



Research on the Innovative Path of Talent Training Mode in the Public Sector under the Background of Digital-Intelligent Transformation

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Abstract. Digital-intelligent transformation has become the core driving force to reshape the public governance system and improve administrative efficiency, while the shortage of talents and insufficient digital literacy have become the key bottlenecks restricting the transformation process of the public sector. Based on Human Capital Theory, Technology Empowerment Theory and Collaborative Governance Theory, this paper reveals four major dilemmas in the current talent training mode: mismatched demand, single supply, rigid mechanism and weak guarantee. On this basis, a four-dimensional innovation framework of precise demand, diversified supply, coordinated mechanism and institutionalized guarantee is constructed, and specific innovation paths are proposed from five dimensions: talent portrait construction, training content upgrading, training mode innovation, coordination mechanism establishment and institutional system improvement. Finally, the talent training practice of the Government Service Data Administration of Province Z is taken as a case for verification, providing theoretical reference and practical enlightenment for the public sector to solve the dilemma of digital-intelligent talents and build a talent training system adapted to transformation needs.

Keywords: Digital-intelligent Transformation; Public Sector; Talent Training

1 Introduction

At present, the digital-intelligent transformation of China's public sector has entered a deep-water zone, and is gradually achieving a key leap from technology application to governance integration. However, the structural contradiction between talent supply and transformation demand has become increasingly prominent. On the one hand, the state has issued policy documents such as National Strategic Outline for Digital Economy Development, Guiding Opinions on Accelerating the Integrated Development of Manufacturing Industry and the Internet, Education Informatization 2.0 Action Plan and Digital Strategy Action Plan for Higher Education, proposing to drive economic transformation with a new generation of information technology, promote

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the supply-side structural reform of education, and accelerate the cultivation of high-quality compound talents for the future. These policies not only outline the strategic blueprint for national digital transformation, but also point out the direction for the reform of higher education[1]. On the other hand, the introduction and cultivation of digital-intelligent professionals are facing multiple dilemmas. The talent gap in key fields such as digital technology, data analysis and network security in the public sector has reached millions, and the practical problems of being unable to attract, retain and make good use of talents are widespread. In the latest Classification of Occupations of the People's Republic of China (2022 Edition), 158 new occupations are added, and 97 digital occupations are marked for the first time. In July 2024, the Ministry of Human Resources and Social Security and other departments issued 19 new occupations, more than half of which are "digital-intelligent" occupations keeping up with cutting-edge technologies, closely related to the development of new quality productive forces. The accelerated evolution of occupational connotation has exacerbated the contradiction between supply and demand in digital talent training and digital skill improvement[2]. The talent shortage has become the core bottleneck restricting the digital-intelligent transformation of the public sector from formalization to substantiation, and it is urgent to build a new talent training model adapted to transformation needs.

Foreign research on the training of digital-intelligent talents in the public sector started early and has formed three clear research contexts: first, focusing on the core connotation of digital literacy and the construction of evaluation system; second, exploring diverse practical modes of talent training; third, paying attention to institutional guarantee and incentive mechanism construction. Domestic relevant research has shown a rapid growth trend in recent years, focusing on three core research directions. First, research on the reform of talent demand in the public sector driven by digital-intelligent transformation. Scholars generally believe that public sector talents in the digital-intelligent era need to have core competencies such as digital technology application ability, data analysis ability, cross-border collaboration ability and innovative thinking. Second, problem diagnosis of the existing talent training mode. Research points out that the current training work has prominent problems such as vague training objectives, disconnection between content and practice, single training mode and imperfect coordination mechanism. Third, preliminary exploration of training mode innovation. Scholars have put forward ideas such as collaborative training of universities, governments and enterprises, online and offline mixed training, and customized precise training.

Digital technologies with big data, artificial intelligence and blockchain as the core are profoundly reshaping the form of social production and life. As the core subject of social governance, the public sector is facing the era proposition of technology-enabled governance. The United Nations Digital Government Assessment Report (2022) points out that digital intelligence has become a key starting point to improve government service efficiency, optimize the allocation of public resources and enhance social governance capacity, and more than 80% of countries around the world have included digital government construction in their national strategies. China also takes digital-intelligent transformation as an important support for the modernization

of the national governance system and governance capacity. The 14th Five-Year Plan for Digital Economy Development clearly proposes to cultivate strategic talents and high-level innovation teams in the digital field, and expand the team of high-level engineers and technical skills talents, pointing out the direction for the training of digital-intelligent talents in the public sector.

Although the existing research has achieved certain results, there are still significant research gaps: first, the lack of systematic theoretical support. Most existing studies focus on single-dimensional problem and countermeasure analysis, and have not constructed a holistic and systematic theoretical framework for the training mode; second, insufficient practical pertinence. Most existing path suggestions are macro qualitative descriptions, lacking operable implementation frameworks and detailed rules; third, insufficient case verification. Most studies lack in-depth analysis of specific cases, making it difficult to fully verify the feasibility and practical effect of the paths. The research significance of this paper is mainly reflected in two levels: theory and practice. At the theoretical level, based on the interdisciplinary perspective of administrative management and human resource management, this paper systematically sorts out the influence mechanism of digital-intelligent transformation on the talent competency structure of the public sector, and enriches the application scenarios of Human Capital Theory in the digital era; by constructing a four-in-one talent training innovation framework, it makes up for the lack of holistic and systematic construction of the digital-intelligent talent training mode in the public sector in existing research, and provides a new analytical perspective for relevant theoretical research. At the practical level, aiming at the practical dilemmas of digital-intelligent talent training in the public sector, this paper puts forward operable innovation paths and implementation strategies, which can provide direct reference for government departments at all levels, public institutions and other public organizations to opti-

2 Theoretical Basis of Public Sector Talent Training under the Background of Digital-Intelligent Transformation

2.1 Human Capital Theory

Proposed by Schultz, the core view of Human Capital Theory is that talents are the core capital of economic and social development, and the quality of human capital can be improved through investment in education, training, etc., thereby promoting efficiency improvement and development transformation. Digital-intelligent transformation is essentially the in-depth integration of technology and governance, and human capital is the core carrier to realize this integration. The digital-intelligent transformation of the public sector needs to invest a lot of resources in the cultivation of digital literacy, technical skill training and innovative ability development of talents, so as to realize the leap of governance efficiency by improving the digital content of human capital.

2.2 Technology Empowerment Theory

Technology Empowerment Theory holds that digital technology is not only an instrumental existence, but also can reconstruct organizational processes, optimize resource allocation and enhance subject capabilities. In the talent training of the public sector, technology empowerment is reflected in two dimensions: first, the empowerment of training tools, that is, through big data, artificial intelligence, online learning platforms and other technologies, to realize the accurate identification of training needs, personalized push of training content and real-time evaluation of training effects; second, the empowerment of ability improvement, that is, through technology application practice, to improve talents' digital technology operation ability, data analysis ability and technological innovation ability.

2.3 Collaborative Governance Theory

Collaborative Governance Theory emphasizes that the solution of complex public problems requires the collaborative cooperation of multiple subjects such as government, market and social organizations, so as to maximize governance efficiency through resource sharing and shared responsibility. Digital-intelligent talent training is cross-field, cross-departmental and high-investment, and a single subject cannot meet all needs: government departments master policy resources and training demand information, universities have the advantages of theoretical teaching and talent reserve, and enterprises have technical practice and training resources.

2.4 New Public Management Theory

New Public Management Theory advocates optimizing public sector management with performance orientation, service core and market mechanism. Under the background of digital-intelligent transformation, the talent training of the public sector should take improving governance performance and public service quality as the core goal, and abandon the traditional training mode that emphasizes form over effectiveness.

3 Reform of Talent Competency Demand in the Public Sector Caused by Digital-Intelligent Transformation

3.1 Reconstruction of Core Competency Structure

Digital-intelligent transformation is promoting a profound reform of the talent competency structure in the public sector, and its core evolution direction is from the traditional administrative ability-led model to a trinity system of digital literacy, professional ability and innovative ability. Specifically, this competency system includes six core dimensions: first, digital basic literacy is the prerequisite support, requiring practitioners to have basic cognition of digital technologies such as big data, artificial

intelligence and blockchain, and be proficient in using basic applications such as digital office tools and government service platforms to lay the foundation for digital work; second, data analysis ability is the core driving force, requiring the ability to collect, sort out and analyze government data, accurately identify key problems in governance practice through data mining, and provide scientific support for decision-making optimization; third, technology application ability is the key to practice, emphasizing the in-depth integration of digital technology and specific government affairs scenarios; fifth, innovative thinking ability is the core of development, requiring breaking the traditional administrative thinking stereotype, exploring new governance models and expanding new service paths supported by digital technology, so as to realize the innovation and upgrading of governance concepts and practices; sixth, cyber security literacy is the bottom line requirement, requiring basic cyber security awareness and protection capabilities to build a secure line of defense for government data and system operation.

3.2 Changes in the Characteristics of Talent Demand

There are significant differences in the progress of digital-intelligent transformation in public sectors at different levels and in different fields, which makes the competency demands of talents in various departments show obvious differentiation. Grassroots public sectors focus more on the practical application ability of digital technology of talents, while higher-level public sectors emphasize more on data analysis and decision support ability, so it is necessary to achieve precise matching between talent supply and demand. The rapid iteration of digital technology and the continuous deepening of digital-intelligent transformation in the public sector lead to the dynamic evolution of the competency requirements for talents. This characteristic determines that talent training needs to abandon the solidified model and establish a dynamic adjustment mechanism adapted to demand changes, so as to ensure that talent supply can respond to the needs of transformation and development in real time.

At present, the professional background requirements for talents in the digital-intelligent transformation of the public sector have broken through the limitations of a single field, and tend to absorb compound talents such as digital technology and public management, data analysis and business fields. Such talents have cross-border integration capabilities, which can better meet the diverse application scenario needs in the process of digital-intelligent transformation and provide comprehensive competency support for transformation practice.

4 Current Situation and Dilemmas of Digital-Intelligent Talent Training in the Public Sector

4.1 Current Training Situation

Policy Support is Gradually Strengthened. A series of guiding policies have been issued at the central and local levels, such as Overall Layout Plan for Digital China

Construction and Civil Servant Digital Literacy Standards (2023), which clarify the core objectives and specific requirements of digital-intelligent talent training.

Training Forms are Initially Enriched. At present, a trinity digital-intelligent talent training system of university training, on-the-job training and talent introduction has been constructed.

The Collaborative Training Mode has Emerged. Some provinces and cities have begun to actively explore the government-university-enterprise collaborative training mechanism, and improve the effectiveness of talent training through resource integration and complementary advantages.

4.2 Core Dilemmas

Vague Identification of Talent Demand and Lack of Precise Portrait. Most public sectors have not established a systematic and perfect digital-intelligent talent demand research mechanism, and lack a clear definition of digital literacy standards and specific skill requirements for different positions, which directly leads to vague talent training objectives and disconnection between training content and actual demand.

Single and Solidified Training Content and Difficult Quality Guarantee. The problems on the supply side are more prominent, and there are obvious deficiencies in training content, methods and teacher allocation, which are difficult to meet the high-quality demand for digital-intelligent talent training.

In terms of training content, the existing training mostly focuses on theoretical teaching, with a low proportion of practical and scenario-based content, and the practical courses directly related to actual work such as data analysis and digital technology application account for a small proportion. In terms of training methods, traditional offline centralized teaching and online recorded courses are still the main ones, and the application of new training methods such as interactive, immersive and practical training is extremely low. There are also shortcomings in the construction of the teaching staff. At present, most of the teachers are scholars in the field of public administration or backbones of internal government services, while the proportion of enterprise experts and technical backbones with rich practical experience in digital technology is extremely low. The singleness of the teaching staff structure is difficult to support the training needs of compound digital-intelligent talents.

Imperfect Collaborative Cooperation Mechanism and Insufficient Resource Integration Efficiency.

The core problem in this field is the lack of collaborative force, poor coordination mechanism between various subjects and departments, and low efficiency of resource integration and utilization. First, insufficient subject collaboration. There is no stable and long-term cooperation mechanism between the government, universities and en-

terprises, showing a discrete state of fighting alone. Some local governments still focus on publicity rather than implementation in the implementation of industry-education integration policies, lacking talent training plans, resource injection plans and mechanism guarantees, and failing to give full play to the guiding role[3].

In addition, the resource sharing mechanism is not yet sound. Key educational resources such as digital teaching resources, training bases and high-quality teachers have not been effectively shared across regions and departments, eventually resulting in a structural contradiction between idle waste of resources in some regions and supply shortage in others.

Imperfect Institutional Support System and Unformed Long-term Training Mechanism.

The construction of various supporting systems for digital-intelligent talent training lags behind, lacking a perfect support system, making it difficult for the long-term training mechanism to be implemented.

In terms of policy guarantee, the supply of targeted talent training policies is insufficient. Key policies such as special fund guarantee, incentive for the introduction of technical teachers, and recognition of training credits are either missing or have not formed perfect implementation rules; some policies are macro-oriented and lack operability, making it difficult to implement effectively.

5 Conclusion

Combined with the analysis of the practical dilemmas of digital-intelligent talent training in the public sector above, based on relevant theoretical basis and drawing on domestic and foreign practical experience, this paper constructs a four-dimensional innovation framework of precise demand, diversified supply, coordinated mechanism and institutionalized guarantee. The specific innovation paths are as follows:

5.1 Precise Demand

First, the state needs to strengthen overall planning, gather data resources of education, industry and other departments, and establish a data co-construction and sharing mechanism on the premise of confidentiality and security. Based on the talent literacy model and demand database, establish a personal exclusive digital literacy file for each staff member, carry out matching evaluation of personal ability and post demand, and accurately locate ability shortcomings; combined with the organizational digital-intelligent transformation strategic objectives, formulate personalized training plans to achieve one-person-one-policy precise training, and promote the in-depth integration of personal development, post demand and organizational strategy. Second, give full play to the role of new technologies in talent demand prediction, post-person matching analysis, etc. Taking Civil Servant Digital Literacy Standards (2023) as the core basis, divide levels by management posts, business posts and technical posts, and categories by government services, market supervision, social governance,

public security and other fields, and clarify the core indicators of digital literacy for different posts. Accelerate the development and iteration of algorithm models to provide technical support for scientific industrial talent demand prediction and trend judgment. Third, accelerate the application of data achievements, establish a data linkage analysis mechanism between education, employment and industry, and make full use of analysis and prediction results to achieve the goals of advanced layout of industrial needs and accelerate the promotion of high-quality employment. The demand list is updated every six months, and the talent training objectives and core content are dynamically adjusted in combination with the progress of digital-intelligent transformation and the pace of technology iteration to ensure that the training work is synchronized with the actual demand[4].

5.2 Diversified Supply

Customized Training Content Design.

(1) Construction of modular curriculum system. Build a four-level curriculum system of basic level, application level, improvement level and innovation level, with several modular courses set at each level. Students can independently select suitable courses according to their post needs and ability shortcomings to achieve differentiated learning goals.

(2) Development of scenario-based practical content. Focusing on core work scenarios such as government services, emergency management and urban governance, develop practical courses such as government data visualization analysis, artificial intelligence approval process optimization, and blockchain government data sharing, introduce real work cases and government data for practical teaching, and strengthen the connection effect between theory and practice.

(3) Construction of dynamic update mechanism. Jointly establish a curriculum update committee with universities and technology enterprises, continuously track the development trend of digital technology and the transformation demand of the public sector, and update no less than 20% of the curriculum content every quarter to ensure the timeliness and forward-looking of training content.

Innovation of Diversified Training Methods.

(1) Mixed training mode. Integrate online and offline teaching resources, provide fragmented curriculum resources online relying on the National Civil Servant Network College and local government digital learning platforms, and carry out offline activities such as centralized training, case discussion and cross-departmental exchange; introduce live teaching, interactive Q&A and other forms to improve students' participation and learning experience.

(2) Practical training mode. Cooperate with technology enterprises and universities to build a digital-intelligent talent training base, implement a practical training mode of real projects and mentor guidance, organize students to participate in practical projects such as government APP development and government data analysis, and effectively improve practical application ability.

(3) Cross-border training mode. Implement cross-departmental job rotation and government-enterprise exchange system, select staff of the public sector to work in technology enterprises for temporary study, and introduce enterprise digital technology talents to work in government departments for a short time to realize two-way exchange and ability complementation of government-enterprise talents.

(4) Immersive training mode. Use virtual reality and augmented reality technologies to build virtual government scenarios, carry out immersive training, simulate practical processes such as emergency event data processing and government decision-making, and improve students' response ability in complex scenarios.

Construction of Professional Teaching Staff.

(1) Construction of trinity teacher database. Integrate three core teaching forces: government business backbones, university professional scholars and enterprise technical experts, with enterprise technical experts accounting for no less than 40%; establish strict teacher access standards and assessment and evaluation mechanisms to ensure that the teaching staff has both solid theoretical foundation and rich practical experience.

(2) Teacher ability improvement plan. Regularly organize teachers to participate in special digital technology training, cross-disciplinary academic exchanges and other activities to systematically improve their digital literacy and teaching ability; encourage teachers to deeply participate in the digital-intelligent transformation project practice of the public sector, accumulate practical experience, and strengthen the relevance between teaching and actual work.

(3) Flexible talent introduction mechanism. Introduce well-known experts in the digital field at home and abroad as training lecturers through project cooperation, short-term employment, visiting professor appointment and other ways to make up for the shortcomings of local teachers in cutting-edge technologies and enrich the supply of teaching resources.

5.3 Coordinated Mechanism

Build a Multi-coordination Platform.

(1) Establish a collaborative training leading group. Led by the government personnel department, absorb representatives of universities, enterprises and social organizations to participate, responsible for formulating the overall plan of talent training, clarifying the rights and responsibilities of all parties, coordinating and solving various difficult problems in the cooperation process, and ensuring the orderly progress of collaborative training.

(2) Sign long-term strategic cooperation agreements. The government signs targeted talent training agreements with universities, sets up customized professional directions, and constructs a closed-loop training system of enrollment, training and employment; signs training cooperation agreements with enterprises to jointly build and share training bases, technical resources and teachers to achieve complementary advantages.

(3) Establish a benefit sharing mechanism. Clarify the investment and return rights and interests of the government, universities, enterprises and social organizations in talent training, and form a win-win cooperation pattern.

Strengthen Cross-departmental Linkage within the Public Sector.

(1) Establish a cross-departmental collaborative working group. Composed of personnel department, business department and technical department staff, the personnel department is responsible for overall coordination of training organization, the business department provides post demand and scenario support, and the technical department provides technical support and professional guidance, so as to build a work operation mechanism with clear division of labor and efficient collaboration.

(2) Implement the dual-mentor system of business and technology. Equip each participating student with a business mentor and a technical mentor. The business mentor is responsible for guiding students to integrate digital technology with specific business work, and the technical mentor focuses on improving students' digital technology application ability, so as to help students improve their ability in an all-round way.

Build a Cross-regional Resource Sharing Mechanism.

(1) Build a digital resource sharing platform. Integrate core educational resources such as high-quality digital courses, training base resources and teacher information in various regions, establish a national or regional digital-intelligent talent training resource bank for the public sector, break regional barriers, and realize efficient cross-regional resource sharing.

(2) Establish a regional cooperation alliance. Encourage the formation of talent training cooperation alliances between provinces and cities, carry out joint training, teacher exchange, student exchange and other activities, effectively integrate high-quality resources in the region, reduce training costs, and improve the overall quality and efficiency of talent training.

5.4 Institutionalized Guarantee

Establish a Unified Training System.

(1) Link training credits directly with civil servants' assessment, promotion, evaluation and commendation. First, optimize the quality standards of talent training in terms of evaluation content, establish the value concept that literacy is more important than scores, and highlight the evaluation of complex problem-solving ability, technological innovation ability, human-machine collaboration ability and professional literacy.

(2) Second, pay attention to effectively integrating representative industry enterprises, social organizations and other external institutions into the education and teaching evaluation system in terms of evaluation subjects, evaluate the curriculum setting, professional construction and graduation design of schools from the perspective of social demand, attach great importance to feedback from society and employers, and build an evaluation system with multiple subjects such as government, enter-

prises, universities and third-party institutions. Finally, pay attention to balancing summative evaluation and developmental evaluation in terms of evaluation methods, and actively explore value-added evaluation[5].

Optimize Incentive and Restraint Mechanism.

(1) Strengthen positive incentives. Give commendation and rewards, priority promotion, special allowances and other incentives to talents with outstanding digital literacy and remarkable achievements in digital-intelligent transformation work; give credit rewards, priority opportunities for further study and training to students who actively participate in training and perform excellently, so as to fully mobilize the enthusiasm of participants.

(2) Improve reverse restraint mechanism. Take interview reminders, post adjustment and other measures for staff who fail to meet the basic requirements of digital literacy and do not participate in necessary training without justifiable reasons; circulate a notice of criticism to departments with ineffective implementation and poor results in talent training, and link it with department performance assessment to compact the responsibility of training work.

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