring short clips as the main content. Though both TikTok and Kwai operate in a similar manner as other social media or video sharing platforms--phone apps backed by Internet companies--TikTok is a subsidiary of Bytedance, and Kwai is owned by Beijing Kuaishou Technology Co., Ltd. In this section, I will scrutinize how rising platforms like TikTok and Kwai formed new paradigms on producing content and utilized the information capital and social capital for e-commerce purposes. Social media platforms like Instagram and Facebook are now following their footsteps by providing similar functions involving contents, social networks, and e-commerce, as all-in-one platforms.

The Social and Technological Background: the rise of suburban netizens in China and the revolution of mobile Internet

	Daily Active Users	Under 24 Years Old	From non-first-tier cities	From Rural Areas(4th-tier cities and below)
Kwai	231 million	66.6%	90.5%	40.3%
TikTok	207 million	75.5%	88.6%	35.6%

Chart 2. Statistics data of Kwai and TikTok users.[48]

[48] Robles, Pablo. "China Internet Report 2019." *South China Morning Post*, www.scmp.com/china-internet-report.

According to the China Internet Report 2019, the number of internet users in rural China increased to 222 million in 2018, increasing the penetration rate to 38%, the number of which was 53 million in 2007.[49] Furthermore, 175 million of the 209 million rural netizens are short video application users, which means 8 out of 10 rural netizens use short video applications in China.[50] As shown in the chart above, the most popular short video apps in China are Kwai and TikTok, who respectively have 40.3% and 35.6% of users from 4th-tier cities or rural areas.[51] Moreover, the new tide of urbanization in the 3rd-tier and 4th-tier cities has made their growth rate of consumption remarkably higher than that of 1st-tier cities.

The fast economic growth and technological modernization in China gave rise to an ever-growing need for entertainment. Meanwhile, the medium through which most Chinese netizens get access to the Internet has also shifted from PC to mobile phone. According to CNNIC, mobile Internet users have already accounted for 97.5% of the Internet users in China in early 2018.[52] TikTok and Kwai both took advantage of the increasing adoption of mobile Internet and the rise of lower-tiered netizens-consumers. However, neither mobile internet nor social media based video platforms are brand new concepts. In a world overloaded with social media apps and video platforms, how differently did Kwai and TikTok appeal to their users and build up their business models?

Social Commerce--The Convergence of Social Media And E-Commerce

[49] ibid
[50] Robles, Pablo. "China Internet Report 2018." Abacus. https://www.abacusnews.com/china-internet-report/.
[51] ibid
[52] CNNIC. Statistical Report on Internet Development in China (January 2018). 11 July 2018, cnnic.com.cn/IDR/ReportDownloads/201807/P020180711391069195909.pdf.

Social media platforms like Facebook and social video platforms like Bilibili have

utilized social capital and information capital to form the UGC user generated content paradigm.

With a good accumulation of content and users, social media platforms and video platforms can

rely on advertising and membership subscription as the two major revenue sources. However, the

attention merchant model of watching ads to get access to content is not the optimal solution and

subject to be changed--the business paradigm started to shift when social video platforms like

TikTok and Kwai further incorporated social commerce functions into their platforms, which

directly brought flows of economic capital into the platform. Traditionally, social commerce

stands for user-generated content-sharing of online products' information, reviews or advice.[53]

Different from the traditional model, the social commerce model of Kwai enables its users to be

both content producers and online store owners--the ethos of which shares traits of social media,

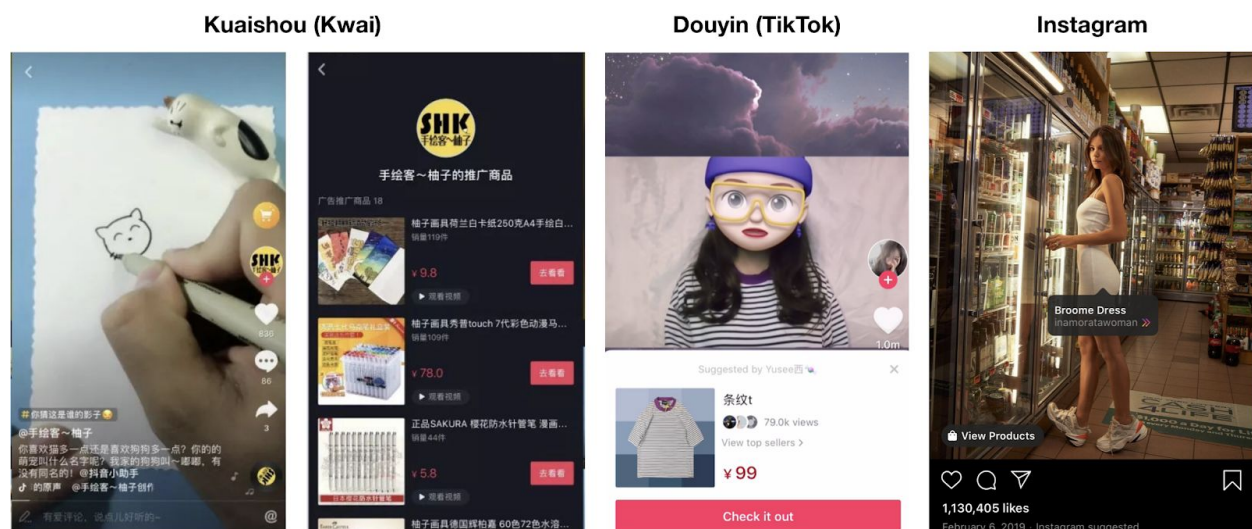teleshopping, and C2C(Customer to Customer) e-commerce platforms.

Figure 5. Screenshot showing the in-app-purchase functions of Kwai, TikTok, Instagram.

[53] "Social Commerce." Wikipedia. Feb 13, 2020.
https://en.wikipedia.org/wiki/Social_commerce#cite_ref-6.

Figure 5 illustrates the various social e-commerce features of Kwai, TikTok, and Instagram. First started in July 2018, the *My Little Store* feature of Kwai is the first attempt made by the three platforms to directly tie contents with e-commerce stores.[54] TikTok and Instagram followed the trend very soon and opened their own e-commerce stores. As we can see in the Kwai example above, the content producer has published many short videos themed on his drawings, and he also opened a shop selling pen sets and drawing papers. After the short video was posted, the blogger gained more than 3.7 million fans following him. Within one platform, the fans of content producers can look at his contents, chat with him or leave a comment, as well as gain easy access to the in-app store to make purchases from the content producer's online store, which I would like to name as an all-in-one platform.

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[54] 加速会. "短视频变现新路径：快手推出"快手小店"，抖音关联淘宝链接." 首页. http://jiasuhui.com/article/53068.

Figure 6. Screenshot featuring celebrities doing live streaming sales on Douyin. On the left is Luo Yonghao endorsing a smartphone. On the right is Stephen A. Schwarzman endorsing his new book.

In this scenario, the content producer becomes an IP, or an Internet celebrity, whose the fans represent his the social capital and the contents he created are seen as the information capital, and more importantly, the content producer can sell their products or get paid by brands to endorse certain products--acts that beget economic capital. The screenshot on the left features Luo Yonghao, an entrepreneur and the former CEO of Smartisan Inc, doing live streaming on Douyin trying to endorse a smartphone. The screenshot one the right was the CEO of Blackstone

Group, Stephen A. Schwarzman, endorsing his new book to the Chinese readers. Luo Yonghao and Schwarzman are already well-known so that they can gain followers easily online. Yet most Internet celebrities are grassroot content producers, and they need to focus on specific categories to gain comparative advantages, and their followers would be the target users in the respective categories. Therefore, the network centered around the content producers forms a private domain, where the information capital, social capital, and economic capital are all related to the same topic and get circulated in a cohesive community. Or we can say that the existence of the three forms of capital and their mutual convertibility is crucial to the final transaction.

The Internet celebrity e-commerce model has been experimented by Jumei.com and VipShop since the early 2010s, and both are still leading e-commerce platforms in China today. Jumei.com recently also incorporated short video functions. Nonetheless, Kwai differs from the traditional Internet celebrity e-commerce model in two aspects: first: Kwai is characterized by its decentralized nature. It is in essence, a short video sharing platform with the slogan "capture the world, share your story", and all of its 200 million users have the privilege to open a shop in Kwai; second: Kwai's target users are non-1st-tier netizens. As shown in a study on Chinese urbanization and economic growth, "goods of different quality levels are sold to different consumers."[55] Kwai's C2C e-commerce affordances cannot compare with Taobao in either the quantity or quality of goods.

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[55] Lin, Boqiang. "Economic Growth, Income Inequity, and Poverty Reduction in China." Economic Research Journal, 2009, 29.

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                        ┌─────────────┐
                        │  All-In-One │
                        │   Platform  │
                        │             │
                        │Kwai/TikTok/Instagram│
                        └─────────────┘
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Information Capital   Social Capital   Economic Capital

Contents   **Connections**   **E-Commerce**

Short Video   Social Network   Online Shops
Music   Recommendations   Advertising
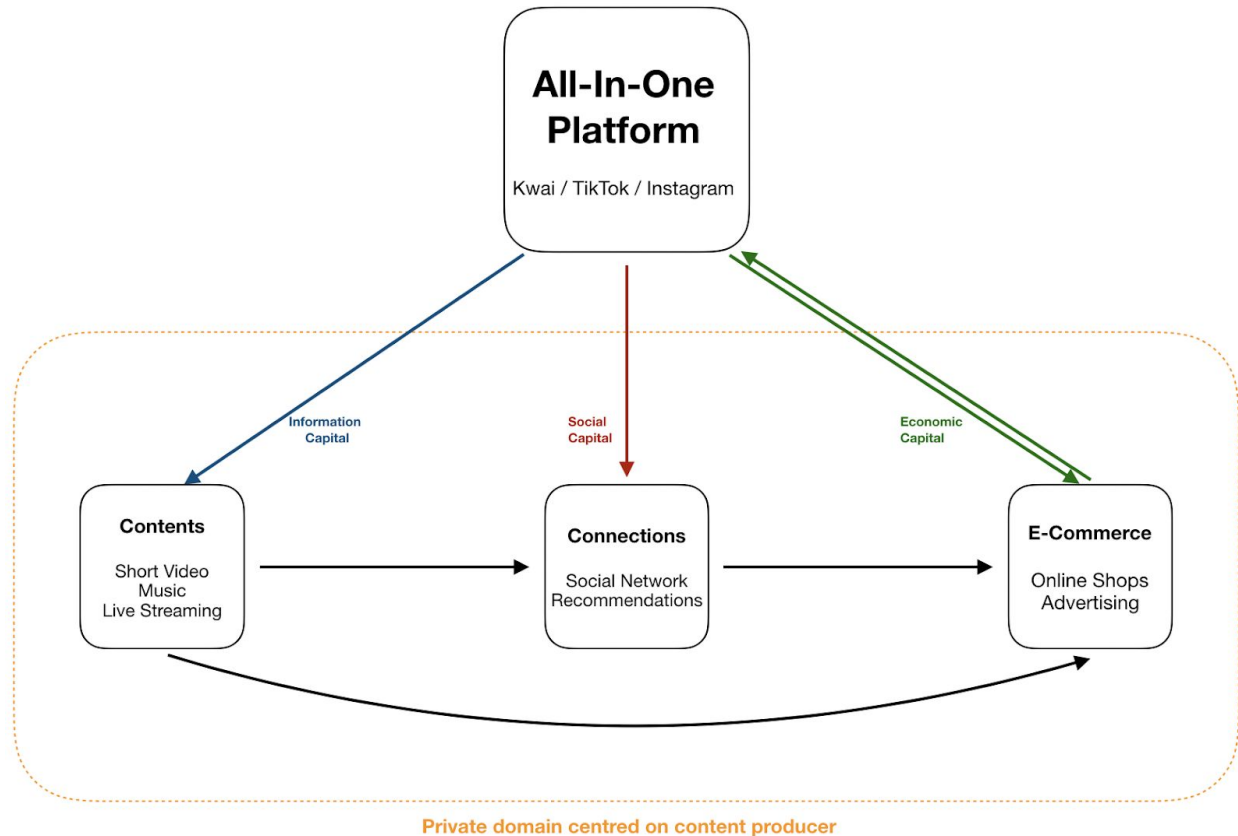Live Streaming

Private domain centred on content producer

Figure 7. The private domain of information capital, social capital, and economic capital.

The new paradigm of all-in-one platforms and its profitability relies on a decentralized fan economy, in which each content producer can form a private domain of contents, community, and commodities. This paradigm is more decentralized compared with traditional advertising. As shown in Figure 7, the platform provides the infrastructures to help users produce content, accumulate followers, and conduct e-commerce activities. Chinese media scholar Yi Yangang argued that the private domain differentiates itself from the mainstream content marketing due to the organically formed user community. Advertising in the private domain can target consumers more accurately and witness a higher conversion rate from a marketing

perspective.[56] However, as Yi pointed out, all the social connections and contents are de facto controlled by the platform, whose power overrides the content producer, so that the private domain is not that private in ownership terms.[57]

RED--an Internet Star is Born[58]

"Zhong cao", which means "growing grass" in Chinese, now refers to the genesis of a person's desire to buy a product when it is recommended by an owner-friend or promoted by an advertisement.[59] Related terms include "zhang cao" meaning "longing for the product", and *ba cao*, literally, "pulling out the grass," meaning "the desire finally can be quenched by purchasing the product." The Chinese social e-commerce platform, RED, is a well-known platform for the *zhong chao* activities. The term *zhang cao* and the action it refers to didn't appear first at RED. In 2009, *China News* already used the term *zhang cao* in a commentary "Growing grass: What makes us want to buy".[60] The concept of *zhang cao* is not new either--manufacturing desires to buy through TV advertisements or films implantations are common tactics of consumerism. However, within the social media context, RED is the most representative platform that combines social media and consumption behaviours and thus integrates social capital and economic capital. RED provides a very specific model of *zhang cao* as a hybrid platform embedded with both social media and e-commerce functionalities. But how did RED start as a

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[56] Yi, Yangang. "'私域流量'崛起？." -- 《青年记者》2019年24期, www.cnki.com.cn/Article/CJFDTotal-QNJZ201924051.htm.

[57] ibid.

[58] Special thanks to Meng Liang, a visiting PhD candidate at GMTaC lab who I worked with to form the arguments and write about the stories of RED in this section.

[59] Zheng, Ruonan, et al. "9 Slang Terms That Explain Chinese Consumer Culture." Jing Daily, 14 Nov. 2017, jingdaily.com/a-chinese-slang-primer-for-luxury-brands/.

[60] Chinanews. "'长草族'：是什么让我们'长草'", www.chinanews.com/cul/news/2009/12-22/2031267.shtml.

business? Now let us briefly review RED's history and the social context of China by raising the following questions: How did international shopping lay the foundation for RED? How has the Chinese cyber culture influenced the business model of RED? What roles do User Generated Content (UGC) and social networking play in the operation of the platform?

By March 2019, RED already accrued over 220 million registered users, and all of this growth started in 2013 with only a few online PDF files that were downloaded and shared among the small communities on the platform. Though the PDF as a medium is not interactive and the sharing method is neither efficient nor organized, the existence of these sharing actions proved there is a need for what RED is providing. The rise of RED was synchronous with China's increasing involvement in the global economy. RED began as a website with a series of PDF documents that provided guidance to consumers heading for overseas traveling and shopping.[61] In September 2013, the company released an iOS version, and the shopping guidelines expanded their focus from Hong Kong to Thailand, America, Japan, Singapore, etc. The travel information also included introductions of local brands, tax and refund information, maps and shopping malls. The cofounders of RED, Mao Wenchao and Qu Fang, invited local online celebrities to write those guidelines, and then users were encouraged to print these PDF guidelines or download them from the app and read off-line.[62]

In the beginning, RED aimed at building a community that enables users to share their overseas shopping experiences. The Hong Kong Shopping Guideline was Red's first example of user-generated content (UGC) model. That was an important step for RED to take as the company transitioned from a traditional top-down, one-to-many media model to a social media

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[61] Ibid.
[62] Ibid.

model. During an interview, the co-founders explained that the transition was aimed at making use of the "fluidity of information" since UCG contents can provide timely and up-to-date information for users. Moreover, the UCG model also helps to build a more cohesive community.[63]

One could, of course, question the business model of RED—how can profit be gained through social networking? The first attempt made by RED was the launch of an e-commerce platform called Fulishe (Perks Society 福利社) , a sub-platform nested within Red in 2014. On this sub-platform, users can purchase various international cosmetics, fashions, snacks and more. The purchase links are usually inserted in the middle of the post (for example, in the image below, the link is placed between the image and the text). Users can directly click on a particular section to browse Fulishe, or, the commodity link can pop up when they are browsing related commodities and guide them to the relevant pages in Fulishe.

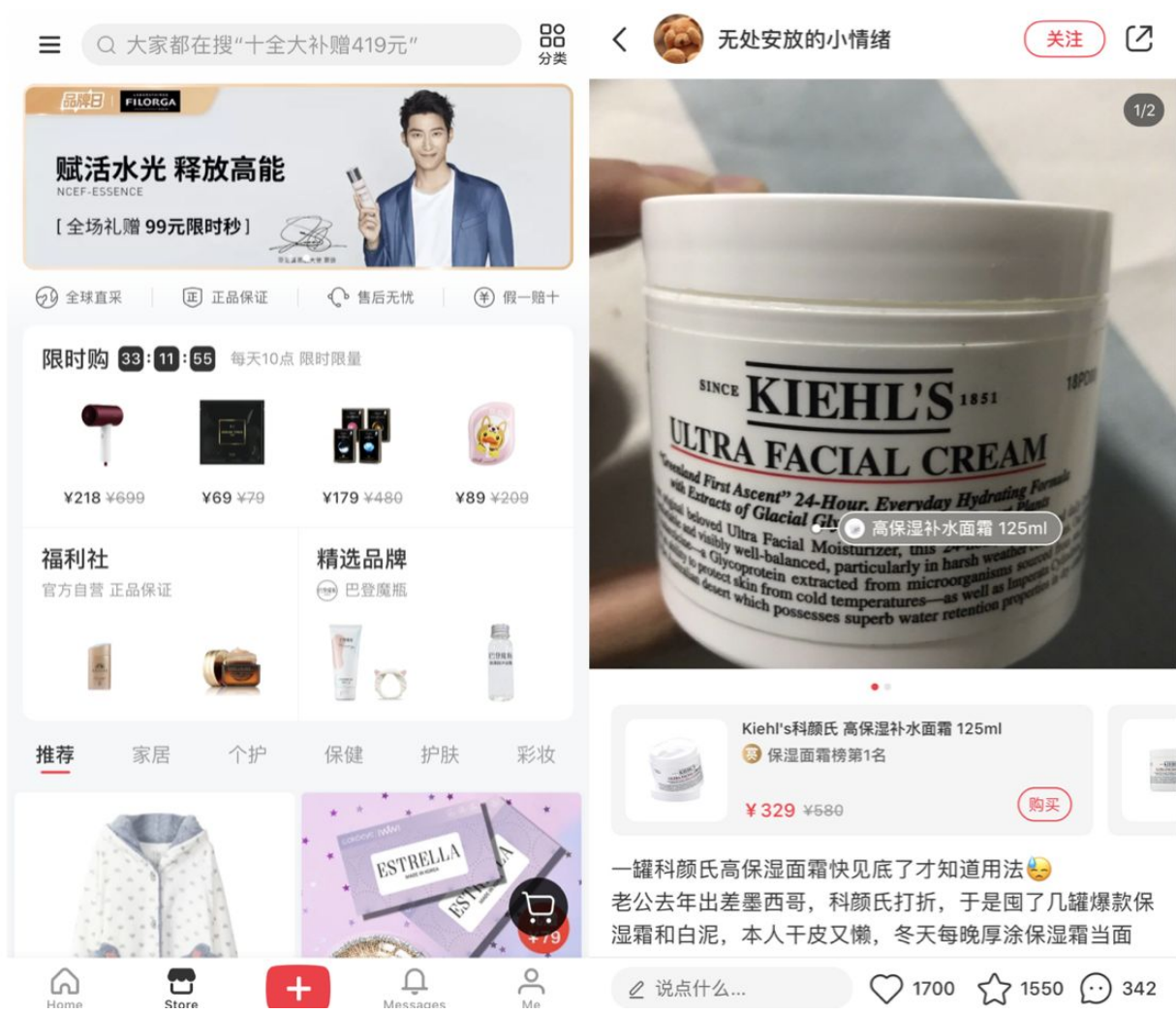[63] *小红书_标记我的生活*, www.xiaohongshu.com/protocols/about.

Figure 8. Screenshot of RED's Fulishe e-commerce app featuring two different shopping links.

The year of 2014 was an important turning point for RED. During this year, RED

established its hybrid model of the so-called social e-commerce platform. RED also used a

branding strategy by inviting stars and online celebrities to open accounts on this platform. RED

then reoriented itself as a platform featuring both commodities and information. This transition is

partially due to external competition—RED was aware that customers tend to gather

information from RED first and then turn to Taobao or other traditional e-commerce platforms to

make the purchase.[64] Therefore, RED changed its strategy from selling tangible commodities itself to an agency of connecting users and brands—In 2019, RED announced a new brand partnership platform. According to RED's website, the new platform enables direct communication between brand advertisers and brand partners, usually KOLs (Key Opinion Leaders). Advertisers can locate the most suitable partner by checking data and information about each RED celebrity account.

Figure 9. Screen capture of the interface of RED's brand cooperator platform.

Now let us take a closer look at how *zhang cao* is popularized within the community. The first keyword here is social networking. The structure of RED's information flow is not characterized by one-way communications like what we saw in mass media, but it is largely based on interpersonal relationships. Can this model motivate people to buy more voluntarily than intrusive traditional advertising? The answer is yes. In fact, similar market strategies have

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[64] "小红书接入淘宝，各取所需的社区与电商们_阿里." *阿里*, 4 Dec. 2018, www.sohu.com/a/279563781_99957087.

already existed long before RED emerged. Think about "Amway", which is famous for marketing based on a one-to-one information spreading mechanism built on interpersonal social networks. "Amway" is an American multilevel marketing company that sells health, beauty, and home care products. When it entered the Chinese market in the 1990s, without advanced internet connections, the multilevel marketing strategy was heavily based on social advertising. In 1999, the turnover of Amway doubled to 640 million yuan, and then 4 billion in 2001 and 6 billion in 2002. Now the term "Amway" has become a buzzword referring to the action of personal endorsement. In social networking, the most influential node is always the internet celebrity, a.k.a KOL, which is another important component of RED's success. KOLs on RED can be TV stars or online celebrities—as long as they enjoy a good number of followers. There is nothing new about the practice of inviting celebrities to do commercial promotions. RED enhanced this model by learning from the characteristics of social media--less well-known celebrities can also be influential in their communities, and the language used does not have to be formal and succinct. Fan Bingbing, a famous TV and film star in China, got a chance to show her other persona on RED:

Figure 10: Screen captures, of Fan Bingbing's RED posts, reveal that her account not only contains what happens in her daily life, but also her recommendations of products to fans. Just like the third image, the tone in promoting the pimple solution is much like recommending something to a friend —according to the post, she said "yesterday I got two pimples on my face perhaps because I'm having my period." "Don't ask me how to deal with pimples again, I told you so," words accompanied by a bunch of emoji and Chinese internet slangs. Such an intimate feeling makes a radical difference between social advertisement and mass media ones).

排名	影响力者	总指数	互动指数	覆盖指数	排名	影响力者	总指数	互动指数	覆盖指数
1	范冰冰	92.9	90.7	95.0	26	MissRED仙女社	78.9	81.8	76.1
2	张郎涵	84.8	84.2	85.4	27	biangbiangbiang	78.5	74.4	82.6
3	林允Jelly	84.3	75.2	93.4	28	十点电影_	78.5	74.6	82.4
4	笑笑_mango	83.6	90.2	77.0	29	//适可而止	78.3	74.8	81.7
5	美妆薯	83.3	72.7	93.9	30	吴昕	78.1	73.9	82.3
6	姜在赫	82.8	86.0	79.7	31	MuMoo	78.1	81.7	74.4
7	Jayla可儿	82.8	87.3	78.2	32	关七是我	78.0	69.3	86.7
8	016sss	82.6	90.5	74.7	33	Miss囧星星	77.9	72.1	83.7
9	沈沐星	82.6	88.9	76.3	34	Maywall	77.8	90.5	65.1
10	生活研究所	81.9	72.1	91.7	35	Dengmiami日本土特产带等	77.6	81.7	73.4
11	Angelababy	81.8	86.7	76.8	36	♂我是陈竞竞♂	77.5	84.4	70.6
12	Moriemi	81.7	90.0	73.4	37	活力多CC子晴	77.5	73.3	81.6
13	软凯凯的粉圆	80.3	88.3	72.3	38	男人相	77.4	74.3	80.5
14	陈贝拉Bella	80.2	91.1	69.2	39	MissY弯她的护肤心得笔记	77.3	76.7	77.9
15	麦姑娘Sabrina	80.1	77.0	83.1	40	是麻吉少女	77.3	81.8	72.8
16	药丸麦丽素	79.9	90.5	69.4	41	欧阳娜娜Nana	77.3	70.6	84.0
17	Juices20160000	79.8	93.0	66.6	42	Ritatawang	77.2	65.2	89.2
18	Pony朴惠敏	79.8	72.4	87.2	43	江疏影	77.2	72.3	82.1
19	peis_gao	79.6	84.4	74.9	44	柯基吃烤鱼_	77.2	75.3	79.0
20	美妆情报局	79.5	65.9	93.1	45	十三姨太_	77.2	81.0	73.3
21	蔡文静	79.3	74.3	84.3	46	大丸子酱Maruko	77.0	87.3	66.8
22	悠悠食记	79.3	70.6	88.0	47	光芒万丈的小超	76.9	70.0	83.9
23	猪小角	79.1	75.2	83.0	48	黄子韬	76.8	83.8	69.8
24	困困小怪瘦	79.1	92.6	65.6	49	景甜	76.8	79.7	73.8
25	穿搭薯	79.0	67.1	90.8	50	陈白羊	76.5	66.4	86.7

Figure 11: Screen captures of the most influential KOL accounts top 50 on RED 2018.

(Pink Lines—stars, Grey Lines—KOL/Online celebrities)

Apart from big stars who can transport their influence in real-life to online spheres, grassroots online celebrities are also important players on RED. For example, Li Jiaqi, a Chinese male beauty blogger and a post-1990 generation online celebrity, has accumulated more than 7 million followers and a net income of more than 10 million yuan ($1.53 million) in 2017.[65] His major income came from brand sponsorship. His signature lines include "OMG!" and "buy it! Let me tell you, buy it", the words and the tone makes Jiaqi feel more like an old friend of the users, instead of a star. 70% of RED's users are born after the 1990s. Why does the young

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[65] Zhang, Jie. "Male Beauty Blogger Finds Road to Wealth on Taobao." *Male Beauty Blogger Finds Road to Wealth on Taobao - Chinadaily.com.cn*, www.chinadaily.com.cn/a/201801/10/WS5a55b328a3102e5b17371e20.html.

generation love RED? I argue that the social media mechanism in some way guarantees the quality of advertisement since the users are posting their own experience of using the product in question .

Social media also contributes to the identity building of users. "It is so important that you see the product works for other girls well. You will have a feeling that you will be as beautiful as they are if you buy it," said 23-year-old Shan Wenran, a recent college graduate.[66] In fact, balancing the KOL's effort to promote commodities while sustaining the trust of the audience is always a challenge for RED. RED's crisis this year proves this: On 29th July, Southern Metropolis Daily reported there is a "grey chain" in the medical beauty industry in RED—advertisers and online celebrities are selling illicit drugs such as clostridium botulinum for plastic surgery. On 30th July, RED application was moved off the shelf in many Android App stores.[67]

RED's response to this move was vague, stating they would cooperate with relative governmental departments to adjust and censor the content in the platform. How to regulate the content is always a challenge for RED. Before this crisis, RED was already aware of the problematic quality of some KOL promotions—in May 2019, RED released a public letter announcing that the platform would elevate the threshold of brand partnership—only KOLs with more than 5000 followers and the average browses of the post more than 10000 per month can be chosen as a brand partner. With this new policy, there are only around 5000 KOLs left while

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[66] Qu, Tracy. "A Red-Hot Chinese Shopping-Review App Shows the Future of Your Online Shopping Experience." *Quartz*, Quartz, 29 June 2019, qz.com/1634577/chinas-xiaohongshu-shows-the-future-of-your-social-shopping-experience/.
[67] 郭苏妍 . "小红书的警报终于拉响." *小红书的警报终于拉响 | 第一财经杂志*, www.cbnweek.com/articles/normal/23799.

more than 12000 KOLs lost eligibility to join this platform.[68] Just as Daxue Consulting indicates, "RED's success is largely due to its content-driven nature."[69] Social capital, i.e., the internet celebrities community resides on RED, has become the crucial factor in RED's business model. Although RED is now experiencing some ups and downs, it is still one of the most representative Internet platforms that combined social media with UGC content and e-commerce. Social e-commerce has given rise to new forms of marketing based on social networking. For example, a popular model used by Pinduoduo is "asking your friends to help cut the price", a mechanism that helps users to get discounts. All in all, RED, as a pioneer platform adopting the social-ecommerce model, sheds a light on how new forms of media can influence traditional industries like e-commerce.

The Comparative Advantages of Emerging Platforms

Bilibili, TikTok, RED, young and fledgling as they are, pioneered the paradigm shift that revolutionizes traditional business models of Internet platforms dependent on advertising or membership subscription. The app ecosystem endows platforms the power to design and control tools for netizens to publish content and store data. Giant platforms find it profitable by playing the role to connect users and services through advertising, a.k.a., attention merchants. Yet the ultimate goal of the Internet platforms should be facilitating user's productions and conversions of social capital, information capital, and economic capital. The emerging platforms proved that rather than competing with giant attention merchants, there are many potential focus small

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[68] 新浪财经综合 . "小红书'点杀'KOL 瞿芳回应一切？." _新浪财经_新浪网, 16 May 2019, finance.sina.com.cn/chanjing/gsnews/2019-05-16/doc-ihvhiqax9198651.shtml.
[69] Allison. "J-Beauty and K-Beauty in China: Key Players in Chinese Cosmetics Market - Daxue Consulting - Market Research China." *Daxue Consulting – Market Research China*, 20 Nov. 2019, daxueconsulting.com/latest-facts-and-insights-about-xiaohongshu-2019/j.

platforms can do to gain comparative advantages against giant platforms --i.e., virtual community building, investing in users for content producing, hybridizing e-commerce with social media features. Thanks to the explorations of new platforms on the mutual convertibility of social capital, information capital, and economic capital, we are seeing emerging economic means of participation of netizens. Though platforms still play a centralized managing role to mediate online activities, netizens as content producers and content consumers are able to conduct interactions involving conversions of different capital, which means there is a potential for netizens to form a self-regulating market around these activities rather than totally rely on the centralized platforms.

Chapter III Progress and Obstacles Towards A

Decentralized Internet

"The empire, long divided, must unite; long united, must divide."[70]
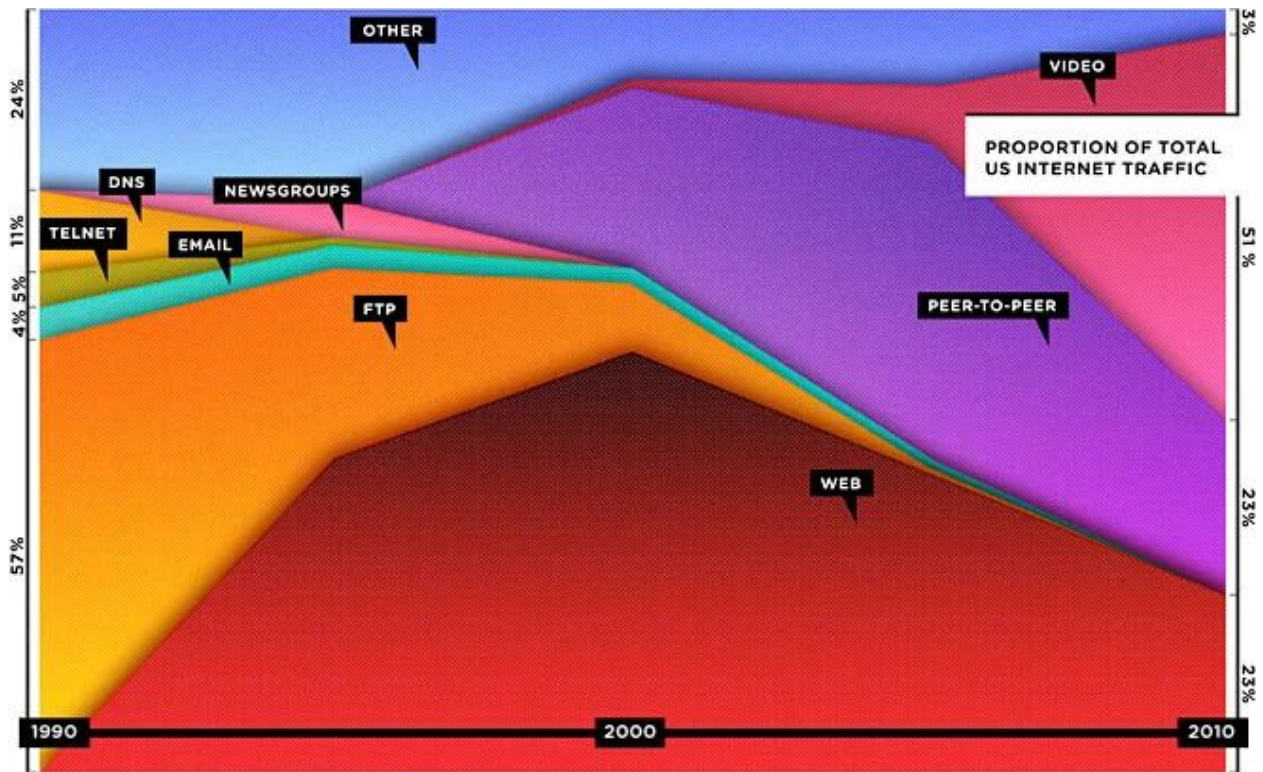
-- Romance of the Three Kingdoms

Figure 12. Proportion of total US internet traffic.[71]

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[70] Luo, Guanzhong, and C. H. Brewitt-Taylor. "Romance of the Three Kingdoms San Guo Yan Yi". G. Brash, 1985., 5.

[71] Wolff, Chris Anderson and Michael. "The Web Is Dead. Long Live the Internet." *Wired*, Conde Nast, 20 Nov. 2018, www.wired.com/2010/08/ff-webrip/?fbclid=IwAR2n6mGs67-xPukALczKsNJDVRplsaI3b50xcSwAsS7mPiX7oWodM_d2XrI.

Media as artifacts are solid like rocks, but media in terms as social activities and arrangements formed around the media change fluidly like rivers. As shown in Figure 12, the traffic of the Web peaked in the early 2000s and then has been declining afterward. As argued in the first chapter, the app ecosystem has replaced the Web as the main force to realize Web 2.0 ideals because apps did a better job in lowering the transaction fees for users to produce and do conversions of information capital, social capital, and economic capital. Yet the privatization of production tools and data storage has turned apps into data silos, which further affected the flow and conversions of different capital. In this chapter, I will analyze the evolution of the medium in the app era, and I argue that the recent development in the app ecosystem all aimed to increase data interoperability between platforms.

The data-oriented model in the app ecosystem makes the game a winner takes all competition. In the current app ecosystem, the more data a platform collects, the more profits it can make and the better service it can provide. Consequently, it has become a norm for apps to collect and utilize user data as the strategic property to further cultivate user adherence to the platform, which has led to problems like data ownership and surveillance capitalism.[72] I argue that privacy and data ownership issues are essentially data interoperability issues between platforms and users. Moreover, the trading of user data in today's data economy marks the bottleneck faced by the app ecosystem, and data driven optimization leads to netizens' chances of getting locked in an iron cage of technological efficiency--a local maximum serves Internet companies interests. To improve the status quo, society should not only provide legal means to

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[72] Zuboff, Shoshana. "Google as a Fortune Teller: The Secrets of Surveillance Capitalism." FAZ.NET. https://www.faz.net/aktuell/feuilleton/debatten/the-digital-debate/shoshana-zuboff-secrets-of-surveillance-capitalism-14103616.html?printPagedArticle=true.

protect netizen's privacy, but also build infrastructure of data interoperability to grant netizens the means to participate in the data economy and to have full control of their data.

The Breakthrough Test

Before we think about the development of media in terms of information, let's first take a look at the history of drinking water as an analogy. The river was a natural medium for water, which gave rise to multiple river valley civilizations. Later, new water mediums have been invented--the well, canal, waterpipe, bottles, semipermeable membrane--which all played indispensable roles in different periods in human civilization. From a historical perspective, we can clearly see the progress of technology closely related to social changes like-- industrialization and , urbanization;, yet in a constantly changing world, how do we preemptively prepare for technological changes that might be revolutionary? Or how do we know when is it ready for the transformation of quantitative improvements to qualitative changes?

In this section , I will formalize McLuhan's "the medium is the message" claim into a test for the evolution of media. McLuhan claims that a characteristic of every medium is that its content is always another (previous) medium.[73] I formalised this statement as a breakthrough test that can be used to predict the next widely adopted medium—if a new medium can provide the same affordances as the previous medium and at the same time has feature(s) that the previous medium cannot provide, then it has the potential to become the next widely adopted medium.

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[73]"McLuhan, Marshall - Understanding Media: The Extensions of Man." McLuhan, Marshall - Understanding Media: The Extensions of Man - Notes - Garnet Hertz, www.conceptlab.com/notes/mcluhan-understanding_media.html.
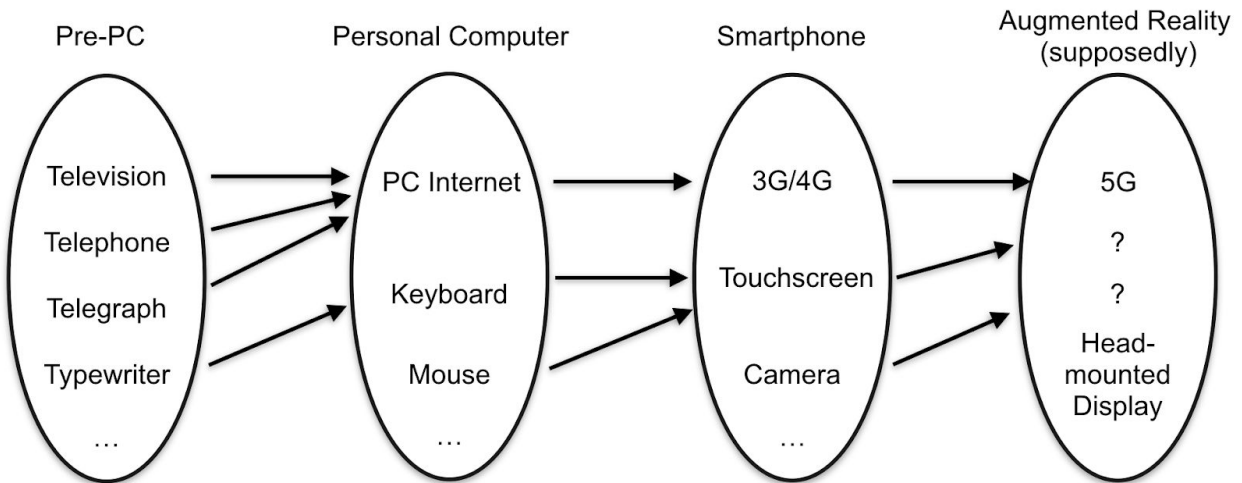
Figure 13. The breakthrough test of hardware.

Now let's analyze the hardware media with the revolutionary test. In the diagram above, we can see the four generations of hardware in the information sphere. The media technologies before the Internet have been grouped into media in the Pre-PC era, which includes the television, telephone, telegraph, typewriter. McLuhan stated in an interview with CBC TV that "the next medium, whatever it is, may be the extension of consciousness—will include television as its content."[74] As McLuhan predicted, the rise of the Internet and personal computers gave rise to streaming platforms, messaging tools and news websites, which contained the affordances of TV, telephone, newspaper. Moreover, another requisite in the breakthrough test is that the new medium should provide feature(s) that the previous medium cannot provide. The PC provided some important new affordances, including, but not limited to, the mouse, an input device as the extension of the hand; and the CPU, the central processing unit that can run software and algorithms as the extension of mind.

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[74] Getto, Erica. "The Medium Is the Massage: Celebrating Marshall McLuhan's Legacy". New York: WNYC. Retrieved March 23, 2020.

If we continue the revolutionary test, we can find that the media device after the PC era follows the smartphone era--mobile Internet, touchscreen, apps, and mobile payment respectively fulfill the functions of computer networks, keyboard and mouse, the *World Wide Web,* and online credit card payment. Moreover, smartphones also provide features not offered by PC, e.g., better portability and cameras. What will be the next revolutionary media device? Google published its version of augmented reality glasses back in May 2014, known as Google Glass. Yet the product failed to meet the expectations and Google shut down the production after seven months in January 2015.[75] At that time, smartphones still provided better user experiences and functions back in 2014 so that Google Glass could not fulfill all the affordances of smartphones according to the revolutionary test. Augmented reality does have the potential to become the next revolutionary medium, yet only when the parallel technologies of AR become mature--when 5G is as accessible as 4G, natural language processing and human-computer interactions in AR can cover the affordances of smartphones, plus the new affordances special to AR headsets, e.g., handsfree portability--could AR become the next generation of media of information.

From the above analysis we can get a sense of the two key points in the revolutionary test. 1. The new medium should be able to provide the same affordances as the previous medium. Or we can say that the new medium should shatter the previous medium in terms of functionalities. 2. The new medium has feature(s) that the previous medium cannot provide. This means the new medium should be born with innate features that compensate for pain points raised by the previous medium. However, note that even if a new medium meets the two

[75] "Google Glass." *Wikipedia*, Wikimedia Foundation, 26 Mar. 2020, en.wikipedia.org/wiki/Google_Glass.

prerequisites, it is not sufficient for the new medium to become revolutionary--meeting the test is

a necessity, yet not a sufficiency. Passing the test means a medium possesses the potential to

replace the previous medium, yet whether the new medium will get generally adopted is

dependent on many qualitative factors. How significant the new features of the new medium are.

What would be new problems the new medium will potentially raise--one criticism of Google

Glass is that the device may contravene the privacy law.

Interoperability--the Achilles' Heel of the App Ecosystem

In the last section, I introduced a method to conduct analysis on the technology

breakthroughs and the transition of media through affordances. The examples ofn social video

platforms and social e-commerce platforms in the last chapter have shed light on the current

trend of the Internet. The development of social media features, user generated content, and

mobile payment bolstered the rise of the app ecosystem. With private servers, professional

designs and operations, the app-led experience surpasses the Web in all the major aspects--

publication, data storage, e-commerce, social networking. However, a major drawback of the app

ecosystem backed by private Internet companies is the lack of *data interoperability* between

platforms, making the current app ecosystem de facto *app silos*.

Data interoperability does not only mean different platforms sharing data between each

other, but also addresses the ability of users, platforms, and other agencies who create, exchange

and consume data to have clear, shared expectations for the usage, context and meaning of that

data.[76] *Data interoperability* serves as the prerequisite to resolve data ownership issues, for the

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[76] "What Is 'Data Interoperability?"." *The Data Interoperability Standards Consortium*, datainteroperability.org/.

new data ownership paradigm requires improved protocol that addresses both privacy concerns and the demands of the market. Following the logic in the breakthrough test, since the current app ecosystem relies heavily on data for both services providers end and users end, the new data ownership paradigm needs to meet the affordances of big data through interoperable data while providing solutions to data ownership and privacy issues.

App silos depicts the ill status quo of different apps practising their own data standards while leaving users out of the loop. Due to the lack of data interoperability among platforms as well as between platforms and users, two major problems have emerged. First, Internet companies have made the data generated on the platforms as private virtual properties, and rely on them to make profits. The same person has to make different profiles on different platforms, and the data footprints are discrete. The popular narrative of big data is that platforms may learn your preferences better through data mining, therefore, providing more personalised services. However, the *app silos* thwarted the ideal since. Because the services used by the same person in different apps, and they are siloed with no interoperability among each other. Each service provider needs to train their own machine learning model based on the limited data collected on the platforms. This may result in "the blind men and the elephant"[77] scenario--service providers are the blind men and users the elephants--each app only learns about a limited part of the elephant and none of them can see the whole picture of the elephant, which makes it impossible to maximize the potential value from users' digital data and live up to the ideal of user-centered design. Moreover, big companies are more advantageous in the competition for they are able to

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[77] Randall. "Blind Men and the Elephant." *AllAboutPhilosophy.org*, All About Philosophy, 22 Nov. 2019, www.allaboutphilosophy.org/blind-men-and-the-elephant.htm. The Blind Men and the Elephant is a famous Indian fable that tells the story of six blind sojourners that come across different parts of an elephant in their life journeys. In turn, each blind man creates his own version of reality from that limited experience and perspective.

train more powerful algorithms with the data owned, making the Internet market more polarized.

For example, Facebook and its subsidiaries are over ten times more valuable than its

competitors—Twitter and Snapchat.[78] Moreover, Facebook plans to create data for

interoperability protocols that integrate WhatsApp, Instagram and Facebook Messenger.[79]

Data economy is the gathering, organization, and exchange of data in a network of

vendors (we only discuss Internet companies here) for the purpose of deriving value from the

accumulated information.[80] Today's data economy has an overt and pressing flaw: users, as the

source of data, are left out of the loop where big Internet companies are the major players. The

legal side has made progress to protect user's rights around the use and sale of sensitive personal

information. GDPR (General Data Protection Regulation) and CCPA (California Consumer

Privacy Act) have set strict terms to protect privacy data. However, the status quo for netizens in

the data economy is *protections without participation*. Netizens have laws to protect the misuse

of their data, yet lack the means to participate in the data economy.

Nowadays, data collection and trading processes are exclusively operated by internet

companies. Reports showed that big companies, Amazon, Apple, Microsoft, Netflix, Spotify and

Yandex, have signed data exchange deals that formed a centralised version of data

interoperability.[81] Apart from Google and Facebook, the world's biggest database provider

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[78] Cyphers, Bennett, and Danny O'Brien. "Facing Facebook: Data Portability and Interoperability Are Anti-Monopoly Medicine." *Electronic Frontier Foundation*, 19 Feb. 2019, www.eff.org/deeplinks/2018/07/facing-facebook-data-portability-and-interoperability-are-anti-monopoly-medicine.

[79] Isaac, Mike. "Zuckerberg Plans to Integrate WhatsApp, Instagram and Facebook Messenger." *The New York Times*, The New York Times, 25 Jan. 2019, www.nytimes.com/2019/01/25/technology/facebook-instagram-whatsapp-messenger.html.

[80] "Data Economy." *Wikipedia*, Wikimedia Foundation, 6 Feb. 2020, en.wikipedia.org/wiki/Data_economy#cite_note-EU2017-1.

[81] "Facebook's Data-Sharing Deals Exposed." *BBC News*, BBC, 19 Dec. 2018, www.bbc.com/news/technology-46618582. Examples include: Microsoft's Bing search engine was able to see the names of "virtually all" Facebook users' friends without those friends' consent in order to personalise the results it

Oracle Inc. also monetizes based on their data business called *Oracle Data Cloud*, whose

statement of purpose is to drive better business outcomes by understanding your audience better.

[82] As Shoshana Zuboff has argued, these kinds of data sales and analysis in the capitalism market

ultimately commodifies personal information and will let corporations prey back on dependent

populations who are neither its consumers nor its employees and largely ignorant of its

procedures.[83] The Facebook-Cambridge Analytica data scandal had alerted the world to the

heinous outcome of leaving users out of the sight of how their data is used.[84] However, vigilant

as we should be, it is equally important to understand the market logic in the data economy in

order to further find proper solutions.

With the goal to increase netizen's participation in the data economy and interoperability,

I will introduce the recent development in the infrastructure of the app ecosystem. Then I will

conclude the chapter with my critics on the current metrics of Internet products and introduce the

attention-capital model.

How to Realize Interoperability: Bottom-up or Top-down?

Data interoperability is more than data sharing for economic purposes. Call on different

parties to reach the consensus on data formatting and fair use of data is the true challenge and the

quintessential value behind data interoperability. The app ecosystem has been constantly making

progress towards *software level data interoperability*. We are seeing an ever-growing

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showed. Sony, Microsoft and Amazon could access members' email addresses via their friends.Yahoo could view
live feeds of friends' posts.

[82] "Oracle Data Cloud." Unlock Hidden Potential | Oracle Data Cloud. https://www.oracle.com/data-cloud/.

[83] Zuboff, Shoshana. "Google as a Fortune Teller: The Secrets of Surveillance Capitalism." FAZ.NET.
https://www.faz.net/aktuell/feuilleton/debatten/the-digital-debate/shoshana-zuboff-secrets-of-surveillance-capitalism
-14103616.html?printPagedArticle=true.

[84] The Facebook–Cambridge Analytica data scandal was a major scandal in early 2018 where Cambridge
Analytica harvested the personal data of millions of people's Facebook profiles without their consent and used it for
political advertising

Application Programming Interface (API) ecosystem: for example, with Twitter API, outside

developers can access data in twitter server with the defined calls or requests that can be made.

Platforms like Facebook and Google are using OAuth to support social login--users can use their

social media account to log on to other Internet services. Team collaboration app Slack has

integrated more than 2000 frequently used services into their platform, including Office 365,

GitHub, and Google Drive. TikTok, the social video platform mentioned in the last chapter, has

an online shop in cooperation with the e-commerce platform Taobao, which enables TikTok

users to use Taobao functions without leaving the platform. From the examples above, we can

see there are plenty of explorations to improve the interoperability between apps, yet most

explorations happen within the software level (see the figure below to see the relationships

between software, platform, and infrastructure) and none of them changed the structure of
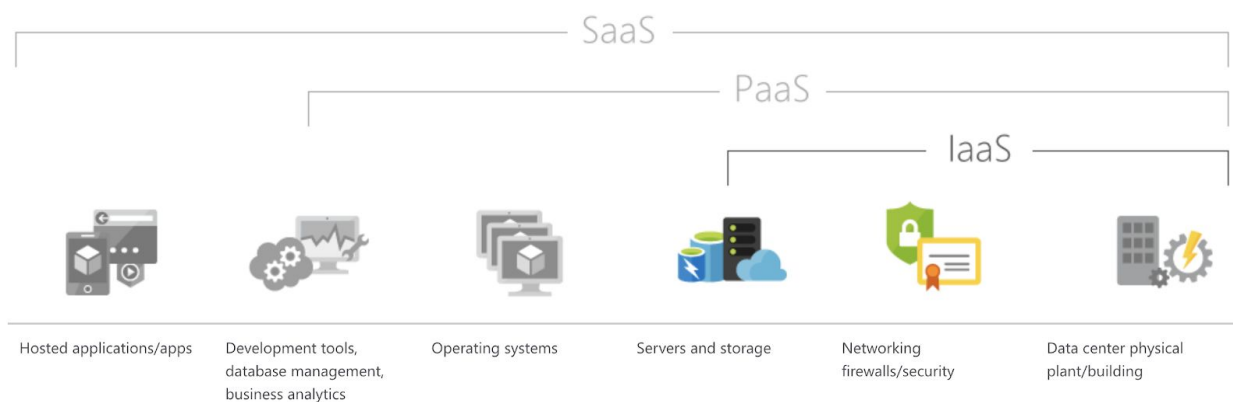
platforms or infrastructures.

Figure 14. Relationship between Software as a Service, Platform as a Service, and Infrastructure

as a Service.[85]

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[85] "What Is IaaS? Infrastructure as a Service: Microsoft Azure." Infrastructure as a Service | Microsoft Azure. https://azure.microsoft.com/en-us/overview/what-is-iaas/.

Now let us look beyond those cooperations between apps that partially realize the software level interoperability. In today's Internet world, two emerging approaches are set to realize data interoperability in the platform level or infrastructure level: *Mini Program* platforms and *Linked Data* protocols. Mini Program platforms realises data interoperability in a top-down manner, as the primary platform where the mini programs dwell has the power to enact policies. Linked data protocols actualize interoperability based on the World Wide Web Consortium (W3C) protocols that web app developers can voluntarily choose to adopt or not. I will analyze the advancements that they added to the app ecosystem and the problems they faced respectively.

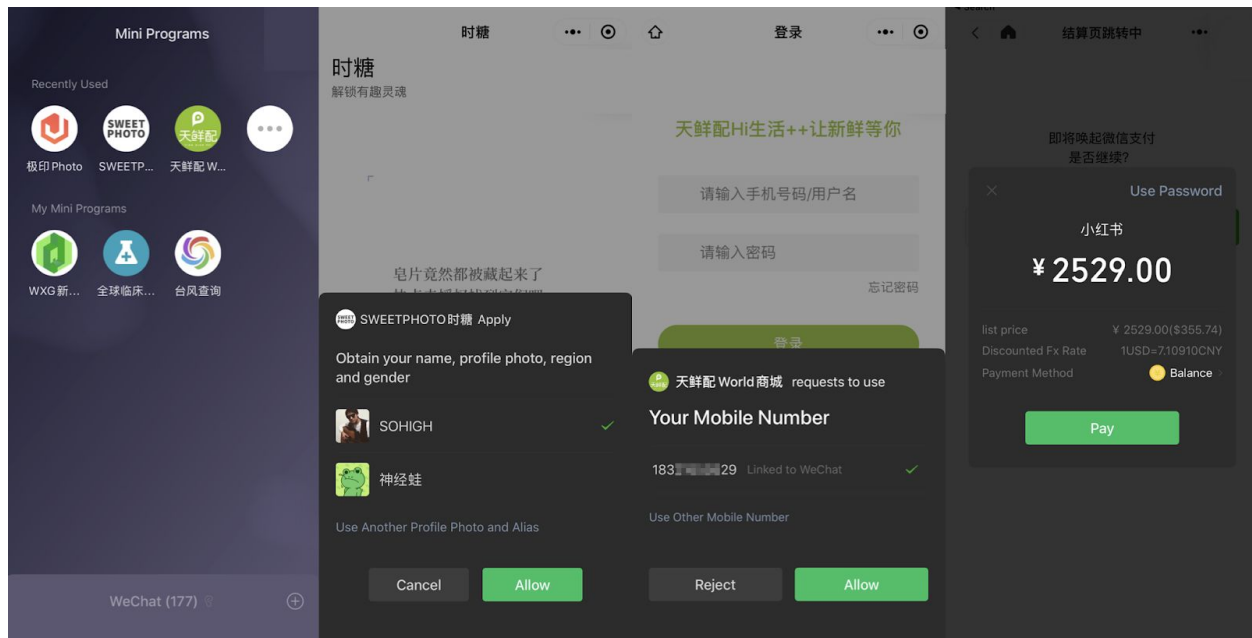## Mini Program: Interoperability Inside Giant Platforms

Figure 15. WeChat Mini Programs Accessing WeChat Data and Features.

Mini Programs in essence are fully functioning apps embedded inside a larger platform, the mechanism works similar to web apps (as the Mini Programs) and browsers (as the larger platform) but in a centralised format. The parent platform promotes *platform level*

interoperability in a top-down manner by enforcing standardized developing languages, data

formats, and user interaction components. Moreover, various APIs have been incorporated into

the Mini Program platform so that all functions are accessible to developers: OpenID for user

login, QR code scanning, augmented reality modules, online payment, map API, location service

and all the features of the main platform. With the help of various interoperable functions, Mini

Programs can stay light in size, rapid in development, and more often than not, focusing on

specific functions that the main platform cannot provide to its users. The social media giant

WeChat first published its Mini Program platform in 2017, followed by Baidu and Alipay: Mini

Programs have become the new battlefield for giant players. Platform level interoperability has

incorporated software level interoperability into the protocols: WeChat allows its Mini Programs

to access user's WeChat public profile with user's consents, sell products or services to users

with WeChat Pay as the payment method, and request privacy-related data stored on WeChat

(see Figure 15). According to the 2019 end of the year report, WeChat has more than 3 million

Mini Programs on its platform with 330 million daily active users. Moreover, users on average

have used 60 different Mini Programs in 2019.

The intrinsic constraints of platform interoperability has to do with the limitation of the

platform--not only because Mini Programs can never overpower the main platform, but also

because Internet platforms are backed by various companies with different stakeholders, Giant

Internet companies have conflicts of interests with each other, so that there is little

interoperability between giant platforms. WeChat does not have Alibaba's products as Mini

Programs and, logically, vice versa. In fact, the companies with close business relationship with

Tencent, a.k.a, *the Tencent Gang (腾讯系)*, only joins the Mini Programs platform ran by WeChat.

An example here may help you better understand the worldly factors that affect platform level interoperability. Zhihu, the Chinese question-and-answer platform, started to deploy its Mini Program version on WeChat explicitly, and users can search Zhihu content through the WeChat search powered by Sougou, another Tencent Gang member. Later on, in August 2019, the Chinese search behemoth Baidu invested in Zhihu's F round fund-raising campaign, and Zhihu joined Baidu Mini Program with all the content available as well. However, due to business competitions, the high-level data interoperability between Zhihu and WeChat, or Zhihu and Baidu, can never happen between Zhihu and Alibaba. Users still can't enjoy unaffected data interoperability.

Therefore, we can conclude that the platform level interoperability has been partially realised through Mini Program, yet the top-down enforcement of interoperability is highly contingent depending on the manifest and latent policies of the mother company. The conflict of economic interests between Mini Program platforms is the deadlock that checked the potential of the Mini Program style interoperability.
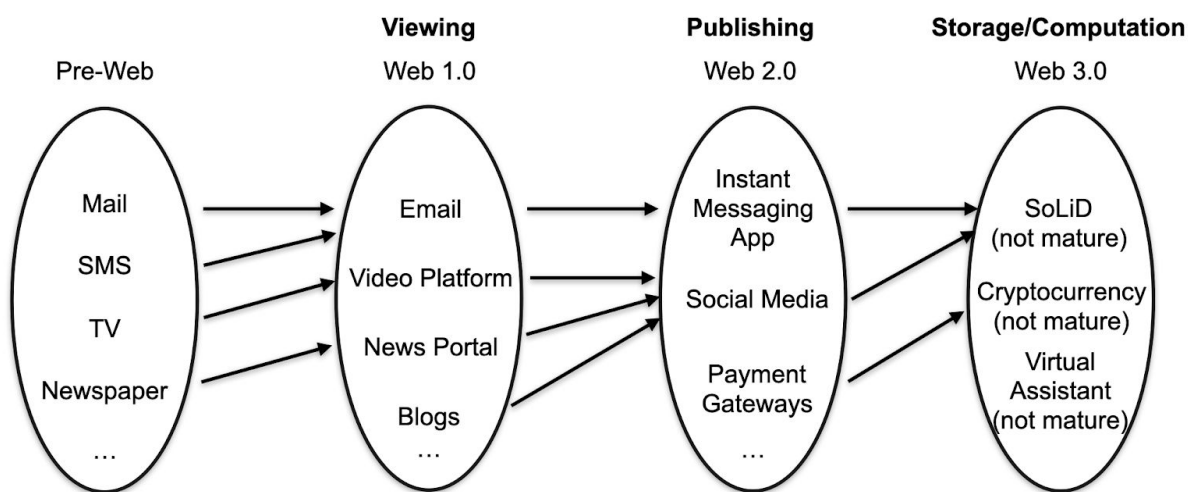
Figure 16. The breakthrough test of Internet platforms.

SoLiD: Where Social Media Become Infrastructure

SoLiD (Social Linked Data) is the new project proposed by Sir Tim Berners-Lee, the inventor of the World Wide Web. Instead of creating a new platform, Solid aims to add three major features to augment the affordances of the current Web. 1. *WebID*, an identification system so that instead of having to sign in to everything with Google or Facebook you can sign in with your favourite Solid provider and you won't be tracked. 2. Ubiquitous sharing control so that you can share anything with anybody no matter which social media they happen to be part of. 3. *Personal Data Pod*, a sort of personal data storage based on the cloud computing infrastructure.[86] The design of Solid does not come out of nowhere, but came after its two predecessors: *Semantic Web* and *Linked Data*. Both projects originated from the World Wide Web Consortium (W3C) and aimed at improving data interoperability by making data more *reusable* and to making data *independent* from applications.[87] However, Semantic Web

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[86] "Definitions." Frequently Asked Questions · Solid. https://solidproject.org/faqs.
[87] Ibid.

technologies or Linked Data standards arguably failed the expectations in reality. Instead, the app ecosystem got more widely adopted by the developers, the market, and the society. Yet Sir Berners-Lee still keeps the faith in the Solid project, he believes that Solid will rejuvenate Semantic Web technologies and Linked Data principles and bring back two principles that are key to the original and potent concept of the web: read-write capability and managed data accessibility.[88]

Solid targets at improving data interoperability in the infrastructure level by granting users the access to their data storage with the Personal Data Pod who can give read-write permissions to various Solid apps. Social linked data also guaranteed social connections to be a secured property linked with users' WebID, which marks the separation of data and affordance. Thus, user's can fully control their social capital and information capital on Solid. Moreover, Solid proposed several potential business models that support netizen's participation in the data economy. "It is likely that several business models emerge, some where the user pays for storage, and some funded by advertising for instance, like on the current Web platforms. However, with Solid, if the terms of your Pod Provider change, or if you want to switch to an advertising-free Provider, you can do so conveniently without losing your data, such as your contacts and chat history."[89] As argued in the media in transition section, for the Solid ecosystem to become the next widely adopted medium and replace today's app ecosystem, the prerequisite needs WebID, Linked Data, and Personal Data Pod to provide the same affordance of the current app standards. From the developer's perspective, the Solid related technologies are still fledging.

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[88] "About." Solid. https://solid.inrupt.com/about.
[89] "Definitions." Frequently Asked Questions · Solid. https://solidproject.org/faqs.

The developing tipping point when developers would like to voluntarily build Solid apps has not arrived.

The Adverse Selection of Online Content and Potential Means of Participation for Netizens in the Online Content Market

Netizens' participation is indispensable for the prosperity of Internet platforms. In this section, I will introduce some potential ways for netizens to participate in online activities with economic means. As argued in the second chapter, we have already seen emerging means for professional users to participate in online activities involving economic capital--virtual gifts, live streaming sale, in-app purchase. I am not arguing everyone can become an Internet celebrity, but trying to bring about more implications from the participatory interactions between fans and Internet celebrities.

Firstly, we want to be clear about the goals of the netizen's participation in the data economy: 1. Avoid undesired consequences of surveillance capitalism like micro-targeting. 2. Recuperate the quality of online information. The quintessence of the data economy is economy, i.e., economic capital. If we want to solve the problem of micro-targeting used in advertising, the most straightforward way is to purchase the vip subscription, which may sound obvious, but is the most effective existing way for netizens to get rid of advertising through economic means of participation. A more realistic question is: what are the new choices that netizens could make with the economic means of participation like paying vip subscription fees, i.e., making a choice to get rid of online advertisements, to opt out of the platform's collection of certain data, choices to use certain algorithms for content recommendation. In terms of more ideal means, netizens could purchase personal storage like Solid POD, which will provide users means of data storage

and management. However, the feasibility of Solid and other personal data services is yet to be tested and validated by the market and netizens.

The second goal is to give users more control of the distribution and production of online information. The quantification driven metrics have also led to another problem--the adverse selection of online content and a shorter attention span of netizens.[90] As a result of the online content market's adverse selection, today we see an increase of sensationalized contents, clickbaits, and frauds online. Platforms today control the design of the mechanisms to distribute content, which favors content that can increase the metrics including click through rate and session time. Content producers and consumers have lost the control of content distribution, which has led to a critical asymmetry of information between users and platforms. As a result, the content market becomes prone to adverse selection, allowing the platforms to select certain contents that can maximize their own interests at the expense of potential information capital users could have gained. Contents that provide users with more stimulus would become prioritized.

Moreover, the attention span of netizens I mentioned earlier may also get affected by online content's proliferation and content sensationalization. A study from Microsoft shows that human attention had dwindled to 8 seconds, which might have to do with people's lifestyle in the mobile internet era and the human brain's ability to adapt and change itself to the heavy

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[90] Adverse selection refers generally to a situation in which sellers (platforms that serve contents) have information that buyers (netizens who consume contents) do not have, or vice versa, about some aspect of product quality—in other words, it is a case where asymmetric information is exploited. Asymmetric information, also called information failure, happens when one party to a transaction has greater material knowledge than the other party.

consumption of digital content.[91] There is a need for healthier mechanisms of motivation for

netizens to produce and consume contents.

As the examples showed in the second chapter, new paradigms of content producing are

emerging, which could motivate netizens to better participate in the content economy.

Furthermore, I argue that user attention and information capital are the two scarcities on the

Internet and should be linked in the Internet market. Platforms today are playing the broker role

of connecting users to online content, but the matching process is nontransparent. Users and

content producers have no access to the decision making of content distribution. I want to

propose the attention-capital model for content payment, where user surfing time is linked to the

money received by content producers. The protocol works as follows, every user pays a

voluntary amount of money they can afford for a fixed amount of time, and based on the time the

user has spent on different contents, a smart contract will proportionally forward the dividend to

the content producers, platforms and other agencies based on certain terms. For example, if I

watched content produced by Bob, Ann, John for 100 hours in total in the last month, and I spent

30 hours on Bob's content, 10 hours on Ann's, and 60 hour on John's. If I have prepaid 10 USD

in the beginning of the month to the smart contract, then Bob, Ann, John will respectively get 3

USD, 1 USD, 6 USD from me. If there are other stakeholders, further mechanisms may need to

be designed. In this way, the central management role of the platform will be replaced by the

market of attention and information capital. Similar explorations include the *Basic Attention*

Token experimented by the Brave browser, and the Voice project recently published by eos.io.[9293]

[91] McSpadden, Kevin. "Science: You Now Have a Shorter Attention Span Than a Goldfish." *Time*, Time, 14 May 2015, time.com/3858309/attention-spans-goldfish/.

[92] "About Brave Rewards." Brave Browser, brave.com/brave-rewards/., Brave Rewards is built on the Basic Attention Token (BAT), a new way to value attention, connecting users, content creators, and advertisers. When you join Brave Rewards, your browser will automatically start tallying (only on your device's local storage) the attention

In a word, the technological affordance today is able to provide various means for

netizens to participate in the online content market, and instead of relying on platforms'

macro-control power of content distribution, we ought to build the infrastructures for a healthy

and well-functioning content market, so that netizens who produce contents and netizens who

consume contents could become the central players with proper representation and power in the

Internet market.

Conclusion & Implications

In this thesis, I propose the three capital models as a means to analyze netizen online

activities and platforms' roles on curating the Internet ecosystem. In the first chapter, inspired by

French sociologist Pierre Bourdieu, I argue there are primarily three types of capital on the

internet: social capital, information capital, and economic capital. Internet platforms can

facilitate netizens to better generate and do exchanges between those three different capital.

However, the privatization of user data has blocked the free flow of those capital from

one app to another, and I call the current app ecosystem as app silos. Scholars have argued

today's top-down app ecosystem is a de facto monopoly by giant Internet companies, which is

logically plausible because the more capital a platform owns, the easier it is to gain new capital

and attract users, especially in the current scenario where the major business models of Internet

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you spend on sites you visit. Once a month, Brave Rewards will send the corresponding amount of BAT, divided up
based on your attention, from your local browser-based wallet to the sites you've visited. You can remove sites you
don't want to support, and tip creators directly too. All of this is anonymous: nobody (not even us here at Brave) can
see who supported which sites. We can only count up the total support for each site and send the BAT their way.
Content creators can use our partner Uphold to convert the BAT they earn into a currency of their choosing.
[93] "Where Truth Has a Voice." Voice, voice.com/., Voice is a transparent, rewards-based social network for
creating, distributing, and discovering content. It aims to foster a new and trusted experience through identity
authentication and transparent database infrastructure. Voice is built by and for its users. Most value is returned back
to its community through Voice Tokens, a utility token that can be earned and consumed to acquire the attention of
other users on the network.

companies are mainly based on advertising or vip subscription. Nonetheless, the reality is not simply winner-take-all. There are still new platforms emerging--how do small platforms survive? I argued in the second chapter that precisely because of the top-down and closed nature of the app ecosystem, platforms also play an important role in mediating the online activities. For example, I analyzed the content producing paradigm of Bilibili and I described the platform as a content incubator. The content on Bilibili comes from two sources: one is the copyrighted contents purchased by Bilibili as owned media--animes, games, comics. While at the same time, Bilibili supports its users with economic incentives to produce contents, which is the core of Bilibili's professional user produced content strategy, and the content produced by uploads would become the platform's earned media. Bilibili's strong focus on ACG (anime, comics, games) and its community building efforts endowed the platform the advantage to compete with big video platforms. Moreover, previous studies on Web 2.0 and participatory culture mostly focus on social capital and information capital instead of economic capital. As I mentioned in the second chapter, new features like virtual gifts and tips have enabled fans to interact with content producers and participate in the Internet market with economic capital, which has provided tools to link the participatory web concept of Web 2.0 to the broader economic context. I concluded that emerging platforms still have a chance to compete with the giant platforms by focusing on its comparative advantages.

Moreover, the strong platform status quo in the app era may lead to various problems. In the current app ecosystem, platforms prioritizes the increase of user transactions on their platform--click through rate, session time, retention rate, etc, which has led to problems including surveillance capitalism. In the third chapter, I argued that the aims of the myriad

micro-targeting mechanisms, or surveillance capitalism, is a consequential result of netizens today lack data ownership, and to realize data ownership, netizens need to have means of participation in the data economy. Web 3.0 Projects like Solid have designed tools including personal data pods and linked data protocols that can potentially bring about the new paradigm of a separate storage and services, which will live up to the infrastructural level interoperability. I then described the progression of the Web as follows: Web 1.0 granted netizens the right to **view** online content, and Web 2.0 gave netizens the right to **publish** in participatory platforms, and Web 3.0 will realize netizen access to personal **storage and computation**. I then concluded the thesis with the expectation that the advancement of data interoperability will bring about more decentralization and gradually make the platforms yield the macro-control right to the market of information capital, social capital and economic capital.

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