

Textual and Quantitative Research on China's Action Plan for Promoting the Development of Big Data From the Perspective of Policy Tools

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Received 12 February 2017; accepted 5 April 2017
Published online 26 May 2017

Abstract

The research on the development of big data from the perspective of policy tools, to help policy makers look for policy tools that can provide guidance and support for the development of big data. The research is of significant theoretical and practical value for promoting development of big data and realizing the strategy of data power country. Using content analysis method and quantitative analysis methods, this paper evaluates and discusses China's action plan for the development of big data from the perspective of policy tools. Government uses more supply-side and demand-side policy tools to stimulate and support the development of big data. Nevertheless, the stage of technology research and development stage has not been given enough attention. To improve and update China's action plan for promoting the development of big data, policy tools system needs to be integrated or coordinated with data powerful country's value-chain.

Key words: Policy tools; Big data; Action plan; Content analysis

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Liu, C. Y., & Wang, L. H. (2017). Textual and Quantitative Research on China's Action Plan for Promoting the Development of Big Data From the Perspective of Policy Tools. *Canadian Social Science*, 13(5), 22-29. Available from: <http://www.cscanada.net/index.php/css/article/view/9588>
DOI: <http://dx.doi.org/10.3968/9588>
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1. STATEMENT OF THE PROBLEM

The high-degree convergence of the ternary worlds (human beings, machines, and substances) has led to a dramatic

increase in the size of the data and the complexity of the data model (Li & Cheng, 2012, p.647). The world has entered an age of networked big data. It has had a profound impact on various areas of the global economy, politics and social life, at the same time it has also brought great challenges. Under these circumstances, people are required to perceive the economic operation mechanism, social life style and national governance in a new way. And government needs to regard the development and application of big data as an important strategy for the development of China. In order to promote economic reconstruction and development to reshape the national competitive advantage and to enhance the government's governance capacity, the State Council plans for the development and application of big data in China from the height of top design and overall deployment. In September 2015, Chinese government formulated and promulgated the "Platform for the Promotion of Big Data Development (No. 50 [2015])" (hereinafter referred to as the "Outline"). This is the first authoritative and systematic document to promote the development of big data so far, and it is also the programmatic policy of building a strong data power country.

The "Outline" reflecting the overall development and application of the country's big data plays a directional role in making policies. However, how does the framework policy succeed from paper work to practice? How can the government departments at all levels to guide the strategy to the operation level? Are there any potential conflicts and deficiencies in the policy? To solve these problems, we need to fully understand the composition of the "Outline" policy and explore the rationality of the policy's tool selection and configuration. At present, there are few studies based on the analysis of big data development policies in China, and the lack of researches about the development of big data based on the perspective of policy tools is also a problem. In the process of promoting the development and application of

big data, the input and delivery of various resources are important, however, it is also crucial to allocate policy tools to promote guidance and support of policy, and play a positive policy effect to promote development of big data. Therefore, this article will proceed from the perspective of policy tools and construct an analytical framework from two dimensions: basic policy tools and data power country, with encoding, measuring and analyzing the policy text of *the Platform for Action to Promote The Development of Big Data* in China and deeply analyzing the characteristics of the “Outline” in the choice of policy tools, organization and construction, and some existing problems and deficiencies. At the same time, this article will also provide some ideas and references for the implementation of programmatic policies, as well as promoting and adjusting the follow-up policies.

2. CONSTRUCTING A TWO-DIMENSIONAL ANALYTICAL FRAMEWORK WITH POLICY TOOLS AND DATA POWER COUNTRY’S VALUE-CHAIN

As means to achieve policy objectives, policy tools have always been an important area of public policy research. In the course of public policy, policy tools are considered as “the specific means and methods that people use to solve social problems or to achieve certain policy objectives”

(Chen, 2006). The perspective of policy tools is the deepening and development of policy analysis at the level of instrumental rationality, and constructs the analysis hypothesis based on the structure of policy: Choosing and designing different policy instruments will have different policy outputs, and policy instruments reflect policy values and ideas of policy makers (Huang, Su, Shi, & Cheng, 2011, p.876). In recent years, many scholars have conducted in-depth researches on policy tools. Most of the research has been done by classifying policy instruments to find the optimal results of different types of policy tools. Among them, Rothwell and Zegveld (1985) are the most representative researchers of the research on technological innovation policy. Rothwell *et al.* argue that policy can be divided into supply-level policy tools, demand-level policy tools, and environment-level policy tools, according to the role of policy in science and technology. This taxonomy fades out the mandatory characteristics of policy tools and reinforces the role of the government as an environmental builder in advancing policy projects rather than just the interventionist and the controller (Wang, 2015, p.83). Compared with other scholars’ policy tools, this classification is more suitable for policy analysis in the fields of science and technology and innovation, and the operation is more clear and specific. Based on this, this paper uses these three policy tools as the X dimension of the policy analysis framework of the “Outline”. These three levels of policy tools have different emphasis and utility on the development of big data (Figure 1).

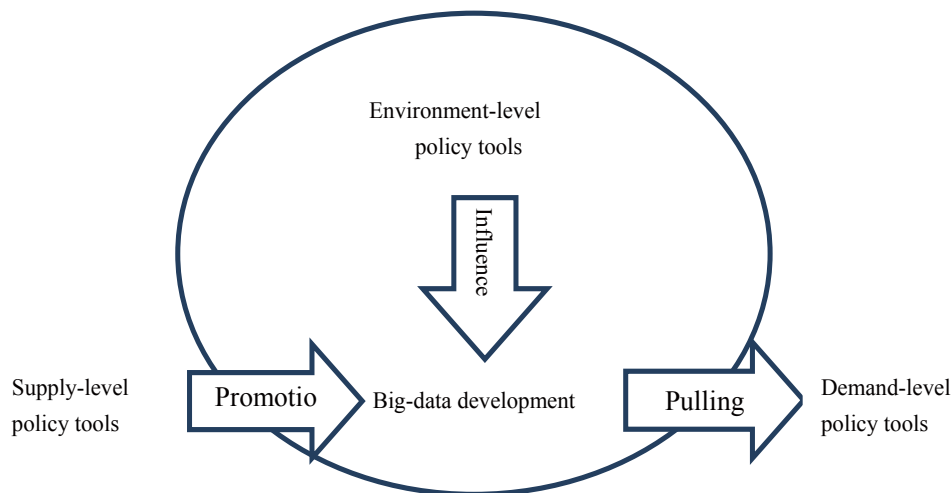


Figure 1
The Role of Policy Tools in the Development of Big Data

Supply-level policy tools mainly refer to the driving force of the policy on the development of big data. It is reflected that government had supplies relevant elements such as capital investment, manpower protection, technology development and support, information and messages sharing, infrastructure construction, site equipment and public resources investment, to further

promote the development and application of big data to achieve sustainable development. Demand-level policy tools are mainly reflected in the pulling power of the policy exerting on the development of big data, referring to the government through the paying attention to and supporting the development of big data and the transformation of application results, as well as some other

measures to promote the results of big data to implement into the market application and promotion. And actively promote the government and social cooperation and reduce the obstacles and uncertainties of industrial development, or actively promote the integration of big data and other related industries and release data dividends, or actively promote the application and conversion of big data in the field of public service, so as to stimulate the development of big data. The specific measures include government and social cooperation, industrial integration, public domain application and overseas exchange and cooperation, etc. Environment-level policy tools mainly refer to the indirect impact and infiltration of policy on the development of big data, and specific performance as follows: government implements planning strategies, tax concessions, financial support, concession regulations, special control and a series of measures in the development and application of big data. These elements provide a favorable development environment for the development and application of results of big data and indirectly promote the development of big data.

The promulgation of the "Outline", highlights the core of China's information development has been back from the early decentralized network and application system construction to focus on giving full play to the core-value of data resources, so as to enhance the quality and level of the development of national information technology, passing the strategic choice that our country will build a data power country (Shan, 2015, p.83). To achieve the

transformation from the data big country to data power country and the sustainable development of big data's development and application, its internal construction and running regularity must also be considered. Especially for the technology research, development and application of big data which have interlocking steps, they need to consider more about their own inherent characteristics and regularities, as well as the dynamic process of creating value at all stages. These are also important elements for a comprehensive analysis and description of big data development policies. According to the technical life cycle and the activity regularity of value chain, the development process of data power country's value-chain can be divided into these stages, including the research and development of information technology, resources configuration, product development, product market application and promotion. These mutually different but interrelated activities constitute the process of realizing the value of data power country. This article summarizes it into three aspects: technology research and development, resource allocation and development and application promotion, as the Y dimension of the policy analysis framework of the "Outline".

From the perspective of policy tools in theory, through segmenting the strategies which promote the development and application of big data, this article builds a two-dimensional analysis framework of the basic policy tools and the data power country's value chain, as shown in Figure 2.

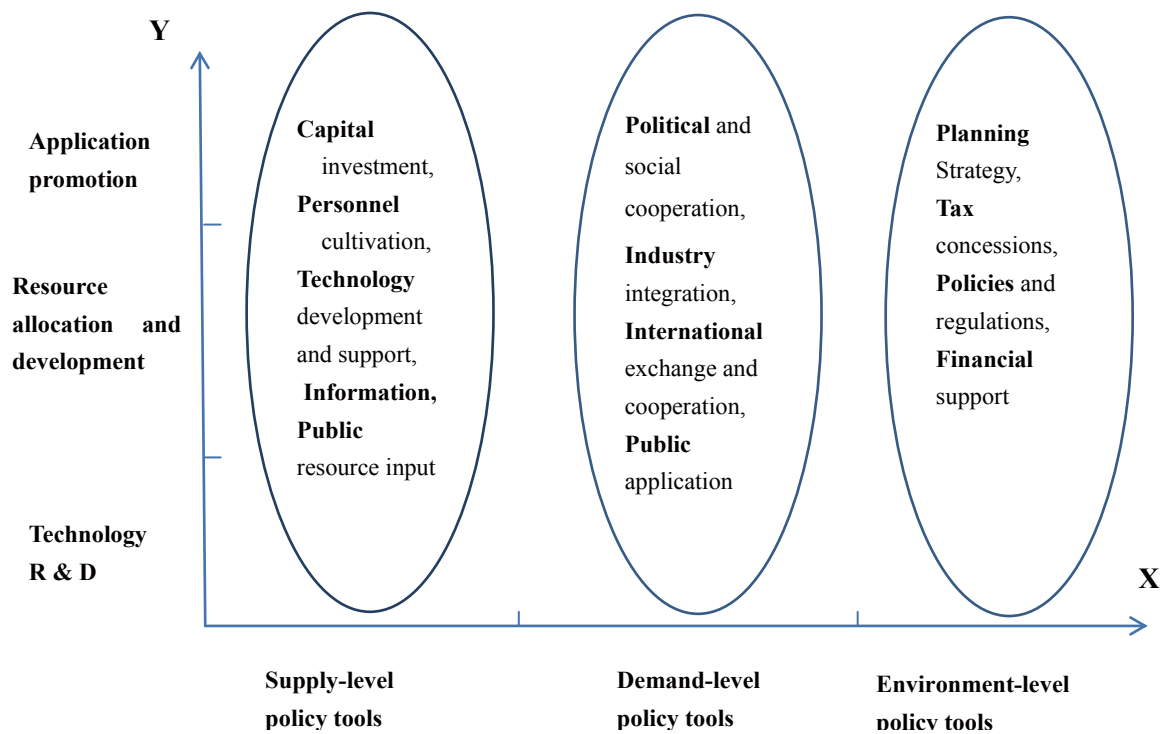


Figure 2
The Two-Dimensional Analysis Framework of the "Outline" Policy

3. ANALYSIS OF THE ACTION OUTLINE FOR THE DEVELOPMENT OF BIG DATA BASED ON POLICY TOOLS

According to the analysis framework, this article will use the policy clauses in the “Outline” as basic units for content analysis. Due to that the preface and the first part “development situation and significance” in the “Outline” mainly elaborate the background

of introduction of the action outline for the big data development, as well as analyze and summarize the current situation, which make little sense for the policy implementation effect of the big data development. In order to avoid the deviation in the process of post-coding and result analysis, this analytical text will not include this part. The analysis is coded according to the “policy clauses- specific clauses” to form a content analysis code table, as shown in Table 1.

Table 1
“Outline” Policy Text Content Analysis Code Table (Portion)

Serial number	Policy clauses	Content unit analysis	Coding
1	Guiding ideology	“Thoroughly implement the spirit of the 18 th National Congress of the CPC and the Second, Third and Fourth Plenary Sessions of the Eighteenth CPC Central Committee, In accordance with the decision of the CPC Central Committee and State Council, let market play a decisive role in allocating resources, and strengthen the top design and co-ordination, vigorously promote...”	1-1
2	Overall objective	“Create a new model of precise governance and multi-cooperative social governance, regard big data as an important means to enhance the ability of government governance, Through the efficient collection, effective integration, deepen the application of government data and social data, enhance the government...”	1-2-1
3		“Establish a smooth, safe and efficient new mechanism for the economic operation and make full use of big data, Continuously improve the acquisition and utilization of data resources in the fields of credit, finance, economy, taxation, agriculture, statistics, import and export, resource environment, product quality, enterprise registration and supervision ...”	1-2-2
...
65		“(7) Promote international exchanges and cooperation, adhere to the principle of equality and cooperation, mutual benefit and win-win, establish and improve the international cooperation mechanism, actively promote the exchanges and cooperation of big data technology, make full use of international innovation resources, and promote the development the related technologies of big data...”	3-7

3.1 The X-Dimensional Analysis of the “Outline”

Using the X-dimension as the basic policy tool for content analysis, according to the same or similar principle, we

can get the distribution of the basic policy tools of the “outline”, as shown in Table 2.

Table 2
X-Dimensional Basic Policy Tools Distribution Table

Tool type	Content analysis category	The clause number of the “outline”	Count	Percentage
Supply-level policy tools	Capital investment	2-Z8-1	1	38.46%
	Personnel cultivation	3-6	1	
	Technology development and support	2-2-5, 2-2-6, 2-Z8-2, 2-Z8-3, 2-Z8-4,2-3-1,2-Z10-3	7	
	Information	2-1-1, 2-1-2, 2-Z1-1, 2-Z1-2, 2-Z1-3,2-Z2-3, 2-1-4,2-Z3-2	8	
	Public resource input	2-1-3, 2-Z2-1, 2-Z2-2, 3-Z7-1, 3-Z7-3,2-3-2, 2-Z10-1, 2-Z10-2	8	
Demand-level policy tools	Political and social cooperation	2-Z3-1, 2-Z3-3, 2-1-8, 3-3	4	36.92%
	Industry integration	2-Z5-1, 2-Z5-2, 2-Z5-3,2-2-7,2-Z6-1	5	
	International exchange and cooperation	3-7	1	
	Public application	2-1-5,2-1-6,2-1-7,2-Z4-1,2-Z4-2,2-Z4-3,2-Z4-4, 2-Z5-4, 3-Z6-2, 3-Z6-3,3-Z7-2,3-Z7-4,2-Z9-2,2-Z9-3	14	
Environment-level policy tools	Planning strategy	1-1,1-2-1,1-2-2,1-2-3,1-2-4,1-2-5,2-2-1, 2-2-2,2-2-3,2-2-4,2-Z9-1,3-1	12	24.61%
	Tax concessions	N/A	0	
	Policies and regulations	2-Z2-4,3-2, 3-4	3	
	Financial support	3-5	1	
Total			65	100%

Overall, the “Outline” takes the supply-level, the demand-level and the environment-level policy tools into account. Among them, the supply-level policy tools account for 38.46% of the total, while the demand-level policy tools account for 36.92%, and the minimum proportion is environment-level policy tools, accounting for 24.61% of the total. The “Outline” comprehensive uses three types of policy tools, indicating that the government should have to give incentives and support from many aspects in the development and application of big data. In particular, the proportion of supply-level and demand-level policy tools which play important roles in promoting and pulling are higher, indicating that the government lays emphasis on the development of big data and also reflecting that the government has put the dynamic issue of deepening the development of current national informatization on the agenda.

Through further in-depth analysis, we can find that in the supply-level policy tools, “technology development and support”, “information “and “public resources investment” account for the vast majority (92%), illustrating that the state concerns about the technological research and development and innovation of the big data’s development, emphasizes the input of public resources which is based on using big data to develop infrastructure construction, and also actively promotes the open and sharing of various economic and social data and information. It plays an important policy-boosting role in developing big data. The using of “capital investment” and “Personnel cultivation” is a bit less, accounting for only 8% of supply-level policy tools, which is bound to restrict the stamina and the sustainable development of big data’s development. Considering that the “Outline” is the programmatic top-level design and overall layout, these aspects which account for little proportion will leave room for the introduction of follow-up local policy.

In the demand-level policy tools, big data has the highest proportion in the “public domain applications”, accounting for more than half (58.33%), which indicates that the government attaches great importance to applying big data technology to public services, in order to enhance the convenience, efficient and intelligent level of public services and stimulate the development of big data. Carrying out the cooperation between government and society in the development and utilization of big data, and promoting industrial integration, innovation and development, are the experimental units that future government has to promote. These are much more reflected in the demand-level policy tools of “outline”, accounting for 37.5%, which highlight the government’s expectation for relying on big data to help the economy transition and release data dividends. The policy tools for “international exchange and cooperation” are

least applied, only mentioned in the last policy of the “Outline”. Compared with the application of other policy tools, the weakening of international cooperation in the “Outline”, considers not only the information security, but also the current level of information technology in China has weak competitiveness in global market, however, the lack of this aspect weakens the forward-looking of the policy.

In the environment-level policy tools, the “planning strategy” accounts for the largest proportion, reaching 75%, but the using of “policies and regulations”, and “financial support” policy tools are much less, moreover, the “tax incentives” is completely not use. Such combined using policy tools, on the one hand, reflects not only the government attaches importance to use informatization to support and lead the economic and social development, but also the urgency of this., with developing various strategic measures to actively promote the development of big data from the macro strategic perspective. On the other hand, it shows that the government’s understanding of the big data’s development environment is not detailed and profound. First of all, in the aspect of opening and sharing of data, China’s laws, regulations and the institutional standards construction are relatively backward. For example, the confidentiality, decryption procedures, leaking punishment and relief mechanisms and other important institutional settings in the “secrecy law” have lagged behind the actual development needs, leading government departments share and open data too cautiously (Shan, 2015, p.35). It is urgent to strengthen the legal system construction in regulating, opening and sharing of data, but this aspect has not been given full attention in the “Outline”. Secondly, the development of big data requires not only the leading of government, but also needs to integrate the whole power of the society. In stimulating the participation of business, social organization and social capital, “financial support” and” tax concessions” are effective means, through financial subsidies, tax regulation, credit and financial services and other tools, creating a favorable investment and financing environment for the development of big data and releasing the vitality of market. But in the “Outline”, these tools are mainly missing and play their roles insufficiently, which will affect the healthy development of big data industry in the long run. Of course, it also provides a space for the development and improvement of follow-up policies.

3.2 The Y-Dimensional Analysis of the “Outline”

Based on the analysis of the basic policy tools of X-dimension, we add the Y-dimension—the factor of data power country’s value-chain, getting the two-dimensional distribution of results of the “Outline” (Figure 3)

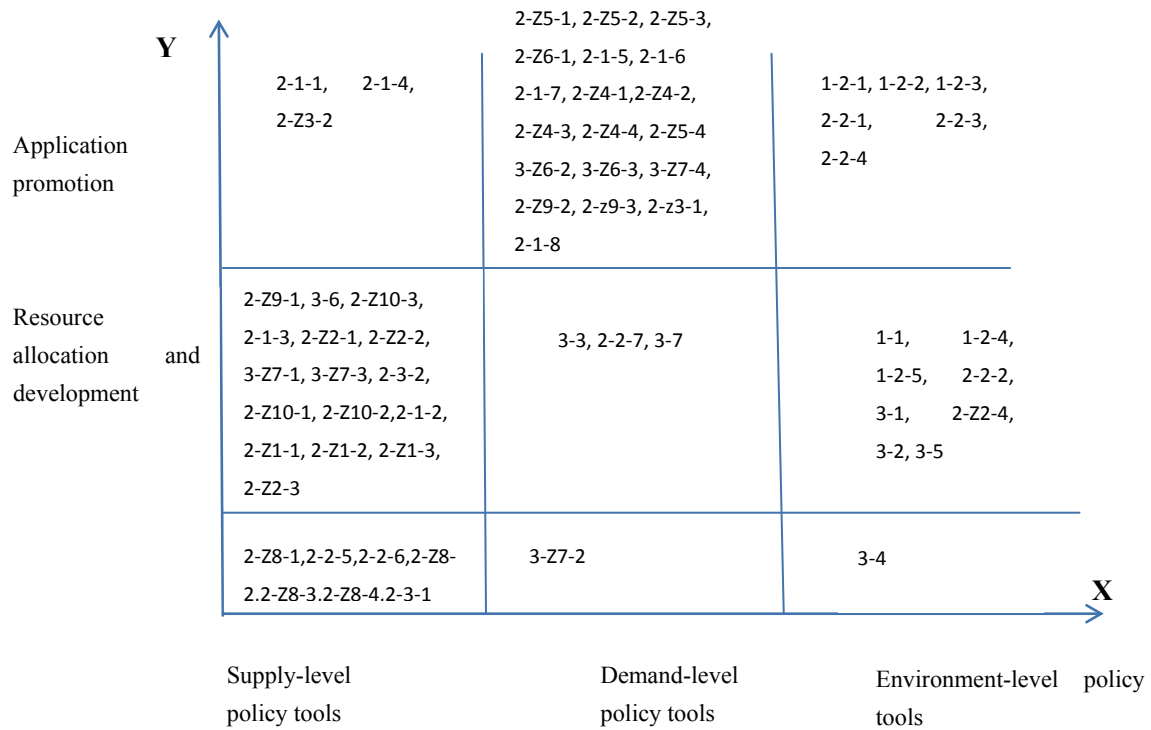


Figure 3
The Two-Dimensional Distribution Map of the “Outline” Basic Policy Tools

Figure 3 shows that there are 29 policy tools for application promotion, accounting for 44.62% of the total and there are 27 policy tools for resource allocation, constituting 41.54%, and the percentage of technology research and development policy tools is in minority, only 9, accounting for 13.85% of the total. In general, in the development of big-data industry, compared with technology research and development, the government pays more attention to the allocation of resources and development products, as well as two value chain links which are the application and promotion of product market. In view of the current issues that domestic people have limited understanding about the application and innovative of big data in various industries, the insufficient information consumption demand, and so on, the “Outline” policy gives more attention and support in promoting product development of big data and creating market demand. And it promotes the combination of

traditional public services and big-data application, integrates resources to develop products, and achieves the integration of big data in different industries and areas to increase the effective demand gradually and to expand promotion of application. However, data science and information technology research and development are the basis and key to promoting the development of big data, and also the starting point of the industrial value chain. But the policy-level of the “outline” in the field is significantly too low and government pays insufficient attention to the research and development stage of information technology, which will be prone to cause weak industrial base and small potential of development due to the weak competitiveness in technology research and development. The irrational and unbalanced structure of industrial value chain will ultimately be detrimental to the long-term development of the strategy to build data power country.

Table 3
The Frequency Distribution Statistical Table of Links in the “Outline” Policy Tools

Application promotion	0	0	0	3	0	3	4	0	13	6	0	0	0	
Resource allocation and development	0	2	1	5	8	1	1	1	0	5	0	2	1	
Technology research and development	1	0	6	0	0	0	0	0	1	0	0	1	0	
	Capital investment	personnel cultivation	support	Technology development and support	Information	Public resources input	Political and social cooperation	Industry integration	Public application	International exchange and cooperation	Planning Strategy	Tax concessions	Policies and	Financial support

According to the results of the frequency distribution statistical table of links in the “outline” policy tools (Table 3), In the evolution of the data power value-chain, the policy tools at all levels have different emphases and effects on the technology research, resource allocation, and application promotion. Supply-level policy tools promote the development of big-data related information technologies through secondary policy tools such as “technology development and support” and “bonus investment”. Through secondary policy tools such as “public resource input” and “information” to allocate relevant resources so as to promote the development of technology application of big data. However, these have little effect on the stage of subsequent market application and promotion. And it is complementary that the impact of demand-level policy tools on the evolution of data power value-chain is more expressed as “pulling power” of the “Outline” policy applied to the product application and marketing of big data, which mainly embodies that the policy promotes the cooperation between government and society, promotes the integration of big data and other industries and promotes the application of big data in the public domain. Their significance lies in the role of the market dimension, so as to stimulate the development of big data. The role of policy tools at the environmental level is mainly reflected in the two stages of the development of big data application product and follow-up marketing. On the one hand, the “Outline” plays a role in guiding the impact of value-added development of big-data products and innovative application, as well as strengthens the role of policy in cultivating big-data service market, enhancing service capability, supporting industry management and some other aspects, by developing and improving the relevant laws and regulations of information technology, constructing standard system, etc. On the other hand, the “Outline” uses the “planning strategy” which is a secondary policy tool to establish an integrated coordination mechanism for the development and application of national big data and speed up the formation of the work pattern that all departments promote the development of big data in a collaborative manner.

4. ENLIGHTENMENT AND SUGGESTION OF THE RESEARCH

4.1 Emphasis on the Impact of Environment-Level Policy Tools and Strengthening the Use of Fiscal and Tax Incentive Policy Tools

In the environment-level policy tools, moderately reduce the use of projected and strategic policy tools and increase the use and implementation of other policy tools. On the one hand, government should implement the implementation and promotion of policy tools such as existing planning strategies, improve and perfect

the corresponding supporting policies. On the other hand, they have to enable fiscal and tax incentive policy tools, formulate feasible measures which aim at the tax incentives and financial subsidies in the process of developing big-data industry, play a role in leverage of fiscal and taxation, encourage more social force and capital into big-data industry and activate market guidance mechanism. Learning from the international tax policy which promotes the development of renewable energy industry, government can provide financial subsidies, concessional loans to the research and development, and investment of big data and implement direct purchase and tax incentives on big-data application, with forming a policy mix which combines investment subsidies, tax incentives and loans, so as to promote the development of big-data industry (Ding, 2014, p3).

4.2 Improving Supporting Policy System of the Strategic Layout of the “Outline” and Accelerating the Construction of Policy-Supporting System

The “Outline” emphasizes that big-data development needs the cooperation with the relevant policies. The guiding ideology clearly points out that in addition to “strengthening the top design and co-ordination”, it is also necessary to further “improve the regulatory system and standard system, use big data scientifically and normatively, and effectively protects the data security”. The open and sharing of data is the primary foundation for the development of big data, and the standardization of data information is the key to the successful integration and sharing of data. Therefore, government needs to introduce some supporting documents to promote the implementation of the “Outline” policy measures as soon as possible, for instance, some policies which propose specification requirements on the right to open the permissions and boundaries of data, data format, and sharing standards, and the policy to optimize the protection of intellectual property and encourage technological innovation, as well as speeds up the legislative work of data security and information protection, improves the institutional environment and policy support system for the development of big data in China.

4.3 Strengthening the Ink of Research and Development and Emphasizing the Value and Effectiveness of Technology Research and Development

At present, compared with developed countries, China's information technology research and development and independent innovation capacity still exists certain disparity, which becomes bottlenecks and constraints in the development of China's big data. Therefore, government needs to further clarify and reaffirm the importance of strengthening information technology research and new technology development. Relevant ministries and governments at all levels have to

implement and perfect the policy system to support the research and development of information technology, strengthen investment of research and development and international exchanges and cooperation, and promote the full cooperation among government research institutions, laboratories, universities and industry, in accordance with the “Outline” development goals. They also need to build a sound technology research and development and transfer system between the production, learning and research and promote the formation of a long-term mechanism of technological innovation.

4.4 Improving and Updating the Future Policies, Focusing on the Coordination Between Basic Policy Tools and the Elements of Data Power Value-Chain

It is important to attach importance to applying policy tools to the whole process and all aspects in the development of big-data industry, especially promote the development and updating of big-data development policies in the future, and also pay attention to the coordination of between basic policy tools and the elements of data power value-chain to form a balanced toolbox combination. From the perspective of the choice and intensity of policy tools, it is necessary to consider maintaining the relative unity with the objectives of “Outline” policy, forming a strong policy system for data power strategy. In terms of policy supply and implementation, relevant departments need to maintain the necessary continuity with the “Outline” policy, fully implement the central strategic layout, and ultimately

achieve multi-party policy performance, and promote China to develop from big data country to data power country.

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