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Digitalization and the Development of a "Smart" Society: The Logic and Practice of Management

Dai Li
Jiangxi Academy of Social Sciences
Nanchang, China
e-mail: 28363616@qq.com

Jiang Xiaoyu
Jiangxi Academy of Social Sciences
Nanchang, China
e-mail: ndncjx@163.com

Vladimir S. USKOV
Vologda Research Center, Russian Academy of Sciences
Vologda, Russian Federation
e-mail: v-uskov@mail.ru
ORCID: 0000-0001-5158-8551; ResearcherID: T-6713-2017

Abstract. The rapid spread of new technologies in all areas of activity leads to quick and profound changes in the structure of industrial production, global markets, and the economic and social sphere. The potential of information and communication technologies, accumulated by the 21st century, causes significant changes in the functioning of economic systems at different levels, from the global economy

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to individual economic entities; informatization and digitalization are the most important factors of economic growth. Under their influence, there is a transition from the introduction of individual digital technologies to the complex construction of a digital ecosystem. The rapid development of digital technologies has led to a model of society in which the real world and virtual space interact, a value orientation that combines big data algorithms with small data mining is emerging, a scenario spanning two opposing modes of decentralization and centralization is constructing, and different governance logics are emerging in which rule management and code-based regulation complement each other. This logic of governance has been put into practice in the process of social construction, creating an open and secure digital ecosystem, a collaborative multi-managerial circle and an inclusive dividend distribution circle, enriching the connotation of "co-building, co-managing and sharing", thereby laying the scientific and technical foundation for modernizing the national governance system and management capacity. The aim of our work is to comprehend the concept, the essence of the term "smart society" in its relationship with the phenomenon of the economy digitalization and studying the practice of management of development of such a society. The scientific novelty and originality of the research is reflected in the development of theoretical and methodological approaches and conceptual apparatus of studying the essence of "smart society" in the context of the economy digitalization; in the development of scientific and methodological foundations of a comprehensive assessment of the state, development trends of "smart" society in the Russian Federation and China; in the formation of a set of practical measures and a list of indicators characterizing the development of "smart" society.

Key words: digitalization, "smart" society, logic and practice of management, sharing, Russia, China.

Introduction

In the era of economic globalization, the digital economy has become a major driver of economic development, not only in promoting faster growth of gross domestic product (GDP), but also in productivity gain, helping to transform consumption patterns, optimizing investment patterns, increasing the scale of enterprise exports, improving the quality of human capital, and developing new "smart" cities.

The transition from the introduction of digital technologies to the complex construction of an international digital ecosystem requires new approaches and changes. This trend reflects the need for effective cross-border interaction between all participants in the digitalization process: public authorities, business, educational institutions, industrial enterprises, and financial structures.

Industry 4.0 is not just a change of a new way of life, not just the digitalization of companies' communications with each other and with the authorities, not just the automation of work processes and the replacement of human resources with software. It is a change in the principles of government activity and business building, transformation of mentality and consciousness.

The deepening informatization, modern media and current environment have made traditional society "intelligent", leading humankind to the "smart" society. The information revolution brought about by the rapid development of digital technology has profoundly shaped every aspect of this society, transforming and reforming how people's way of living and thinking, interaction, as well as social order. The popularization of the industrial Internet and the Internet of Things, together with the promotion of the projects such as "Smart" City and "Smart" Transportation have gradually shown a specific digital logic for social

governance, which diversify the concept of co-construction, co-governance and sharing. The increasingly mature concept of social governance has built the scientific and technological base for the modernization of the national governance system and governance capacity.

Materials and research methods

The study is based on the application of an interdisciplinary approach, which involves the use of a single methodological framework to summarize the research results of scientific, technological, industrial, socio-economic, institutional, managerial, political, legal and other areas of complex analysis of the key development factors promoting digital economic transformation and the development of "smart" society.

The information base of the study includes the works of Russian and foreign economists in the field of research and technological and innovation development, public administration; scientists working on the digitalization of the economy, the problems of formation and implementation of the digital transformation of the economy in their relationship with socio-economic development problem.

The research uses the following scientific methods: analytical review of theoretical information; analysis and processing of statistical information; review of the regulatory framework in the regulation of the digital economy; generalization and presentation of the research results in graphical form.

Theoretical aspects of the study

Digital economy and "smart" society

The term "digital economy" was first introduced by American businessman Tapscott Don (1996), who was recognized as the "father of the world digital economy". He detailed the impact of the Internet on the economy and indicated that the development of e-commerce would determine the future trend of the digital economy, but he did not conduct in-depth quantitative research on the digital economy. The digital economy is an important driver of fairer and more efficient digital transformation (Zuo, Chen, 2021).

S.A. Belozyorov believes that the spread and improvement of digital technologies affect the development of industrial relations, economic structures and education, and determine new requirements for communications, computing power, information systems, and services (Belozyorov et al., 2020). Yu.N. Guzov thinks that the biggest innovations in the digital economy are the emergence of artificial intelligence and robotics, cryptocurrencies, "smart" factories, "smart" cities, "smart" things, blockchain technology, etc. (Guzov, 2021). I.A. Strelkova states that in modern business world the digital economy is understood as a fast-growing economic sector, which completely changes the usual business relationships and existing business models (Strelkova, 2018).

Huang Jie points out that the digital economy is a new economic form in which data resources are the key element, modern information networks are the main carrier, the convergence of information and communication technology apps and the digital transformation of all factors are important driving forces (Jie, Ying, 2022).

In modern conditions, economic development is undergoing significant qualitative changes, which are associated with its transition from the level of industrial development to the new post-industrial level, which is characterized by an increased degree of intellectualization of all activity types and informatization of all technological processes.

Informatization and digitalization taking place in economic processes are becoming comprehensive trends covering not only the information and communication industry itself, but also all economic activity areas. Internet commerce, digital manufacturing, "smart" grid systems, unmanned vehicles, personalized healthcare, each of these

areas is feeling the impact of the digital revolution gaining momentum. As a result, it is reflected in changing structure of cross-border resource flows. Since 2005, annual international information flows have increased by almost 70% (Bublik et al., 2018). At the same time, migration flows increased by only 20%, and capital and goods – about 5–7%.

The technological revolution of the late 20th century has led to the transition from a "material" to "information" society based on the transformation of information into a priority production factor, which is expressed in such socio-economic transformations as the change in the GDP structure, emergence of new professions, the development of information and communication infrastructure of society, economic globalization and digitalization, convergence of services and technologies, networks and information transmission and processing systems (Kuzovkova et al., 2017).

In the context of the implementation in production, the theoretical basis for developing the information technology was formed within the framework of several theoretical views. They are based on the theories of information society; post-industrial society (Bell, 2001); economic theory of new industrialization; the theory of new industrial society (Galbraith, 2004), etc.

The information society as a concept began forming due to the development of the post-industrial doctrine, which gave information and knowledge the main role in developing production and society.

At the same time, the scientific community has not reached a consensus on the methodological approaches to the definition of the post-industrial society economy, there is no single generally accepted term.

In the literature, the terms "knowledge economy", "information economy" and "smart society" are used to define modern processes in the economy along the lines of the information society.

In our opinion, "smart" society is a society in which the efficiency of socio-economic development depends on the production, processing, storage and transmission of information. Thus, "smart" society should be understood as a qualitative improvement in the socio-economic state of society through modern information and communication technologies. The emergence and development of "smart" society would not be feasible without an adequate technological base that makes it possible to spread codified knowledge beyond spatial constraints with minimal time and labor.

Changes to the shape of "smart" society

Along with the accelerated advancement of digital technology, various data aggregation has set the stage for the revolution of production factors, and the innovation of various new business models has become the "engine" for rebuilding social order. The new societal form has broken through the tangible barriers of physical space, where people gradually transcend the physical structured space and explore the unstructured space of digital form. The iteration of information technology has pushed users in the digital environment closer to each other, so that even if they are separated from each other in the offline physical space, people can still "meet online" and feel each other and go through experiences together. The intermingling of time and space is ultimately a set of paths through which social support, resources and connections can be exchanged and developed (Changshan, 2020).

(1) Digital space dilutes the presence of physical space

On the one hand, digital space reshapes behavioral patterns. In the "smart" society, the flattening or horizontalization of the organizational structure in the workplace tends to transform labor into creativity expression, and the mechanical model in the traditional factory or company is gradually being replaced by a resilient, interactive and open model (Kapur, 2014).

The frequent attention to the digital landscape has solidified some of the constant attention as a behavioral norm. While the depth of individual attention is shallowing, its breadth is growing. People are increasingly fostering the ability to freely switch between scenes in the process of adapting to digital space.

On the other hand, digital space changes social relations. The virtual space enabled by information technology no longer applies to traditional geographical rules, but to a whole new realm. People are able to reap the benefits of a virtual "third space" outside the home and workplace, where they can spend time in the company of others.

In this layer of space, people get to participate in a voluntarily chosen, non-coercive form. The low level of obligation allows them to feel their presence and the existence of the dialogue in large-scale conversations, even if they are just slightly involved. Such a mode of feeling interpersonal relationships enables individuals to feel that they are being integrated into a society where their life is important and valued (Chayko, 2019).

For individuals, excessive participation may lead to an unhealthy escape from offline responsibilities, but the existence and expansion of the "third space" is a positive presence for society as a whole, as it continues reshaping social relations.

(2) The demand for expansion of the scope of digital space gives rise to more practical exploration of physical space

First, in the digital space, the zero distance of information constantly strengthens the coverage and influence of communication media. By December 2022, the number of online video users (including short videos) in China had reached 1.031 billion, an increase of 55.86 million over December 2021, accounting for 96.5% of the total netizens. Among them, the number of short video users was 1.012 billion, an increase of 77.7 million compared with December 2021, accounting for 94.8% of the total netizens[1].

Meanwhile, audiences are immersed in their own information cocoons and gradually lose their initiative to leave their comfort zone. In contrast to the growing number of media platforms provided by digital channels, audiences' search for information has become increasingly homogeneous and limited, followed by the manipulation of public opinion and the reinforcement of the echo chamber effect, which constantly weakens the judgment of audiences.

Moreover, most social communities that do not follow the "winner-takes-all" model have one thing in common: they are often parasitic on pre-existing, real-world social networks, so that the expanding influence in digital space produces more practical experiences in physical space (Hindmann, 2016).

(3) Physical space and digital space are co-constructed and mutually shaped by reality and fiction

Although digital and physical spaces have essential differences, new scenes of human life reshaped by information technology are not a binary existence where online and offline lives are independent and separate from each other. The accelerated renewal of information technology such as the Internet, big data, cloud computing and artificial intelligence, as well as the speedy rise of new models and new business models such as the industrial Internet, platform economy and contactless economy have not only promoted the integration of physical and digital spaces and facilitated the extensive and deep integration of data elements with the real economy, but also broken down industry barriers horizontally, making cross-border integration the norm and contributing greatly to the development of "smart" society. In 2021, the scale of China's digital economy reached 45.5 trillion yuan, among which, the scale of

[1] CNNIC. The 51st Statistical Report on the Development of China's Internet.

digital industrialization reached 8.4 trillion yuan, accounting for 18.3%, and the scale of industrial digitalization reached 372,000 yuan, accounting for 81.7%[2].

The vigorous development of new models and industries has incubated a number of new jobs, such as e-contract delivery workers, digital business operators, online education trainers, heads of community group purchases, copyright buyers, and so on.

In a cultural context unique to "smart" society that allows free participation and broad mobility, we also witness the growing "prosumers" group, a neologism derived from "producers" and "consumers", who pay for their own digital experiences by providing labor and data (Hebblewhite, 2016). For the numerous contents created, configured, consumed and disseminated on the Internet, they are both passive consumers and digital laborers who are highly active and constantly producing content for public consumption, and the free sharing, exchange and consumption of content is driving the rise of participatory culture.

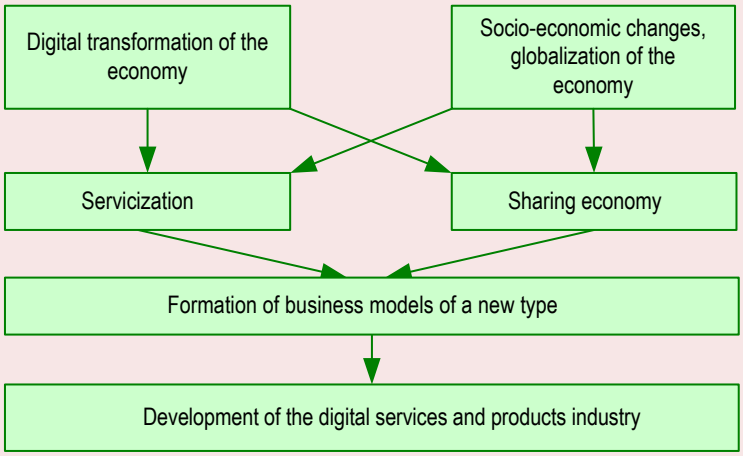
The deep intersection of the two space layers has enabled the current society to move beyond simple digitalization and is considered the "beginning of the Fourth Industrial Revolution" for promoting the birth of a global platform that is closely connected to the real world (Schwab, 2016).

Digitalization and the "smart" society

Thus, digitalization is changing the very nature of production and provision of services by introducing entirely new technologies and service provision platforms, providing digital formats for service provision, eliminating intermediaries, redefining the principles of interaction with customers, suppliers and partners, enabling ecosystems and connecting partners and contractors to the infrastructure, and providing new payment schemes.

The development of digitalization is determined by combination of the following key trends (*Fig. 1*):

Figure 1. Trends shaping current digitalization development



Source: (Gorbashko, Vatolkina, 2019).

[2] China Academy of Communications. China Digital Economy Development Report (2022). Available at: https://www.toutiao.com/article/7117986854318047759/?app=news_article&timestamp=1681638311&use_new_style=1&req_id=202304161745103CCEF8BCC5D549C3596E&group_id=7117986854318047759&wxshare_count=1&tt_from=weixin&utm_source=weixin&utm_medium=toutiao_android&utm_campaign=client_share&share_token=45114752-e56c-4658-9d7f-454778f82456&source=m_redirect&wid=1681638989370.

1) digital transformation of the economy and social life; 2) socio-economic processes of globalization and sustainable development; 3) trends of serviciation and the emergence of hybrid products; 4) development of the collaborative consumption economy and cooperation economy.

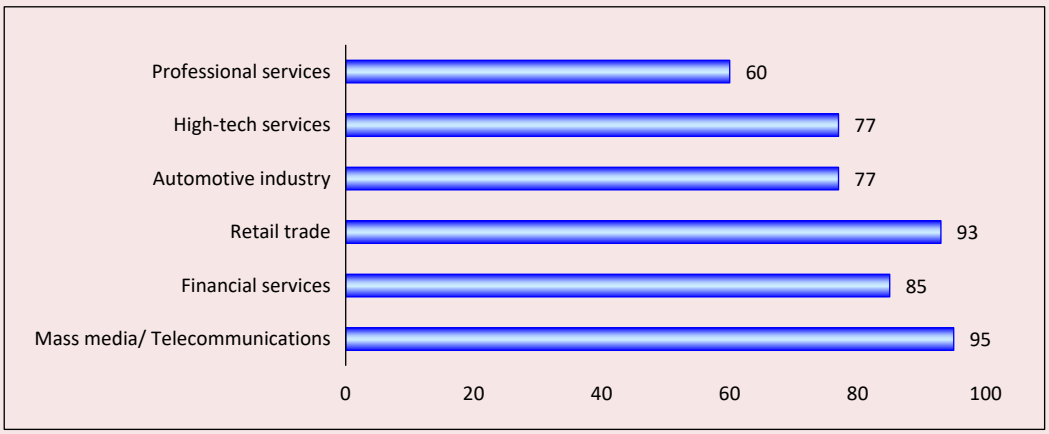
The experience of companies in the USA, the EU and China in introducing digital technologies into production shows that the level of digitalization in these countries is still not high. On average, the level of digitalization is only about 25% of the total potential of the sector (*Tab. 1*).

Global experience shows that in the most digitally developed sectors of the economy, the "winner takes all" principle works. Today, the 10% of companies with the highest digitalization revenues account for up to 80% of the income received in their sector: from 60% in professional services, to more than 90% in the media and telecommunications (*Fig. 2*).

Table 1. Level of digital technologies use by industries in the USA, the EU, and China

Industry	Organizations using digital technologies, %	Factors limiting the industry's development in the context of digitalization		
		Cash flow	Automation and supply chain	Digital workforce
Pharmaceuticals	13.4	+	+	+
Business and professional services	17.0		+	+
Health care	24.3	+		
Media	25.0			+
Consumer goods	28.5	+		
Financial services	29.7	+	+	
Telecommunication services	31.0		+	+
Retail	46.0	+		
Travel services	51.0		+	
Average level by industry	**25.0**			
Source: mckinsey.com				

Figure 2. Revenue share of the top 10% companies using digital technology in their sector, %



Source: mckinsey.com

Table 2. Comparative characteristics of the development level of digital services in the RF and EU countries in 2021, %

Indicator	Russia	China	EU countries
Share of population shopping online	42	48	75
Share of organizations using CRM systems	17	14	38
Share of e-commerce in the total volume of retail trade	3,9	15.9	14.8
Share of population receiving public services online	40	23	56
Share of organizations having an website	51	43	75
Mobile Internet penetration rate	77	98	68
Internet penetration rate	76	82	88

Sources: own compilation according to Abdrakhmanova G.I., Baskakova O.E., Vishnevskii K.O., Gokhberg L.M. et al. (2020). *Tendentsii razvitiya interneta v Rossii i zarubezhnykh stranakh: analiticheskii doklad* [Trends in Internet Development in Russia and Foreign Countries: Analytical Report]. Moscow: HSE University; Tadviser; Rosstat; Kommersant; Tinkoff; Eurostat, Profit.

Digitalization processes in Russia have gained momentum in recent years. Private companies have made significant progress, the labor market is gradually changing, the state is implementing major infrastructure projects, and the Internet, mobile and broadband communications are being widely implemented. Despite the efforts, Russia still lags behind the digital leaders in key indicators of the development of the digital economy, in particular the European Union countries (*Tab. 2*). For example, the share of organizations with the Internet sites in Russia is almost two times lower, there is low citizens' activity receiving public services via the Internet and making purchases online, and there is a smaller number of organizations that have CRM systems.

The achieved level of digital technology development has had the most significant impact on the transformation of the services sector allowing unlimited scaling of business. According to the results of 2019, the contribution of the Internet economy to the Russian economy, amounted to almost 4 trillion rubles. The main share is occupied by the e-commerce (finance and trade) sector and market for electronic payment services, which is the fastest-growing sector of the digital economy[3].

The main factor in the development of the digital economy and information society is considered to be the Internet penetration rate. In recent years, the Internet audience has been growing slowly, mainly due to the inclusion of elderly users. The indicators characterizing the dynamics of the use of electronic services in the Russian Federation in the period 2013–2020 (*Tab. 3*) allow concluding that the fastest growth rates of electronic services are the Internet use for ordering goods, services (226%), the use of the Internet to obtain state and municipal services in electronic form (242.9%). During the study period, the share of the population using mobile Internet via smartphones increased from 12 to 59%.

The Internet penetration rate in business and social sectors is also high and has remained virtually unchanged since 2013.

[3] Kazaryan K., Saykina M. Runet Economy 2018. Digital Economy of Russia 2018. Electronic Communications Association. Avaialble at: https://raec.ru/upload/files/ru-ec_booklet.pdf

Table 3. Selected indicators characterizing the dynamics of the electronic services use in the Russian Federation in 2013–2020, %

Indicators of electronic services use	2013	2014	2015	2016	2018	2020	2020 to 2013,%
Share of population that has ever used the Internet in total population aged 15–74	71.0	74.1	77.7	80.8	83.7	87.3	122.9
Share of population using the Internet almost every day in total population aged 15–74	48.0	51.6	55.1	57.7	60.6	68.8	143.3
Share of population using the Internet for ordering goods and services in total population aged 15–74	15.3	17.8	19.6	23.1	29.1	34.7	226.8
Share of population using the Internet to get state and municipal services in electronic form in the total number of people aged 15–72 who received state and municipal services in the last 12 months	30.8	35.2	39.6	51.3	64.3	74.8	242.9
Share of business sector organizations (in their total number) that use:							
Broadband Internet	80.8	81.4	78.9	80.5	81.6	–	101.0*
Cloud services	11.0	13.8	18.4	20.5	22.6	–	205.5*
Electronic data exchange between own and external information systems	24.1	53.1	59.2	61.6	62.2	–	258.1*
Share of social sphere organizations (in their total number) that use:							
Broadband Internet	75.8	79.2	79.3	81.5	83.5	–	110.2*
Cloud services	12.0	14.1	20.0	21.8	24.4	–	203.3*
Electronic data exchange between own and external information systems		49.8	57.6	61.0	62.6	–	125.7**
Share of the population using mobile Internet with smartphones, %	12.0	18.0	37.0	42.0	52.0	59.0	491.7

Sources: Abdrakhmanova G.I., Vishnevskii K.O., Gokhberg L.M. et al. (2017). *Digital Economy Indicators in the Russian Federation: Data Book*. Moscow: HSE University; Abdrakhmanova G.I., Gokhberg L.M., Kevesh M.A. et al. (2019). *Digital Economy Indicators in the Russian Federation 2019: Data Book*.. Moscow: HSE University; Internet Penetration in Russia. Moscow. GfK Research. Available at: https://www.gfk.com/ru/insaity/press-release/issledovanie-gfk-proniknovenie-interneta-v-rossii/

In order to increase the level of digitalization of services, a set of measures is needed to reduce their cost, and to improve their quality, especially their simplicity, usefulness and security. The perception of the quality of electronic services and the intention of their use are influenced by personal, social and marketing factors. That is why the formation of a positive image of electronic services, information literacy improvement and accumulation of positive experience in the service use currently have the main influence on the increase in the audience of users.

The term "smart society" is widely used as a slogan which indicates a nation's vision or a region's future plan to achieve a highly developed information society.

Most studies describe "smart" society as a state, in which citizens' quality of life, as well as the efficiency, productivity and competitiveness of society are significantly improved through widespread use of such advanced information and communication technologies, and artificial intelligence technologies.

The word "smart" is widely used in such terms as "smartphone", "smart car", "smart house", etc. In such phrases as "smart car", "smart house", the word "smart" means that a car, house, building and agricultural object fulfil their functions autonomously with the help of programming technology or artificial intelligence with no manual manipulation of an owner. At the same time, the concept of "society" includes a kind

of sub-elements: governance, citizens, lifestyle, etc. Therefore, for a society to be called "smart", its governance, citizens and lifestyle should be intelligence (Netesova, 2020).

"Smart" society uses the potential of technologies to increase the workforce productivity; to enable them to use their resources for truly meaningful actions and relationships; and ultimately to improve health, well-being and quality of life.

The Center for Big Innovation has identified five factors that will contribute to the continued development of "smart" society, encompassing what it takes: a data-driven culture; empowered and digitally literate citizens; empowering government institutions that provide "smart" leadership; empowering infrastructures; and open platforms and markets. These are the aspects that should be focused on in order to maximize the opportunities offered by the next wave of "smart" society development[4].

The formation of a "smart" society depends on the degree of the digital technology development. "Smart" technologies make our lives better in three main areas:

– currently, almost all activities are being carried out more efficiently and effectively;

– digital technologies are changing the relationship norms, making new kinds of relationships possible and expanding and strengthening our connections with each other;

– new types of business models are being created which produce, deliver and add value by increasing efficiency and effectiveness through new forms and norms of relationships, and innovative and complementary products and services.

The Internet is also having a significant impact on how businesses conduct business and interact with each other. Cloud storage, integrated procurement systems and "enterprise social networks", which improve real-time communication within and between organizations, help states to increase the quality of life of their citizens. Thus, "smart" digital technologies are helping to create a "smart" society.

Society consists of components such as politics, government/public service, productive/economic activities, knowledge creation (education), culture (attitudes and lifestyles) and citizens, hence the

Table 4. Main features of "smart" society

Category	Characteristics or features necessary for a society to be called "smart".
Politics	Citizens' active participation in politics (legislative and policy development); openness of legislative/policy development processes
Public administration/public service	Citizens' active participation in the process of public administration and service delivery; openness of the process of public administration and provision of public services; transition from civil servant-centered to citizen-centered public administration and public service delivery
Production and economic activities	Development of products and services which enable autonomous operation or functioning based on sensing and artificial intelligence technologies; realization of demand and interest of citizens in the field of production and economic activities
Knowledge creation (education)	Active participation of ordinary citizens in the process of knowledge creation, e.g. collective intelligence; realization of the principle that a pupil is the main participant in the learning process in educational institutions
Culture (attitudes and lifestyles)	Shaping a culture to promote innovative lifestyles focused on a citizen's needs; harmonization of diverse lifestyles and values/views through non-discriminatory treatment of all citizens regardless of their status, including race, gender, age, income level, region of residence, etc.
Citizens	Developing the potential of every citizen to participate in information creation and community activities

[4] Question 1/2: Shaping a "smart" society: Socio-economic development through ICT applications. Final report. Available at: https://www.itu.int/pub/D-STG-SG02.01.1-2017

characteristics of "intellectual capabilities" can be described in relation to each component of society, as presented in *Table 4*.

Thus, a "smart" society can also be described as follows: it is a society in which the spheres of politics, public administration/public service, production and economic activity, knowledge creation (education), culture (attitudes and lifestyles), as well as the civic sphere, exist and function with the active participation of citizens not only through the use of advanced ICTs, but also through changes in the legislative sphere and systems of society.

The logic of governing "smart" society

The development of the IoT technology and people's reliance on "smart" devices has brought the volume and type of data gathered to a new level accelerating positive feedback between big data and algorithmic analysis. The function of algorithms is no longer limited to prediction and service, as governments and platforms make more use of them to promote the digital economy development and construction of social order. However, along with the expanding scope of algorithmic analysis, the arising issues are no longer necessarily related to simple model construction and calculation. In fact, some alarming issues worth our attention have emerged in the process of convergence of algorithmic analysis with offline everyday life contexts.

(1) The value orientation of coupling big data algorithms with small data mining

One of them is algorithmic collusion. In general, the fine-grained analysis of individuals in digital society can be regarded as a neutral interpretation of the objective world, and the transparency of the market environment is positively correlated with the utility of competition mechanisms. However, along with the deepening of social transparency, the normal differences between individuals may expand due to the dramatic increase in the amount of available information, resulting in the illusion of a fully competitive and equilibrium market, but in fact it is an implicit allocation of client resources by using subtle algorithms to adopt conscious parallel behaviors to target specific groups (Ezrachi, Stucke, 2018). Under the combined influence of the attributes of the online market, the ease of access to data, the continuous upgrading of algorithms, and the increased transparency of the market, coupled with the promotion of similar algorithms, the platform for algorithmic collusion is built, the results of solid collusion are sustained, and the negative impact on individuals is continuously expanded.

The second trend is algorithmic discrimination. The use of algorithms can eliminate structural ambiguities in social relationships to a certain extent. For example, platforms such as Alipay and WeChat can accurately screen consumers based on data indicators such as their average consumption amount, daily consumption frequency and borrowing status, effectively identify low- and middle-income groups or groups with spending power, so as to collect data for its potential offering of financial help and assistance to those target demographic groups. But the results of algorithmic collusion may harbor more implicit and deeper levels of oppression and discrimination. When highly automated programs differentiate between populations based on the identity data collected, their propensity to measure and select data with bias allows unjust assumptions and values to be embedded at every step of algorithm creation adversely affecting disadvantaged populations. In addition, an over-reliance on data correlation can lead to neglect of the accuracy of the data in the operation of the algorithm. When errors are systematized, algorithmic control fails. For collective discrimination, groups may be able to get organized to protest, but for algorithmic injustice and discrimination against individuals, they may be completely unaware of the reasons or have difficulty protesting effectively.

In fact, individual needs and value preferences are mainly derived from the evaluation of the value of things, and the "calculations" lurking in the algorithm render the rational thinking directly based on individual biological instincts or innate moral values less stable (Pentland, 2015). Further, computer systems may evolve into more complex architectures and states of connection, but this does not mean that algorithms will purposefully become self-aware in the future (Zarkadakis, 2017); human dependence on algorithms does not equate to computers acquiring human consciousness. Accordingly, in the new social form created by humans and machines, although the issues may grow more diverse and complex, and the range of people's professional skills will continue developing, the direction of responding to people's appeals and creating a more equitable social contract to meet their expectations remains unchanged. We still need to "be humble and bear in mind the essence of human nature" (Mayer-Schönberger, 2013), avoid falling into the "knowledge arrogance" caused by over-reliance on data algorithms, and start exploring small data from the perspective of showing a deeper sense of humanity.

If big data is a collection of individual or local data flowing to the overall or holistic data, then small data is a personalized and targeted "return flow" after the formation of the data pool, through the immersive perception of individual traits, observation of insignificant behavior, and personalized labeling of data to explore the unmet needs and even unknown needs.

The relationship between algorithmic analysis built on data and structured information and the immersive mining of small data is not a contradictory or opposing one. First, big data algorithms and small data mining are symbiotic in scientific decision making. Algorithmic analysis of recognition models predicts future behavior based on aggregation of data about individuals and perceived similar entities, while algorithms built on internal computation and built-in preferences influence the outcome of an individual's online search. The weakening of habitual human thinking is such that in the near future we may no longer be able to observe our true selves, as algorithms will decide for us "who we are and what we should know about ourselves" (Harari, 2018). And the mining of small data is to build a stronghold of balance in the "poles" that are beyond the reach of big data algorithms, and to supplement the "cold" algorithms with a sense of "human" warmth. Second, these two concepts are in a progressive relationship. Big data algorithms build a connection channel between the quantifiability of information and the uncertainty of the world through exhaustive enumeration to present significant correlations between things in quantitative analysis. Probabilism encodes our beliefs about a static world, while causality tells us whether and how probabilities change when the world is altered, regardless of the form through which they are realized (Pearl, Mackenzie, 2019). Small data mining, within the range determined by the quantitative analysis that has already eliminated uncertainty, is a way of using qualitative analysis to further understand patterns and uncover the value of data in order to form a course of action conducive to achieving the desired results.

(2) Scenarios of order in which decentralization and centralization are juxtaposed

The information technology revolution has reconstructed the basis of order and the cognitive architecture of human society.

On the one hand, there is the logical revolution of decentralization. The Internet has opened a new era of connected networking and decentralized communication, and the production and dissemination of information has shifted from centralized to decentralized, as has the power of governance (Xuefeng, Ping, 2018), leaving the conventional social governance structure facing severe challenges.

For example, in the platform operation, under the multiple influences caused by the increasing personalization of customer needs, diversification of information sources, transmission and processing channels, marketization of intra-organizational relationships, as well as the increase in the density and frequency of social connections, the pyramidal organizational structure common to large-scale production is constantly being impacted and challenged, with the boundaries of enterprises being increasingly blurred and the boundaries of various platforms continuously expanded, in which different transaction players are integrated and converted with one another, thereby forming a multilateral market with a web-like structure. The distributed network has greatly expanded public access to information, fundamentally transforming the traditional centralized, hierarchical and top-down information paradigm, and enabling more value- and wealth-creating interactions among individuals through the detailed sharing of virtual but universal and standardized digital identities.

Another example is that along with the maturity and marketization of 5G, artificial intelligence and other technologies, AI scenario-based applications for personal assistants, self-driving, education and other industries will generate a huge demand gap for edge computing resources[5]. The accelerated expansion of data scale has led to an exponential growth in the number of devices to be accessed and data to be processed in the cloud space, and edge computing has emerged to alleviate the problem of over-centralization occurred in the centralized data processing model of the central servers, as edge computing deploys nodes with caching and compute processing capabilities at the edge of the network to handle specific business needs locally in a direct fashion (Ligang, 2019). In-place processing of private and redundant data at the edge of the network close to the data source means deploying a new data processing platform between end devices and the core network, which significantly reduces data response latency and broadband costs and effectively relieves the burden on the central server. It is therefore suitable for various industry applications under distributed architecture and more tailored to the realistic needs of the IoT era.

Similarly, all rules in the blockchain network are presented in the form of "smart" contracts, and its unconditional trust between nodes that do not depend on third parties breaks the barrier of severe credit inequality in the centralized world. The consensus mechanism shown as code or semi-code also guarantees the free will of the two parties when contracting.

As we can see, the blockchain network accurately defines the access power and participation of nodes, and its qualities of immutability, unconditional trust, automatic execution, coupled connection, etc. build up a decentralized autonomous ecological landscape. An important technology that opens a new era of the Internet, the distributed ledger data repository constructed by blockchain takes the holographic multi-backup serial structure and asymmetric encryption algorithm as its precondition, and opens a new distributed and shared paradigm that weakens and divides the central control, whose open-source architecture enables the consensus algorithm to be iteratively innovated and more compatible, which means the end of social hegemony, economic hegemony, and racial hegemony. In addition, it also ends health and gender discrimination, and gender identification.

On the other hand, there is the trend of re-centralization, which differs from decentralization. First, individual information data are absorbed into

[5] Big Data Industry Ecological Alliance, CCID Consulting Co., Ltd. 2020 China Big Data Industry Development White Paper.

the data pool. The larger the data volume is, the better it is for improving the accuracy of algorithm prediction, forming an intermediate node that tend to be stable. Within the radius of this intermediate node, platforms are keener to enhance the speed of network connectivity and the efficiency of big data algorithms in the pursuit of digital competitiveness. They continue using algorithms to gain a dominant power in the market and apply data tools to find out market clearing prices, suppressing similar competitors while narrowing users' choices. Immediately afterwards, the process of social cell division accelerates, which results in a digital divide between various groups due to differences in access to and use of digital technologies, followed by the gradual formation of monopoly advantages by some enterprises in the process of seizing digital competitiveness, which in turn further deepens the digital divide. Consequently, the unbridled growth of big data algorithms leads to excessive concentration of wealth and power, leading to more intractable issues of digital inequality.

Second, the cloud space that houses big data has become a commanding position for companies to compete for. Very few companies control the process of global expansion of network data centers, and their monopoly on bulk data and information technology makes it possible for organizations and individual data to move into a shared pool of resources on a large scale. The cloud space with its superior storage capabilities and processing power has reshaped the information technology industry by combining channels and devices more efficiently. It is because cloud computing provides a broad, convenient, on-demand formulation of the network that has enabled a qualitative leap in data, applications, information storage, processing, and distribution. The cloud space is "involved in a global oligopoly and on its way to a global coterie" growing increasingly into a new gravitational field for centralization (Mosco, 2017).

Then again, blockchain technology is not entirely decentralized or immune from centralization. In the Bitcoin network, at first the nodes are divided so that miners can get value recognition that exceeds of non-miners by mining for bookkeeping rewards, and then the competition between miners for bookkeeping rights intensifies leading to a wealth gap between nodes. In the absence of external regulation, the entire network will inevitably cause monopolization of resources and drift away from the original intention of decentralization. According to statistics on Bitcoin mining pools, ranked by the computing power owned, the top 10 mining pools accounted for about 85% of all mining pools' computing power in 2017, while the top 40 pools harvested all bitcoin output that year (Ran, 2019). Bitcoin uses proof of workload as the consensus mechanism, with the hashrate as the core to ensure the low threshold for network node entry as well as the fairness and transparency of the miner competition and testing process, which reflect procedural justice. The ensuing rapid development of the mining industry has also led to the expansion of arithmetic power and concentration of transactions, triggering a recentralized oligopoly.

On the whole, the banner of decentralization raised in the Internet era will help individuals gradually leave the solidified central field by giving them more power, but in the competitive struggle of the market, individuals will not escape from becoming the "trophies" of recentralization. From centralization, decentralization to recentralization, it is not a repetition or regression of the same process, but a progression of social evolution to a higher level in the process of migration from social networks to virtual networks, with the achievements of the Internet technology as the carrier. In this process, the laws of decentralization of connection and centralization of nodes, decentralization of content and centralization of

modalities, and decentralization of communication and centralization of creation are juxtaposed with each other, enabling decentralization and re-centralization to flourish in different scenarios. Therefore, the constitution of "smart" society is not the centralization of efficiency and extreme collectivism, nor the decentralization of equity and complete anarchism, but rather a polycentricity that seeks a balance between the two on the basis of stability, i.e., within the overall structure of the state organization, the principle of polycentricity is used to lay out the corresponding weights of equity and efficiency in the different levels of the whole social collaboration system (Sanderson, 2015).

(3) Principle according to which rules of governance and code regulation complement each other

The Internet has helped mankind to unfold the magnificent scroll of "smart" society, where development of information technology has created new opportunities for human communication and mobility and the heterogeneous network is replacing the homogeneous functional system (Kucklick, 2018). In this complex network system where everyone is closely related and everything is interconnected, the two-layer space continues breaking through the established pattern of time and space to accelerate integration, and the uniqueness and differences maintained by members of society become the link to build a balanced society. As a result, the cornerstone of social trust has changed profoundly, as the trust mechanism built on the basis of information technology has completely overturned the traditional trust of society of acquaintances, which relies on geographical and kinships, and further promoted the leap forward of institutional trust in a strangers' society. The digitization and quantification of trust relationship ensures free expression of will, free conclusion of contract, traceability of the whole life cycle, and safety of labor value by using the Internet as the boundary, code as the carrier, data and algorithm as the basis, which continuously dissolves the restrictions of geography, lineage and social system, and enhances the tolerance of uncertainty and error. In the digital space arising from a specific technical architecture, the only thing that computers can recognize is the legal rules that are converted into codes. Therefore, it is necessary to value the important role of technical regulation in the governance of digital space, and within a certain scope, the code can even be regarded as the legal rules of cyberspace (Xuefeng, Ping, 2018).

In the initial stage of the platform, all kinds of participants continue flooding in, and each party can obtain certain value under the effect of positive network. As the number of users reaches its peak, the relationship between the platform and its customers is transformed from a win-win cooperation of "mutual benefits" to a zero-sum game of "your loss is my gain", in which consumer data forms a closed loop within the platform ecosystem and consumers seem to be the forever "targets", no matter to whom the scale is tilted. The rapid iteration of data volume and quality has aided platform companies to increasingly hold the power of governance. As a result, operating platforms with a dominant position have started the game of "price discrimination against existing customers". Apps and websites providing online products or services, such as shopping, trip booking and taxi/ride hailing, have been the sectors bearing the brunt (Shouhu, 2020).

Obviously, the competitive edge gained by operating platforms relying on code regulation comes at the expense of user welfare, which is followed by weakened user experience, reduced stickiness, and "disaffection" of the users when conditions are ready. There is an ever-increasing sense of social mistrust, which is positively related to the unnecessary growing loss of social welfare. Thus, although in some cases code regulation is more straightforward and effective than sole legal

regulation, to equate code entirely with law would be no different from realizing the utopian ideal of complete network autonomy. Moreover, it requires attention whether codes that can be recognized by computers can be self-consistent in physical space and consistent with the requirements of legal rules.

As we enter the post-pandemic era, the technological revolution will pick up the pace of innovation, the "smart transformation" ushers in the historical milestone of development, and the digital world achieves a decisive or even permanent expansion and development (Schwab, Malleret, 2020). However, the digital space is not a lawless place to grow arbitrarily, and the idea of replacing regulation with automated operation is as unrealistic as flying cars or space colonization (Pasquale, 2015). So to achieve the effectiveness of governance of "smart" society, it is necessary to strengthen the institutional constraints and government regulation through laws and norms to prevent a "regulatory vacuum", but also to construct the Internet-based design options and software code that specifies user behavior as a support to prevent the governance gap. The reality of the development of the Internet shows that the existing legal norms, the behavior of network platform operators and users are not completely separated from each other. Whether in physical space or digital space, no one can be free from the control of the laws of a sovereign state, and there is no need to create a separate legal code that is completely disconnected from the actual laws in the real world.

Of course, adherence to the principle of the rule of law is not to directly copy the rules applicable to physical space and paste them to the digital space, but to form a normative complex combining various laws and regulations formulated by the government with self-regulatory norms established by network platforms and industry associations, and the weights of the two will directly affect the effectiveness of the rule of law. Extreme intervention may lead to problems such as inefficiency and lack of incentive to innovate, while the absence of regulation may trigger issues such as unfair competition and oligopoly, which in turn consume high socio-economic costs. Therefore, sticking to a user-demand-centered stance, we need to weigh the benefits and costs of regulation, gain positive-sum outcomes instead of playing the zero-sum game, and adopt the constraint principles that rule-based governance and code regulation complement each other, so as to ultimately promote sustainable social innovation and governance.

The path of practicing the governance of "smart" society

Intense development of information technology has elaborately analyzed the "smart" society, where people form distributed participation and inter-mingled interaction by relying on social media such as Weibo, WeChat and live streaming. In this type of society, the one-way and hierarchical linear model can no longer meet the practical requirements of social governance, and various entities face the common goal of interdependence and collaborative development. The interweaving of multi-level entities of information rights and data objects, such as society, government, industries, enterprises and individuals, gradually constructs a model of a pluralistic governance, whose typical feature is to involve but not limited to the participation of multiple entities[6]. The open, collaborative and inclusive governance synergy of diversified and multi-level entities makes the concept of social governance increasingly moderate and mature, and also makes the connotation of social governance of co-construction, co-governance and sharing more extensive and comprehensive.

[6] China Academy of Information and Communications Technology. White Paper on China's Digital Economy Development. 2020.

(1) Formation of open and secure digital ecosystem

The current demand for open data sharing maps out the common challenges of the big data industry, which urgently requires the construction of "digital ecosystem" that is highly open to various technologies and devices and has a well-organized participating community (Koulopoulos, 2019). This ecosystem collects and integrates fragmented data from a series of devices that are organized and in constant communication, building a data pool that ensures data relevance and covers the real-time picture.

The transparency of data network required by the digital ecosystem is not only the process of opening and flowing individual or local data to the totality or overall data, but also includes the opening and exchange between various data pools. Only by breaking down information barriers and promoting smooth data exchange can the efficiency of the digital ecosystem as a whole be maximized. Thus, data openness helps to avoid excessive concentration of value and power that leads to imbalance of benefits and risks, and also facilitates the replacement of anomalies or incompatible structures among different cities or sectors to share data resources.

Accompanying with data openness is the issue of data security. With the rapid development of the Internet, the IoT and other technologies, the volume and dimension of data collected by individuals in real time have expanded as never before. While data technology refines the analysis of individuals, it also intensifies the risk of personal privacy being exposed, and the ability of individuals to control and manage their own data gradually weakens. In order to regulate data ownership within the realm of legal governance and to take into account the interests of all stakeholders including data subjects, data ownership can be considered as a result of negotiation, and organizations that collect data and individuals who are data samples are encouraged to use contracts as a means to share risks and responsibilities (Millard, 2019) . On the one hand, individuals are given more rights to manage their personal information to ensure that they are aware of the effects of signing the agreement and how the data will be used; on the other hand, an umbrella privacy option is set up to raise the cost of data use for both collectors and users by relying on technology, so that data users and owners can be informed and mutually supervised in both directions at all stages from data collection to use.

(2) Building synergistic and joint multi-governance circle

Entering "smart" society, the state and social forces can interact, empower and transform each other (Yongnian, 2014) using online platforms to promote efficient arrangement of resources and personnel in collaborative and linked multi-governance circle.

At the national level, we should promote the construction of "smart" government. Parallel to the process of fine interpretation of everything in "smart" society is the accelerated disintegration and reconstruction of laws and systems formed in the "coarse-grained society" in many fields. The refinement of "smart" society makes individual life no longer limited to the simple obedience to the code, but subject to the comprehensive influence brought about by multifaceted complex composed of observation, guidance, supervision, prediction, evaluation, adjustment and other elements. The "mobile expectations" created by the penetration of people's consumer experiences from one industry to another are a new dimension for governments to consider when understanding and defining value strategies.

Unlike the conventional "wholesale government" that follows a set of standards and rules, the advantage of "smart" society government is that like a retailer, it takes a more flexible and personalized

approach to issues (Goldsmith, 2019), truly putting the experience of resident satisfaction ahead of the evaluation of rules. In such a governance system, the government proactively responds to actual requests for help before they occur by fully grasping and interpreting urban demand signals and using social feedback loops. While the "visible hand" cannot solve all problems on its own, the extra attention, necessary interventions, and flexible governance can indeed help understand and mitigate potential risks in a data-driven marketplace environment, as well as obtain sufficient market information to provide a valuable framework of ideas for the incubation of new enforcement tools.

At the social level, there is a multifaceted collaborative participation in governance. On the one hand, there is individual distributed presence and interaction. Along with the accelerated integration of physical space and digital space, the flattening, fragmentation and mobility in space are also intensifying. The developing individualism, wireless connectivity, and ubiquitous Internet all promote networked individualism (Rheingold, 2013). The differences and uniqueness of individual behavior are magnified by digital technology, forming an increasingly "granular" distributed presence of individuals as prosumers in the digital space. The cornerstone of order in "smart" society is no longer social control, but the mutually beneficial behavior between individuals. However trivial an individual's behavior may be in comparison to the entire network, it can play a specific role in refining algorithms and improving processes. Individuals form distributed participation and mingling interactions through online media such as Weibo, WeChat, and live streaming, which reshape the public opinion field and governance logic where numerous nodes in the public space co-construct and co-govern on the basis of diverse and differentiated social relations. On the other hand, the serious challenges of data divide, algorithmic collusion, algorithmic discrimination and recentralization in digital space require more smooth channels for public participation. Platforms, people, industry organizations, media and other social forces should be empowered to govern society collaboratively, integrating the top-down "pull" of the state and the bottom-up "push" of society to generate vital momentum for the construction of a collaborative and linked multi-governance circle.

(3) Shaping inclusive dividend sharing circle

The basis for building "smart" society is the sharing economy, in which physical and digital spaces coexist. In the multilateral market, the joint participation of different social groups, such as owners, operators and users, becomes a catalyst for the expansion of the capital market, yet at present, the result of multiple participation is excessive concentration of wealth. Taking the platform as an example, whether it is the executives or founders within the platform company or the general producers who provide products and services on the platform, essentially, they all contribute value to the platform by rendering their individual labor. As a member of this ecosystem, the role of consumers is equally indispensable to an active market. To motivate producers to be diligent and encourage consumers to actively participate, it is common practice for platform companies to use a credit system. However, the value of these credits may be only 1% or 0.1% of the cost of the actual products and services on the platform (Ran, 2019). Rewarding users for their contributions increases the frequency of use as well as the internal stickiness of the ecosystem, however, at the same time, the credits excluded from the mainstream value of the platform not only fail to bring users benefits commensurate with what they actually contribute, but result in the wealth gains of the platform's top employees far exceeding those of the ordinary producers and consumers under the effect of capital amplification.

In the information era, there is a strong correlation between wealth and data, and the monopoly of data resources is often a problem that accompanies excessive concentration of wealth. Therefore, we should protect people at the grassroots from falling into the trap of "information cocoon", breaking thinking of "zero-sum game", and overcoming the preference of "technological empowerment", so that people can share the digital dividend and resulting social dividends. Only in this way can we guarantee the improvement of social governance and the effectiveness of national governance.

Conclusion

In conclusion, we should note that under the influence of digitalization, networking and intelligence, a panoramic form of interaction between physical space and digital space has been formed; and information technology has served as the "fuel" for the exponential expansion of the scale of society, while the implementation of the concept of "human + artificial intelligence" has given wings to social development. "Smart" society increasingly generates the governance logic in which big data algorithm and small data mining are coupled, decentralization and centralization are juxtaposed, and rule governance and code regulation complement each other. This logic exists in the grand process of social development and has nurtured the digital ecosystem, multi-governance circle and dividend sharing circle, adding a dynamic footnote to the modernization of the national governance system and governance capacity.

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Information about the Authors

Dai Li – Doctor, Researcher, Jiangxi Academy of Social Sciences (649, North Hongdu Avenue, Nanchang, Jiangxi, 330077, China; e-mail: 28363616@qq.com)

Jiang Xiaoyu – Master, Researcher, Jiangxi Academy of Social Sciences (649, North Hongdu Avenue, Nanchang, Jiangxi, 330077, China; e-mail: ndncjx@163.com)

Vladimir S. Uskov – Candidate of Sciences (Economics), Senior Researcher, Vologda Research Center, Russian Academy of Sciences (56A, Gorky Street, Vologda, 160014, Russian Federation; e-mail: v-uskov@mail.ru)

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