Abroad

The Impact of the COVID Crisis on the Innovative Potential of China's Internet Platforms

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Abstract—Although the COVID-19 crisis has hit the Chinese economy hard, China's Internet companies have benefited from the quarantine. However, the long-term consequences of the 2020 crisis for the development of the innovative potential of Chinese Internet corporations, primarily the largest platforms such as Alibaba, Baidu, Tencent, and JD.com as integrators of the Chinese Internet economy, are still unclear. This article provides a general overview of changes in the consumption of services of large platforms, including moderate growth in demand, strengthening of the segment of high-tech services (cloud solutions for business, digital healthcare, etc.), digitalization of small and medium enterprises, and expansion of the user audience. The innovative and technological initiatives of the platforms are analyzed. Within the framework of the announced state plans, large platforms, in partnership with regional authorities, business, and universities, intend to develop an advanced digital infrastructure (5G, data centers, etc.) and innovation infrastructure (digital clusters, technology parks, and research centers). Despite the lack of new breakthrough initiatives, the innovation capacity of the platforms is expected to strengthen in the long term.

Presumably, the key role will be played by qualitative changes in the markets owing to the diffusion of digital technologies and competences, which will lead to an increase in demand for Internet innovations. The mechanisms of transforming market changes into a resource for innovative development of the platforms are associated with the expansion of market data, the emergence of a complex system of services, and unique innovative ecosystems of the platforms, making it possible to organize and coordinate the innovative activities of various entities, as well as to coopt promising start-ups able to create breakthrough innovations during the crisis.

Keywords: Internet platforms, digital innovation, China, knowledge-intensive online services, technology diffusion, COVID-19 pandemic.

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The COVID-19 pandemic has seriously affected the well-being of the global economy [1, 2]. One of its main victims is the People's Republic of China, for which the severity of the consequences of the COVID-19 epidemic is aggravated by the trade and technological war with the United States, a long-term slowdown in GDP growth, and other challenges. Meanwhile, as in other cases of major economic shocks, the impact of the COVID crisis on the economy of China (and the world as a whole) has not been uniform. The Chinese Internet segment, which, along with the American one, had been the leader of the global digital economy before [3, pp. xvi, xvii, 2, 6–8, 54–57; 4], became one of the key beneficiaries of the crisis. The strict quarantine led to the inaccessibility of traditional offline services and processes (visiting workplaces and entertainment, work

of schools, cafes and restaurants, shops, etc.), determining the expansion of the use of Internet services. The current situation is of fundamental importance for the state and prospects of the development of the Chinese Internet segment. The COVID crisis and the resultant economic processes require an adequate response from Internet market participants.

In this situation, the question arises of changing demand for online services, as well as of promising areas of innovative and technological development of the largest Internet corporations in China (Alibaba, Tencent, Baidu, JD.com) in the context of the COVID crisis. Taking as a working assumption the idea that the crisis can potentially stimulate creative destruction [5, pp. 1, 6–8; 6, pp. 304, 305; 7, p. 303], the key research problem in this case is assessment of the long-term consequences of the COVID crisis for the innovative and technological potential of these corporations as backbone players of the Chinese Internet market. This is even more important considering that, in the conditions of a slight slowdown in the economy of

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China and other large economies, the aggravation of global competition, and the growing challenges associated with the scientific and technological cooperation of the PRC with Western countries, restrictions are formed on the further extensive growth of large Chinese Internet platforms. We proceed from the hypothesis that, considering the specifics of the organization of innovation activities of the platforms (open innovations, ecosystems, user innovations, etc.), the key factor in their further development is not so much their own technological activities as the development of innovative ecosystems and, more broadly, systems of interaction with stakeholders.

THE GLOBAL INTERNET ECONOMY

The problems of the digital economy have attracted increasingly more interest of late. From the standpoint of innovation (to a lesser extent, technology), the attention of scientists and analysts is focused on the phenomenon of Internet platforms—companies that own services based on the principles of multisided markets. Their transformational potential for individual industries, markets, the economy as a whole, labor, and government policy is emphasized, as are the risks that they provoke [3, 8–16].

However, in studies that in one way or another relate to the innovation processes at these enterprises [3, 9–11, 14, 15], the main emphasis is placed on business models and the specifics of platform markets. Although these features are usually weakly associated with technological and purely product innovations, their analysis is useful for understanding the specifics of this group of enterprises and the conditions of their management. We mean, for example, the enormous importance of raw data and big data for the development of platforms; primacy of growth (reaching maximum user audience) over profits until the stage of high maturity; and the multisided nature of markets, which determines the importance of the number and characteristics of the actors involved and the links between them. Such studies make it possible to introduce important adjustments to the analysis of the main directions of innovation activities of platforms, as well as to the assessment of market factors for their potential.

The block of studies dedicated to platform innovation itself appears less systematic. Save considering some general issues [9, 17], as well as evaluating the effects of certain promising technologies (for example, artificial intelligence or the Internet of Things), most works are focused mainly on certain important aspects of organizing platform innovation. One of the most significant topics is interaction with clients, using their potential for innovation in the logic of open and user-inspired innovations [18–24]. A related issue is innovation platform ecosystems [24–28], which, due to the scale and specificity of platform activity, can be considered a special phenomenon. In some cases, organizational and technical [29] or technical and techno-

logical [30] factors associated with the implementation of some product or process innovations are analyzed. As in the case of business models (and in close connection with their conclusions), the content of works on this topic makes it possible to identify certain specific aspects of the problem. In particular, we mean the need to take into account ecosystem factors and the nature of the client audience as the most important resource for innovative and technological development of companies.

Surprisingly few studies [31, 32] are dedicated to innovative and technological strategies and priorities of large Internet companies, especially in the context of market and other socioeconomic factors of their implementation.

From the standpoint of this paper, it turned out to be useful to study the world literature on the problems of innovative development during a crisis and the innovative behavior of companies during periods of economic turbulence. It is known that due to the fall in demand and in the availability of capital, the intensity of innovation processes during crises decreases. This applies primarily to indicators such as R&D and related innovative expenditures, patenting dynamics, etc. [5, pp. 6, 7; 33, p. 1322; 34, p. 188; 35; 36, pp. 1, 6, 25, 26; 37, pp. 11–18; 38, pp. 364–366; 39, p. 5]. However, the theoretical neo-Schumpeterian literature and authors close to this trend promote the thesis that a crisis is simultaneously a period when conditions for the creative destruction of the old and the emergence of new markets and (sub)industries are formed due to the appearance of revolutionary innovations and technologies [5, pp. 7, 8; 6, p. 305; 36, p. 26; 40; 41, p. 1259; 42; 7, p. 303] and the related process of replacing old leaders with new dynamic enterprises is underway [6, pp. 304, 305; 7, p. 303; 41, pp. 1254, 1255; 43]. Purely historically, the former statement is not so obvious, while the latter conclusion is partly confirmed by empirical observations. Data related to the 2008–2009 crisis and the previous period indicate that a group of companies does form during a crisis that become leaders at least in some indicators of resource provision for innovative activities [6, pp. 308, 309; 44; 43].

More complicated is the situation with the study on innovative behavior, strategies, and other aspects of the activities of enterprises in the Internet sector or other sectors of knowledge-intensive services under a crisis. The greatest attention of the authors is focused on the problem of aggregated assessment of the dynamics of resource provision of corporate innovation, but to a much lesser extent, on its measurable return, including patenting [5, 6, 33–36, 38, 41, 44]. These works reveal several facts that seem important from the point of view of this study. First of all, we mean the well-known dichotomy in assessing the innovative potential of large and small enterprises [6, pp. 303–305; 7, p. 272; 33, p. 1322; 36, pp. 26, 33; 38, pp. 361, 364, 365; 45–47]. Theoretically, it is small

and medium-sized enterprises that have more opportunities to create breakthrough innovations during a crisis. However, the overall picture of resource indicators clearly shows a significantly greater stability of innovation in large, especially high-tech, corporations [6, pp. 303, 305; 36, pp. 1, 31, 32; 45, p. 2; 34, p. 188; 36, pp. 22, 30; 48; 45, pp. 1, 2]. This conclusion confirms the reasonability of choosing large Chinese Internet platforms as the subject of research. By becoming the leaders of knowledge-intensive services from the early 2010s, they build their innovative and technological activities on the basis of flexible interaction with the venture capital community. Massive investments in start-ups, including “unicorns” (very large companies), have already turned them into major players in the Chinese and regional venture capital markets [49, 50], and, owing to the developed ecosystem tools for coopting start-ups, they increase their chances for revolutionary innovations.

GROWTH AND DIVERSIFICATION OF DEMAND FOR ONLINE SERVICES

One of the most significant results of the crisis for the market of services of Chinese Internet platforms is a noticeable increase in the use of online services [51]. The most pronounced effects were observed in the field of online retail, which was predictable. Before, China had also had a high level of online retail penetration [4, 52].¹ Quarantine gave this sector a new impetus—mainly in the market of fast moving consumer goods and food products [53, 54]. Particularly fast growth rates and large-scale sales volumes are characteristic of the time on which the Chinese New Year falls (from two to seven or more times for certain product categories).² The same can be said about the use of various messengers and media and communication online platforms [54].³ The consumption of online business services—teleconferencing and remote workplace interfaces such as DingTalk (Alibaba), WeChat Work (Tencent), and Tencent Meet-

ing—by businesses and other organizations, including government ones, has rapidly increased.⁴ The powerful Chinese financial technology sector also continued to develop. Yet an even more important point is the growth in consumption of advanced knowledge-intensive services, primarily services in the field of cloud technologies and artificial intelligence focused on the business sector. In recent years, their most active users in the PRC were mainly technology start-ups, while a rather restrained position was observed on the part of large corporations and the market as a whole, which significantly lagged behind in the degree of digitalization from developed countries [55, pp. 116, 117, 124, 125].⁵ However, in the new context, companies have to increase the use of advanced online solutions.

The stably positive trends in the cloud services market are evidenced by the data of quarterly reports of Chinese Internet corporations. For the first quarter of 2020, data is available on the market leader, Alibaba (up to half of the entire Chinese cloud services market). Revenue from operations of the cloud segment of the corporation amounted to about RMB12.2 bln (about \$175 mln), which corresponds to an increase of 14.5% compared to 4Q 2019 and approximately 60% in annual terms.⁶ Losses, on the contrary, decreased by almost 3.6%, to RMB12.3 bln (because of the focus on rapid growth, this direction is planned to be loss making).

From the point of view of the growth and assessment of financial indicators, as well as the ongoing qualitative changes in the structure of consumption, note the targeted support for the transfer to the “cloud” of Chinese micro, small, and medium enterprises (MSME). In addition to the system of discounts and other assistance from Alibaba, Tencent, JD.com, and other providers of these services,⁷ stimulating measures for the transition of MSMEs to cloud technologies in the first quarter of 2020 were announced

¹ <https://www.emarketer.com/content/china-ecommerce-2019> (accessed April 1, 2020).

² http://www.xinhuanet.com/english/2020-02/07/c_138764468.htm (accessed April 29, 2020); <https://www.forbes.com/sites/kenrapoza/2020/02/07/panic-shopping-in-hong-kong-while-mainland-china-depends-on-ecommerce/#67cd1685b7ba> (accessed April 30, 2020); <https://economictimes.indiatimes.com/small-biz/startups/news-buzz/coronavirus-outbreak-drives-demand-for-chinas-online-grocers/articleshow/74079594.cms> (accessed April 30, 2020); <https://epaper.chinadaily.com.cn/a/202003/20/WS5e73fea2a310a2fabb7a3112.html> (accessed April 30, 2020).

³ <https://www.chinadaily.com.cn/a/202004/17/WS5e99580ca3105d50a3d1701d.html> (accessed April 30, 2020); <https://global.chinadaily.com.cn/a/202003/19/WS5e7313d8a31012821728072d.html> (accessed April 30, 2020); <https://www.abacus-news.com/tech/coronavirus-pushes-shoppers-buy-fresh-groceries-online/article/3049994> (accessed April 30, 2020); http://www.chinadaily.com.cn/a/202004/21/WS5e9e68b8a3105d50a3d17b41_3.html (accessed April 30, 2020).

⁴ <https://epaper.chinadaily.com.cn/a/202003/20/WS5e73fea2a310a2fabb7a3112.html> (accessed April 30, 2020); <https://global.chinadaily.com.cn/a/202003/19/WS5e7313d8a31012821728072d.html> (accessed April 30, 2020); http://www.xinhuanet.com/english/2020-02/07/c_138764468.htm (accessed April 29, 2020); <https://seekingalpha.com/article/4338512-alibabas-game-changing-role-in-chinas-digital-currency> (accessed April 30, 2020).

⁵ <https://www.chinadaily.com.cn/a/201808/28/WS5b84abcfa310add14f3881d3.html> (accessed June 1, 2020); <https://www.bain.com/insights/how-chinas-cloud-market-differs-from-others/> (accessed June 1, 2020); <https://1prime.ru/experts/20200420/831296610.html> (accessed June 1, 2020).

⁶ <https://otp.investis.com/clients/us/alibaba/SEC/sec-show.aspx?Filin-gId=14171258&Cik=0001577552&Type=PDF&hasPdf=1> (accessed July 7, 2020).

⁷ <https://www.scmp.com/tech/big-tech/article/3079893/tencent-launches-package-cloud-services-global-fight-against> (accessed April 30, 2020); <https://global.chinadaily.com.cn/a/202003/19/WS5e7313d8a31012821728072d.html> (accessed April 30, 2020); <https://www.scmp.com/tech/big-tech/article/3081173/alibaba-cloud-rolls-out-us30-million-program-help-global-small-and> (accessed May 15, 2020); <https://www.globaltimes.cn/content/1188850.shtml> (accessed May 23, 2020); <https://www.tencent.com/zh-cn/business/digital-transformation-partner-action.html> (accessed July 11, 2020).

by the National Reform and Development Commission and the Ministry of Industry and Information Technology of the PRC.⁸

As for final consumers, they have also increased their use of some truly knowledge-intensive online solutions. The most important is the spread of digital health care. We mean both various miniprograms⁹ and truly complex services, which include, in various combinations, telemedicine services, online medical records, drug purchases, health insurance, etc., and are provided by WeDoctor (Tencent), AliHealth (Alibaba), JD Health (JD.com), and Good Doctor (owned by one of the largest insurance groups in the world Ping An).¹⁰

At least two points are important in this respect. As far as the available data of the largest companies¹¹ (considering significant differences in the assessment of the user audience and in the breakdown by different business segments) for the first quarter of 2020 show, the growth in the number of new consumers has slowed down. However, it continues in the range from 3% to more than 10%, and, given the economic uncertainty, it is during this period that this result is of fundamental importance. Some indirect signs indicate that the consumption of Internet services has increased among those categories of customers (residents and companies in small towns and less developed provinces, MSMEs, etc.) that for various reasons were previously either not covered by them or covered insufficiently. As a consequence, further spread of Internet technologies and competences may become one of the important accompanying results of the growth in demand for and consumption of online services. Although some of the new consumers will return to traditional offline processes after the normalization of the epidemiological and economic situation in the country,

most of them will obviously maintain their consumption at a higher level than before the quarantine.

INNOVATIVE AND TECHNOLOGICAL ACTIVITIES OF CHINESE INTERNET CORPORATIONS

The innovative and technological activities of major Chinese platforms and some related promising start-ups show a mixed picture. The dynamics of corporate spending on innovations rather confirms the opinion about the “innovation pause” during a crisis. Despite the rapid growth in previous years, Baidu’s R&D in Q1 2020 decreased by 8% compared to Q4 2019, while JD.com remained at the same level. Alibaba’s “Product Development Expenditures” category (the share and volume of R&D are not disclosed in the reports) in the same period saw a 4.4% drop (no data available for Tencent). The analysis of the measures implemented shows a more complex picture. One can identify at least three major areas of the technological and, partially, innovative activities of large Internet platforms.

First, there are opportunistic, mainly process-oriented, technological innovations associated with the specifics of the pandemic and quarantine. In addition to solutions such as, for example, the installation of vending machines with artificial intelligence elements in Beijing, Shanghai, and Chongqing¹² or the use of robots and drones for disinfection and to measure the temperature of visitors to organizations,¹³ these should include the use of the technical capabilities of the platforms for public safety purposes and to prevent the spread of COVID-19. These are digital “health codes”¹⁴ and other Internet solutions to control/track the movement of potentially infected persons (including migration modeling), drones and city cameras with special software and hardware to identify people who are not wearing masks, police robots and drones (preventing crowds in public places), etc.¹⁵

⁸ http://www.xinhuanet.com/english/2020-03/19/c_138895377.htm (accessed May 2, 2020); http://www.xinhuanet.com/english/2020-02/19/c_138798652.htm (accessed May 2, 2020).

⁹ <https://www.china-daily.com.cn/a/202004/08/WS5e8d2a9aa310ae-aeed50aa9.html> (accessed May 3, 2020); https://www.china-daily.com.cn/a/202003/12/WS5e697370a31012821727e51b_1.html (accessed April 30, 2020).

¹⁰ <https://vc.ru/services/117460-kak-rabotaet-ping-an-good-doctor-samaya-uspeshnaya-medicinskaya-ekosistema-v-kitae> (accessed June 1, 2020); <https://www.economist.com/business/2020/03/05/millions-of-chinese-cooped-up-and-anxious-turn-to-online-doctors> (accessed June 1, 2020); <https://global.china-daily.com.cn/a/202004/09/WS5e8e6a64a310e232631a4d6f.html> (accessed May 4, 2020); <https://hbr.org/2020/04/in-the-face-of-lockdown-chinas-e-commerce-giants-deliver> (accessed May 3, 2020); <https://www.china-daily.com.cn/a/202004/08/WS5e8d2a9aa310ae-aeed50aa9.html> (accessed May 3, 2020).

¹¹ Among the largest companies, reliable quarterly data on user growth, unfortunately, poorly comparable with each other due to reporting differences, is provided by Alibaba, Tencent, and Baidu. <https://otp.investis.com/clients/us/alibaba/SEC/sec-show.aspx?FilingId=14171258&Cik=0001577552&Type=XLS> (accessed July 7, 2020); <https://cdc-tencent-com-1258344706.image.myq-cloud.com/uploads/2020/05/18/13009f73ecab16501df9062e43e47e67.pdf> (accessed July 7, 2020); <http://ir.baidu.com/node/12091/pdf> (accessed July 7, 2020).

¹² <https://epaper.chinadaily.com.cn/a/202003/20/WS5e73-fea2a310a2fabb7a3112.html> (accessed April 30, 2020).

¹³ https://www.china-daily.com.cn/a/202003/12/WS5e697370a31012821727e51b_1.html (accessed April 30, 2020); <https://jdcorporateblog.com/jd-launches-drone-disinfection-in-inner-mongolia/> (accessed May 2, 2020); http://www.chinadaily.com.cn/m/beijing/zhongguancun/2020-03/03/content_37534101.htm (accessed April 29, 2020); <https://global.china-daily.com.cn/a/202004/09/WS5e8e6a64a310e232631a4d6f.html> (accessed May 4, 2020).

¹⁴ The Alibaba and Tencent applications, depending on the health status of the user, assign him or her a certain color code (green, red, etc.), which determines his or her access to various objects and movement around the city as a whole.

¹⁵ <https://epaper.chinadaily.com.cn/a/202003/20/WS5e73-fea2a310a2fabb7a3112.html> (accessed April 30, 2020); http://www.xinhuanet.com/english/2020-04/20/c_138992446.htm (accessed May 8, 2020); <https://www.china-daily.com.cn/a/202004/08/WS5e8d2a9aa310ae-aeed50aa9.html> (accessed May 3, 2020); <https://www.china-daily.com.cn/a/202003/12/WS5e697370a31012821727e51b.html> (accessed April 30, 2020); <https://www.china-daily.com.cn/a/202004/08/WS5e8d159aa310ae-aeed509ef.html> (accessed May 7, 2020); <https://global.china-daily.com.cn/a/202004/09/WS5e8e6a64a310e232631a4d6f.html> (accessed May 4, 2020).

The second direction includes measures for approbation of individual advanced technological solutions and related processes. This applies primarily to the use of drones, robots, and autonomous driving systems for the delivery of drugs and goods in megalopolises and to hard-to-reach regions.¹⁶ In fact, we are talking about analogues of pilot and demonstration projects related to the development of schemes for the mass diffusion of new technologies or new ways of using them. In particular, Baidu has launched more than 100 robotic taxis equipped with its Apollo system in 17 cities from Wuhan to Beijing and Shanghai to deliver goods and medicines.¹⁷ Tencent has released a simulator to practice its TAD (Tencent Autonomous Driving) system. Alibaba continues its active partnership with the WeRide start-up using the Amap navigation platform, including its testing in Guangzhou.¹⁸

Formally, the start of market and technological experiments with these technologies dates back to the second half of the 2010s (JD.com pilot projects of 2017–2018 for the delivery of goods by drones in large cities and to remote areas of China and other countries of operation¹⁹). However, the quarantine provided nearly ideal conditions for expanding such attempts in technical terms (empty roads, for example),²⁰ as well as owing to consumer acceptance of digital services and support from authorities. The scale of the process turned out to be so significant that observers started talking about the “golden age” of autopilots.²¹

It makes sense to single out experiments with the most advanced technologies in a separate direction,

when companies are more likely to find out their capabilities and potential than prepare them for rapid replication in the markets. For example, Alibaba has provided researchers and medical professionals with access to its cloud solutions and artificial intelligence algorithms to accelerate COVID-19 diagnosis, protein structure analysis, and sequencing and study of the COVID-19 genome.²² Baidu also worked on similar solutions (the LinearFold algorithm).²³ Promising start-ups, including the leader of the Chinese segment of artificial intelligence SenseTime (one of the major investors is Alibaba), have also offered their systems in diagnostics and treatment protocol definition using artificial intelligence systems.²⁴

Finally, there is a promising technological and innovative infrastructure. Within the national plan of developing the so-called new infrastructure up to 2025, large Chinese Internet corporations have formed, on the one hand, programs for the development of 5G networks and high-speed Internet and data centers, and, on the other, technology parks, smart cities, and industrial technological smart clusters/belts. Broad participation in this initiative is expected on the part of regional/local authorities, universities, and large industrial and technological actors.²⁵ In particular, Alibaba announced a large-scale program for the development of a software and hardware base and infrastructure of cloud technologies (RMB200 bln, or about \$28 bln).²⁶ Tencent expects to invest RMB500 bln (about \$70.1 bln) over the next five years to develop a new innovative technology infrastructure in the field of cloud computing, artificial intelligence, and quantum computing.²⁷ In parallel with the national ones, megaprojects are planned to create an innovative and technological infrastructure at the regional level. Tencent, Alibaba, Baidu, and JD.com announced investments of over RMB100 bln (about \$14.1 bln) in the development

¹⁶<https://finance.yahoo.com/news/jd-com-makes-drone-deliveries-145406667.html> (accessed April 27, 2020); <https://www.foodnavigator-asia.com/Article/2020/02/12/JD-reports-surge-in-fresh-food-orders-in-China-during-Chinese-New-Year-and-coronavirus-outbreak> (accessed April 28, 2020); <https://hbr.org/2020/04/in-the-face-of-lockdown-chinas-e-commerce-giants-deliver> (accessed May 3, 2020); <https://jdcorpblog.com/world-economic-forum-highlights-jds-use-of-drones-in-covid-19-fight/> (accessed May 1, 2020).

¹⁷See the company's 4Q financial statements. <http://ir.baidu.com/node/12091/pdf> (accessed July 7, 2020).

¹⁸http://www.xinhuanet.com/english/2020-04/19/c_138990078.htm (accessed May 3, 2020); <https://global.china-daily.com.cn/a/202006/24/WS5ef2fd83a310834817255339.html> (accessed June 30, 2020); http://www.xinhuanet.com/english/2020-06/28/c_139172320.htm (accessed July 1, 2020); <https://global.china-daily.com.cn/a/202006/11/WS5ee1c2dfa310834817252602.html> (accessed June 14, 2020).

¹⁹http://www.xinhuanet.com/english/2019-01/16/c_137749202.htm (accessed April 29, 2020); <https://techcrunch.com/2019/01/22/jd-drone-indonesia/> (accessed May 3, 2020); http://www.xinhuanet.com/english/2019-05/20/c_138074136.htm (accessed May 3, 2020); <https://hbr.org/2020/04/in-the-face-of-lockdown-chinas-e-commerce-giants-deliver> (accessed May 3, 2020).

²⁰<https://hbr.org/2020/04/in-the-face-of-lockdown-chinas-e-commerce-giants-deliver> (accessed May 3, 2020); <https://www.therobotreport.com/covid-19-pandemic-prompts-more-robot-usage-worldwide/> (accessed May 4, 2020).

²¹<https://global.china-daily.com.cn/a/202006/11/WS5ee1c2dfa310834817252602.html> (accessed June 14, 2020).

²²<https://www.zdnet.com/article/alibaba-cloud-offers-ai-platform-to-support-coronavirus-medical-research/> (accessed May 8, 2020); <https://investorplace.com/2020/04/opportunities-alibaba-stock/> (accessed May 8, 2020); <https://global.china-daily.com.cn/a/202004/09/WS5e8e6a64a310e232631a4d6f.html> (accessed May 4, 2020); <http://www.china-daily.com.cn/a/202004/08/WS5e8d2a9aa310ae-aeed50aa9.html> (accessed May 5, 2020).

²³See Baidu Q1 2020 Financial Statement. <http://ir.baidu.com/static-files/c7ab9d2d-ca42-47fd-8a68-2366fa311d9e> (accessed July 5, 2020).

²⁴http://www.chinadaily.com.cn/m/beijing/zhongguancun/2020-03/03/content_37534101.htm (accessed April 29, 2020).

²⁵<https://www.scmp.com/tech/policy/article/3085362/china-has-new-us14-trillion-plan-seize-worlds-tech-crown-us> (accessed June 12, 2020).

²⁶<https://www.reuters.com/article/us-china-alibaba-cloud-investment/alibaba-to-invest-28-billion-in-cloud-services-after-coronavirus-boosted-demand-idUSKBN22208E> (accessed June 20, 2020).

²⁷http://www.xinhuanet.com/english/2020-05/31/c_139102970.htm (accessed June 4, 2020); <https://www.china-daily.com.cn/a/202006/16/WS5ee83040a310834817253531.html> (accessed July 1, 2020).

of smart transportation systems, including robotic taxis, and promised colossal investments in the pandemic-stricken province of Hubei and other regions.²⁸ We mean projects for the digitalization of public administration and the activities of enterprises (including industrial cyber-physical systems within the ideology of Industry 4.0), support for research centers and technology and industrial parks, and training in the field of artificial intelligence and other advanced technologies.

INNOVATIVE AND TECHNOLOGICAL EFFECTS OF THE SPREAD OF DIGITAL TECHNOLOGIES AND COMPETENCES

The data on the state of the market and on the main directions of innovative and technological activities of Internet corporations formally confirm the hypothesis of an innovation pause in a crisis [33, 36, 38]. Innovative and technological measures proper during this period were predominantly incremental in nature and were largely determined by market factors. Market and technological experiments are to a greater extent associated with the continuation of work on scaling advanced solutions and services, which is quite reasonable (the crisis will not last forever). The available limited resources also do not give grounds to speak of an emphasis on advanced technologies and new products/services as a response to the crisis. It is possible, of course, that during 2020 some truly revolutionary technologies, business models, or products/processes will appear, but, obviously, they will not become a significant economic phenomenon in the near future.

However, such a deduction, strictly speaking, does not make it possible to derive a conclusion about the long-term consequences of the crisis for the innovative potential of large Chinese Internet platforms. Reflecting ideas about the primacy of technological innovation and the overwhelming importance of formal resource indicators of development, it does not account for several important considerations, some of which are of fundamental importance specifically for platform companies.

First, there is the conclusion about the protracted effect of the crisis on innovation, primarily about the relationship between the processes of changes in demand and the creation of new products and technologies. Second, an accompanying factor in this case

is the growth in the number and the diversification of the structure of consumers and platform partners. Considering that this growth is de facto accompanied by a forced (in our case, due to quarantine conditions) acceleration and expansion of the diffusion of digital technologies/competences and knowledge-intensive services, it turns out to be significant for the innovative and technological potential of the companies. There are several causes of this.

From a purely technical point of view, this trend will provide increased access to big data about markets and specific consumers, which are necessary to improve existing products/services and form new ones, fine-tune algorithms, etc. [56–58]. More importantly, it will have a positive effect on the development of corporate ecosystems as almost the key factor in the innovative development of platforms [24–28]. On the one hand, we can talk about their further complication owing to new clients, partners, and other stakeholders as an important indicator of the development of platform ecosystems [23]. On the other hand, it is the development of existing advanced start-ups and the emergence of new ones, which during the crisis and postcrisis period test new technologies, business models, and products that can be coopted by large platforms through ecosystem mechanisms.

These processes will receive an additional incentive on the horizon of four to seven years through the creation of a new powerful technological and innovative infrastructure by Internet corporations and its linkage with regional development strategies, as well as owing to the observed rise of market and technological experiments, which will lead to the optimization and replication of existing advanced solutions (i.e., again, to an increase in the consumption of digital knowledge-intensive services and the number of stakeholders) and to the emergence of new innovative products, services, processes, technologies, and competences.

Further, even omitting the question of increasing revenue, audience coverage directly determines the investment attractiveness of large Internet platforms. In the current realities, this remains the most important condition for the implementation of their large-scale innovative activities. Note that it is these factors that have determined the rapid growth of both Chinese digital start-ups in the last decade and the expenditures on technological and product innovations of large Chinese Internet corporations and their massive investments in the venture capital segment. Although large platforms have optimized innovation expenditures and investments during the crisis, there is no reason to believe that, in the period after the pandemic, capital inflows will not contribute to the active innovation and technology strategy of Chinese Internet corporations. This is even more so the case in the face of growing competition both among Chinese platforms in the national market and between Chinese and American companies in the global markets.

²⁸<https://www.chinadaily.com.cn/a/202004/08/WS5e8db-bc5a310e232631a4c82.html> (accessed May 8, 2020); <https://www.chinadaily.com.cn/a/202004/09/WS5e8e8148a310e232631a4eca.html> (accessed May 8, 2020); global.chinadaily.com.cn/a/202004/10/WS5e8f-dabea3105d50a3d153f5.html (accessed May 10, 2020); http://www.xinhuanet.com/english/2020-04/07/c_138955258.htm (accessed May 10, 2020); <https://global.chinadaily.com.cn/a/202006/11/WS5ee1c2dfa310834817252602.html> (accessed June 14, 2020).

Therefore, favorable conditions are being formed for a pronounced increase in the innovative and technological potential of large Chinese Internet corporations in the medium and long term. In this case, an analogy can be drawn between the COVID-19 pandemic and the SARS epidemic of 2003. At that time, according to some researchers and observers, there was also a forced increase in interest in online services, which was one of the factors of the subsequent forced growth of the Internet segment of the Chinese economy [59].²⁹ As a consequence, successful business models, technological and other solutions were formed and worked out.

It is also important to account for the innovative and technological effects of the diffusion of digital technologies and competences, as well as knowledge-intensive services, including the phenomenon of feedback between consumers and Internet corporations. The most interesting object in this respect is the Chinese MSMEs. Against the background of the growth of competitive challenges, the spread and consumer perception of knowledge-intensive online services and Internet technologies create an opportunity to increase their efficiency significantly. Apart from global experience [60–62], this hypothesis is confirmed by the results of a survey conducted in 2020 by the China Association of Small and Medium Enterprises and Alibaba: 45% of SMEs with a high level of digital technology use either were not affected by the crisis or even increased revenue.³⁰ For precrisis China, the well-studied phenomenon of “Taobao villages/towns” could be direct confirmation of the hypothesis [63, 64].³¹ Accordingly, if the penetration of knowledge-intensive B2B online services and Internet technologies leads to the expected positive results for the development of Chinese MSMEs, new capacities markets for innovative products and services will open for large Chinese Internet platforms.

WHAT ARE THE PROSPECTS?

Despite the fact that full-fledged consequences of the COVID crisis for the Internet markets and the innovative and technological potential of the largest Chinese platform companies have yet to be assessed, the analysis of the evidence suggests that the research hypothesis, according to which, in the context of the specifics of the organization of innovation of platforms, the key factor for their further development is not so much their own technological activities as the

development of innovation ecosystems and, more broadly, the systems of interaction with stakeholders, has been partly confirmed.

We are witnesses of quite a specific situation. Indicators of resource support for innovative and technological activities of the platforms formally do not allow them to be ranked among the leading companies that innovate actively during a crisis [6, 43, 44]. The analysis of information about platform efforts also indicates the continuation of the existing activities rather than breakthrough projects (the same relates to large start-ups), as well as a focus mainly on incremental—rather process than product—innovations.

On the other hand, there is a significant intensification of activities initiated in previous years and associated with the development of schemes for the mass diffusion of a number of advanced technologies and the development of the corresponding infrastructure. These events run in parallel and, as can be understood, in close relation with the observed processes of the forced change (because of the COVID-19 pandemic and, especially, quarantine) in the dynamics of demand for online services and lead to the diffusion of technologies and competences. In this context, we can say with some degree of caution that the observed key areas of innovative and technological activities of the platforms are *de facto* focused on the formation of promising markets and the diffusion of technologies/competences.

The growth and complication of demand for digital, including knowledge-intensive, Internet services in the domestic market will stimulate further innovation and the development of advanced technologies by large Internet corporations and related start-ups. In fact, we are already observing this process, which can be seen at least from the example of using artificial intelligence and related technologies for solving biomedical problems and developing smart cyber-physical systems. The ongoing globalization of the operations of China’s Internet giants, especially in the market of knowledge-intensive online services, will only intensify these changes. After all, the confrontation between Chinese and, above all, American actors in the field of digital technologies will be determined precisely by qualitative—innovative and technological—factors.

It seems that the most important condition that ensures the positive effect of the considered processes on the innovative and technological potential of the platforms is the specificity of the platform companies themselves. Analysis of the existing works makes it possible to conclude that there are effective channels for the formation of strong direct and feedback links “consumer/stakeholder—technology developer—platform/vendor of services.” They function with support of both technical and technological means (big data, etc.), as well as a complex system of services, and, most importantly, institutional tools (cooperation

²⁹http://www.chinadaily.com.cn/m/beijing/zhongguancun/2020-03/03/content_37534101.htm (accessed April 29, 2020); <https://www.scmp.com/tech/big-tech/article/3073961/will-coronavirus-crisis-sars-give-birth-next-big-thing-china-tech> (accessed June 11, 2020).

³⁰<https://www.chinadaily.com.cn/a/202007/03/WS5efec-ca310834817257216.html> (accessed July 11, 2020).

³¹The emergence of the services of the Taobao platform (owned by Alibaba) in a village/city, as well as related services, stimulates the rapid growth and diversification of local MSMEs.

with partners within the framework of ecosystem and the development of start-ups with further cooptation into platform ecosystems).

These conclusions make it possible to clarify some theoretical provisions related, on the one hand, to the innovative development of platform companies and, on the other, to the study of the impact of crises on innovation. At the same time, for the final confirmation of the hypothesis that, in the context of the specifics of the organization of innovation activities of the platforms (open innovations, ecosystems, user innovations, etc.), the key factor for their further development is not so much their own technological activities as the development of innovative ecosystems and, more broadly, stakeholder engagement systems, additional statistical and empirical data will be required, including interviews with platform representatives and other actors. However, such a possibility will arise much later, bearing in mind the availability and completeness of statistical data and the formation of complex assessments of the changes that have occurred. Note again the need to clarify the still insufficiently worked out theoretical issues related to the ecosystems and innovative technological processes of Internet platforms, as well as the problems of innovative development in the context of crises and recessions.

REFERENCES

1. *OECD Economic Outlook 2020* (OECD Publishing, Paris, 2020), Vol. 2020, Issue 1, No. 107. <https://doi.org/10.1787/0d1d1e2e-en>
2. *World Bank: Global Economic Prospects, June 2020* (World Bank, Washington, DC, 2020). <https://doi.org/10.1596/978-1-4648-1553-9>
3. *UNCTAD Digital Economy Report 2019: Value Creation and Capture: Implications for Developing Countries* (United Nations, Geneva, 2019). https://unctad.org/en/PublicationsLibrary/der2019_en.pdf. Cited April 11, 2020.
4. I. V. Danilin, "Development of the digital economy in the USA and China: Factors and trends," *Kontur. Glob. Transform.: Polit., Ekon., Pravo* **12** (6), 246–267 (2019). <https://doi.org/10.23932/2542-0240-2019-12-6-12>
5. *OECD Policy Responses to the Economic Crisis: Investing in Innovation for Long-Term Growth* (OECD Publishing, Paris, 2009). <https://www.oecd.org/sti/42983414.pdf>. Cited April 10, 2020.
6. D. Archibugi, A. Filippetti, and M. Frenz, "Economic crisis and innovation: Is destruction prevailing over accumulation?," *Res. Policy* **42**, 303–314 (2013). <https://doi.org/10.1016/j.respol.2012.07.002>
7. E. T. Pereira, "Innovation and entrepreneurship during the economic crisis," in *Handbook of Research on Entrepreneurship, Innovation, and Internationalization*, Ed. by N. M. Teixeira, T. M. de Costa, and I. M. Lisboa (Business Science Reference, Hershey, Penn., 2019), pp. 258–274. <https://doi.org/10.4018/978-1-5225-8479-7.ch010>
8. <https://ec.europa.eu/digital-single-market/en/news/commission-staff-working-document-online-platforms>. Cited April 8, 2020.
9. M. de Reuver, C. Sørensen, and R. C. Basole, "The digital platform: a research agenda," *J. Inf. Technol.* **33** (2), 124–135 (2017). <https://doi.org/10.1057/s41265-016-0033-3>
10. S. P. Choudary, M. W. Van Alstyne, and G. G. Parker, *Platform Revolution: How Networked markets Are Transforming the Economy—And How to Make Them Work for You* (W.W. Norton & Co., New York, 2016).
11. R. Fijneman, K. Kuperus, and J. Pasman, Unlocking the value of the platform economy. Dutch Transformation Forum. KPMG N.V. 2019. <https://dutchitchannel.nl/612528/dutch-transformation-platform-economy-paper-kpmg.pdf>. Cited April 11, 2020.
12. W. Sutherland and M. H. Jarrahi, "The sharing economy and digital platforms: A review and research agenda," *Int. J. Inf. Management* **43**, 328–341 (2018). <https://doi.org/10.1016/j.ijinfomgt.2018.07.004>
13. L. Zhang and S. Chen, "China's Digital Economy: Opportunities and risks," IMF Working Paper WP/19/16. International Monetary Fund. 2019. <https://www.imf.org/~media/Files/Publications/WP/2019/wp1916.ashx>. Cited February 11, 2020.
14. OECD Vectors of Digital Transformation. OECD Digital Economy Papers. 2019. No. 273. DSTI/CDEP/GD(2017)4/FINAL. <https://www.oecd-ilibrary.org/docserver/5ade2bba-en.pdf?expires=1571320653&id=id&accname=guest&checksum=5C01B398E81E953AA43894EE32FC57A0>. Cited April 10, 2020.
15. J. van Dijck, "Governing digital societies: Private platforms, public values," *Comput. Law Security Rev.* **36** (2020). <https://doi.org/10.1016/j.clsr.2019.105377>
16. Y. Chen, "Improving market performance in the digital economy," *China Econ. Rev.* **62** (2020). <https://doi.org/10.1016/j.chieco.2020.101482>
17. D. Nylén and J. Holmström, "Digital innovation strategy: A framework for diagnosing and improving digital product and service innovation," *Business Horizons* **58** (1), 57–67 (2015). <https://doi.org/10.1016/j.bushor.2014.09.001>
18. L. Bengtsson and N. Ryzhkova, "Managing a strategic source of innovation: Online users," *Int. J. Inf. Management* **33** (4), 655–662 (2013). <https://doi.org/10.1016/j.ijinfomgt.2013.04.003>
19. K. Wu, J. Vassileva, and Y. Zhao, "Understanding users' intention to switch personal cloud storage services: Evidence from the Chinese market," *Comput. Human Behavior* **68**, 300–314 (2017). <https://doi.org/10.1016/j.chb.2016.11.039>
20. R. Ciuchita, D. Mahr, and G. Odekerken-Schröder, "Deal with it': How coping with e-service innovation affects the customer experience," *J. Bus. Res.* **103**, 130–141 (2019). <https://doi.org/10.1016/j.jbusres.2019.05.036>
21. Y. Vakulenko, P. Shams, D. Hellström, and K. Hjort, "Service innovation in e-commerce last mile delivery: Mapping the e-customer journey," *J. Bus. Res.* **101**,

- 461–468 (2019).
<https://doi.org/10.1016/j.jbusres.2019.01.016>
22. N. N. Ho-Dac, “The value of online user generated content in product development,” *J. Bus. Res.* **112**, 136–146 (2020).
<https://doi.org/10.1016/j.jbusres.2020.02.030>
 23. S. Flowers and M. Meyer, “How can entrepreneurs benefit from user knowledge to create innovation in the digital services sector?,” *J. Bus. Res.* (in press).
<https://doi.org/10.1016/j.jbusres.2020.01.025>
 24. J. W. Peltier, A. J. Dahl, and E. L. Swan, “Digital information flows across a B2C/C2C continuum and technological innovations in service ecosystems: A service-dominant logic perspective,” *J. Bus. Res.* (in press).
<https://doi.org/10.1016/j.jbusres.2020.03.020>
 25. A. Gawer and M. A. Cusumano, “Industry platforms and ecosystem innovation,” *J. Product Innov. Management* **31** (3), 417–433 (2014).
<https://doi.org/10.1111/jpim.12105>
 26. R. C. Parentea, J.-M. G. Geleilateb, and K. Rong, “The sharing economy globalization phenomenon: A research agenda,” *J. Int. Management* **24**, 52–64 (2018).
<https://doi.org/10.1016/j.intman.2017.10.00>
 27. A. Hein, M. Schrieck, T. Riasanow, et al., “Digital platform ecosystems,” *Electron Markets* **30**, 87–98 (2020).
<https://doi.org/10.1007/s12525-019-00377-4>
 28. I. V. Danilin and Z. A. Mamed'yarov, “The role of global platforms in stimulating digital transformation: Competence and innovation aspects,” *Vestn. MGIMO (Univ.)* **13** (3), 267–282 (2020).
<https://doi.org/10.24833/2071-8160-2020-3-72-267-282>
 29. G. Zhang and M. N. Ravishankar, “Exploring vendor capabilities in the cloud environment: A case study of Alibaba Cloud Computing,” *Inf. Management* **56** (3), 343–355 (2019).
<https://doi.org/10.1016/j.im.2018.07.008>
 30. K. Zheng, Z. Zhang, and B. Song, “E-commerce logistics distribution mode in big-data context: A case analysis of JD.COM,” *Industrial Marketing Management* **86**, 154–162 (2020).
<https://doi.org/10.1016/j.indmarman.2019.10.009>
 31. N. Kshetri, “The evolution of the internet of things industry and market in China: An interplay of institutions, demands and supply,” *Telecommunications Policy* **41**, 49–67 (2017).
<https://doi.org/10.1016/j.telpol.2016.11.002>
 32. L. Casanova, P. K. Cornelius, and S. Dutta, *Financing Entrepreneurship and Innovation in Emerging Markets* (Academic Press, San Diego, 2018).
 33. B. Laperche, G. Lefebvre, and D. Langlet, “Innovation strategies of industrial groups in the global crisis: Rationalization and new paths,” *Technol. Forecast. Soc. Change* **78**, 1319–1331 (2011).
<https://doi.org/10.1016/j.techfore.2011.03.005>
 34. A. Filippetti and D. Archibugi, “Innovation in times of crisis: National systems of innovation, structure, and demand,” *Res. Policy* **40**, 179–192 (2011).
<https://doi.org/10.1016/j.respol.2010.09.001>
 35. C. Paunov, “The global crisis and firms’ investments in innovation,” *Res. Policy* **41** (1), 24–35 (2012).
<https://doi.org/10.1016/j.respol.2011.07.007>
 36. *OECD Science, Technology and Industry Outlook 2012* (OECD Publishing, Paris, 2012).
<https://doi.org/10.1787/19991428>
 37. K. Izsak, P. Markianidou, R. Lukach, and A. Wastyn, “The impact of the crisis on research and innovation policies. Study for the European Commission DG Research by Technopolis Group Belgium and Idea Consult (2013). https://ec.europa.eu/research/innovation-union/pdf/expert-groups/ERIAB_pb-Impact_of_financial_crisis.pdf. Cited April 12, 2020.
 38. A. Brem, P. Nylund, and E. Viardot, “The impact of the 2008 financial crisis on innovation: A dominant design perspective,” *J. Bus. Res.* **110**, 360–369 (2020).
<https://doi.org/10.1016/j.jbusres.2020.01.048>
 39. B. Hardy and C. Sever, “Financial crises and innovation,” BIS Working Papers No. 846, 2020. Bank for International Settlements.
<https://www.bis.org/publ/work846.pdf>. Cited May 11, 2020.
 40. C. Pérez, *Technological Revolution and Financial Capital: The Dynamics of Bubbles and Golden Ages* (Edward Elgar, Northampton, MA, 2002).
 41. D. Archibugi, A. Filippetti, and M. Frenz, “The impact of the economic crisis on innovation: Evidence from Europe,” *Technol. Forecast. Soc. Change* **80**, 1247–1260 (2013).
<https://doi.org/10.1016/j.techfore.2013.05.005>
 42. L. Berchicci, C. L. Tucci, and C. Zazzara, “The influence of industry downturns on the propensity of product versus process innovation,” *Ind. Corp. Change* **23** (2), 429–465 (2014).
<https://doi.org/10.1093/icc/dtt011>
 43. D. Archibugi, “Blade Runner economics: Will innovation lead the economic recovery?,” *Res. Policy* **46** (3), 535–543 (2017).
<https://doi.org/10.1016/j.respol.2016.01.021>
 44. M. D. Amore, “Companies learning to innovate in recessions,” *Res. Policy* **44**, 1574–1583 (2015).
<https://doi.org/10.1016/j.respol.2015.05.006>
 45. F. Zouaghi, M. Sánchez, and M. G. Martínez, “Did the global financial crisis impact firms’ innovation performance? The role of internal and external knowledge capabilities in high and low tech industries,” *Technol. Forecast. Soc. Change* **132**, 92–104 (2018).
<https://doi.org/10.1016/j.techfore.2018.01.011>
 46. T. Papadopoulos, K. N. Baltas, and M. E. Balta, “The use of digital technologies by small and medium enterprises during COVID-19: Implications for theory and practice,” *Int. J. Inf. Management* **55** (2020).
<https://doi.org/10.1016/j.ijinfomgt.2020.102192>
 47. A. Kuckertz, L. Brändle, A. Gaudig, et al., “Startups in times of crisis—A rapid response to the COVID-19 pandemic,” *J. Bus. Ventur. Insights* **13** (2020).
<https://doi.org/10.1016/j.jbvi.2020.e00169>
 48. M. G. Colombo, E. Piva, A. Quas, and C. Rossi-Lamastra, “How high-tech entrepreneurial ventures cope with the global crisis: changes in product innovation and internationalization strategies,” *Industry Innova-*

- tion **23** (7), 647–671 (2016).
<https://doi.org/10.1080/13662716.2016>
49. CB Insights: The Asia Tech Investment Report. 2017. https://www.cbinsights.com/reports/CB-Insights_Asia-Tech-Investment-Report.pdf?utm_campaign=Report%20-%20Content%20Emails&utm_source=hs_automation&utm_medium=email&utm_content=52306389&_hsenc=p2ANqtz-FZ693KpStPhVHI6bMJ-4dy353yjdHY4AP7aDatY0u7I4u8pcnAJgigdR7zhjmErV8Cm3NnfwsMxZ-9F2Oj2eGIn0bbA&_hsmi=52306389. Cited February 1, 2020.
 50. J. Woetzel, J. Seong, and K. W. Wang, et al., China's digital economy: A leading global force (McKinsey Global Institute, 2017). <https://www.mckinsey.com/~media/McKinsey/Featured%20Insights/China/Chinas%20digital%20economy%20A%20leading%20global%20force/MGI-Chinas-digital-economy-A-leading-global-force.ashx>. Cited February 8, 2020.
 51. R. De', N. Pandey, and A. Pal, "Impact of digital surge during Covid-19 pandemic: A viewpoint on research and practice," *Int. J. Inf. Management* **55** (2020). <https://doi.org/10.1016/j.ijinfomgt.2020.102171>
 52. H. Yue, National report on e-commerce development in China. WP 17. https://www.unido.org/sites/default/files/2017-10/WP_17_2017.pdf. Cited February 8, 2020.
 53. S. Fei and J. Ni, Local food systems and COVID-19: A look into China's responses. http://www.fao.org/uploads/pics/Food_system_and_COVID-19_China_8_4_20_v2.pdf. Cited April 29, 2020.
 54. Y. Wang, A. Hong, X. Li, and J. Gao, "Marketing innovations during a global crisis: A study of China firms' response to COVID-19," *J. Bus. Res.* **116**, 214–220 (2020). <https://doi.org/10.1016/j.jbusres.2020.05.029>
 55. N. Kshetri, "Institutional and economic factors affecting the development of the Chinese cloud computing industry and market," *Telecommunications Policy* **40**, 116–129 (2016). <https://doi.org/10.1016/j.telpol.2015.07.006>
 56. A. Rizk, B. Bergvall-Kåreborn, and A. Elragal, "Digital service innovation enabled by big data analytics: A review and the way forward," in *Proceedings of the 50th Hawaii International Conference on System Sciences* (2017), pp. 1247–1256. <http://hdl.handle.net/10125/41302>.
 57. W. Li, The value of data: There's no such thing as a free lunch. <https://www.imf.org/~media/Files/Conferences/2018/6th-stats-forum/session-3-wendy-li-value-of-data-theres-no-such-thing-as-a-free-lunch-in-the-digital-economy-paper.ashx>. Cited April 10, 2020.
 58. D. Isabelle, M. Westerlund, M. Mane, and S. Leminen, "The role of analytics in data-driven business models of multi-sided platforms: An exploration in the food industry," *Technol. Innov. Management Rev.* **10** (7), 4–15 (2020). <https://doi.org/10.22215/timreview/1371>
 59. D. Clark, *Alibaba: The House That Jack Ma Built* (Harper-Collins, New York, 2016).
 60. J. Rodrigues, P. Ruivo, and T. Oliveira, "Software as a service value and firm performance—A literature review synthesis in small and medium enterprises," *Procedia Technol.* **16**, 206–211 (2014). <https://doi.org/10.1016/j.protcy.2014.10.085>
 61. T. Vasiljeva, S. Shaikhulina, and K. Kreslins, "Cloud computing: Business perspectives, benefits and challenges for small and medium enterprises (case of Latvia)," *Procedia Eng.* **178**, 443–451 (2017). <https://doi.org/10.1016/j.proeng.2017.01.087>
 62. E. Gromova, D. Timokhin, and G. Popova, "The role of digitalization in the economy development of small innovative enterprises," *Procedia Comput. Sci.* **169**, 461–467 (2020). <https://doi.org/10.1016/j.procs.2020.02.224>
 63. J. Qi, X. Zheng, and H. Guo, "The formation of Taobao villages in China," *China Econ. Rev.* **53**, 106–127 (2019). <https://doi.org/10.1016/j.chieco.2018.08.010>
 64. Y. Lin, "E-urbanism: E-commerce, migration, and the transformation of Taobao villages in urban China," *Cities* **91**, 202–212 (2019). <https://doi.org/10.1016/j.cities.2018.11.020>

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