Connotation and Assessment of National Power Based on Big Data

HU Jian

HU Jian, Professor, Director, Center for Soft Power Studies, SASS

E-mail: hujian@sass.org.cn

This paper in Chinese was originally published in *Social Sciences in China*, 2018 (06).

Introduction

National power, also known as comprehensive national power in China, refers to the overall competence of a country on economy, politics, military, culture, technology, etc., as well as an important index to measure a country's position in the international system. The research on the components of national power roughly began in the 1960s, most of which was qualitative analysis. The concept of national power is not yet uniformly defined in the academic circle. What is generally accepted by most scholars is that national power is an academic concept with multiple meanings whose components may change with the emphasis on different sides during the research course.[1]

In the mid-1970s, T. L. Saaty, an operational researcher and professor from University of Pittsburgh, put forward the Analytic Hierarchy Process (AHP). AHP, "in essence, is a manner of decision making that dissolves a complex question into components and classifies those components according to their dominance relations to make an organized hierarchical structure, determines the relative importance of components in each level by comparing each two of them, and then composites them within the hierarchical structure to get the overall ordering of decisive components relative to the importance of goal". [2]Based on the new methodology for the research on national power provided by AHP, scholars begin to model the assessment of national power. However, constrained by different viewpoints on the components of national power, scholars put forward different models to assess national power. Among them, Klein model that divides national power into material element and spiritual element is the most representative one. Material element covers the critical mass (population, territory), economic capability (gross national product, energy, mineral, industry, food and international trade) and military capability (strategic force and conventional force); spiritual element refers to strategic purpose and the will to pursue national strategy. The model may be expressed with this equation:

---

[1] Japan Planning Office, eds., *Integrated Force of Japan*, Tokyo: Dawei Publishing House, 1987, p.3.

[2] T. L. Saaty, Analytic Hierarchy Process - Application in Resource Allocation, *Management and Conflict Analysis* [In Chinese], trans. XU Shubo, et al., Beijing: China Coal Industry Publishing House, Preface, 1988, p.1.

$$P_p=(C+E+M) \times (S+W) \quad (1)$$

wherein, Pp refers to national power, C refers to critical mass, E refers to economic capability, M refers to military capability, S refers to strategic purpose, and W refers to the will to pursue national strategy. [1]In the 1980s, the Japan Research Institute introduced a model that divided national power into international contribution capability, viability and compelling force and further subdivided them into more than 100 assessment indexes. [2]In the Internet era, Joseph Nye realized that "the power is transferring from 'a wealth of capital' to 'a wealth of information'" and put forward the concept of "soft power" for the first time, dividing national power into military power, economic power and soft power. Among them, "both military power and economic power are typical 'hard' powers", while soft power derives from cultural and political values and foreign policy. [3]On this basis, Joseph Nye and Robert O. Keohane suggested that "information is power". [4]In the 21st century, Joseph Nye included "information power" into the soft power system and raised that the country "with the more channels of communication has a larger influence on explaining issues" and "may gain soft power". [5]

Since the 1980s, Chinese scholars explored a lot in the research of national power. The most representative models, among them, were Comprehensive National Power (CNP) model put forward by Overall National Power Comparative Research Group, Institute of World Economics and Politics, Chinese Academy of Social Sciences and the model designed by HUANG Shuofeng. In CNP model, national power involves 8 components, namely, resource, economic vitality, foreign economic vitality, science and technology capability, social development degree, military capability, government's capability in economic adjustment and diplomatic capability, which could be subdivided into 85 indexes and gathered into 64. [6]The model introduced the index of "social development degree" for the first time and started China's assessment and research on national power. HUANG Shuofeng's model, by comparison, has more comprehensive indexes. The model divides the components of national power into economic power, technology power, defense power, resource power, political power, culture and education power and diplomatic power, the first four of which are hard national power while the last three are soft national power. [7]In this model, the element of soft national power increases significantly, while the index of "social

[1] Refer to R. S. Cline, *Evaluation of National Powers* [In Chinese], trans. NIU Xianzhong, Taipei: Liming Cultural Inc., 1976.

[2] Japan Planning Office, eds., *Integrated Force of Japan* [In Chinese], p.39 and p.66.

[3] Joseph S. Nye, Jr., "Soft Power", *Foreign Policy*, No.80,1990, pp.153-171; Joseph Nye, *Hard Power & Soft Power* [In Chinese], trans. MEN Honghua, Beijing: Peking University Press, 2005, p.6; Joseph Nye: *Soft Power: The Means to Success in World Politics* [In Chinese], trans. WU Xiaohui and QIAN Cheng, Beijing: Science Press, 2005, p.11.

[4] Robert Keohane, Joseph Nye, *Power and Interdependence* [In Chinese], trans. MEN Honghua, Beijing: Peking University Press, 2003, p.263.

[5] Joseph Nye, *Hard Power & Soft Power* [In Chinese], p.153.

[6] Project Group of the Comparative Study of Comprehensive National Power, Measurement and General Analysis on China's Comprehensive National Power [In Chinese], *Social Science in China Press*, 1995(5).

[7] HUANG Shuofeng, *New Theory on Overall National Power* [In Chinese], Beijing: China Social Sciences Press, 1999, p.98.

development degree" is not covered.

From the research on national power mentioned above, we know that the components of national power change continuously with the time variation and the development of technology. In particular, driven by technology, the system of components of national power is becoming more and more abundant from basic elements to soft power. With new elements added into the system of national power, the function of technological innovation in the system of national power is shown. As the human society is entering an age of big data, the big data and its application are becoming important elements that influence the existence and development of a state. [1]The academic circles both at home and abroad had done some researches on this issue; however, few observes it from the angle of the components of national power. For that matter, this paper is to analyze the contents and assessment of national power under the background of big data.

I. The Connotation of National Power Based on Big Data:

With the sustainable development of information technology, big data is growing into a new element of national power, namely BD power. On the one side, big data is a component of national power; on the other side, the coming of big data invisibly multiplies other components of national power, which greatly promotes the whole system of national power.

Big data technology, as the most important technological achievement of the fourth industrial revolution, represents the latest result of technological revolution in the world nowadays. The level of big data technology represents national power to a great extent. In the course of data integration, we notice that the most obvious feature of the age of big data, while comparing with the previous ages, is that cloud technology is used to integrate data into data structure with internal logic connection. This data structure is not an integration of random samples, but the sum of total samples; the key point of this data structure is not the precision, but the hybridity. The logical relation of this data structure is correlation, rather than causality. [2]

Supported by big data technology, a state can gain data of TB-level, PB-level, EB-level and even ZB-level, and access data and excavate the large value produced by data. [3]At present, the most widely used security storage systems in the world, such

---

[1] Big data is a set of massive and diverse data. Big data technology refers to the big data generated from the Internet and cloud platforms and its relevant technologies for data mining, analysis prediction and decision-making. Concepts like cloud platforms, cloud technology and cloud computing are mentioned in the paper. Cloud platforms are virtual data warehouses based on the Internet. Cloud technology is a general term that refers to the technologies carried out according to the business model of cloud computing, such as network technology, information technology, integration technology, management platform technology, and application technology, whose essence is computation and integration. Cloud computing is the virtualization process of hardware resources.

[2] Viktor Mayer-Schönberger, and Kenneth Cukier, *Big Data: A Revolution That Will Transform Now We Live, Work, and Think* [In Chinese], trans. SHENG Yangyan and ZHOU Tao, Hangzhou: People's Publishing House, 2013, p.27, p.45, and p.67.

[3] A terabyte (TB) is 10^{12} bytes of data, a petabyte (PB) is defined as 10^{15} bytes, an exabyte refers to 10^{18} bytes, and a zettabyte (ZB) equals to 10^{21} bytes of data.

such as GFS (Google File System) and HDFS (Hadoop Distributed File System), are developed by American big data enterprises. America has formed a huge industrial chain in the whole world. [1]Both the development of data storage, data analysis and similar tools, and the huge Internet big data service industry shaped up as a result are bringing new driving force for the advancement of the state. Moreover, "Internet + traditional industries" based on big data technology has become the latest mode of industrial development nowadays. This industry trend also shows the development status of national power under the background of big data to a large extent.

Besides, "big data + scientific forecasting" is improving the national decision-making capability. The presence and application of big data allows national decision to be made based on complete information. All the decisions could be expressed through data. [2]Decision based on big data allows the decision-maker to avoid bureaucratism and disturbance from special interest group, facilitating accurate situation assessment and judgment by decision-makers. [3]The national decision-making in the age of big data, in some way, is a large game for every country on big data collection, storage, excavation and analysis.

From the angle of international politics, big data is reconstructing the space of international politics and enriching the connotation of international politics. The space of traditional international politics is a physical space with the research object focusing on nation, international relationship, international system and international structure in this physical space. Big data based on Internet and cloud platform, however, put the international politics into a vast and boundless virtual space. For this purpose, a state becomes the combination of tangibility and intangibility from tangibility only; international relationship becomes dual structural relations of tangible international relationship and intangible international relationship from tangible international relationship only; international system and international structure have brand-new game content in virtual space. [4]In the meantime, big data brings with new connotation of internal politics. The data, before then, mainly involved some specific state secrets; now, the age of big data characterizes data itself the essential attribute of an entity equity. [5]In this sense, big data endows state sovereignty with a new connotation.

---

[1] GFS is a scalable, distributed file system designed by Google for storing massive search data, which supports large-scale, distributed and vast data access, and provides high-performance services for a large number of users. HDFS is a distributed file system based on an open source platform called Hadoop, which is a cluster storage system. See the work done by Michael Minelli, Michele Chambers, and Ambiga Dhiraj, *Big Data Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business* [In Chinese], trans. Business Department of Alibaba Group, Beijing: People's Publishing House, 2014, pp.61.

[2] Viktor Mayer-Schönberger, Kenneth Cukier, *Big Data: A Revolution That Will Transform Now We Live, Work, and Think* [In Chinese], pp.28.

[3] LU Gang, Research on Foreign Policy Decision Making in the Age of Big Data [In Chinese], *Social Science in China Press*, 2014(7).

[4] HU Jian, Research on International Problems in the Age of "Internet Plus" [In Chinese], *Social Outlook*, 2015(7).

[5] For more details on "data sovereignty" refer to "CAO Lei, Research on Data Rights in Cyberspace" [In Chinese], *International Review*, No.1, 2013; CAI Cuihong, "The Concept of Data Sovereignty and Its Prospect for Future Application in the Cloud Era" [In Chinese], *Contemporary International Relations*, 2013(12).

Of course, the BD power also depends on the capability of a sovereign state to create "information right difference plus data right difference" upon other countries through big data. Such a difference constitutes the main content of data sovereign interaction and game between countries in the age of big data.

From the perspective of analysis above, the big data technology not only provides a new technical approach for human, but also shapes the component of national power, which structurally changes the composition of national power. Both hard power and soft power are infrastructures of national power, and when hard power and soft power are combined with big data, the traditional hard power and soft power will see an exponential growth. Plugging BD power into Klein's equation will better show the connotation and meaning of national power under the background of big data.

$$Pp=BDpt\ (C+E+M) \times (S+W) \quad (2)$$

In equation (2), BDp refers to big data power as a component to national power. Its combination with other elements of national power will produce a huge increasing effect. Based on this, BDp could be regarded as a special constant in the system of national power. T refers to the time closely related to BD power, reflecting the development status of the national power of big data at different time points. The reason to add the variable of time is that in the age of big data, national power is sensitive to time. Besides, the more rapid technology development will lead to higher time sensitivity of the national power. From equation (2), we know that BD power plays a decisive role among elements of national power. It will become core competitiveness for a state in international game in specific historic stage, as well as a key component of national power which supports a state's international status.

II. Big Data Remodels the Structure of National Power

What aspects should big data, as a component of national power, remodel the structure of national power?

The first aspect is infrastructure, namely those needed for developing big data. Infrastructure, a condition to produce BD power, as well as an element to constitute BD power, consists of: data: both data and the capability to identify data; technology: tools to develop, collect and utilize big data; enterprise: social units mastering the big data technology under the jurisdiction of a state; relevant technical personnel.

The second aspect is structure, namely the abilities to collect, store, manage and analyze big data. In some sense, structure is also a specific manifestation of infrastructure.

Firstly, the capability to collect big data. Big data is not a direct sample collection, but an automatic collection of data distributed among different storage systems. The capability to collect big data refers the software and intelligence degree of data collection methods based on the explosive growth of three dimensions of data

(namely, volume, growth rate and category of data). [1]At present, the academic circles have developed and constructed many database and data collection tools. [2]Collected and gathered data, through some technical processing, will be filed on the cloud platform, which may become available information gained according to required logical relation.

Secondly, the capability to store big data. The storage system of big data is a hardware platform and a data center including server, network equipment and storage facilities. However, hardware equipment doesn't equal to the storage capability of big data. Big data storage capability refers to the capability to provide storage space for mass data and to regroup data conveniently and effectively in the space through relevant hardware equipment. In addition, the capability to store big data also compasses the backup capability of big data. This is a big data disaster recovery system built to cope with different kinds of disasters. Since the "September 11 Attacks", big data security backup system has been an indispensable content in the course of carrying forward national big data strategy.

Thirdly, the capability to manage big data. Unlike conventional digital management, the management of big data is an intelligent control relying on cloud platforms. From a national level, the capability to manage the big data management itself is evidenced by a nation's technology for visualizing cloud hardware, programming various data, and building platforms that provide big data services. On the other hand, the capability to manage the results of big data usage is embodied in a nation's legislative power that matches up to the big data era, which can enhance the management of results from big data usage through effective legislation. [3]This capability is of the most importance midst all big data management capabilities.

Fourthly, the capability to analyze big data. Data is not able to "voice" and become a component of national power until it is analyzed. The capability to analyze the big data is an analytical thinking capability based on big data, including: (1) using all or more data to build predictive models; (2) integrating multiple predictive models and techniques to make results closer to the objective reality; (3) creating closed loops to allow new knowledge to be applied to production models; (4) constructing a real-time analysis model to averse outcome bias; (5) focusing on the application of technical analysis rooting in predictive models instead of inventing new technologies. [4]

Above the aforementioned, another element is function, that is, the power of big data to influence the outside world, including its capabilities in discursion, prediction, integration & restructure, and computing & mining. Jeff Jonas, an expert in big data,

---

[1] See the work done by Michael Minelli, Michele Chambers, and Ambiga Dhiraj, *Big Data Big Analytics: Emerging Business Intelligence and Analytic Trends For Today's Business* [In Chinese], pp.55.

[2] See YANG Zhenghong, eds., *Smart City: Big Data, Internet of Things and Cloud Computing* [In Chinese], Beijing: Tsinghua University Press, 2014.

[3] HU Jian, "A Revolution of Big data and Public Management" [In Chinese], *Administrative Tribune*, 2016(6).

[4] See the work done by Michael Minelli, Michele Chambers, and Ambiga Dhiraj, *Big Data Big Analytics: Emerging Business Intelligence and Analytic Trends For Today's Business* [In Chinese], pp.98.

proposes the idea to let data "speak". [1]However, the discursive competence of big data depends on the quantity of data. Eric Siegel said, "The more data, the more power; the more powerful the data is, the more sensitive it will be." The so-called sensitivity means that the closer the circumstance reflected by data to the objective reality, the more beneficial for decision making. [2]In other words, decision-making tends to be more sensitive to such data. Big data prediction is a sort of forecast based on vast data or even whole data. What it seeks for is not data accuracy, but the relationship hidden among complex data. Nevertheless, the result predicated by big data still goes after accuracy. It is for this reason that big data predication has become a component of national strategic capability. Certainly, new capabilities will emerge only when data is integrated and reorganized, while "isolated data is of no value." [3]Nothing but integrated and restructured data can voice in different discourse systems and diverse logic frameworks, and influence human cognition, before it has a bearing on decision making. This big data capability, in a sense, is a national power to "create brains".

In addition, the remolding of functions of national power through big data also covers the capability to compute and mine big data, which is the competence to build data correlations and excavate their value. Big data formed by integrating dispersive data is just the acquisition of big data assets, and its value can be gained by processing it on cloud platforms utilizing cloud technologies, understanding its inherent correlation, and mining it by using suitable algorithms.

The last one is objective. At the moment, there are numbers of indicators to measure innovation capability, such as the Innovation Union Scoreboard (IUS), an evaluation system constituted by 25 basic indicators released by the EU to evaluate national innovation performance among EU members. [4]Global Innovation Index (GII) issued by the World Intellectual Property Organization (WIPO) jointly with European Institute of Business Administration and Cornell University is another index evaluation system, and it consists of 84 basic indicators for the purpose of assessing and ranking the innovation capability among around 150 economies across the globe. [5]The National Innovation Index report, annually issued by the Chinese Academy of Science and Technology for Development, not only takes the aforementioned indicators into consideration, but also integrates 5 primary indicators (which consist of innovation resource, knowledge creation, enterprise innovation, innovation performance, and innovation environment) and 33 secondary indicators to measure national innovative power. [6]However, all these evaluation systems are traditional

---

[1] Viktor Mayer-Schönberger, and Kenneth Cukier, *Big Data: A Revolution That Will Transform Now We Live, Work, and Think* [In Chinese], pp.28.

[2] Eric Siegel, *Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die* [In Chinese], trans. ZHOU Xin, Beijing: People's Publishing House, 2015, pp.36.

[3] ZHAO Guodong, et al, *Historical Opportunities in the Age of Big Data: Industrial Change and Data Science* [In Chinese], Beijing: Xinhua Publishing House, 2013, pp.31.

[4] European Commission, Innovation Union Scoreboard 2015, March, 2015, see https://www.researchgate.net/publication/278903737_Innovation_Union_Scoreboard_2015,Jan.8,2018.

[5] Global Innovation Index 2017 Report, Jan.1, 2018, see https://www.globalinnovationindex.org/,Jan.8,2018.

[6] *National Innovation Capability Evaluation Index System*, Nov. 29, 2013, see http://www.most.gov.cn/cxdc/

indicators to assess national capability to innovate. In the context of Internet and big data, although national innovative power is indispensable from the above indicators, its core lies in the innovations of thinking modes and institutional aspects, and the innovations of procedure and decision making basing on the former two.

In fact, the reshaping of infrastructure, structure and function of national power through big data is driven by innovations. Therefore, the structural reconstruction of national power through big data should also include the remodeling of innovative capabilities, of which the capabilities to innovate in thinking modes, institutions, technologies and industries are of key importance.

What big data reshapes is not just an era, but the way people think. Traditional geopolitics and geo-economic patterns have been re-formatted virtually by big data. From the perspective of big data, no such a thing as geopolitical pattern exists, but only a big data network is formed under big data logic. Consequently, human thinking must keep abreast of the changing big data era, so as to acquire the capability to innovate in thinking. To put it another way, the way people think in the era of big data must be rooted in big data.

Big data is a product generated from the integration of thinking and technology. Technological innovation will not be carried out in an environment where institutional innovation is scarce. Institutional innovation takes the form of the process of institutional set-up, in which, the way knowledge stock and its increment are treated determines the future of institutional innovation. It is true that knowledge stock serves as the basis for institutional innovation. If too much attention is paid to its stock, however, the knowledge increment will be ignored, and innovation will be difficult to proceed. Knowledge stock is really powerful, while knowledge increment is the weaker. If the weak one is not appreciated, it will be harder to attract attention in the era of big data. Under this circumstance, it will be too hard to sustain institutional innovation. In this sense, the capability of a nation to innovate its institutions is dependent on its attitude toward new knowledge. Thinking innovation determines institutional innovation. Where there is no thinking innovation capability, there will be no way to realize institutional innovation. Moreover, once the institutional innovation is initiated, it will in turn further innovation in thinking.

It is of no doubt that owning big data is not the destination, rather than growing technological innovations by leveraging big data. A nation's creative capability is increasingly reflected in innovative technologies on the basis of big data. For example, the Internet of Things and artificial intelligence leading scientific and technological innovations are both state-of-the-art technologies to interpret big data technology, which will become fundamental signs to show a nation's international status in the international system and become a nation's way-out power.

Moreover, industrial innovation capability based on "Big Data Plus" is another part of

/cxdczbtx/201311/P020131204326192340968.pdf,Jan.8,2018.

national innovative capability brought forth by big data. Industry 4.0, a currently prevalent innovation plan rooted in big data technology to guide high-tech industries, refers to an industrial development plan, in which supply, manufacturing, sales, and other links in production will be digitalized and intelligent for a ultimate goal of fast, effective and personalized supply of products. Standing at the point of industry competition, those who first realize Industry 4.0 will become the new leader of global industry innovation.

An index system that can be used to evaluate BD power is established by analyzing how big data reshapes national power structures (see the table below). It comprises 4 primary indicators (Infrastructure, Structure, Function, and Objective) and 16 secondary indicators. BD power is the sum of the 4 primary and the 16 secondary elements (see Equation (3)):

$$BDp=I+S+F+O \quad (3)$$

The Index System to evaluate BD Power

Primary elements	Infrastructure (I)	Structure (S)	Function (F)	Objective (O)
Secondary elements	Data Technology Enterprise Personnel	Gathering capability Storage capability Management capability Analysis capability	Discourse capability Predictive capability Integration & restructure capability Computing & mining capability	Thinking innovation capability based on big data Institutional innovation capability based on big data Technological innovative capability based on big data Industrial innovation capability based on big data

III. National Power Evaluation Based on Big Data

Given that obvious differences exist between the two sorts of national powers, the methods for assessing traditional national power cannot be used to evaluate the national power in the context of big data. Assessing the components of traditional

national power is largely done by using a system of specific indicators, in which the basic method is to assign values to each corresponding indicator, so that whether national power is strong or weak can be determined in accordance with the score obtained. For all the results determined by this method, they are static and fail to reflect the dynamics of national power. Such an assessment is an evaluation method based on samples, cause and effect, precision thinking, and linear thinking. In the age of big data, when data changes rapidly, the national power manifested by the value of data mining may vary substantially from time to time. Therefore, the assessment of national power based on big data must follow a big data-style way of thinking, which is nonlinear, full-sample, and logical thinking with ambiguity and relevance.

Based on it, this paper seeks to base on the Cline equation, and to use the AHP developed by T.L.Saaty, together with quantitative and qualitative methods, for evaluating national power in the context of big data. In this process, data collected is considered directly as authoritative data, and for data that cannot be quantified, perception index will be used, which is scored by experts to give corresponding weights.

However, what need to be pointed out it that BD power is a complex and non-linear component system, of which the 4 primary indicators are not parallel, but any combination of the two will result in a huge increase effect on overall national power. Simply, summing these indicators will not truly reflect the development of BD power. Therefore, Equation (3) is effective only if the assumption is made in the initial state. Taking a point time as a reference, then a nation's BD power at that point in time is:

$$BDpt0=I+S+F+O \tag{4}$$

But if BD power is evaluated in the dynamic analysis and the strength at the reference point in time is viewed as a constant K,

$$BDp_{t0}=K=I+S+F+O \tag{5}$$

As time and technologies change, Equation (5) will translate to:

$$BDpt=BDp_{t0}I^{\alpha}S^{\beta}F^{\gamma}O^{\eta} \tag{6}$$

when $\alpha=\beta=\gamma=\eta=0$, it means that the BD power at the reference time point remains the same, which means that $I^{\alpha}S^{\beta}F^{\gamma}O^{\eta}$ is invariant, and the BD power is a constant, K, i.e. BDp_{t0}, which equals to the sum of I+S+F+O in the beginning. By linearizing the logs of the two sides of Equation (6) a new equation will be combined:

$$Ln\ (BDp_t)=Ln(BDp_{t0}I^{\alpha}S^{\beta}F^{\gamma}O^{\eta}) \tag{7}$$

The resulted equation to calculate BD power is:

$$LnBDp_t=LnBDp_{t0}+\alpha LnI+\beta LnS+\gamma LnF+\eta LnO \tag{8}$$

where BDp_{t0}, α, β, γ, and η are constants; BDpt, I, S, F, and O are variables. [1]To explain further, in the case where I, S, F, and O are determined, then BDp_{t0} is determined according to Equation (5), and a nation's BD power at a certain time point can be calculated according to Equation (8). The values of α, β, γ, and η will be reckoned according to Equation (8), and then become constants in Equation (6). Next, based on Equation (6), the BD power BDpt of any nation at any point can be worked out.

As mentioned above, BDpt can be used to calculate the value of national power based on big data by Equation (2).

Of course, any model or equation is relative. The corresponding values in the equation will deviate, if time reaches an adequate length or the growth of technology accelerates. When it happens, the model needs to be adjusted accordingly. But within in a certain period of time, this equation is valid. According to this equation, the national power based on big data at any point can be evaluated. However, due to limited space, the difficulty of data collection, and the complexity of data organization, this paper mainly proposes an assessment method, and the comparative analysis of national power based on big data at any point can be explained in other research papers. [2]

Conclusion

National power under big data not only provides a new dimension to understand a nation's strength, but, more importantly, reveals a new composition of national power in the context of big data, and reflects the latest contents in the game of power among nations as major international actors. In the era of information, every country is in a different development state of information power. Therefore, an enormous "digital divide" is formed due to the fact that developed countries lead in the forefront of new technological development, while most developing countries, suffering from unenlightened information technologies, are still in a weak position in terms of national information strength. This "digital divide" facing all nations is resulted from "economic disparity". [3]Also, America has an innate advantage in big data in the big data era. According to an Internet industrial report, most of Top 100 big data companies in the world are born in American. [4]It means that America can provide the

[1] This equation is constructed under the assistance of JIANG Kaizhong, an associate professor of Shanghai University of Engineering Science. He has been engaging in the research of mathematical sciences and big data for a long time. With his assistance, the author has performed repeated logical deductions by reasoning on this equation. Thanks!

[2] Due to limited space, deductive details are not presented here, and will be explained in a standalone paper. It is certain that any method may have flaws, which is similar to big data itself, making it hard for us to grasp all the data. Similarly, the evaluation method established in this paper is not perfect, but this equation aims to inspire more research effort, to be reviewed and referenced by academic colleagues because it's a brand new field.

[3] For the research results concerning global "Digital Divide", refer to the work done by HU An'gang and ZHOU Shaojie, New Global Gap between the Rich and the Poor: The Swelling "Digital Divide*"* [In Chinese], *Social Science in China Press*, 2002(3).

[4] Joyce Wells, "DBTA 100 2017 - The Companies That Matter Most in Data", June 15, 2017, http://www.dbta.com/Editorial/Trends-and-Applications/DBTA-100-2017-The-Companies-That-Matter-Most-in-Data-118003.aspx,Jan.15,2018.

the basic tools concerning big data (tools for collecting, storing, analyzing, and managing big data) and new global public goods for all other nations who can only be passive recipients of such goods. This phenomenon shows that the original “Digital Divide” is evolving into a “Big Data Gap”. “Big Data Gap” mirrors the disparity of national power among different nations. From the aforementioned equations, the difference in national power shown by big data as it is reflected in “Big Data Gap” is not a multiple gap instead of an exponential divide. It means that inter-country competition is getting fiercer amid closer national relationship resulted from big data technology in the era of big data, because big data has become a component of national power.