Big Data, Transparent World and Individual Freedom

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Abstract: Big data technology turns everything into computerized information, so everything has its own data footprint. These footprints come together to form a data world that maps everything. By mining the data world, everything can be calculated and recognized. Our black box world is gradually open and transparent. Everything can be recognized, grasped, and predicted. Although big data may diminish individual privacy and even threaten personal freedom, through the precise portrayal and analysis of big data, people will gradually come to understand the laws of nature and society, and those once hidden in the black box will gradually move from the realm of necessity to the realm of freedom. Big data, therefore, brings a new world of freedom while bringing constraints to individuals.

Keywords: Bid data; data world; transparent world; individual freedom

With the revolutionary breakthroughs in technologies such as intelligent perception, the mobile Internet and cloud computing, the data amassed by people has also undergone revolutionary increases. We have rapidly ushered in the era of big data. Big data turns everything into computerized information to form a data world that maps the physical world, which can then be analyzed by computers through a process referred to as data mining. This process can not only recognize the past, but also predict the future. The world is becoming transparent and so is society. This transparency threatens the freedom of people who are used to a black box life. But is threat the only thing that big data brings to individual freedom? Is it possible that this new transparency will bring new freedom to people? Will it create a world freer than before? Let's look at why big data will make the world transparent, and make an analysis of the impacts a transparent world will have on individual freedom.

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1. Big data and the formation of a data world

The impact of big data on individual freedom mainly comes from the data world it forms, which is the fundamental ontology for big data to threaten individual freedom. So how are big data and its data world formed?

Data is the quantity used by individuals to measure things, a description of the intrinsic nature of things through quantitative relationships and its attributes, and a universal representation of the inherent nature of things.[①] Individuals have been analyzing data for a very long time. Ancient Egyptians used data to measure land and calculate wealth. We Chinese also described the attributes of things by quantity and unit of measurement. The most striking feature of the modern scientific revolution is the datafication of the natural world and the recognition of the internal laws of objects and behaviors through the quantitative relationships of external parameters. However, due to the limitations of datafication technology in the past, difficulties were faced in data collection, storage, transmission and processing. The large number of blank areas where data was unavailable could only be speculated upon through the limited available data and the patterns it exhibited. For complex individual and societal issues, only a small amount of data could be captured through questionnaires and sampling, and it was difficult to portray complex, varied individual thoughts and behaviors with this limited data. Due to the small sample size, the past is also known as the era of small data where there was a lack of sufficient mapping between the real world and the data world, so it was impossible for us to rely solely on data to understand the real world. We could only describe the issues with extremely rare and limited data. As a result, data distortion in the small data era was serious. We could not use the available data to adequately understand the past nor to predict the future of the real world.

Data collection, storage, transmission and processing have undergone tremendous changes as information technology has advanced, especially technologies like intelligent perception, the Internet, cloud storage and cloud computing. Intelligent perception enables small changes in patterns to be perceived and made recognizable by individuals. The Internet, especially the mobile Internet, allows data units that were once isolated and segmented to be aggregated to form large clusters of data. Cloud storage technology has enabled intelligently collected data to be stored in a distributed layout, allowing massive amounts of data to be permanently available. The processing and calculation of massive data is done by cloud computing technology. Cloud computing, through distributed computing, enables computing power to be distributed to form a collective force to jointly complete the analysis of the data. Cloud computing turns waste data, which was considered unmanageable in the past, into a treasure from which you can discover all manner of useful information. Driven by these technologies, data collection and storage has grown exponentially. The era of big data is coming.[②]

With datafication technology, massive volumes of both structured and unstructured data can be collected. This change in size represents items and their states that can now be analyzed and the results can be used to better describe the physical world. From the perspective of big data, the whole world is now a data-based world. This fulfills the prophecy of the ancient Greek philosopher Pythagoras who, more than two thousand

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① Huang, 2016
② Viktor Mayer−Schönberger & Kenneth Cukier, 2013, pp. 9−15

years ago, said, "All things are numbers." Although the world is a physical world as said by Marx from the perspectives of the ultimate and the original, any matter carries energy and information. So Wiener, founder of cybernetics, believes that matter, energy and information are the three elements that make up the world. There is a mapping relationship between matter, energy and information. Although at the material level, there is no definitive statement about whether the world can be reduced to elementary particles, from the information point of view, everything can finally be characterized by the two most basic numbers: 0 and 1. Big data also has an ultimate pursuit: "to quantify everything," that is, to transform everything into data that individuals can recognize and analyze. That is why Schönberger once optimistically said, "With a little imagination, a cornucopia of things can be rendered into data— and surprise us along the way."[1]

Big data technology has freed data collection from manual work, realized automatic data generation, and embarked on intelligent and automated data production. At present, the automatic generation of data is mainly through the following means. (1) Perceptual data: Various intelligent sensors can be installed in anything, and the state of each object and its changes are automatically sampled and reported as discrete data, such as stress levels of bridges, positioning of vehicles, and recordings from cameras. (2) Network data: People's every move on the Internet, such as web browsing and search histories are automatically recorded. (3) Social data: People have become accustomed to online life and social platforms like QQ, WeChat, Weibo and Tieba, as well as telephone SMS and other communication tools. All these are achieved through datafication. (4) Business data: Merchant's business transactions including production, circulation and sales, customer purchases and other business activities are converted to data and permanently recorded. Automation and intellectualization of data collection are the technical foundation for the big data revolution.

All the states of the natural world and individual societies and their changes can be automatically generated as data, which constitute a mapping world that is both different from and connected to the physical world. We can call it the data world. The physical world has a mapping relationship with the data world, and the data world can fully depict and reflect all the states of the physical world. In this way, in the era of big data, all things and their behaviors can be monitored by a data tail, which we call a data track. The state of all things in the world can be recorded in the form of data and though their states may be constantly changing each iteration is permanently recorded, awaiting analysis. Through the datafication of all things and through the storage, transmission, and processing of the Internet, cloud storage and cloud computing, the physical world can be mapped to a world of data that can be stored, analyzed, and utilized. The data world has not only created opportunities for understanding and changing the world, but has also created a series of new problems affecting individual freedom.

2. The advent of a transparent world and its challenge to individual freedom

To understand how this world is we need to use data to depict and discover its underlying structure. Therefore, data is an important medium linking individuals to the world, and the size of the data reflects the depth of our understanding of the world. The emergence of big data technology has brought about a revolution in data collection, storage, transmission and processing. It is gradually transforming the world into data and

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① Viktor Mayer−Schönberger & Kenneth Cukier, 2013, p.123

changing the world from a hard-to-recognize black box into a transparent sphere where everything is crystal clear. The so-called transparent world is relative to the black box world. It means that things have lost their covers, and people can see everything inside them. They can know their past historical trajectories and predict their future changes.

Every day we deal with many things, observe and touch things, but we can't fully understand everything before it becomes data. If we don't have data describing the items and their states, our understanding will remain at the level of sensibility and superficiality, and we will not be able to acquire the understanding of intellectuality and rationality, nor grasp the quantitative relationships between items and issues and their internal elements. Nor will we be able to gain insights into the inherent laws of quality through the understanding of quantity.[1] We call this system a black box. To know and understand items and issues you have to open the black box, and to do so, you must collect data on the state of things and their changes. The datafication of the world brought about by big data technology provide the technical foundation for us to understand and grasp nature, society and even thinking. Big data technology opens the door to a cognitive world for us. As Schönberger said, "Seeing the world as information, as oceans of data that can be explored at ever greater breadth and depth, offers us a perspective on reality that we did not have before. It is a outlook that may penetrate all areas of life."

Obtaining data is only the first step to understand things. The key is to discover the laws and knowledge from the data. In the era of small data, the relationships between the data and the world was relatively simple and it was easier to identify the laws. But in the era of big data, the relationships between the data and the world have become extremely complex. It is extremely difficult to deal with the relationships between massive data and the black box world by relying on manpower alone, let alone discovering the laws hidden within. Big data technology uses data mining (especially deep learning) to analyze the data world to recognize the physical world. Data mining is the use of algorithms to examine the underlying structure of the data and thus extract its useful information.[2] By turning everything into data and then applying data mining technology, we can discover the secrets hidden within the data world.

The datafication of the natural world and human society are the processes through which the world becomes transparent. At first, people were ignorant of the world, and completely hidden in the darkness of the black box. With the development of the natural science, people have obtained a large amount of data through observation and experimentation and have gradually opened the black box and discovered some of nature's secrets. As the British put it to praise the great scientist Newton: Nature, and nature's laws lay hid in night; God said, "Let Newton be!" and all was light. The progress of the natural science means that the secrets hidden in the darkness are gradually being revealed, and the world is gradually becoming transparent. However, due to the limitations of science and technology, we can only uncover the secrets of simple, linear systems. The secrets of complex and nonlinear systems, especially those of individuals and their societies, are still hidden in the dark. It is difficult for us to quantify what we think and what we do, because it is not easy to depict the complex state of individuals and society with a limited number of parameters. It is difficult to see the secrets of complex individuals and their societies through limited data.

Big data, however, in a complete and accurate way can record the state of complex things and the changes

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① Tony Hey et al., 2009, p.26
② Judith Hurwitz et al.,2013, pp.145−146

in their trajectories. By means of data mining, we can then see the secrets inside issues and items through the changes in their states, thus opening the black box of complex things.[①] As big data technology develops, the natural world and human society have been quantified in an all-round way, and the black box of everything has been opened by individuals. The world has gradually changed from a black box to a partially transparent gray box, and will finally become a completely transparent sphere, a transparent world. The advent of the era of big data means that individuals have entered a transparent era, and the world we live in will become completely transparent. The dark curtains that have hidden things for so long will be entirely raised. Individuals will be completely exposed to the bright sunshine, which will bring many challenges to individual freedom.

The increasing transparency of the world allows others to see our past, thus undermining individual privacy. In the era of big data, everything about us is being quantified, and our every move and every thought may soon be recorded and stored in the cloud. Each of us will soon leave an uninterrupted data track, as if we are tied by an invisible rope. The data stored in the cloud will be automatically generated and collected without our knowledge. We will know almost nothing about it.[②] What's more, the data may be stored permanently, and we will not be able to remove it, which means that our personal data will be undeletable.[③] In this way, others can follow our data track and dig into our past. We will not only expose everything in the moment, but our past will have been recorded, stored, and may be mined and exposed at any time. In this sense, with big data, every move we make will be registered as a permanent history, available to others, so that there are no more secrets.

Also, this transparency will allow others to anticipate our future thinking and behaviors. The historical trajectory that each of us has left in the past not only reveals everything about our past, but more importantly, big data technology can use data mining and correlation analysis to speculate on our future.[④] We may not know our own future thinking and behaviors, but big data will make fairly accurate predictions based on our past. It is possible that big data will be better than us to know what we think and do.

Finally, the greatest challenge brought about by a transparent world is its violation of individual free will. Free will means that people's thoughts and behaviors are completely determined by themselves and will not be manipulated or influenced by foreign objects or others. Individual behaviors depend entirely on the thoughts of the self and should be free and unpredictable. We can hardly quantify and model the causal analysis of the physical world like physics or other sciences, and it is even more impossible to do causal analysis or scientific research to find the causality between our thoughts and behaviors. In the era of small data, we could not conduct scientific research on free will, and it was impossible to do reduction analysis. Big data technology, however, converts people's thoughts and behaviors to data that can be analyzed, modeled, calculated and predicted. The individual free will that could not be analyzed before will become understandable, computable data. In this way, everything will be included in the scope of rational analysis that can be quantified, analyzed and predicted. Free will is no longer free, and everyone becomes a truly transparent person.[⑤] This is a great challenge to free will and individual freedom.

In short, the transparent world will completely destroy the mystery and privacy of individuals. The era

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① Steve Lohr., 2015, p.11
② Glenn Greenwald, 2014, pp.85−86
③ Viktor Mayer−Schönberger, 2013, p.6
④ Parker, 2015, pp.10−16
⑤ Viktor Mayer−Schönberger & Kenneth Cukier, 2013, p.207

of big data is becoming a truly transparent era. In the past, we used the omnipotent gods to scare people. As the proverbs go, "Whatever you do, God is watching" and "The gods are watching, so don't think you can get away with anything." These are of course the imaginations to frightened people. But in the era of big data, this omnipotent god will become a reality for all. Big data will oversee everything, like the eye of God. Under the surveillance of big data, it will be like living in a huge, invisible cage. We will be closely monitored and entirely exposed. Everything will lose its mystery, and privacy will be a thing of the past.[1] Big data will turn our mysterious world of obscurity into a world without mystery, a world of total disenchantment and complete transparency.

3. Individual freedom in the transparent world

With the advent of a transparent world everything will lose its cover and will be completely exposed, changed from hard-to-recognize obscurity to crystal transparency, creating powerful challenges to individual freedom. But in the transparent world will individuals completely lose their freedom, or will transparency bring new freedom to individuals?

Freedom literally means the power to do as one pleases without influence by other factors. However, freedom does not include the ability to do what you want when you affect the freedom of others. In this sense, the meaning of freedom is free behaviors under certain constraints. Due to technical limitations it was difficult to collect relevant data regarding complex individual behaviors in the era of small data. People lack precise understandings of nature, society and other individuals. Many individual behaviors are hard to observe or recognized and even harder to constrain. Thus, the black box was a fig leaf that blocked the line of sight and evaded tracking by others. With the opacity of the world, people can often do things that do not conform with laws, regulations, or ethics. They think this is individual freedom, that they can do what they want to do. The advent of the transparent world will raise the veil that shields and protects these individuals. People will not be able to live with masks as in the past. No matter what we have done in the past or what we want to do in the future, all will be completely exposed to the public. In this way, the transparent world will indeed cause people to lose the freedom to do as they wish, the freedom to avoid supervision by others, and the freedom to evade legal and moral punishment. Big data, just like the eye of God, will overlook and monitor everything. No one will be able to escape legal punishment or moral condemnation, so each of us will be responsible for all our actions. In the past, we were reliant on the unreliable individual conscience to guarantee that freedom would not to be violated by others. Now it will be the job of the omnipresent big data. In the transparent world, big data will constrain everyone from infringing on the rights of others so that freedom guaranteed by technology and freedom is truly limited under the constraints. Big data and the transparent world it brings will restore the original meaning of freedom.

Is the transparent world just a constraint on freedom? The answer is no. In addition to restoring freedom its original meaning, it offers people more freedom. Before the world was transparent, individual freedom were limited by nature, society and individuals themselves. Under these triple shackles, true freedom was difficult to obtain. We were all forced to live in a realm of necessity dominated by laws. Big data and the transparency of

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① Parker, 2015

the world it brings will allow individuals to break these shackles, discover their laws through data, and use the laws to gain more free space.

First, from the perspective of natural cognition, big data and its transparent world will allow individuals to gain greater freedom. When Marx and Engels discussed communism, they said that individual beings have always lived in the realm of necessity, and the aim of communism is to get rid of the realm of necessity and move toward the realm of freedom. The so-called realm of necessity is a natural world that is controlled by natural laws and people can do nothing about it. We live in the natural world, which is the basis of individual existence. But we are ignorant of the world in which we live, and we are at the mercy of nature. After a long practice, we have gained some understanding of the natural world, especially the scientific revolution and the technological revolution, which have a better understanding of nature. However, due to the complexity of nature and the limitations of individual cognition, we only opened a window to the natural world, with secrets still hidden in the darkness. To accurately understand and utilize the world, people must first quantify it. The parts that are not being quantified are a black hole for individual understanding. Before the dawn of the era of big data individuals could only collect data by hand and the amount of data was extremely limited. With the approach of the era of big data, data collection, storage, transmission and processing have replaced the manual work and we have entered the intelligent automatic production mode. Therefore, more and more objects are being quantified. Once the relevant data of various phenomena are obtained, we can identify the correlations between the data through data mining and data processing. Once the laws of nature are mastered by individuals, we can truly understand nature, make use of nature, and even transform nature. In the past individuals could only obey nature and were often manipulated by the laws of nature, hence they could hardly obtain true freedom in the past. But big data opens the black box of the natural world. Individuals can not only peek into the secrets of nature, but also make full use of nature to satisfy their own varied needs. With the advent of big data and its transparent world, individuals will gain more data and understanding of nature, so they will gradually be rid of the manipulation from the realm of necessity and move toward the realm of freedom. Therefore, big data and its transparent world will enable individuals to have more free space in the natural world.

Second, from the perspective of social cognition, big data and its transparent world will enable individuals to gain more understanding of society and thus enjoy more freedom. Society, composed of individual groups, is a structural organization formed by individuals. Individuals have the subjectivity, the ability to think and innovate, and a complex structure of needs, so it is difficult to understand individuals. When the social organization is composed of thousands of complex individuals, the social organization is more complex, changeable, diverse, and interactive. Hence, society is more difficult to recognize than nature. In the past, we used natural science to study society, but natural science research methods cannot be applied to social cognition. For example, the most commonly used controlled experimental methods in natural science cannot be used in social science. Uncontrolled methods such as interviews, questionnaires and sampling can only be used to obtain data. There are three limitations to this method of data collection. One is that it is still a manual collection; second is that the data size is extremely limited; third is that the data may be seriously polluted and distorted. Before the era of big data, individuals had a particularly limited understanding of the societies they formed. It was difficult to have a comprehensive understanding of a society and its laws. Therefore, in a complex society, individual could hardly have true freedom, basically staying in the realm of necessity. With the advent of big data and its transparent world, the social research paradigm has undergone revolutionary

changes. First, most of the data is obtained through intelligent perception or network traces, and data collection is intelligent and automated; second, data size exploded and all aspects of society have huge amounts of data; third, because there is no specific individual participation, the data is not polluted (although data acquisition devices are individual-based, they are inter-subjective, so it is objective).With massive big data, individuals collectively can more accurately describe the complexity of society, accurately depict the past, and predict the future. Even though societies are more complex, thanks to the technical tools of big data, their hidden laws can still be tapped, recognized and grasped by researchers. By knowing the laws of a complex society, individuals can make full use of the laws of social development to serve themselves. They are no longer completely outsiders, but can actively participate in social changes, thus gaining freedom from social cognition and moving from the social realm of necessity to the social realm of freedoms. For this reason, big data and its transparent world allow individuals to gain more freedoms in a complex society.

From the perspective of individual self-cognition, big data and its transparent world will allow individuals to acquire more knowledge about themselves, and thus gain more freedom for themselves. From the biological, psychological and cognitive levels, individuals are extremely complex. It is generally believed that because we have traveled into space and explored the earth, we must be well aware of ourselves. But this is not the case. The truth is that do not know ourselves better than we know nature and society, even it can be said we are unaware at all. For instance, we know very little about our physical and mental activities. The reason why individuals are ignorant of themselves is mainly because of the complexity of human body and the limitations of our technical tools. The human body is small, exquisite but complex, and it is hard to quantify with traditional technical tools. Without datafication tools, individuals can hardly know and understand themselves, and therefore we are constrained by the realm of necessity and can hardly have free space. Take another example. Individuals know little about the mechanisms of individual diseases, so they are powerless over many diseases. As individuals lack the knowledge of their own aging laws, although they have been hoping for immortality for thousands of years, they still cannot rid themselves of aging and sickness. For another example, we know little about how our brains operate and lack scientific understandings of the mysteries of thinking. Therefore, people still worship geniuses, and cannot use the laws to achieve creative thinking. However, big data and its transparent world will provide individuals with more feasible technical means, such as wearable devices, micro-chips that can be implanted into the body, etc. These intelligent technologies will record all our states, behaviors and changes in our bodies, and all individual behavior data will be stored in the online cloud. With the help of data mining and analysis, we will be able to peek into the secrets of our minds and discover the hidden laws, and make full use of these laws to diagnose and treat diseases, conduct intellectual development and make use of individual aging mechanisms and their prevention. In this way, it will be possible for people to escape the inevitable law of life and death and move toward an ideal life we design for ourselves, thus gain more freedom.

From the perspective of individual liberation, big data and its transparent world will provide a solid foundation for artificial intelligence technology, which will reduce the burdens of individual physical and mental labor, thereby bringing about individual liberation and freedom. Labor and wealth are the most direct factors that constrain individual freedom. Marx said, "External labor, labor in which man alienates himself, is a labor of self-sacrifice, of mortification." In order to liberate themselves, people have invented various tools and machines and used science and technology to free themselves from heavy physical labor. Mental work

is a more complicated labor, but because of the lack of understanding of brain and its laws of thinking, it is difficult to liberate people from mental labor. Big data and its datafication of the world help us to have a better understanding of the laws of nature, society and individual thinking, and will gradually replace our brain labors with machines, so that individuals can be liberated from physical and mental labor in every way. Artificial intelligence based on big data and intelligent robots has created enormous wealth, and social wealth will increase sharply as individuals bid farewell to the constraints of wealth by being liberated from the bondage of wealth. Therefore, with the approach of big data and its transparent world, individuals will be liberated from the labor and wealth that binds them and move toward the full liberation and freedom that Marx and Engels yearned for. In the future transparent world, individuals will not only be freed from the bondage of nature but will also be freed from the bondage of society and individuals themselves, so that each person's personality, talent and wisdom will gain more freedom.

4. Conclusion

The development of big data technology is bringing about the all-round datafication of the world. Everything, after being quantified, will formed a data world that has a mapping relationship with the physical world. Through the mining and processing of the data world, people will be able to accurately recognize and predict the world in which they live, and the world will gradually change from a black box to a transparent sphere. This transparency will make it difficult for people who are accustomed to living in the black box to keep up, as it will change the original rules of the game, thus posing a threat to individual freedom. However, the transparency will make it easier for people to understand nature, society and others, and consequently they will better understand the laws of nature, society and individuals. Through inevitable laws, individuals will be able to both trace the past and predict the future. They will gradually eliminate the realm of necessity and move toward the realm of additional freedoms. The new freedoms in the transparent world will be freedoms under constraints which will be more in line with the essential meaning of freedom.

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