From Digital Divide to Data Divide:

A New Development Stage and Bridging Strategies of China's Territorial Digital Divide

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2022-7-7

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What is Data divide?

- The "digital divide" was proposed in the early 1990s. OECD (2001) defined it as “the disparity in access to information and communication technology (ICT) and the use of the Internet for various activities among individuals, households, enterprises and geographic areas at different socioeconomic levels”.
- The digital divide is an evolving concept, and a "constantly moving target" (Hilbert, 2014).
- China has made remarkable progress in the digital economy. However, China is still a developing country and its domestic digital development is still very uneven.
- In the new stage of development, data gap emerges in China.

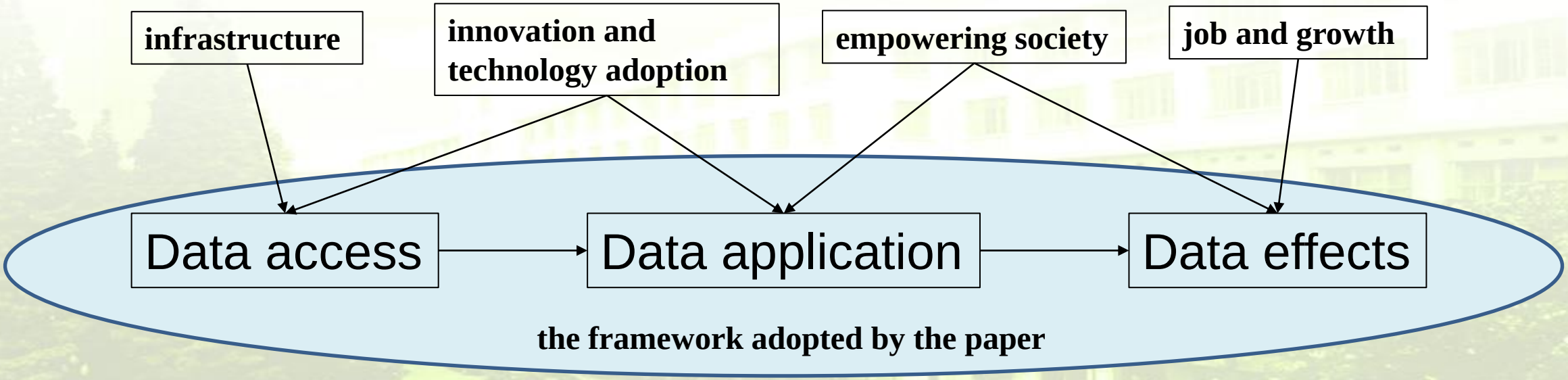
What is Data divide?

- OECD (2021) has recognized the importance of data divide and divides digital divide into three layers: the network or connectivity layer; the application interfaces and data layer; and the end-user layer.
- The "Data Divide" report released by the Ada Lovelace Institute in the United Kingdom in 2021, proposed that in the process of epidemic prevention and control, the British people have witnessed a "data divide". Leslie et al. (2021) proposed that although AI systems provide valuable contributions to medical diagnosis and research, they also generate inequality and discrimination.
- Liang and Zhang (2022) proposed that compared with digital divide, the data divide emphasizes the difference in the ability of individuals or organizations to control big data from the perspective of algorithmic governance.
- Based on this, we define “data divide” as **the difference to digital services due to the different opportunities and capabilities of data access, processing and utilization of different groups of people, enterprises, governments or territories in the process of accessing and using digital technology.**

Measuring the data divide

- **In the 2018 Digital Economy Initiative led by the G20, the "G20 Toolkit for Measuring the Digital Economy" was developed and approved in 2018.**
- **The framework is currently the most influential indicator system for measuring the digital economy.**

The "G20 Toolkit for Measuring the Digital Economy"



Measurement of data divide

Dimension	Meaning	Indicators
Data access divide	reflecting the difference in data access between different provinces, which is related to the construction of data infrastructure; it mainly examines the supply of communication infrastructure.	• Capacity of mobile phone exchanges • Base stations of mobile phones • Broadband subscribers port of internet
Data application divide	reflecting the differences in data application in different provinces, whether public or private sectors	• Broadband subscribers of internet • Flow accessed to mobile internet • Proportion of enterprises with E-commerce transactions • Public data
Data effects divide	Reflecting the output released by data, the value of data	• Income from related software business • Sales through E-commerce

Territorial data divide in China

Level	Formula	Description
Provinces	PDD_i = $(TOP5_i\text{-}BOTT5_i) / TOP5_i$	PDD_i is the provincial data divide coefficient of the i-th indicator, and the value range is (0, 1). The larger the coefficient, the deeper the gap. $TOP5_i$ refers to the average of top 5 of the i-th indicator. $BOTT5_i$ is the average of bottom 5 of the i-th indicator.
Regions	QDD_i = $(MAX_i\text{-}MIN_i) / MAX_i$	China can be divided into four quarters: **eastern, western, middle, northeastern.** The average value of provinces in each large quarter is used for comparison, and the maximum and minimum values are selected from them

Data gap coefficients by province in China

Dimension		Data access			Data application				Data effects	
Indicators		Capacity of mobile phone exchanges	Base stations of mobile phones	Broadband subscribers port of internet	Broadband subscribers of internet	Flow accessed to mobile internet	Proportion of enterprises with E-commerce transactions	Public data*	Income from related software business	Sales through E-commerce
Data divide coeffi.	**2016**	0.532	0.507	0.641	0.532	0.671	0.659	-	0.996	0.979
	Aver.	0.560			-				0.988	
	2021	0.545	0.430	0.461	0.375	0.472	0.613	1.000	0.998	0.985
	Aver.	0.479			0.615				0.992	

Note: There is no public data for each province in 2016. If it is included, there should be a large gap in this value judging from experience, and the average data application gap is expected to increase. The data in brackets on the data application divide in 2021 is the average of the first three indicators

Source: * Digital and Mobile Lab of Fudan University. "2021 China Local Government Data Openness Report". The data sources for other indicators are China's National Statistical Yearbook (2021, 2016)

China Territorial Data Gap Coefficient by region(2021)

Region	Eastern	Middle	Western	Northeast	Data divide	Average
1-1 Switch capacity per thousand households	0.632	0.711	0.451	0.518	0.366	0.322
1-2 Number of mobile base stations per thousand people	7.705	8.016	5.743	6.379	0.284	
1-3 Internet broadband access port penetration rate (%)	81.93	64.36	55.86	71.20	0.318	
2-1 Internet broadband penetration rate (%)	99.64	91.39	92.93	67.87	0.319	0.532
2-2 Mobile Internet access traffic per capita (GB)	129.44	141.15	98.42	96.98	0.313	
2-3 Proportion of enterprises with e-commerce transaction activities	12.08	10.08	9.92	5.60	0.536	
2-4 Public data	17.64	6.83	4.73	0.70	0.960	
3-1 Software business income	6464.63	848.87	723.97	803.12	0.888	0.875
3-2 E-commerce sales	13389.20	2040.58	4236.10	1846.33	0.862	
GDP per capita 2020(thousand yuan)	1,014,000	553,730	606,000	507,690	0.499	
Per capita disposable income 2020	447,460	250,350	272,340	277,970	0.441	

China's data divide bridging policies and projects

- **"New infrastructure" investment plans in selected provinces in China**

Province	Region	Program	Planned Investment
Guangdong	Eastern	"Guangdong Provincial Key Construction Project Plan in 2020"	arranged a total of 1,230 provincial key projects, and 5.9 trillion yuan "new infrastructure" projects
Shanghai	Eastern	"Action Plan for Promoting New Infrastructure Construction in Shanghai (2020-2022) "	The first batch of 48 major projects and engineering packages of the, with an estimated total investment of about 270 billion yuan
Beijing	Eastern	"Beijing Key Project Plan for 2020"	includes 300 projects, covering three major areas, and plans to complete an investment of about 252.3 billion yuan. Among them, 100 infrastructure projects are planned to complete an investment of 66.2 billion yuan
Fujian	Eastern	"Three-Year Action Plan for New Infrastructure Construction in Fujian Province (2020-2022) "	52 new digital infrastructure projects in 2020, with a total investment of 72.9 billion yuan and an annual planned investment of 28.6 billion yuan
Jiangsu	Eastern	"Policies on Accelerating the Construction of New Information Infrastructure and Expanding Information Consumption"	Plan to invest 12 billion yuan in 2020 and build 52,000 5G base stations
Hebei	Eastern	"Guiding Opinions on Strengthening the Planning and Reserve of Major Projects"	About 140 new infrastructure projects such as 5G networks, data centers, industrial Internet, and artificial intelligence are planned to be started or under construction in 2020-2021, with a total investment of 174.4 billion yuan
Hubei	Middle	"Three-year Action Implementation Plan for Reinvigorating, and Strengthening New Infrastructure Projects in Hubei Province after the Epidemic (2020-2022) "	Plan to invest 773.1 billion yuan in 3 years to implement 595 new infrastructure construction projects
Chongqing	Western	"Action Plan for the Construction of New Infrastructure Major Projects in Chongqing (2020-2022) "	promoting 7 major sectors, 21 special projects, and 375 projects with a total investment of 398.3 billion yuan
Sichuan	Western	"Sichuan Province's '14th Five-Year Plan' New Infrastructure Construction Plan"	The cumulative investment in information infrastructure is 100 billion yuan, and 250,000 5G base stations have been built, achieving universal coverage of areas above township level and administrative villages, and 5G application penetration rate reaching 60%
Jilin	Northeast	"Jilin Province New Infrastructure "761" Project Plan"	plan to implement 2,188 projects with a total investment of 1,096.2 billion yuan. Among them: the total investment of intelligent information network is 83.9 billion yuan
Total	￥9,049.2 billion yuan(~$1,311 billion)		

The "Channels Computing Resources from the East to the West" project (“Dong Shu Xi Suan”, the “CCREW” project)

- Officially launched in February 2022.
- The eight national computing hubs: develop data-center clusters, carry out collaborative construction between data centers, cloud computing and big data, and bridge the gap in computing resources.
- A large amount of data that need to be calculated in the east is transmitted to the west through the optical fiber information channel, and the calculation is performed using the computing power hub in the west, and the results are returned to the east for analysis and research.
- First, CCREW can achieve the intensive effect of energy utilization, thereby effectively matching the advantageous resources of the east and the west.
- Second, CCREW can bring into play the synergistic effect of the computing power industry, thereby expanding the industrial cooperation between the east and the west.
- CCREW can release the spillover effect of digital technology and promote the equalization of development opportunities in the east and the west.
- Fourth, CCREW is conducive to realizing the driving effect of digital talents.

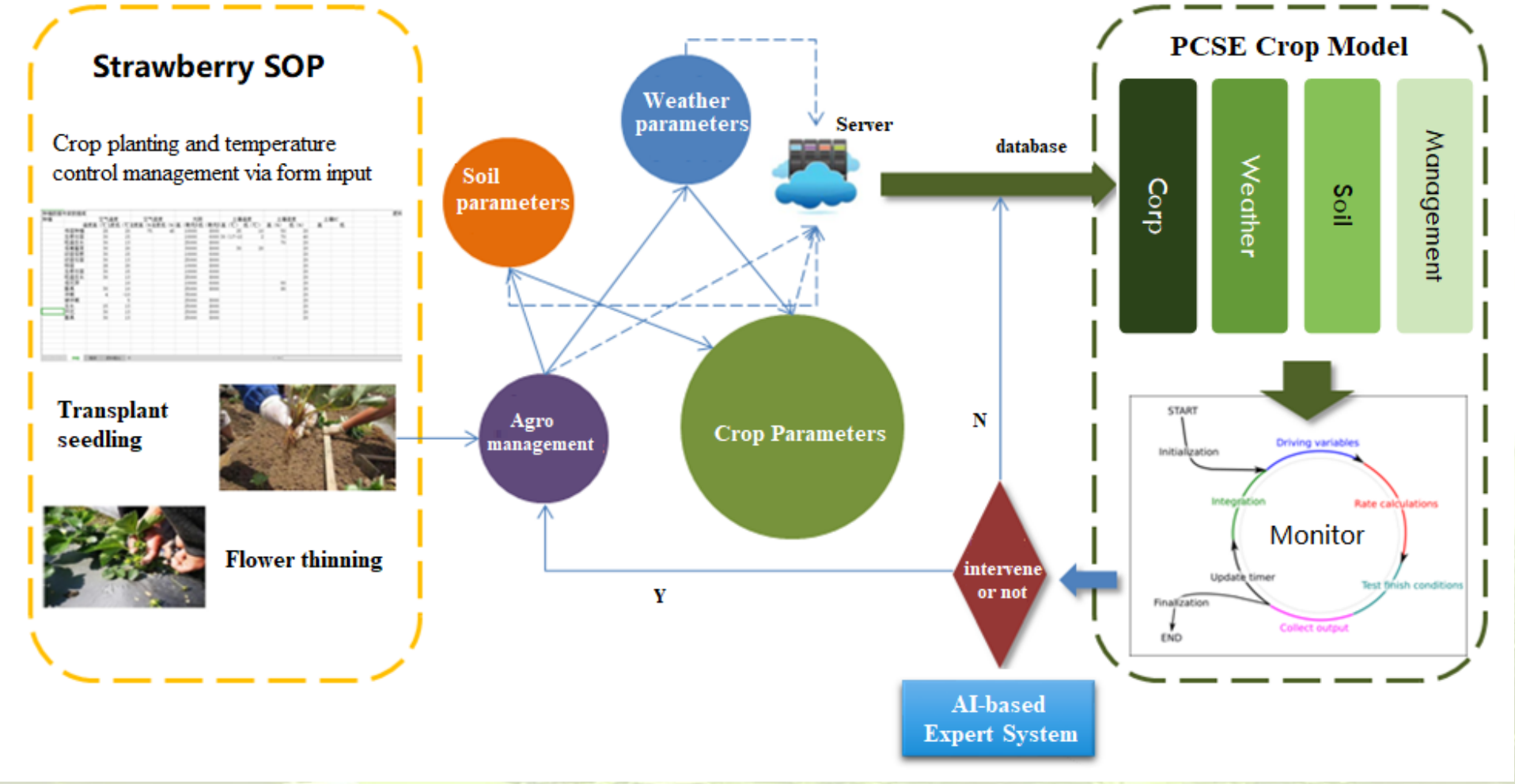
"ZhiDuoMei" Smart Agriculture Case

- Bridging data divide requires both public and private efforts(OECD, 2021).
- Nujiang Prefecture in Yunnan Province, a western province of China is a state-level poverty area. Its per capita disposable incomes of urban and rural residents are equivalent to 85% and 45.5% of the national average, respectively.
- The development of the strawberry industry in the region faces several obstacles:
  - First, the local technical force is weak.
  - Second, local vertical climate characteristics are different significantly, which brings difficulties to the cultivation of standardized operations.
  - Third, the arable land is in poor condition, and it is basically a small area reclaimed on the mountain and difficult to achieve large-scale planting.

"ZhiDuoMei" Smart Agriculture Case

- Established in August 2020. It won the second prize in the first "Duoduo Agricultural Research Technology Competition" organized by the United Nations Food and Agriculture Organization (UNFAO).
- The operating mechanism of ZhiDuoMei: The agricultural group and AI group are connected by the product group.
- To satisfy farmers with different needs, the ZhiDuoMei team updated the database and used the stimulating model by using big data analytic tools, and to achieve a full range of services from land evaluation to yield forecasting.

"ZhiDuoMei" Smart Agriculture Model



Key findings

- China has basically eliminated the broadband Internet access divide through moderately advanced infrastructure investment, But more needs to be done to bridge the data divide.
- Data divide can be classified into three levels: data access, application, and effects divides.
- Large-scale new infrastructure investments in China bridge access effectively.
- In China, data effects divide between provinces is still significant. It has become prominent challenge facing by policy makers

Suggestions

- The first is to establish the concept of leapfrog development and invest in digital infrastructure moderately ahead of time.
- Secondly, Governments should set aside more space for the market and private enterprises to encourage them to make full use of the infrastructure, give full play to the advantages of the platform
- Thirdly, promoting digital technology and planting technology in rural areas to promote agricultural intelligence is the fundamental way to bridge the data gap.
- Fourth, governments should pay more attention to the release and disclosure of public data, including geographic data, meteorological data, population data, etc.

Q & A