

The influence of algorithms on citizens

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ABSTRACT. *Purpose: The purpose of this paper is to explore a quintessential understanding of the influence produced by algorithms to citizens in their daily life. In the algorithm-based internet environment, our daily life of speech and behaviours have been more or less influenced by the statistical analysis generated by algorithms of the internet. With the impacts accompanied, this essay is aiming to investigate how algorithm affect citizen in the areas of the public sphere, reality formation and citizen construction. Methodology: This paper is based on the literature review, the empirical case analysis and adopts qualitative analysis method to make research. Then, gathering all the evidence and connected with the theoretical review to make a conclusion regarding the influence of algorithms to citizens. Finding: Analyses reveal that the influence of algorithms on citizens is manifested in many aspects. For the occurrence of this phenomenon, relevant departments need to implement effective management and governance for achieving citizens' network neo-liberalism. Value: The paper systematically clarifies the ways algorithms influence to citizens regarding the use of algorithms and appropriate suggestions of the governance and regulation of using algorithms. And it also provides the reference data to further research.*

KEYWORDS: *Algorithm; Public sphere; Citizen; Filter bubble*

1. Introduction

Along with the advent of the internet era, the level of social informatization has been continuously improved, the information output increased in a high level and information update has accelerated rapidly, which represents the modern information technology has become an indispensable and essential tool that affects people in various ways such as study, work, politics and other fields. Besides, internet-based algorithm technology plays an important role in information classification and filtering (Tryfonopoulos, Koubarakis & Drougas, 2009). In addition, the algorithm-based technique is adopted by many software such as Google, Facebook, YouTube and other apps. Furthermore, as Manovich (2013) indicates that 'software takes command' by it has become the interface to connect our imagination, creation and memory with others and the world. Therefore, algorithm technology has become the medium and the gatekeeper between software and human, so that this kind of techniques play a significant role to influence our daily lives.

Considering the influence of the intervention of algorithm technology in our daily lives, on the one hand, it largely optimizes the online experience to internet visitors and provides the most appropriate and efficient way for users to pursue the information, and also lowers the threshold for the ways of obtaining information. Meantime, some of the previous research reveals for the positive effect of algorithm technology that has significantly facilitate the efficiency and accuracy in business strategy (Moldoveanu, 2016). On the other hand, however, based on the functions of algorithm technologies that are capable of automatically filtering, selecting and sorting information, there is a series of case studies that indicates the negative influence produced by algorithm technology such as the invasion of private data and information

(Zimmer, 2008). Therefore, there is a large number of potential guesses regarding whether the statistical analyses produced by algorithm technology are controlling or concealing certain realities and truths (Driscoll and Walker, 2014); or whether misleading the ways of people's thinking (Zhang and Dimitroff, 2005). There is an exponential growth trend that scholars are trying to figure out the operation principles of algorithms, and the influence mode of the algorithm to citizens. Hence it can be figured out that there are both advantages and disadvantages of using algorithm technology and it is convinced that the algorithm is increasingly influencing citizens in their daily life.

Therefore, I argue that the influence of statistical analyses produced by the algorithm technology to citizens in different areas and I will specifically concentrate on the influence in three aspects to developing discussion: the public sphere, the formation of the public opinion and the construction of realities. This paper will be applied with the methodology of qualitative analysis and combined with the academic resource, a case study and a theoretical review to prove my argument with all the evidence gathering. Finally, a clear conclusion will be presented at the end of the essay to restate my argument with a brief explanation of the evidence.

2. Literature Review

In order to gain a better understanding of the relation between the public sphere and algorithms, the conception and attributes of the public sphere would be presented to make an analysis and conclusion. The theory of the public sphere was first put forward by Hannah Arendt (1958) in 'The human condition' and she argues that the public sphere is a realm of freedom that distinguished by the biological necessities. Then, the conception of the public sphere was perfected by Habermas (1989) and he indicates that the public sphere is a realm between the nation and society to mediate their relationship and refers to the public space where citizens gain the permission of free expression about their opinions and views and unbounded conversations regarding social and public affairs without the intervention of governments. With the emergence of the internet era and new media technology, there is a virtual space produced by the internet and related technologies and forms a public community to amplifies avenues for

personal expression and enhance the online activities of citizens (Bell, 1981; Papacharissi, 2002). Under the background of the revolutionary change in new media, web culture prompts citizens to participate in the public space and increasing involvement of users in the creation of content and conveyance of information (Beer and Burrows, 2007). Although citizens have been always emphasizing the requirement of building a democratic free speech in the network environment and the public domain, under the influence of intelligent algorithm technology, rarely can we gain the opportunity to develop the free communication and interaction in the political field in some sovereign countries, leading to the fragmentation of democratic and political speech (Papacharissi, 2002; Beer, 2009). For example, China is a socialist country under the people's democratic dictatorship dominated by the working class and based on the alliance of workers and peasants. With China's deeply rooted belief system and impending political pressure, the government has limited on people to express themselves through any media platforms, especially on some sensitive political topics. (Emmons, 2001; Longanecker, 2009). In addition, in western countries, some scholars put forward that “free

Speech is not free”. Fowler (2012) proposed that the threat of government manipulating speech is obvious. Under the oppression of the authority of the government, broadcasters are forced to express the fact that may contrast to their deep-rooted views, and public opinion is forcibly controlled by the government. Because they know that public opinion is a powerful force for improving the national economy, politics and other fields. Ziolkowski (2001) points out that public opinion cannot be technically controlled by politics, and it has greatly influenced people's way of thinking and ideology. In addition, Krippendorff (2005) explained that public opinion is the embodiment of the public and a powerful political role, whose composition is closely related to mass media, public relations and the construction of realities.

Algorithmic technology act as the gatekeeper of information transmission, in Woolley and Howard's words (2016 p. 4882), ‘What constitutes the Internet has always been an evolving suite of technologies and a dynamic set of social norms, rules, and patterns of use.’ In addition, through the definition of algorithm represented by Cormen and Leiserson (2009 p. 5), Basically, an algorithm is a designed calculation process, through the input of relevant values or information, after the calculation process to generate a certain value or information as a result, so the algorithm can be defined as an input and output calculation process.’ To put it simply, algorithmic technology is the process by which a computer obtains a certain result by setting a parameter based on human operation. For example, if a user searches for a keyword on Facebook, it will make a judgment based on the content and information generated by the user on their profile and preference, and the algorithm system will automatically generate the content and results that the user wants to see. In addition, the algorithmic system acts as a convenient search engine to filter information and content. At the same time, by collecting the data generated by users, Facebook and Google regard users as 'quantified selves' and influence their choices. Pasquale (2015) described

the problem as a 'black box' and explained that the term meant that the system worked mysteriously because users had no idea where the data entered in the application would be transported. The 'black box' theory has been widely used by scholars in various fields, Petersen et al. (2009) explained that in users' perspectives, they pay less attention to the internal principle and structures of a certain product or device, but only cares about the functions and the ways of using it. 'black box' is treated as a nontransparent or vague technology or product, Schnabel (2009) illustrates an example of television, he points out that television is similar to the 'black box effect'. It is unnecessary for the users to understand the operating principle and electrical circuit inside of television, but the ways of using it. Caplan and Boyd (2016) metaphorize algorithmic techniques into a black box effect because its non-transparency and non-disclosure accompanied with a strong impact on the formation of the public opinion and the public sphere. In addition, Garimella (2018) "Echo Chambers" to metaphor the influence of the algorithm technology brings to the citizens, "Echo Chambers" is also called the 'stratosphere effect', refers to the user in a relatively limited environment with some similar opinions and voices repetitively, and repetition in the form of exaggeration or other distortion, made the environment is full of this kind of thinking and most people think that the story of these distortions is the whole story. In other word, algorithmic technology encourages citizens to be biased, because people cannot recognize their cognitive biases. For example, if you only read

Liberal sources or only have liberal friends around you, Facebook is more likely to show you the news and information related to liberal media. Citizens have realized that there is an urgent need for a non-restrictive space where they develop the discussion regarding issues of the public interests, under the effect of Echo Chambers, the development of a strong and vibrant civil society and the freedom of citizenship to obtain information are limited (Gr ömping, 2014).

The Internet as a public platform for communication media, the exposure of the Echo Chambers and the influence of algorithmic techniques have limited citizens to receive information, exchanges opinions, interacts with others, and even unconsciously prompted the public to expose to political differences and even prompt potentially for the occurrence of political homophily in our real life (Colleoni, Rozza and Arvidsson, 2014). Political homophily refers to the shared view of citizens in the political field in the world. "Homophily limits people's social worlds in a way that has powerful implications for the information they receive, the attitudes they form, and the interactions they experience" (McPherson et al., p. 23). Thus, caused the formation of political polarization and the reduction of political diversity. Therefore, algorithm technology has achieved special importance as a medium for citizens to communicate on the Internet. From restricting citizens' open dialogue in the public domain to the deviation and singleness of consciousness in the real world, all the evidence points out that algorithm plays a guiding role in the formation of public opinion and the composition of reality under the influence of algorithm technology (McPherson et al.).

In short, by analysing the nature and characteristics of the algorithm technology, a conclusion could be illustrated from the literature sources that the risks of using algorithm technology are manifested in many aspects, such as manipulation, realistic bias and distortion, citizen's cognitive ability, the ability of expression and communication etc. Then, connecting with the conception of the public sphere, the formation of the public opinion and construction of reality, it can be concluded that the statistical analyses produced by algorithm technology are increasingly influencing citizens of their communication and interaction.

3. Background/Case Study: Filter Bubble

Google limited company is a multinational technology company originating from the United States. It is a subsidiary of Alphabet incorporated company, in addition, Google company has a comprehensive business circle, such as Internet search engine function, cloud computing function and other software and programs based on computing technology serving the public. (Tene, 2008). Google's search engine marketing is a wise choice and it is the largest and most influential search engine on the Internet. According to Google search statistics, there are about 3.5 billion information transactions of Google search every day, and the search volume is growing by 10% per year. (Google Search Statistics, 2014). Google's online search method is to filter network information content based on keywords and meta tags. It is estimated that Google changes its search algorithm by about 500 to 600 per year (Moz, 2016). In 2009, personalized search technology was introduced by Google company to enhance users' search engine experience. By analysing the information and activities recently which create by users and referring the variable meaning of the same keyword of different users, Google generated information automatically to build a separate environment where only replenished with users' preference (Smyth et al. 2011).

Over the years, scholars have conducted a lot of discussions on whether Google has "filtering bubble" effect. The 'filter bubble', in short, is a web filter based on algorithmic technology that tries to infer and calculate information or things that users might like based on their search, browsing, and purchase histories (Hertgers, 2017). The Internet "filter bubble" provides unprecedented power for the construction of the Internet and the transactions of information. Whereas, if personalization is over excessively, it may prevent people from communicating with each other in the public society and may impede the innovation of the cognitive processes about the world and themselves, and eventually fall into the trap of "filter bubble". In searching for political topics, for example, the filter bubble plays a role of guidance. Because when undecided online voters search the web for election articles, the filter bubble has the potential to recommend extreme articles or information that could have a significant impact on the political outcome. Therefore, it can be concluded that it is possible that the algorithm technology based 'filter bubble' of Google search engine manipulates the results of users input of keywords in the Google engine. Consequently, algorithm technology in Google may influence human ideologies and the way of

thinking and communication so that waving citizens' public sphere, the formation of public opinion and the construction of reality.

4. Discussion and Analysis

By combining relevant literature and theoretical knowledge of algorithm technology, this paper provides the characteristics of online algorithm technology and how its technology affects citizens' public sphere, public opinion formation and reality composition. Although the statistical analysis produced by algorithmic technology and its personalization function brings high efficiency and accuracy influence, meanwhile, the technology limits the cognitive scope and personal ideology of citizens. The generation of algorithmic technique is a challenge or risk to the traditional cognition of citizens through the reference to theories such as 'Echo chambers', 'Black Boxes' and 'Filter Bubbles'. From the case study of the Google search engine, there have been many improvements to the algorithm technology due to the influence of the filter bubble. Such as pushing, biasing, guiding, inspiring, controlling, manipulating and restraining human behaviour. It can be seen that algorithmic technology influences to shape and guide our behaviour and social governance in a new way of network technology. As the governance of algorithmic techniques and related regulation rules skyrocketing, we must ensure the validity and fairness of algorithmic techniques and their impacts on citizens' cognitive and personal ideology. It can be seen that algorithm technology is still in the stage of development in the current era and is not fully mature. However, there are still many difficulties to overcome on the road to full maturity. Therefore, effective governance is at the heart of algorithm technology for its rapid developments in the future.

For the measures of governing algorithm technology, Saurwein et al. (2015) put forward constructive suggestions for the management of algorithmic techniques and provide various governance options to reduce risk and increase the benefits of algorithm selection. Firstly, they argue that every risk and threat posed by algorithmic technology needs to be targeted. Secondly, he believes that the governance perspective should be holistic to analyse and improve supervision. Then, through the command and control of national authorities as well as self-regulation and public supervision to achieve a mutual collaboration.

5. Conclusion

In conclusion, this article introduces the derivatives of the new network era, algorithmic techniques, and the impact of citizens on the public sphere, the formation of public opinion, and the construction of reality. First of all, in order to bring in the social issue, the importance of algorithm technology and its advantages and disadvantages are described in the first paragraph and made a brief illustration of the explanation and conjecture to both the negative and positive effects produced by algorithm technology. Then, in the paragraph of the literature review, in order to clarify the relationship between algorithm and citizens, this

paper makes analyses, explanation and their relationships regarding the conception of the public sphere, public opinion and realities. Through the understanding of the public theory, take the citizens' freedom of speech and the composition of individual ideology as basis and precondition, judging from the influence produced by the algorithm, whether it is harmful to citizens. After combining all the evidence and the support of theories such as 'Echo chambers', 'Black Boxes' and 'Filter Bubbles', the results show it could be concluded that citizens' voice and individual ideology are restricted by the personalized environment where is generated by the algorithm-based internet technology. In such an environment where civic freedom of speech is restricted, as the diversity of civic opinion is drastically reduced as well as the change of the cognitive ability, expression and communication ability of citizens. Thus, leading to a result of the differentiation of the public sphere, the homophily of public opinion and the distortion of the reality. In the end, through the combination of Google case and filter bubble theory, it is concluded that under the influence of algorithm technology, the traditional cognition of citizens and their thoughts and life will be changed. Because algorithm technology has manipulative behaviour and nontransparent working mechanism. In addition, algorithm technology in the political field of democratic elections and freedom, democracy maintains an inseparable relationship or influence. Therefore, this paper argues that establishing effective and perfect governance of algorithm technology is significant to avoid the negative influence produced by the algorithm to citizens, which is beneficial for the development of algorithm technology in the future.

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