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Social Informatics Turns under Geo-Political Economic Dynamics:

The Battle for Technological Hegemony and Soft Power in the 5G Era

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1. Introduction

Currently, technological competition over 5G is turning into a struggle not only for economic hegemony but also for political hegemony related to national security, while guiding, dividing, monitoring, and controlling by "information" that appears in the network society. The aspect of is deepening. A glimpse of that step from the path dependence of the technology trajectory leads to the 2nd & 3rd generation of digital mobile technology. Having the establishment of dominant positions in the second and third generations' mobile phone market with the European standard GSM and the global standard W-CDMA, NOKIA takes Apple lead in conversion to smartphones in the transition to the fourth generation. Forgiveness, in line with Google's Android OS equipped Samsung's catch-up, it was decided to lose its position in the mobile terminal market ("NOKIA shock"). The transformation to the fourth generation is different from the market competition that takes advantage of the "scale economy" backed by the dominant design of handsets seen in previous generation changes, and the development of the app market. The terminal itself has become a mere input/output device of the platform application in the competition in the "economy of scope" with the multi-functions of the service. Here, Samsung, which integrates the element technology of the terminal device, becomes a competitive factor as to how the functionality of the application can be exhibited, and Apple, Inc., which holds the app approving right from the device design and has controllability in fragmentation of the global market progressed by utilizing EMS (Electronics Manufacturing Service). On the other hand, in the Asian market, in which the development of the mobile communication backbone has progressed rapidly, emerging mobile handset manufacturers are emerging in China, which has a strong domestic market. The foremost tip was Huawei, which was trying to occupy the global market for the fifth generation. However, it came here and the war between the United States and China was cut off. It has not only been an imbalance issue of trade (balance of payments) but has spread to an international issue that extends to the issue of intellectual property rights related to national security and technology development ("Huawei Exclusion").

At the same time, the U.S. and China are locked in a confrontation over technological

hegemony, not only in the field of 5G technology, but also in the fields of AI and data science. The issue of "fair trade" and "privacy protection" for platformers has also come to the fore in each domestic market. Ian Bremmer (2021) examines the influence of big tech (Apple, Google, Facebook, Microsoft, Amazon, and Tesla, and Chinese technology companies such as Alibaba, ByteDance, and Tencent) as a geopolitical power that opposes the state. This has raised the awareness that the rise of information technology and data science, with its implications for national security, will determine the future global order in the post-Corona era. The complex of economic blocs such as the RCEP and TPP, as well as the Five Eyes (FVEY) framework of strategic agreements such as the ANZUS (Australia-United States Security Treaty), AUKUS (Australia-United Kingdom-United States Agreement), and QUAD (Quadrilateral Security Dialogue), have also brought to light the composition of conflicts in the Asia-Pacific region. Furthermore, United States government promotes to establish the IPEF (Indo-Pacific Economic Framework), the conflict in the border area of technological hegemony over the Indian and Pacific Oceans is becoming increasingly clear.

This paper examines the industrial technology segment strategies of companies in the social acceptance of technology within a global geopolitical and economic framework, with a view to today's 5G developments, based on the technological trajectory to date.

2. Technological Trajectory, Services, Demands for Mobile Communications

The first generation (1G) of the mobile telecommunications business, which began with analog systems, was born in North America (AMPS) and Northern Europe (NMT), and in Japan (NTT-Hicap) in the form of regional "car phones" with portable (capable) phones in each region. The 1980s was a time when there were calls for a shift to digital technology that aimed to integrate telephony and data communications. Not long after, the shift to digital technology for mobile communications was followed by the establishment of the second generation (2G) European technical standard GSM (global system for mobile communications), which aimed at cross-border use with the establishment of the European Union (EU), and the expansion of the GSM system into the global market. The curtain was lowered on the competition. The Nordic companies Ericsson and Nokia made great strides. In the U.S., Motorola emerged as a cell phone manufacturer in the 1G period, and entered the international business with dominant designs such as foldable cell phones. During the transition to the third generation (3G), the company competed with Ericsson over the international standardization of North American and European standards. On the other hand, in Japan, TACS (Total Access Communication System) was adopted as the Japanese

specification of Motorola's system when new mobile carriers entered the market, along with NTT's system during the 1G period. In this case, we can see the dawn of the international strategy for technological standards.

The second generation was a period of technological development under geographical (regional) restrictions, but with the standardization of the second generation, the technology was to be deployed in the global market. The GSM standard, which became the technological standard in Europe, was a success. Originally, the use of mobile communications was to expand mobility (the range of use commensurate with the range of people's activities). In Europe, telecommunications services are provided by monopolistic operators in each country, and services are complete when interconnection and interoperability are ensured for wired communications, but in the case of wireless communications, tracking functions (roaming) In order to realize cross-border services by means of roaming, standardization of mutual networks among multiple countries is required from the viewpoint of efficiency of network construction and operation costs. From this perspective, standardization of mobile communications has been promoted in Europe together with regional standardization organizations, and Scandinavian manufacturers (Ericsson and Nokia) with technological capabilities cultivated in first-generation analog technology (NWT) have emerged in the global market under the banner of GSM.

After 2000, the Qualcomm standard in North America and the W-CDMA standard in Japan and Europe were mutually accredited for the third generation (3G), and the two standards covered the global market in a way that allowed mutual market entry, and a single global standard was pursued for the next fourth generation (4G). The next fourth generation (4G) will be the first to pursue the planning and setting of a single global standard. Emerging companies in the Asian region, in addition to Samsung and LG Electronics of Korea, are Taiwan's Foxconn and Pegatron, which provide EMS (Electronics Manufacturing Services) and semiconductor manufacturing foundries, respectively. (TSMC), a semiconductor manufacturing foundry. In 2008, Google introduced Android as a mobile OS, contributing to the expansion of the smartphone market, and RIM (Research in Motion: Currently Blackberry Inc.) introduced a keyboard phone under the name of Blackberry. In 2008, Google introduced Android as a mobile OS and contributed to the expansion of the smartphone market. At the time, the Chinese market was dominated by "Shanzhai handhelds," which were imitations of not only the iPhone, but also Nokia and Motorola models. However, Chinese-made mobile phones and smartphones had yet to establish their own brand. The shift to the smartphone market, along with demand for EMS from Taiwanese firms, has been a driving force behind the global fragmentation of the value chain. The creation of the smartphone market also marked the emergence of the platform business, which has helped the Internet business via

mobile communication terminals to flourish.

Even if the evolution of technology (genes) is continuous as symbolized by Moore's law, companies (life forms as "vehicles") as the expressive entities that inherit such technology are forced to adapt to the market (environment) and compete for survival through entry and exit (natural selection) in a competitive market. Furthermore, corporate (life-form) activities are conducted in a cyclical structure in which goods and services are traded (food chain of intake and emission) via the market. In this light, the ecosystem of information and communication technology has generated a new market structure through the intermittent development of new goods and services and the realization of institutional phase transitions with the development of high-speed, large-capacity technology. The business structure of social networking is strongly influenced by socio-cultural, political, and economic factors. Specifically, Facebook, which was expected to be used globally as a social networking service, and Gmail and Google Maps, along with Google's search system, are not allowed to expand their business in China due to national policy, while WeChat, provided by Tencent, and Baidu, a search system, provide similar services in China. In South Korea and Japan, chat services such as Kakao-Talk and LINE are thriving, but these services are also not allowed in China.

And today, the 5th generation (5G) is about to realize ultra-low latency and multiple simultaneous connections. We are now at a stage where the question is how the industrial structure (ecosystem) will be transformed (mutated) by this change. In general, whether the implementation of IoT and AI will lead to a richer, freer, and more open social life, or whether the use of technologies that strengthen surveillance and guidance will lead to a stagnant society, depends on the social shaping of technology.

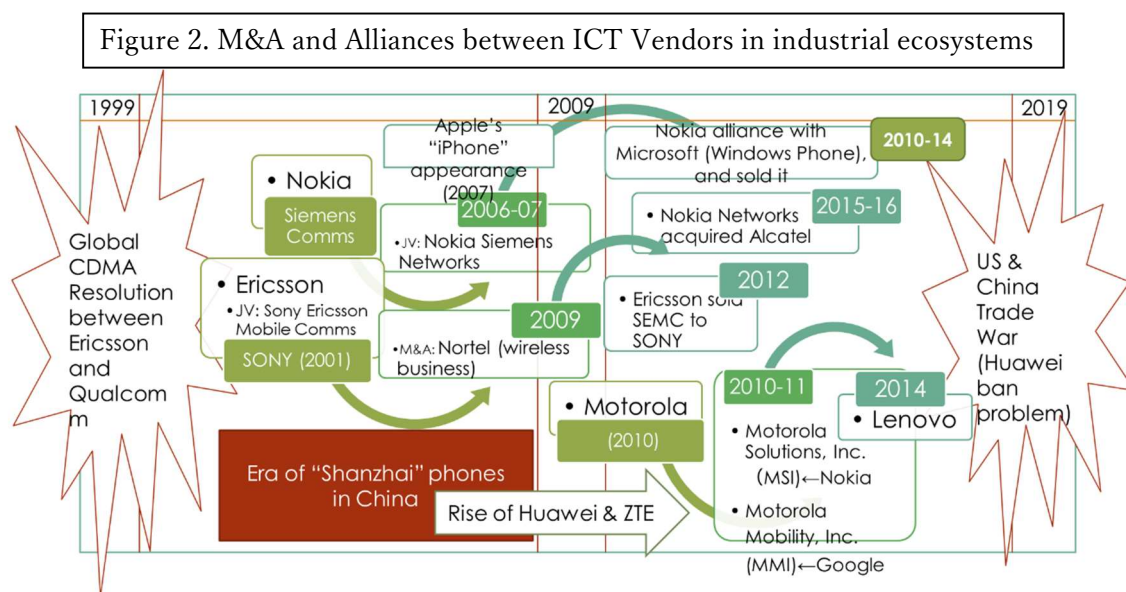
Figure 1. Technologies, Institutions, and Social Shaping

	Technologies	Institutions	Key Players	Social Usage
1G	Realization of Cellular Concept (Analog)	Regional development: Europe (Nordic, etc.), America, Japan	Nokia & Ericsson, Motorola, NTT	Voice telephone <Smaller and lighter>
2G	Digitalization (2.5G = Combination with Internet)	Establishment of standardization: GSM, CDMA, PDS (regional competition)	Nokia & Ericsson, QUALCOMM, NTT	Voice & Email (SMS)-<Message & Imaging>
3G	Broadband (Multi-media): Integration with Internet	Global standardization: International coordination (ITU – IMT2000)	Nokia & Ericsson, QUALCOMM, NTT, Blackberry	Mobile Internet + SNSs: Games & Music <Networking>
4G	Seamless IP based Networking: Convergence between Wired(Fixed) and Wireless(Mobile) _ LTE-Advanced / Cloud Computing	Telecom (centralization) vs. Internet (decentralization/bazaar) vs. Broadcasting (cathedral)	Apple-iPhone, Google-Android, Samsung; GAFA vs. BATH	Platform Business (Streaming, Subscription) <Connectivity & Visualization>
5G	"5G NR" (5G New Radio) software: Enhanced Mobile Broadband (eMBB), Ultra Reliable Low Latency Communications (URLLC), and Massive Machine Type Communications (mMTC) / Big Data, AI, IoT	FinTech: Platformers vs. Financial Service Industry (Government) MaaS: Internet Applicators vs. Transportation (incl. Connected Car), Tele-Medicine (incl. Remote Surgery)	Platformers, Governments, and Citizens/Customers/People	"Metaverse" (DeFi: Decentralized Finance, NFT: non-fungible token) <Distributed/Decentralized>

3. Globalization, GVC, and National Competitive Advantage

The confrontation with China's BATH, symbolized by the U.S. GAFA, has reached the point where it has extended to national and trade issues between the U.S. and China, and has also led to conflicts over the right to control the flow of digitalized data such as technical and personal information across borders in a network-connected global society, both within and outside each country.

The first milestone was reached in 1999, when the battle over the global standard between Qualcomm's cdma technology and Ericsson's W-CDMA, which had entered its third-generation phase, was settled. Ericsson and Nokia, which had pioneered the mobile communications field in Europe, began to combine their respective telecommunications vendors. Ericsson acquired Nortel's wireless communications business in Canada (2009) and established a joint venture with Sony to distance itself from the handset business (2001), eventually handing the business over to Sony (2012). Nokia developed a joint venture with Siemens' wireless telecommunications business and formed an alliance with Microsoft to develop and market Windows Phone, but it did not work out and was eventually let go, while acquiring former telecommunications equipment giant Alcatel to expand its telecommunications equipment business (2015-2016). The company also acquired Motorola's solutions division (2010-2011), but eventually sold it to Lenovo, which had acquired IBM's former PC manufacturing and sales division (2014). In addition, Google would acquire Motorola's mobile communications company and begin developing and selling its own mobile communications devices.



The turning point of the third generation was the appearance of Apple's "iPhone," which was announced and released in 2006-2007. Until then, pen-touch mobile terminals had been developed as electronic organizers and PDAs, but with the iPhone, a cell phone terminal with a touch panel and applications was introduced, leading the subsequent smartphone market. On the other hand, Qualcomm, which is developing and designing chips for the mobile communications field globally with cdma wireless technology at the core, attracted mobile carriers competing with the W-CDMA system and established a presence in the highly oligopolistic mobile communications business. Furthermore, just as iPhone is developing Mobile OS as an extension of MacOS and Microsoft is pioneering MS-Mobile OS through its alliance with NOKIA, Android Mobile OS technology will be acquired, and the customer base acquired through search engines and Gmail will be deployed in the mobile communications field. The development of smart phones has led to the development of mobile communications. The development of smart phones will usher in a warring age in the mobile communications field, and Asian companies will leapfrog into the fray. The groundwork for this is laid by Samsung and LG Electronics of South Korea, which entered the mobile communications terminal market in the 1990s when Western telecommunications carriers embarked on direct investment in China's huge potential market under the country's reform and open-door policies, and used their price competitiveness to gain a reputation and establish brands in the Chinese market, as well as by the latecomers, Samsung and LG Electronics of the United States and Europe, which have been developing their own brands in the mobile communications market. Chinese companies through joint ventures with Europe and the U.S. began to make a name for themselves in the global market with the technical capabilities of contract manufacturing and sales that they had developed through domestic counterfeit "Shanzhai" terminal products. The first of these were telecommunications equipment vendors such as Huawei and ZTE.

The global diffusion of mobile communication technologies, as seen in the previous section, is one of the classic examples of geopolitical dynamism. "Geopolitical architecture" is "is used to describe the ways in which states and non-state organizations access, manage, and regulate the intersection of territories and flows (*of people, goods, money, and information*) and in so doing establish borders between inside/outside, citizen/alien, and domestic/international.¹ (*Author's additional pen*)" The spread of information and communication technologies, especially mobile communications, structures a world that easily transcends borders through the Internet, which is interconnected across boundaries but

¹ Dodds, Klaus (2014) *Geopolitics: A Very Short Introduction (Very Short Introductions)* updated, Oxford University Press, p.53 (Kindle Version).

segregates inside and outside, while at the same time regulating and controlling its operation and ensuring interchangeability. The geopolitical structure also reinforces transnational networks as well as divides them by boundaries, and they are connected not only by political but also by economic networks, and this connectivity is made dynamic by information and communication technologies². Parag Khanna has clearly depicted these dynamics in terms of the concept of "connectivity" and presented the 21st century as the Asian century³. On the other hand, as a historical overview of the macro development of international trade, he views the progress of globalization as the liberation from banding due to the lowering of the three distance costs⁴. In other words, the cost of moving goods, ideas, and people has rapidly decreased due to technological innovation in the transportation and communication fields. In the first stage, the cost of transporting goods has decreased, and production and consumption have been separated, and in the second stage, the cost of moving ideas has decreased due to the development of the communication environment and complex activities can be coordinated from remote locations. In the second stage, the telecommunications environment reduced the cost of moving ideas and accelerated the shift of labor-intensive industries to low-wage regions. In the third stage, the face-to-face costs of human mobility were lowered, and it was suggested that "telepresence" and "tele-robotics" would enable the physical separation of labor services from workers, which is precisely what is being sought in the COVID-19 disaster. At this stage, however, the international situation is characterized by fragmentation and confrontation, especially in the field of information and communications, where conflicts over technological hegemony and information hegemony are coming to the surface.

On the other hand, Mochinaga (2021) analyzed China's "One Belt, One Road" strategy from the perspective of digitalization using Strange's structural approach in the political economy and Nye's behavioral scientific approach to analyze soft power⁵, and Shiono, Makoto (2020) showed the dynamics (balance of power) of international politics from the perspective of digital technology. Some studies incorporate a geopolitical perspective. In the next chapter,

² Flint, Colin (2012) *Introduction to Geopolitics*, Routledge.

³ Khanna, Parag (2016) *Connectography: Mapping the Global Network Revolution*, Weidenfeld & Nicolson. 及び Khanna, Parag (2019) *The Future is Asian: Global Order in the Twenty-first Century*, Simon & Schuster.

⁴ Baldwin, Richard (2016) *The Great Convergence: Information Technology and the New Globalization*, The Belknap Press of Harvard University Press.

⁵ Refer to Strage, Susan (1988) *States and Markets* (Bloomsbury Revelations: 1st edition), Bloomsbury Academic, and Nye, Joseph S. (2005) *Soft Power: The Means To Success In World Politics*, Public Affair.

we discuss how the international political framework has strengthened its influence on national security and the international economy, resulting in environmental changes in the economic ecosystem of the global marketplace, and how global corporations are adapting to this environment or even creating mutant species in this environment.

4. Technological Hegemony & Geo-Political Economy

The current conflict of information and communication technology hegemony, which has been highlighted by the U.S.-China trade war and is also being addressed in national security and political campaigns, has developed into a cultural friction over the protection of not only national secrets but also personal information, with the Huawei issue at the forefront, as well as Tik-Tok and WeChat social networking sites, and the spread of the COVID-19 infection has accelerated this conflict. The spread of COVID-19 infection has spurred it on. What has become apparent in these developments is that the chain (network) of global value chains established by the advance of globalization has been broken, the struggle for technological hegemony has become apparent, the transfer (outflow) of core technologies has become a political (security) issue in terms of national strategy, and the reorganization of economic (trade) interdependence has become imminent. In addition, the transfer (outflow) of core technologies has become a political (security) issue in terms of national strategy, forcing a reorganization of interdependence in the economy (trade). As a result, corporate strategies must not only secure core technologies, but also reorganize market development and supply systems.

Looking back at the strategies of major companies, Ericsson and Nokia in Europe, while getting out of the manufacturing and sales of mobile terminal equipment in the 3G-4G period, have been making M&As in the North American and European markets, focusing on core technologies for mobile networks and playing a key role in today's mobile communication technologies. It is a competitor to China's Huawei. Its M&A strategy has been to consolidate its technology and markets in North America and Europe by acquiring the wireless business of North American telecommunications equipment manufacturer Nortel (2009), while Ericsson remained part of the smartphone handset market through a joint venture with Sony (2001-2012), while Nokia embarked on a joint venture with Siemens Comms (2006), while also acquiring the submarine cable business of Alcatel (2015). Nokia also acquired Motorola's Network Solutions division (2010) to gain the North American market and network core technology. During the introduction of 3G to mainland China, these Western companies entered the huge Chinese market through joint ventures with Chinese companies. Although Google once purchased Motorola's mobile handset business, it eventually sold it to China's

Lenovo, which did not take on its own production system, but only secured mobile handset technology. On the other hand, Chinese companies secured funds, technology, and human resources through joint ventures with Western telecommunications equipment manufacturers in China based on the technology cultivated during the "shanzhai handheld" era, Huawei and ZTE emerged as the leading companies against a backdrop of strong domestic demand.

The 20 years from 3G to 4G can be seen as a period of decline for Nokia's mobile handset business, but it was also a period of entry into the global market by Samsung of Korea with the advent of Apple's iPhone (2006-2007) and Google's Android-based mobile OS smartphones, and a foothold in the Chinese domestic market. While Apple created its own mobile market, its production system was managed by PCH International, an Irish company, which managed supply chains not only in Europe and the U.S. but also in China and other Asian countries, establishing a network of suppliers and a global business. The company has established a global business through a network of suppliers not only in Europe and the U.S. but also in Asia, especially China. The suppliers that have played an important role in this process include Taiwanese EMS companies (led by Hon Hai's Foxconn), but recently, due to U.S. economic sanctions against China, some of Taiwan's Wistron's Chinese factories have been sold to China's Lixun Luxshare (*Nikkei* 2020/07/23).

In addition, under the Trump administration in the U.S., the Clean NETWAORK campaign was launched to shut out Huawei products, and even Taiwanese telecommunications equipment manufacturers and carriers in the U.S., Europe, and Japan came forward to join the campaign, thereby capturing Taiwan⁶. Furthermore, in the construction of submarine cables that straddle national borders, there was an oligopoly of three companies in Europe, the United States, and Japan: Alcatel Submarine Networks (ASN: formerly Alcatel-Lucent Submarine Networks) affiliated with Nokia (France) and TE Submarine Networks (France), and the Taiwanese telecommunications equipment manufacturers and telecommunications carriers. (ASN: formerly Alcatel-Lucent Submarine Networks) affiliated with Nokia (France)/TE SubCom (Tyco Electronics Subsea Communications Ltd./US)/OCC (Ocean Cable & Communication: NEC/Japan). Huawei's subsidiary Huawei Marine Networks' entry into the market raised concerns that it could pose a security threat. Eventually, Huawei announced that it would sell its stake in the company in June 2020⁷, and the Hengtong group bought an 81% stake in the company, which changed its

⁶ The Clean Network - United States Department of State: Carrier, Apps, Store, Cloud, Cable, Path [https://2017-2021.state.gov/the-clean-network/index.html] in 2017-2021 ARCHIVED CONTENT released online from January 20, 2017 to January 20, 2021.

⁷ "Global Marine Group Fully Divests Stake in Huawei Marine Networks", *Submarine Cable Networks* (06 June 2020) [https://www.submarinenetworks.com/en/vendors/hmn-tech/global-marine-completes-sale-

name to HMN Technologies in November of the same year⁸. Submarine cables are the key to international communications. American platform operators are now among the investors in submarine cables laid in the Pacific Ocean, indicating the growing demand for traffic between the U.S and Asian countries⁹.

On the other hand, as the competitive factors of advanced technology move toward the collection of vast amounts of information data and the acceleration of their transmission and processing at high capacity and high speed, U.S. transformers have begun to expand their own data centers, collaborating with related technologies to acquire core technologies, while also developing their own. Here, the focus is on the development, design, and manufacture of proprietary SoC (System on a Chip) in relation to mobile communications technology. On the customer sensor side for flat formers, the pressure to support 5G has led Apple to develop its own M1-Pro/Max. Meanwhile, in the push toward AI, Google has developed a Tensor Processing Unit (TPU) and started to incorporate it in its own Pixel 6/6Pro smartphones. Amazon is also developing a SoC-OnDive for its Echo smart speaker. In addition, Samsung, which competes with Apple in smartphones, is developing the Exynos 2100 with 5G support. Qualcomm is competing with them with Snapdragon. The competition in the development of these SoCs is the advancement of data integration processing, and it can be said to be a predictor of future trends. In addition, Taiwan's TSMC is contracted to manufacture Apple's SoC, M1-Pro/Mac, and Taiwanese companies are increasing their presence in the market because of their essential foundry technology and the fact that the U.S. and Japan are actively inviting TSMC to build factories. The fact that the U.S. and Japan are actively seeking to attract TSMC factories is also a testimony to the fact that it is essential to incorporate Taiwanese companies predominantly into GVCs at a time of U.S.-China economic friction.

Furthermore, the competitive factor has also turned to the creation of new platforms, with the renamed Facebook company Meta Platforms, Inc. focusing on the development of Metaverse, which bears the new company name. It remains to be seen whether this new platform will be successful, but today, when the COVID-19 disaster has restricted behavior and increased the social acceptance of remote systems, it remains to be seen what form the shared space in virtual space, including teleconferencing systems such as Zoom, will take, as we have seen with TikTok's video The form of cultural platforms may bring diversity, given

of-30-stake-in-huawei-marine-networks-for-85-million]

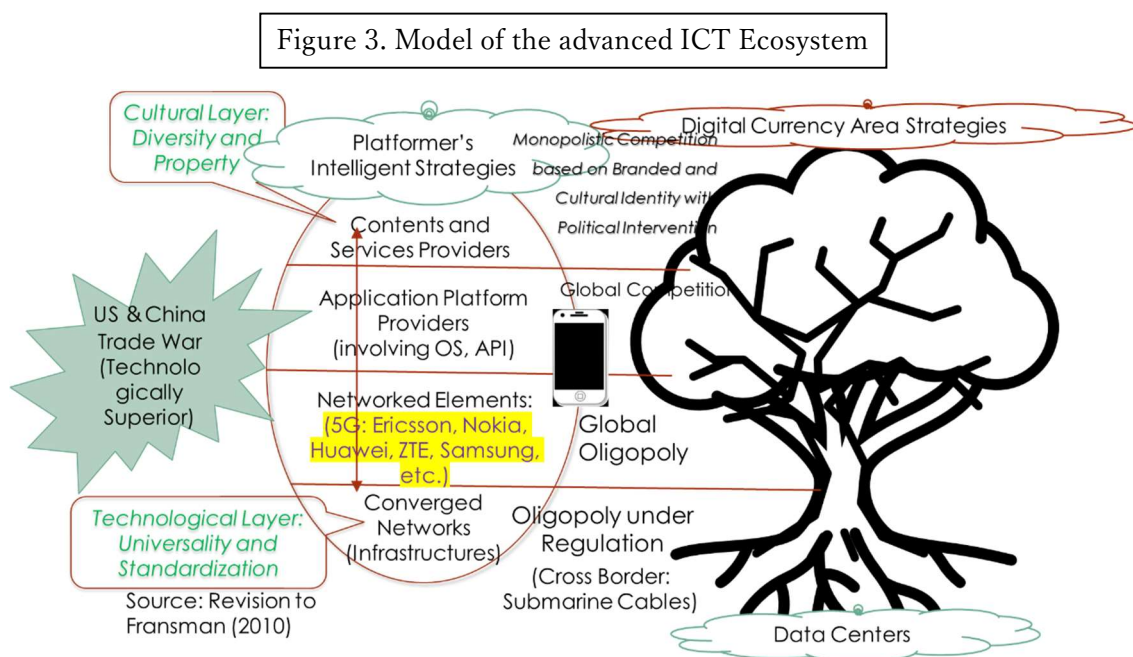
⁸ Huawei Marine Networks Rebrands as HMN Technologies (03 November 2020)
[<https://www.hmntechnologies.com/enPressReleases/37764.jhtml>]

⁹ Data on traffic demand between Japan and the U.S. is estimated and published by the Japanese Ministry of Internal Affairs and Communications.
[https://www.soumu.go.jp/joho_tsusin/eidsystem/market01_05_03.html]

the popularity of TikTok video chat and Nintendo's "Atsumori" (Animal Crossing New Horizons: Nintendo Switch) in China and Japan, respectively.

5. States vs. Markets: Network ecosystems of fragmentation and linkage

Looking at the development of corporate strategies in the US and Europe to date, European companies have horizontally specialized in the field of telecommunications equipment infrastructure construction and have specialized in the development and research of highly profitable network equipment through global sales strategies to telecommunications carriers, which are the oligopoly demand side. Asian firms in South Korea and China, as comprehensive electrical equipment manufacturers, are involved in everything from network equipment to the development of terminal equipment for the final demand side of the global competitive market and have adopted a strategy of having global bases for everything from development to manufacturing and sales. On the other hand, U.S. companies, under the horizontal division of labor, specialize in the development and design of semiconductors, the core technology in the mobile communications field, and outsource their semiconductor manufacturing to Taiwanese companies that have enhanced their technological capabilities as contract foundries and contract assembly manufacturers. These technologies form the ecosystem of mobile communication technology, and from the infrastructure and network components that form the core of the network technology, the social network service applications and content fields of the platform companies that have extended their branches and leaves will flourish.



On the other hand, the state has intervened in the information and communication business sector not only in trade friction over technological hegemony between the U.S. and China, but also in terms of cross-border data and anti-monopoly. The GDPR requires companies and organizations to strictly manage personal information¹⁰. The regulation prohibits the misappropriation and unauthorized distribution of information based on the content and method of data acquisition, and requires the same restrictions to be applied to countries and regions subject to cross-border data. Therefore, it also influences the strategies of companies in the location and accumulation of data centers. Furthermore, in December 2020, the EU will develop a "Digital Market Act (DMA)" and a "Digital Services Act (DSA)," which will restrict preferential treatment of its own services in app distribution, online shopping, social networking, and search services, and require the elimination of illegal content and proper display of advertisements. These Acts were proposed rules were passed in March and April 2022, respectively¹¹, as part of the new digital strategy "Shaping Europe's digital future." While these Acts were developed with the so-called "Big Tech" U.S. platformers, the Future Internet Public-Private Partnership (FI-PPP) programme was established in 2011 to develop a common infrastructure for platforms. This programme has been promoted since 2011 as a common platform for the platform, and "FIWARE" as an Open Source Platform has been established.

In the U.S., the American Innovation and Choice Online Act (passed in 2022) prohibits platforms from manipulating search results to their advantage, the Open App Markets Act (passed in 2021) prohibits them from forcing app providers to use their payment services, and the Platform Competition and Opportunity Act (passed in 2021) prohibits acquisitions that impede competition. The "Open App Markets Act" (passed in 2021), which prohibits companies from forcing app providers to use their own payment services, and the "Platform

¹⁰ The general data protection regulation (GDPR) on 24 May 2016 the general data protection regulation entered into force. It has been applicable since 25 May 2018.

[<https://www.consilium.europa.eu/en/policies/data-protection-reform/data-protection-regulation/>]

¹¹ Digital Markets Act (DMA) [<https://www.consilium.europa.eu/en/press/press-releases/2022/03/25/council-and-european-parliament-reach-agreement-on-the-digital-markets-act/>]

Digital Services Act (DSA) [<https://www.consilium.europa.eu/en/press/press-releases/2022/04/23/digital-services-act-council-and-european-parliament-reach-deal-on-a-safer-online-space/>]

Competition and Opportunity Act" (passed in 2021), which prohibits acquisitions that impede competition, have been passed in rapid succession, making it tougher for platform providers to compete. Similar legislation was passed in Japan in 2021 as the Digital Platform Competition and Opportunity Act, which requires the disclosure of terms and conditions with online retailers and the reporting of app store operations to the Minister of Economy, Trade and Industry (METI), Japan. The same regulations will be required for overseas expansion of platform operators as in their home countries. In China, the Anti-Monopoly Law of the People's Republic of China (AML) enacted in 2007 was amended and the "Anti-Monopoly Guidelines for the Platform Economy" was promulgated on February 7, 2021, setting forth the standards for abuse of a dominant market position by platform companies and embarking on the regulation of platform companies through The State for Market Regulation ("SAMR"). The targets of this regulation include Alibaba and Tencent were included in the list, and the power of the state is now being extended to online businesses (*JETRO*, April 22, 2021; *Reuters*, November 16, 2021).

Figure 4. New Conflicts in "Information Strategies, Competition Policies & Privacy Rules : Era of *Data Hegemonies*"

	USA	Korea	Japan	EU	Taiwan	China
Privacy Policy	Freedom	In principle the consent of the individual is required			-	Restriction
Related Laws	FTC Laws, Gramm-Leach-Bliley Act (GLBA) (1999)	Personal Information Protection Act (2012), I&C Network Act	Personal Information Protection Law (2003)	General Data Protection Regulation (GDPR, 2016-2018)	Personal Data Protection Act (2012/2016)	Personal Information Protection Law (PIPL, 2021) Cybersecurity Law of the P.R. of China (2017)
	CBPR (Cross Border Privacy Rules) _ APEC (2011-2022)				CBPR	
Industrial Information	Principle of Freedom (Except of Security-related Information)					
Antitrust Laws	American Innovation and Choice Online Act (2022) Open App Markets Act (2021) Platform Competition and Opportunity Act (2021)	Online Platform Fairness Act (2021); Korea Fair Trade Commission (KFTC)	The Act on Improving Transparency and Fairness of Digital Platforms (TFDPA, 2021) MITI Antitrust Law: Digital Platforms (2019); Japan Fair Trade Commissions (JFTC)	Digital Markets Act (DMA, 2020-22) Digital Services Act (DSA, 2020) Future Internet Public-Private Partnership Programme (FI-PPP, 2011); FIWARE (Open Source Platform)	Fair Trade Act (1999, Amend. 2015)_Merger Control	E-Commerce Law of the P.R. of China (2019) Anti-monopoly Law of the People's Republic of China (AML, 2007, Amend.: 2022)_The State Administration for Market Regulation ("SAMR")
Data Management /Data Use Initiative	Industry (Platformers: GAFAM)	-	Under Making Rules with US (SoftBank, Rakuten) & EU (NTT, KDDI)	Individual: Citizenship	-	Nation: Government

Figure 5. Major Application Service & Content Providers in U.S.A, EU, and Asian Countries/Regions

	USA	Korea	Japan	EU	Taiwan+	China
Privacy Policy	Freedom	In principle the consent of the individual is required			-	Restriction
Data Management/Data Use Initiative	Industry (Platformers: GAFAM)	-	<i>Under Making Rules with US (SoftBank, Rakuten) & EU (NTT, KDDI)</i>	Individual: Citizenship	-	Nation: Government
Major Players:	GAFA	Kakao-Talk	LINE	FIREWARE		BATH
e-Commerce#	Amazon Walmart.com	NAVER	Amazon, Yahoo!, Rakuten	Amazon	Shopee, Ruten, MoMo, PChome	Alibaba, JD.com
Search Engine#	Google, bing	Google, Naver	Google, Yahoo!	Google, bing	Google, Yahoo!	Baidu, Sogou, bing, Haosou
Social Media#	Facebook, Pinterest, Twitter, Instagram, YouTube	Facebook, Twitter, YouTube, Pinterest, Instagram	Twitter, Pinterest, Facebook, YouTube, Instagram	Facebook, Twitter, Pinterest, Instagram, YouTube	Facebook, YouTube, Pinterest, Twitter, Instagram	Reddit, Pinterest, Twitter, Sina Weibo, Facebook,
Messaging Apps*	Facebook Messenger WhatsApp	Kakao-Talk	Line	WhatsApp Facebook Messenger(NO, SE)	Line	WeChat (Tencent)
Mobile Venders (incl. Semiconductors)	Apple, Qualcomm, Intel, ...	Samsung LG Electronics	NEC, Fujitsu, SONY, etc.	Ericsson, NOKIA	Foxcom, TSMC, ...	Huawei, ZTE, ...

Source: # StatCounter [<https://gs.statcounter.com/social-media-stats/all/worldwide/2021>]

* WeSquare [<https://www.wesquare.nl/the-most-used-messaging-apps-and-how-to-choose-the-right-one/>]

+ e-commerce: Official Website of the International Trade Administration [<https://www.trade.gov/knowledge-product/taiwan-ecommerce>]

The competitive relationship in information and telecommunications technology also strongly reflects the policy stances of Asian countries on the issues of intellectual property rights over advanced technology and the ownership and management of big data for the protection of personal information. In particular, the fierce battle of wits is being waged between China and the United States. Under the Chinese government's control and regulation of the sector, the entry of U.S. companies into the Chinese market is constrained. Specifically, Facebook has not been available in China since 2009, and Twitter, Google's search engine and maps, and the video distribution service YouTube have not been available in mainland China since 2010. Apple also has a Clyde Services location in China and sells a virtual private network (VPN) application, but it was forced to transfer that business to a Chinese company after the "Cybersecurity Law of the People's Republic of China" went into effect in June 2017. Meanwhile, the U.S. government-imposed sanctions against Chinese companies ZTE and Huawei for violating Iran sanctions. As a result, the two Chinese companies' telecommunications equipment trade was banned due to violations of trade export controls and fears of theft of their activities using "backdoor" and "kill switch" programs (Nikkei 2018/04/18). This issue has been not only a point of contention in the current "U.S.-

China trade war," but also a move by the Australian government and other U.S. allies to shut down Huawei and ZTE for the deployment of 5G (5th generation) mobile communications equipment. Furthermore, with the implementation of the National Security Law, which will negate the "one country, two systems" policy amid the growing democratic movement in Hong Kong in 2019, some European countries have begun to reconsider the introduction of Huawei's 5G equipment. In addition, in connection with trade negotiations in the Americas, the U.S., in addition to Huawei and ZTE, has also imposed restrictions under the National Defense Authorization Act on Hikvision and Dahua Technology, which have surveillance camera technology, and Hytera as companies subject to regulation (*Nikkei* 2020/08/09). Furthermore, the trade war between the U.S. and China in the information and telecommunications sector has intensified into a dispute over platform providers, extending to the business operations of TikTok, a video application popular in the U.S., and the WeChat service provided by Internet-related company Tencent.

Regarding future technological innovation and data supremacy, as mentioned above, Apple and Samsung have developed their own SoCs independently in response to 5G technology, and Google and Amazon have developed AI-powered SoCs and are developing their own 5G + AI (Artificial Intelligence) on their own strategies for technology-integrated processing. In the future, as quantum computers are developed, information processing capabilities will increase dramatically, and if decentralized network utilization technology based on blockchain technology would be socially shaped, crypto-assets and non-fungible tokens (NFTs) may push the realization of digital currencies (but in such a case, how the credibility of the currency would be secured in such a case depend on the institutional design of the system). In addition, the key players with competitive advantages at that time could be incumbents, and strategies to capture a niche in the techno-economic ecosystem and a dominant position with "collective power/force" of customers/citizens/people would become increasingly important in the future.

6. Conclusion

From the perspective of technological choice and institutional system dependence (including path dependence), we can depict the social shaping of technology accompanying the generational evolution of technological trajectories and the transformation of services through mobile devices, while the battle for hegemony comparability shift to a technological aspect (strategic transformation of companies with technological superiority). The COVID-19 pandemic, coupled with the U.S.-China conflict, is forcing the hegemony of information (data) to reconfigure the global value chain (GVC), a situation that has been exacerbated by

the U.S. state-of-the-art technology companies, such as Qualcomm, Intel, and others, as well as the U.S. government and private sector. This situation is being concentrated in the core technology and offshoring¹² businesses of cutting-edge U.S. technology companies such as Qualcomm, Intel, Microsoft, and GAFA, as well as in platform strategies of Google, Apple, Facebook, Amazon, and others. The information and telecommunications technology ecosystem become more and more concentrated and aggregated functionally. This is precisely because, in the information and telecommunications technology ecosystem, smartphones are increasing their functions of individual identification and guidance, while at the same time, the information (intelligence) hegemony struggle in the information collection function through upper layer applications and the big data analysis and control function in the home country based on the infrastructure located in the lower layer is intensifying. The "fragmentation" and "connectivity" that accompanies this struggle for supremacy will emerge as an era of conflict.

Information and communication technologies are becoming increasingly aggregated and integrated, and network-integrated terminal devices are increasing their ability to identify people as individuals based on their behavior, purchases, and network preference records. Will it be a society in which conflict becomes a digital twin, dividing and fighting the real world? Will we accept the technology in the face of technological innovation, or will we incorporate the technology into our society, directly or indirectly, undergoing behavioral restrictions in a world shaken by COVID-19 and increasingly recognized as a general-purpose technology? directions seem to have been indicated. Which direction to take, and how companies should read that direction and expand or transform their businesses, is the pressing question.

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¹² Urry, John (2014) *Offshoring*, Polity Press.

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		APEC	CBPR	DEPA	PPT	RCEP	JKC-FTA (+3)	ASEAN	IPEF	Five Eyes	ANZUS	AUKUS	QUAD	The Clean Network	GDCP (2021)	ADB Operations	AIIB (OBOR)	SCO	Shangha Five							
Europe	Russia	<input checked="" type="checkbox"/>														<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>										
	Finland																									
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	Switzerland																									
	Czech Republic																									
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	France																									
	Germany																									
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	Mexco	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>							<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>													
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Oceania	Australia	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>												
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	China	<input checked="" type="checkbox"/>			<input type="checkbox"/>		<input checked="" type="checkbox"/>															<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
	South Asia	Bangladesh	<input type="checkbox"/>																	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					
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Pacific	Papua New Guinea	<input checked="" type="checkbox"/>							<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>										
	Fiji														<input checked="" type="checkbox"/>											
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	Cook Island																	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>						
	Maldives																	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>						
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Five Eyes (Five Eyes Intelligence Oversight and Review Council: FIORC)

ANZUS (The Australia, New Zealand and United States Security Treaty, 1951)

AUKUS (a trilateral security pact between Australia, the United Kingdom, and the United States, announced on 15 September 2021 for the Indo-Pacific region)

QUAD (Quadrilateral Security Dialogue, 2007)

IPEF (Indo-Pacific Economic Framework Prosperity, 2022)

APEC (Asia Pacific Economic Cooperation, 1989: 12 members)

ASEAN (Association of Southeast Asian Nations, 1967)

ADB (Asian Development Bank, 1966)

AIIB (Asian Infrastructure Investment Bank, 2014)

TPP (Trans-Pacific Partnership Agreement: -11, 2018)

RCEP (Regional Comprehensive Economic Partnership, 2022)
Shanghai Cooperation Organization (SCO, 2003; Shanghai Five²; China, Kazakhstan, Kyrgyzstan, Russia, and Tajikistan, 1996)

CBPR (Global Cross-Border Privacy Rules, Declaration: 2022) (☒: Observers and Dialogue partners)

DEPA (Digital Economy Partnership Agreement, 2020)

GDCP (Global Digital Connectivity Partnership; 2021): United States and Japan