

# Research on science and technology policy theme clustering based on root theory

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**Abstract.** Taking 34 science and technology policy documents issued by Hubei Provincial Government in 2013-2020 as analysis samples, the qualitative research method was used to analyze the theme clustering of science and technology policies. Then, the science and technology policy system was sorted out based on the policy text, and the theme clustering model of science and technology policy was obtained. It is concluded that science and technology policies can be understood from function dimension and effect dimension, function dimension mainly reflects the function of science and technology policies, and effect dimension mainly reflects the supply, demand and environmental effect of science and technology policies.

**Keywords:** Science and technology policy; rooted theory; theme clustering

## 1. Introduction

In his report to the 19th CPC National Congress, General Secretary Xi Jinping pointed out that innovation is the primary driving force for development and the strategic support for building a modern economic system. In the comprehensive implementation of the innovation-driven strategy, science and technology policy has become a systematic tool for the national, regional, corporate level and research level to promote the development of science and technology and realize the national strategic goals, covering many policies such as science, technology and innovation. At present, the academic circle has paid general attention to the composition and function of the science and technology policy system.

### 1.1 Literature review

On the whole, the research has generally recognized the importance of science and technology policy, and the research on the construction of science and technology policy system also has certain results. At present, the construction of the science and technology policy system is mainly divided into two categories.

The first classification of science and technology policy system is science policy, technology policy and innovation policy. In Gong Li [1] and others, the focus of scientific policies is to produce scientific knowledge, whose functions including funding research institutions and carrying out higher education. Guo Xu [2] and others pointed out that the focus of technology policy is on the development and commercialization of industrial technology, whose functions include public procurement, formulating technical standards, strengthening the association between industry and science, etc. Zheng Qiong'e [4] and others proposed that the focus of innovation policies is the overall performance in economic development, whose functions include education and training, achievement transformation, etc.

The second classification method of science and technology policy system covers supply policy, demand policy and environmental policy. Xie Qing [5], Kuckertz [6] and others pointed out that supply policies include financial support, human resources and infrastructure; Zhao Xiaoyuan [7] and Li Dan [8] proposed demand policies are mainly government procurement and technical standard policies. Feng [9] has pointed out that with the relatively high operation efficiency of science and technology policies, it will largely promote the early development of the industry.

Overall, the importance of science and technology policy is widely recognized, but the composition and functions of science and technology policies have not yet formed a systematic system.

Based on this, we want to further comb the theme of science and technology policies and provide decision-making ideas for scientific and reasonable science and technology policies; second, provide reference suggestions for identifying the functions, characteristics and effects of various innovation subjects and actively participate in the formulation and implementation of science and technology policies.

### 1.2 Theory of public governance and policy clustering

Human political history has experienced a development process from "rule" to "management", and then to "governance".The concept of "governance"originated in western countries in the 1990s.Economic globalization and the development of information society pose challenges to the traditional public administration mode, and they must call for a new governance mode.The theory of public governance was proposed and developed into one of the core analysis tools of public management along with the change of public administrative environment and government reform.

[10] Ma pointed out that public governance is the process and activity of multiple subjects to jointly manage public affairs based on diversified objectives.Public governance theory emphasizes the governance of a multiple subject. Under the theory of public governance, the governance subjects are diversified, the governance subjects depend on each other, and the governance objectives and means of governance are also diversified.Under the public governance system, government departments, enterprise departments and non-profit departments respectively play different functions and roles to jointly constitute an interdependent governance system.Therefore, when carrying out the spindle coding and selective coding of the theme clustering of science and technology policy, the logical system can be constructed based on the public governance theory.

## 2. Materials and Methods

### 2.1 Rooted theoretical research methods are introduced

Rooted theory is a new method of qualitative research proposed by Glass and Strauss in 1976. It is a systematic program to develop and inductively guide a certain phenomenon, which is still widely applied in various fields.It starts from the observed phenomenon, collects and sorts out the data around a certain problem, and then constantly decompose, summarize and develop the collected data, and then summarize the theory in a new way.In the data analysis stage, Strauss calls the analysis process of data in rooted theory coding, which refers to the operational process of decompose the collected written data, identify the phenomenon, conceptualize the phenomenon, and then re-abstract, improve and synthesize the concept as the category and the core category in the appropriate way.The purpose of its research is to establish a theory based on the data by describing the nature of the phenomena.The process of the study is shown in Figure 1.

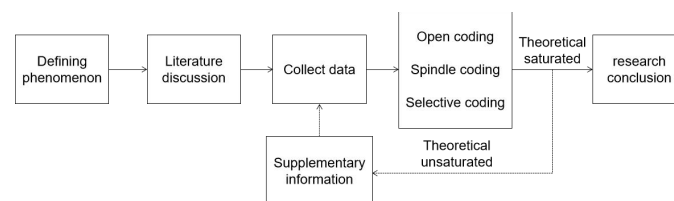


Figure 1 The procedure of the rooted theory

### 2.2 Datum source

Considering the cohesion, pertinence and representativeness of the policy analysis, the policy texts selected by this institute are all derived from the official public documents of 2013-2020, including the science and technology policies issued by various departments of the national level, Hubei Province and Wuhan City.Based on this, the source of the policy text of this study should meet the research needs of the study, and 34 relevant documents were sorted out in the past 7 years, some of which are shown in Table 1.

Table 1 Summary of the raw data

number	Policy name	Policy number	Post time
1	The General Office of the Provincial People's Government issued a notice on several measures to accelerate scientific and technological innovation to promote stable economic growth	Hubei government office issued (2020) No.26	May 19,2020
2	Hubei Provincial Department of Science and Technology issued a notice on the Implementation Plan for Scientific and technological Innovation to Support the resumption of work and production and smooth economic operation	Hubei Science and Technology Development Zone (2020) No.6	March 27,2020
3	Opinions of the General Office of the Provincial People's Government on the implementation of the multiplication plan of postdoctoral talents	Hubei government office issued (2019) No.47	August 16,2019
4	Notice of the General Office of the Provincial People's Government on the issuance and issuance of the implementation plan of relevant documents granting research institutions greater autonomy to personnel in Hubei Province	Hubei government office issued (2019) No.24	April 2nd, 2019
5	Notice of the General Office of the Provincial People's Government on Printing and Issuing the Implementation Plan for the Reform of the Science and Technology Award System in Hubei Province	Hubei government office letter (2018) No.56	July 25,2018
6	The General Office of the Provincial Party Committee and the General Office of the Provincial Government issued the Implementation Opinions on the Implementation of the Distribution Policy Guided by Increasing the Value of Knowledge	Hubei office article (2017) No.56	October 9,2017
...	...	...	...

### 3. Results & Discussion

After the data collection, it enters the coding stage of root theory, which is divided into three stages: open coding, spindle coding, and selective coding.

#### 3.1 Open code

Open coding is to gradually shrink the collected data, select meaningful words and sentences from the original material, give corresponding concepts to correctly reflect the content of the material, and summarize and reintegrate the abstract concepts, to form a new category to express

the content of the data. At this stage, its main purpose is to identify the phenomenon, define the concept and the discovery category. Because of the diversity of data sources, in order to reduce the repeated concept content, its concepts and categories need to be constantly investigated. Finally, this article open-encodes the collected data, and finally summarizes 28 concepts and 7 categories.

Table 2 Open Open Ending

Policy text	Subject refining	conceptualization	category
If in-the-job professional and technical personnel are employed as science and technology commissioners at or above the provincial level, their rank, establishment and salary (including allowance) shall be paid "three unchanged" ..... in the original unit	<p>To improve the selection of scientific and technological personnel</p> <p>To improve the security of scientific and technical personnel</p> <p>To increase the motivation of science and technology personnel</p>	<p>A1 Talent selection</p> <p>A2 Talent appointment</p> <p>A3 Talent development</p> <p>A4 Talent incentive</p>	A Sci & tech talent policy
We will coordinate the implementation of provincial scientific and technological innovation projects, arrange 260 million yuan to implement a number of provincial scientific and technological innovation projects, and promote the domestic replacement of key products in the industrial chain...	<p>To get high-level projects on the ground</p> <p>To facilitate the declaration of scientific and technological projects</p> <p>To support the development of science and technology projects</p>	<p>B1Project landing</p> <p>B2Project application</p> <p>B3Project operation</p> <p>B4Project support</p> <p>B5 Project acceptance check</p>	B Sci & tech project policy
The post-subsidy for special funds of provincial science and technology plan includes: pre-project subsidy, post-incentive subsidy, post-subsidy for science and technology innovation platform and post-sharing service subsidy...	<p>Special Fund subsidy</p> <p>Competitive Allocation of special funds</p> <p>Pre and post subsidies</p>	<p>C1 Application for funding</p> <p>C2 Fund and investments</p> <p>C3 Fund and investments</p>	C Sci & tech funding policy

		management  C4 Financial aids	
We will change the structure and mode of government investment in science and technology. Basic research projects mainly adopt pre-funding, free support, continuous and stable support...	To change the structure and mode of financial investment in science and technology  To standardize project budget preparation  Timely disbursement of project funds	D1 Financial Appropriation  D2 Tax Preference  D3 Subsidy Incentive  D4 Special Fund	D Sci & tech fiscal and tax policies
Establish and improve a sound science and technology management information system. Promote the construction of a unified science and technology plan information management platform for the province, and promote the informatization, network and intelligence of the whole process of management of science and technology management	To improve selection of experts and talents  To improve the resource pool expert pool  To improve the management information system of science and technology	E1 Public service  E2 Infrastructural construction  E3 Talents and experts promotions  E4 Fund and investments	E Supply-oriented policy
Platform and environmental construction projects are mainly supported through government purchase of services, post-performance evaluation subsidies and other ways	To attract top-level talents and experts  To strengthen cooperation between the government and enterprises  To support the development of the entire science and technology industry	F1 Experts and talents acquisition  F2 Government purchases  F3 Overseas export	F Demand policy
We will strengthen the optimal allocation and open sharing of scientific resources, improve the investigation mechanism and joint evaluation	Innovation of system	G1 Finance and taxation convenience  G2 Resource	G Environmental policy

mechanism for financial scientific and technological funds, prevent repeated purchase and idle waste, and provide open services in a unified way to the society	and mechanism  Intellectual property protection    Supervision of credit system	sharing  G3To perfect the system  G4 Comprehensive and broad advertisement	
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**3.2 Axial coding**

The next stage of open-ended encoding is the spindle decoding. The main task at this stage is to discover and establish various relationships between categories and reconstruct the resulting categories to new connections. The principle is to summarize the primary categories formed in the upper stage, and to form a number of main categories. That is, the process of finding the potential logical relationship between the various overview categories and connecting the various categories. After analysis, this paper summarizes science and technology talents, projects, funds and finance and tax as science and technology policy functions; science and technology policy, environmental policy and demand policy as science and technology policy effect.

**3.3 Selective coding**

The main purpose of selective coding is to choose the core category, and by establishing the relationship between the core category and other categories and concepts, it can also be connected at this stage, finally forming a complete theory. The core categories are identified by further consideration of the seven categories. Finally, we form a clustering model of science and technology policy theme in series according to the final category of the root theory, which can be expressed around these core categories and according to the public governance theory as follows:

At present, science and technology policies can be summarized from functional dimension and effect dimension. The function dimension of science and technology policy is scientific and technological talents, science and technology projects, science and technology funds, science and technology finance and taxation respectively. The talent policy represents a series of work arrangements introduced to promote and facilitate the attraction, training, use and retention of scientific and technological talents issued and implemented by government departments in a specific period. Project policy represents the policy support of the whole process of project science and technology project from application to implementation. Funding policy, in the aspects of investment, management and application of science and technology funds, the implementation of comprehensive funding support for the promotion of science and technology projects. Fiscal and tax policies provide policy support to promoting the development of science and technology from the macro financial support such as financial appropriations and tax incentives.

The effect dimension of science and technology policy is supply type, environment type and demand type respectively. Supply-based tools emphasize increasing investment through supply-side reform, improve the supply and demand situation related to talents, and directly promote the development of innovative and entrepreneurial talents. Environmental tools emphasize the

construction of a benign development environment for innovative and entrepreneurial talents through indirect or abstract policy means, and thus give full play to the positive influence of its butterfly effect and group effect. Demand-based tools emphasize to stimulate the endogenous power of the existing talent market through the demand-side reform, and to drive the talent cause to become the coordinated development mode of "introducing" and "holding the hand".

The two-dimensional model of impact effect synthesis is shown in Figure 2.

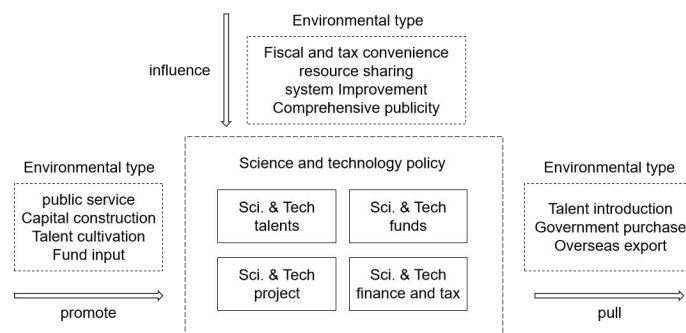


Figure 2 Science and technology Policy theme clustering model

### 3.4 Theoretical saturation test

After the completion of the tertiary coding of the rooted theory, the saturation test of the theory is conducted. When the new concepts or categories cannot be found in the collected data, the theory is saturated. If the theory is not saturated, we should continue to expand the new materials to find the new category improvement theory. The remaining data are used in the article to test the saturation of root theory. After material analysis, no new concepts and categories were found, which can explain the model saturation built by root theory.

## 4. Conclusions

This paper uses the qualitative research method to analyze how to cluster the topics of science and technology policies, and then based on the science and technology policy text in Hubei Province from 2013 to 2020, and obtains the theme clustering model of science and technology policy. It is concluded that science and technology policies can be mainly understood from the function dimension and effect dimension, function dimension mainly reflects the function of science and technology policies, and effect dimension mainly reflects the supply, demand and environmental effect of science and technology policies. Based on this, the following suggestions are put forward for the development of science and technology policy system construction:

First, from the four perspectives of science and technology talents, science and technology projects, science and technology funds, science and technology finance and taxation, to improve and supplement the existing science and technology policies in terms of finance and taxation. Improve the policy, introduce and implement the attraction, training, use and retention of innovation and entrepreneurial talents; provide policy support in the application to application, the implementation of science and technology investment, management, application, and the macro financial support from financial allocation and tax incentives.

Second, we will improve the science and technology policy system from the functional perspective of environment, supply and demand. Based on supply tools, the focus should still focus on talent training, especially to clarify the training mechanism of different types of talents. On this basis, we will ensure capital investment, actively respond to demand, improve service quality, and lay a solid foundation for talent development. On the other hand, it is also imperative to improve the whole-process government work responsibility system. Based on environmental tools, environmental tools mainly reflect the government policy incentive and care guidance, essence is supporting talent policy, so should broaden the policy design influence, through talent planning, regulation, financial, finance, preferential tax, policy measures to build benign self-discipline

cultivation environment, institutional environment, financial environment, organizational environment. Based on demand tools, first should supplement in quantity, followed by pay attention to talent structural demand, pay attention to the structural system of talent team construction, "open source" should be targeted, and talent development pay attention to according to their aptitude and mastery simultaneously, develop the talent itself compound diversity, do a versatile.

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