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The Logical Construction and Implementation Mechanism of Full-Chain Synergy in Science and Technology Talent Policy

--A Qualitative Analysis Based on Qingyuan City

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Abstract

Against the backdrop of the "Talent-Strong Nation" strategy, regional competition for talent is intensifying. However, local science and technology talent policies commonly suffer from "fragmentation" and "policy silos," which sever the intrinsic links between the four key stages of talent work—"attraction, cultivation, retention, and utilization"—leading to low policy efficacy. This paper focuses on the systematicness and integration of talent policy, taking Qingyuan City as a typical analytical field. Using qualitative research methods, it deeply analyzes the internal logic and practical dilemmas of "full-chain synergy" in science and technology talent policy. The study posits that full-chain synergy is a necessary requirement driven by four logics: the value logic of responding to the "holistic" needs of talent throughout their life cycle; the functional logic of ensuring the "emergent" realization of the policy system's functions; the objective logic of reducing "dual" transaction costs for both talent and market entities; and the governance logic of advancing the "holistic governance" paradigm shift. However, the case analysis of Qingyuan City reveals four practical dilemmas: cognitive barriers of "prioritizing attraction over cultivation, retention, and utilization"; structural barriers of overlapping and fragmented functions; instrumental misalignment between the policy chain and the industrial chain; and operational blockages in information and evaluation mechanisms. To address this, the paper proposes implementation pathways to construct full-chain synergy from a mechanism design perspective: First, constructing a synergistic governance architecture centered on unified rights and responsibilities to achieve holistic top-level design. Second, reshaping a closed-loop operational system based on process re-engineering to achieve seamless process management. Third, anchoring a precise linkage objective guided by industrial demand to achieve a high fit between policy and needs. Fourth, establishing a long-term evaluation orientation supported by systematic assessment to achieve systemic incentive-constraint alignment. This research aims to provide theoretical reference and practical insights for local governments seeking to optimize their talent policy systems and build high-level talent ecosystems.

Keywords

Science and Technology Talent; Policy Synergy; Full-Chain; Attraction, Cultivation, Retention, and Utilization; Logical Construction; Qualitative Analysis; Qingyuan City.

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1. Introduction

Talent is the strategic resource for national revitalization and for gaining a proactive stance in international competition. The report of the 20th National Congress of the Communist Party of China placed "talent-led development" in a vital position within the overall modernization drive, highlighting the extreme importance of talent in national development. Against this backdrop, regions across the country have successively adopted "Talent-Strong City" and "Talent-Strong Province" as core development strategies, and the regional competition for science and technology (S&T) talent has entered a white-hot phase. In practice, however, local talent policy systems often exhibit significant characteristics of "fragmentation" and "horizontal and vertical segmentation."

Current talent policies are mostly led by different functional departments (e.g., Organization, Human Resources and Social Security (HRSS), S&T, Education, Industry and Information Technology), each acting independently. This results in policy tools being disconnected across the four key stages of "attraction, cultivation, retention, and utilization," thus forming "policy silos" [1]. For example, some regions spend heavily on "attracting talent" but lack systematic "cultivation" and "utilization" mechanisms, leading to talent "failing to acclimatize" or being "attracted but not used." Some regions focus on "cultivation" (such as building university towns) but ultimately "make wedding dresses for others" due to a poor "retention" environment and insufficient industrial absorption capacity, resulting in a persistent "brain drain" phenomenon. This "treating the head for a headache, treating the foot for a footache" policy model may seem to be "blossoming at multiple points" on the surface, but at a deeper level, it severs the organic chain of talent development. This not only causes significant waste of administrative resources but also severely undermines the overall efficacy of the policies, failing to create sustained appeal and cohesion for high-level talent.

The academic community has achieved fruitful results in talent policy research, but limitations persist. Existing research has largely focused on policy analysis of a single stage—such as the incentive effects of "attraction" policies, the industry-education integration models for "cultivation," or the environmental factors for "retention"—or has emphasized quantitative evaluation of policy effects, such as the contribution of talent inflow to regional innovation. However, few studies have adopted the perspectives of systems theory and holistic governance to deeply explore the internal mechanisms of "why to synergize" and "how to synergize" across these four stages. In particular, there is a lack of in-depth, practice-based qualitative analysis that reveals the real-world dilemmas and institutional obstacles policy synergy faces at the grassroots level. The theoretical explanation of "why synergy is necessary" remains insufficient, and the practical pathways to "how it is achieved" remain vague.

This paper attempts to bridge this research gap. The core research questions are: In the practice of local governance, what is the theoretical necessity (i.e., logical construction) for the "full-chain synergy" of S&T talent policy? In reality (using Qingyuan City as a case), what are the institutional dilemmas hindering its implementation? And how can effective implementation mechanisms be constructed to move from "fragmented" governance to "integrated" synergy?

To answer these questions, this study selects Qingyuan City, Guangdong Province, as its case for analysis. The case of Qingyuan is highly typical: First, located in northern Guangdong, Qingyuan is a key node in the province's "Hundred-Town, Thousand-County, Ten-Thousand-Village' Project" and a major recipient of industrial transfer from the Pearl River Delta. Its "Manufacturing as the Mainstay" strategy creates an urgent demand for S&T talent. Second, Qingyuan is adjacent to Guangzhou, a "talent highland," facing both the immense pressure of the "siphoning effect" and the "first-mover" advantage of capturing talent spillover. Third, as a late-developing, catch-up city, Qingyuan is not burdened by deep historical policy paths, giving it both the possibility and the necessity for "corner-overtaking" and institutional innovation.

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Therefore, Qingyuan's talent policy practice provides an excellent "typical case" for observing how a developing region attempts to build a systematic talent policy framework to overcome its "talent bottleneck."

This study will employ qualitative research methods. Through deep coding analysis of Qingyuan's policy texts, supplemented by (simulated) in-depth interview data from relevant stakeholders (including government officials, enterprise managers, and high-level talent representatives), it will conduct a "thick description" of the current state of synergy in Qingyuan's talent policy. Building on this, using an analytical approach derived from Grounded Theory, the study will distill the core obstacles impeding "full-chain synergy" and subsequently construct mechanisms for its realization. The theoretical contribution of this study lies in its attempt to build an analytical framework for "full-chain synergy" in talent policy, revealing its internal generative logic and operational mechanisms. Its practical contribution is to provide a systematic policy optimization plan for Qingyuan and other local governments facing similar dilemmas to transition from "fragmentation" to "synergy."

2. Conceptual Definition and Literature Review

2.1. Definition of Core Concepts

Science and Technology (S&T) Innovation Talent

In this paper, S&T innovation talent, as distinct from general talent, refers to core human capital that possesses high-level professional skills and innovative capabilities, capable of leading and supporting regional industrial upgrading and S&T progress. This category includes not only traditional scientists and engineers in research institutes but also high-level R&D personnel and Chief Technology Officers (CTOs) in enterprises, as well as technology entrepreneurs and high-skilled craftspeople familiar with market operations.

The Full Policy Chain: "Attraction, Cultivation, Retention, and Utilization"

"Attraction, cultivation, retention, and utilization" are widely recognized as the four core stages of talent work, jointly forming a complete talent life-cycle management chain.

"Attraction": Refers to attracting desired talent from outside the region (both internationally and domestically) by formulating preferential policies, building career platforms, and optimizing the service environment. This is the "entry" management for talent.

"Cultivation": Refers to the training and capacity-building of existing and potential talent within the region (such as students) through higher education, vocational training, industry-university-research cooperation, and project-based experience. This is the "stock value-add" and "reserve supply" of talent.

"Retention": Refers to ensuring talent is willing to stay long-term by providing competitive compensation and benefits, broad career development prospects, a livable living environment, and a social atmosphere of respect. This is the "stabilizer" for talent.

"Utilization": Refers to establishing scientific talent evaluation, incentive, and mobility mechanisms to ensure that talent is properly placed and their potential is fully realized, achieving maximum alignment between talent value, organizational goals, and regional development. This is the "exit" and ultimate purpose of talent work.

Policy Synergy

Policy synergy, derived from Synergy Theory, emphasizes that elements (subsystems) within a system interact to produce an overall effect greater than the sum of their individual parts (a "1+1>2" effect) [2]. The "policy synergy" discussed in this paper is distinct from simple "policy coordination" or "policy cooperation." Coordination and cooperation are often temporary, passive, and shallow, aimed at resolving immediate conflicts. Synergy, in contrast, is strategic, proactive, and deep, aimed at achieving common strategic goals. It does not refer to temporary

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compromises or information sharing between departments. Instead, it signifies a deep systemic coupling, functional complementarity, and process alignment among different policy tools, implementing bodies, and resource allocations across the four stages of "attraction, cultivation, retention, and utilization," all aimed at a common talent strategy. The goal is to form an organic policy ecosystem that is structurally complete, functionally complementary, and operationally efficient.

2.2. Literature Review

Fragmented Research on the "Four Stages" of Talent Policy

A review of the existing literature shows that academic research on talent policy has largely followed the "attraction, cultivation, retention, utilization" framework, but with a significant "fragmented" research tendency. In "attraction," research has focused on comparing talent acquisition policy texts (e.g., the effects of material incentives like "talent titles," settling-in fees, and research start-up funds) and analyzing the drivers of cross-regional talent mobility [3]. Scholars have found that the marginal effect of purely material incentives on high-end talent is diminishing, with career platforms and development opportunities becoming more critical factors. In "cultivation," research has mainly explored reforms in university talent-training models, industry-education integration mechanisms, and the growth paths for local talent, particularly how to overcome the "two-skins" problem of disconnection between cultivation and utilization. In "retention," the research perspective has gradually shifted from early-stage salary satisfaction to non-economic factors such as organizational justice, career management, work-life balance, and urban "livability" [4]. Research indicates that the "soft environment" and a "sense of belonging" have a significant impact on the retention willingness of talent, especially the new generation. In "utilization," research hotspots focus on the "breaking the five 'onlys'" (only-paper, only-title, only-degree, only-award, only-hat) reform, the diversification of talent evaluation systems, and the "unfettering" and empowerment of researchers.
This fragmented research path, while providing deep insights within each respective area, overlooks the indivisible internal connections among the four stages. Talent's decisions are comprehensive, and a "short plank" in any one stage can lead to the failure of the entire talent policy system.

Research on Policy Synergy and Holistic Governance

Policy synergy is a key topic in public administration. Scholars have explored the obstacles and drivers of cross-departmental synergy from various angles. Early research identified departmentalism, budget barriers, and different organizational cultures as major obstacles. The rise of "Holistic Governance" theory provided a theoretical weapon to crack "fragmented" governance. This theory emphasizes achieving "seamless government" services by restructuring government, integrating information systems, and re-engineering business processes [5]. In recent years, Chinese scholars have also begun to apply the concept of holistic governance to the Chinese context, exploring synergistic governance models within the "tiao-kuai" (vertical-horizontal) system [6]. Research has found that within China's governance framework, strong political impetus (e.g., high-level leading groups) and the application of information technology (e.g., "one-stop government services") are important means of achieving cross-departmental synergy [1]. However, research that systematically applies holistic governance theory to the field of talent policy, especially in-depth analysis of the full-chain synergy mechanism of "attraction, cultivation, retention, and utilization," is still rare.

Research Gaps and This Paper's Entry Point

In summary, the "gaps" in existing research are mainly twofold: First, in terms of research content, "fragmented" research outnumbers "integrated" research, lacking a systematic exploration of the synergistic effects and internal mechanisms among the four stages. Most literature stops at calling for synergy, failing to deeply answer the theoretical logic of "why

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synergize" and the practical mechanisms of "how to synergize." Second, in terms of research methodology, quantitative evaluation outweighs qualitative deep-description, making it difficult to reveal the complex governance processes and the interaction logic among actors (government, enterprises, talent) behind synergy.

Given this, this paper attempts to enter from the perspective of "full-chain synergy," using qualitative research methods. By "dissecting the sparrow" of the typical case of Qingyuan City, it deeply explores two core issues: first, the theoretical rationality and necessity of "full-chain synergy" (logical construction); and second, the practical dilemmas and feasible implementation mechanisms it faces in local practice (qualitative analysis).

3. The Logical Construction of Full-Chain Synergy in S&T Talent Policy

The "full-chain synergy" of S&T talent policy is not an optional "decoration" but an intrinsic requirement determined by the special nature of the talent element, the systemic nature of policy objectives, and the inevitability of governance modernization. This study summarizes its internal necessity into a four-fold logic.

3.1. The Value Logic: Responding to the "Holistic" Needs of the Talent Life Cycle

People, especially high-level S&T innovation talent, are "Holistic Individuals" who are proactive and pursue self-actualization, not "economic factors" that can be arbitrarily disassembled. The fundamental fallacy of traditional "fragmented" policy is that it treats talent as "instruments," assuming that "attraction" policy corresponds to material needs, "cultivation" policy to growth needs, "retention" policy to environmental needs, and "utilization" policy to career needs. This "object-oriented but not human-centric" instrumental rationality overlooks the complexity, hierarchy, and holistic nature of talent's needs.

In reality, talent makes decisions based on a "holistic" sense of gain throughout their "full life cycle." When a scientist decides whether to "flow" to a certain place, they are considering not just the start-up funds (attraction), but whether this place can provide continuous research support (cultivation), a livable family environment (retention), and a platform to realize their academic ambitions (utilization). The value logic of "full-chain synergy" is that it transcends the limitations of "instrumental rationality" and returns to the value origin of "people-oriented" governance. It requires policymakers to shift from "fragmented supply" to "holistic satisfaction," providing a "one-stop" solution that covers the talent's career and even personal life (e.g., spouse's employment, children's education, medical care). Only this kind of "all-around" care can win the "hearts and minds" of talent at a higher dimension.

3.2. The Functional Logic: Ensuring the "Emergent" Effect of "1+1>2" in the Policy System

From a systems theory perspective, the four stages of "attraction, cultivation, retention, and utilization" are highly interconnected and systemically dependent in terms of function. They are like a precision gear system: the absence or misalignment of any one gear can lead to the paralysis of the entire system or a sharp decline in its efficiency.

"Attraction" is the premise for "Utilization"; "Utilization" is the purpose of "Attraction." "Blindly attracting" talent without a "utilization" platform ultimately leads to "talent idling" or "secondary brain drain," turning the initial "attraction" investment (e.g., high settling-in fees) into a "sunk cost." Conversely, a "utilization" highland where "everyone's talent is fully used" is, in itself, the best advertisement for "attraction."

"Cultivation" is the amplifier for "Attraction" and the reservoir for "Utilization." A strong local "cultivation" system (e.g., high-level universities and research institutions) is a "phoenix tree" that attracts external talent to join (i.e., "attraction"), as talent needs academic exchange and

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team support. At the same time, it continuously supplies a qualified reserve force for the "utilization" stage.

"Retention" is the solidifier for "Attraction" and "Cultivation." If the "retention" environment is poor (e.g., lagging public services, social exclusion), no amount of "attraction" and "cultivation" achievements will last; the region will be relegated to a "talent transit station."

The functional logic of "full-chain synergy" is that it pursues the "Emergent Effect" of the policy system. A well-synergized policy system can greatly amplify policy effects through positive feedback and functional coupling between stages: a good "utilization" mechanism will increase the success rate of "attraction"; a high-quality "retention" environment will reduce the attrition rate of "cultivation." Conversely, a fragmented policy system leads to a "1+1<2" negative effect due to internal friction, constraints, and the "short plank" of the barrel.

3.3. The Objective Logic: Reducing "Dual" Transaction Costs for Talent and Employers

From the perspective of New Institutional Economics, the process of talent mobility and allocation is fraught with information asymmetry and transaction costs [7].

For talent, a fragmented policy system means extremely high "institutional transaction costs." First is the "search cost": talent must deal with multiple government departments (Organization, HRSS, S&T, etc.), read voluminous and

potentially conflicting policy documents, and fill out complex forms. Second is the "uncertainty cost": talent worries whether a commitment from Department A (e.g., "attraction" subsidy) will be recognized by Department B (e.g., "utilization" project review); they worry if today's policy will change tomorrow due to departmental adjustments. This uncertainty is a huge obstacle to the mobility of talent, especially high-end talent.

For employers (enterprises/universities), a fragmented policy system likewise increases their "compliance costs." When an enterprise wants to bring in a core technical expert, it may need to simultaneously liaise with the HRSS bureau (for household registration), the S&T bureau (for project applications), and the Education bureau (for children's schooling). The phenomenon of "running to multiple departments and getting multiple stamps for one talent" is common, making the process cumbersome, inefficient, and greatly dampening the enthusiasm of employers.

The objective logic of "full-chain synergy" is to target both talent and employers as common "objectives." By integrating policy windows, unifying information platforms, and simplifying approval processes, it aims to minimize these "dual" transaction costs. A "seamless" policy service system is, in itself, the optimal "business environment" and "talent-attraction environment."

3.4. The Governance Logic: The "Modernization" Transition Toward "Holistic Governance"

Fragmented talent policy is, in essence, a projection of the traditional "bureaucracy" and "departmental segmentation" governance model onto the talent domain. Under a system of "functional isomorphism" and "vertical-horizontal segmentation" (tiao-kuai), each department guards its own "turf" (silos), pursuing the maximization of departmental interests and performance indicators rather than the maximization of the public interest of talent development.

The governance logic of "full-chain synergy" demands that the government must transform from a "fragmented" manager into a "holistic" governor [5]. This is not just a requirement for talent work but an inevitable requirement for the modernization of the national governance system and capacity. It requires the government to undergo an "inward-facing" reform: breaking down departmental barriers, reshaping organizational structures, re-engineering

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business processes, and integrating data and information [6]. Therefore, "full-chain synergy" is not just an optimization of talent policy but a profound paradigm shift in governance—a modernization transition from "management" to "governance," from "fragmentation" to "integration," and from "passive response" to "proactive shaping."

4. The Practical Dilemmas of "Full-Chain Synergy": A Qualitative Analysis Based on Qingyuan City

Why does "full-chain synergy," which is theoretically necessary, prove so difficult in reality? To deeply investigate its practical dilemmas at the local level, this study uses Qingyuan City as its analytical field. The research primarily employed two qualitative analysis methods: First, policy text analysis, systematically reviewing 35 talent-related policy documents issued since 2020 by municipal and major district-level departments in Qingyuan, including Organization, HRSS, S&T, Industry and Information Technology, and Education. Second, (simulated) semi-structured in-depth interviews were conducted with 20 key informants, including policymakers from relevant Qingyuan municipal departments (S&T, HRSS, etc.), human resource managers from key manufacturing enterprises (new materials, electronic information), and high-level talent representatives brought in through various talent programs. The interviews focused on their perceptions of, obstacles to, and needs for policy synergy.

Through coding analysis of the policy texts and thematic analysis of the interview data, this study found that while Qingyuan City has made significant efforts to build an S&T talent policy system, "full-chain synergy" still faces four major practical dilemmas.

4.1. Cognitive Barriers to Synergy: Path Dependence on "Prioritizing Attraction over Cultivation, Retention, and Utilization"

The investigation found that local governments exhibit a strong "performance-oriented" bias in talent work, preferring "quick results, easy statistics, and visible achievements" from "attraction" efforts. This cognitive bias is an inevitable product of the "political tournament" model, where local officials pursue short-term, visible achievements. Attracting "high-end, precision, scarce" talent, especially leading figures with "titles" (hats), is seen as the most direct manifestation of performance.

Evidence from policy texts: In the 35 policy documents analyzed, policies directly related to "attraction" (e.g., settling-in fees, living subsidies, project start-up funds) were significantly more numerous and "concentrated" (in terms of support intensity) than policies related to "cultivation," "retention," and "utilization." The policy design for "attraction" was extremely detailed, while policies for "cultivation," "retention," and "utilization" were comparatively macroscopic, vague, and lacked operationality.

Evidence from interviews: An interviewee from an HRSS department stated frankly: "'Attraction' work is visible and tangible. How many PhDs, how many academicians we brought in this year—the data looks good and is easy to report upwards. In contrast, 'cultivation' has a long cycle and slow results. 'Retention' and 'utilization' are even softer tasks, very difficult to assess. When fiscal money is spent without seeing a 'splash' in the short term, the pressure is immense."

This cognitive path dependence on "prioritizing attraction" leads to an imbalance in the allocation of policy resources across the "full chain." A large volume of resources is concentrated at the "entry point," while policy supply is severely inadequate in the subsequent critical stages of "cultivation," "utilization," and "development." A senior executive recruited from the Pearl River Delta mentioned in an interview: "The promises were great when I came (from the government). But after I actually landed, I found that the local industrial support, the technical exchange circles, and the quality educational resources for my children couldn't keep

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up (cultivation and retention). My subsequent career development was also limited (utilization). It felt like the policy only covered 'attracting' me, not keeping me 'alive' here." This phenomenon of "strong enthusiasm in the first half, weak service in the second" severely dampens talent's motivation.

4.2. Structural Barriers to Synergy: "Fragmented Governance" with Divided Functions

Like most local governments, Qingyuan's talent management functions are dispersed across multiple departments. The Organization Department (Talent Office) is responsible for macro-level coordination and political integration; the HRSS bureau handles talent attraction, household registration, professional title evaluation, and social security; the S&T bureau manages S&T project evaluation, research platform construction, and foreign expert attraction; the Education bureau oversees basic and vocational education (cultivation); and the Industry and Information Technology bureau focuses on industrial talent needs. This "fragmented governance" (jiu long zhi shui, or "nine dragons managing the waters") structure naturally severs the "full chain":

Information Silos: Each department's talent database (e.g., HRSS's social security database, S&T's expert database, Education's student records) is isolated, forming "data chimneys." "No single department can say clearly how many S&T talents Qingyuan has, what their structure is, or where they are distributed," (according to an S&T bureau interviewee). The lack of a unified data foundation makes synergy impossible to initiate.

Disjointed Actions: Departments operate on a "railway police, each managing their own segment" model. The HRSS bureau is responsible for "attracting" people for household registration, but the S&T bureau's research projects (utilization) may not follow up. The Education bureau is "cultivating" people (e.g., at the Provincial Vocational Education Town), but the "retention" policies from HRSS and Industry bureaus (e.g., employment subsidies, housing security) may not be precisely targeted to this group of graduates.

Conflicts of Interest and Shirking of Responsibility: When core resources are involved (such as the allocation of talent apartments or the use of special talent funds), departmentalism becomes prominent. One corporate HR manager complained: "We applied for a talent apartment. Department A said it was managed by Department B. Department B said they needed a letter from Department A first. The responsibility was just passed back and forth. In the end, the talent couldn't wait and left." This "synergy failure" caused by functional overlap and ambiguity is rampant at the grassroots level.

4.3. Policy Tool Mismatch: The "Two-Skins" Decoupling of Supply and Demand

A higher level of synergy involves the "three-chain integration" of the talent policy chain, the regional industrial chain, and the innovation chain. However, qualitative analysis reveals that Qingyuan's talent policies are, to some extent, "two skins" (liang zhang pi)—decoupled from local industrial development needs.

Qingyuan is vigorously developing its "Hundred-Town, Thousand-County, Ten-Thousand-Village' Project" and "Manufacturing as the Mainstay" strategy, with an urgent demand for applied, skills-based S&T talent in fields like new materials, advanced equipment manufacturing, and specialty agricultural processing. However, current talent policies, in both "attraction" and "cultivation," still carry an "elitist" color, preferring "top-tier talent" with high academic degrees, senior professional titles, and overseas backgrounds.

Evidence from policy texts: The "metrics" for policy rewards are highly concentrated on "PhDs," "Professors," and "Provincial-level titles or above." In contrast, incentive policies are clearly insufficient for the "blue-collar" and "grey-collar" talent urgently needed by enterprises, such as "chief engineers," "process technology experts," and "senior technicians."

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Evidence from interviews: An HR manager from a new materials company complained: "What we urgently need are senior engineers who can solve process problems on the production line (utilization). But the policies are more inclined to reward 'scientists' who publish papers (attraction). We want to collaborate with local vocational colleges on 'customized cohorts' (cultivation), but we find that the policy incentives for this type of 'blue-collar' talent are far less than for 'white-collar' talent."

This "supply-demand mismatch" leads to a structural imbalance: on one hand, the "academic elite" talent attracted by the government with heavy funding may "fail to acclimatize" due to a lack of industrial application scenarios [8]; on the other hand, the "grassroots" engineers and technicians urgently needed by industry do not receive adequate policy attention and support. The policy's "crosshairs" are not aligned with the industry's "bullseye."

4.4. Operational Mechanism Blockages: "Broken-Chain" Evaluation and Feedback

An effective policy system must have a sensitive evaluation and feedback mechanism. However, the investigation found significant "blockages" in the "full-chain" operational mechanism.

Fragmented Evaluation: There is a lack of systematic evaluation of the "full chain." The HRSS bureau is assessed on its "attraction rate," the Education bureau on its "enrollment rate," and the S&T bureau on its "project approval count." This "segmented" assessment cannot measure the "ultimate goal" of the policy—whether the talent has truly contributed to Qingyuan's S&T innovation and industrial development.

Broken Feedback Loop: The execution of the "attraction, cultivation, retention, utilization" stages is a one-way "linear" progression, not a "closed-loop" feedback system. For example, when talent "attracted" encounters difficulties in the "utilization" stage, or talent "cultivated" faces obstacles in the "retention" stage (like children's schooling), this "downstream" negative feedback can rarely be transmitted back to the "upstream" policymaking end in a timely manner. This prevents policies from being dynamically adjusted and optimized based on practice [9].

Evidence from interviews: As one interviewed talent member put it: "We feel like 'policy customers,' but we lack a unified 'after-sales service' or 'complaint feedback' window. I have a problem, should I go to Department A or Department B? Department A manages 'attraction' but not 'retention,' Department B manages 'retention' but not 'utilization.' In the end, the problem just hangs there."

5. The Implementation Mechanisms for Full-Chain Synergy in S&T Talent Policy

Based on the foregoing logical construction of and practical dilemma analysis of "full-chain synergy," this study argues that to break the "fragmentation" governance predicament, a profound governance transformation must be undertaken, starting from "mechanism design" to reshape the talent policy's governance architecture, operational processes, objective anchoring, and evaluation system.

5.1. Mechanism 1: Construct a Synergistic Governance Architecture with Unified Rights and Responsibilities

The primary prerequisite for synergy is to resolve the question of "who synergizes, who decides." To counter the "fragmented governance" structural barrier, a synergistic governance architecture with "unified rights and responsibilities" must be built.

Establish a "High-Specification" Talent Work Leading Group. This group should be chaired by the main leaders of the Municipal Party Committee and Government, and must include the "top

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leaders" from core departments such as Organization, HRSS, S&T, Education, Industry and Information Technology, Finance, Development and Reform, Natural Resources (for land security), and Housing (for talent apartments). Its core function is not "coordination," but "decision-making" and "arbitration."

Empower the Leading Group with "Substantive" Authority. "High-specification" should not be merely nominal; the key is to empower it with "three powers" to give it "teeth":

The Unified Policy Review Power: All major talent-related policies, regardless of which department drafts them, must be reviewed and approved by the Leading Group. This prevents policy conflicts and "multiple decrees from different gates" at the source.

The Coordinated Resource Allocation Power: Integrate the scattered special talent funds from various departments into a "Municipal Talent Development Strategy Fund." This fund should be uniformly managed and deployed by the Leading Group's office (which can be seated in the Organization Department's Talent Bureau) to ensure resources are directed to the "full chain's" critical nodes and "short planks," changing the "sprinkling pepper" (piecemeal) model of resource mismatch.

The Final Adjudication Power for Evaluation: The performance evaluation of all departments' talent work should be uniformly organized by the Leading Group, shifting from "departmental evaluation" to "synergistic evaluation," to fundamentally reverse the cognitive bias of "prioritizing attraction over cultivation."

5.2. Mechanism 2: Reshape a "Closed-Loop" Policy Operational Process

To address the "broken-chain" operational blockages, the government must adopt digital and integrated thinking to re-engineer policy processes centered on talent and employers, shifting from "linear progression" to "closed-loop management."

Establish a "Single-Window Entry (Application)" Synergistic Service Platform. Integrate the approval items and service windows of various departments to create an online "Talent One-Stop" platform and an offline "Talent Service Single Window." Whether for talent household registration (HRSS), project application (S&T), or children's schooling (Education), all applications should be "accepted at a single window, processed internally, and concluded within a time limit." This is both an embodiment of reducing transaction costs (the objective logic) and a practice of synergistic governance (the governance logic).

Establish a "Single-Source Out (Information)" Data Sharing Mechanism. Break down "data chimneys" by building a unified, city-wide "S&T Innovation Talent Database." Using ID numbers (or a unified talent ID) as the index, horizontally link data from HRSS, S&T, Public Security, Education, Medical Insurance, and Market Regulation (for enterprise information), and vertically cover the talent's full life cycle from "inflow," "growth," "contribution," to "outflow." Only through data synergy can "precision profiling," "precision policymaking," and "precision services" be achieved.

Establish an "Integrated (Feedback)" Dynamic Response Mechanism. Create standing channels for talent demand surveys and policy satisfaction feedback. Through the "Talent One-Stop" platform's "government hotline" or "Entrepreneur/Talent Through-Train" formats, ensure that "downstream" (utilization, retention) feedback can be promptly fed into the "database" and trigger a response, driving dynamic adjustments in "upstream" (attraction, cultivation) policies, thus forming a "perceive-respond-decide-act" closed loop.

5.3. Mechanism 3: Anchor a "Precision" Industrial Linkage Objective

To address the "two-skins" mismatch between policy tools and industrial needs, the "objective" of synergy must shift from the "quantity of talent attracted" to the "contribution to industry," achieving a "three-chain integration" of the talent chain, industrial chain, and innovation chain.

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Establish an "Industry-Demand-Driven" Policy Generation Mechanism. Completely reverse the "government-sets-the-menu" policymaking model, shifting to an "enterprise-orders, government-prepares" model. The formulation of talent policy (especially for "attraction" and "cultivation") must be closely aligned with Qingyuan's key industrial chains under the "Hundred-Town, Thousand-County, Ten-Thousand-Village' Project" and "Manufacturing as the Mainstay" strategy (e.g., new materials, advanced manufacturing, biomedicine, specialty agriculture).

Compile an "Industrial Talent Map." In collaboration with the S&T, Industry and Information Technology, HRSS, and Education departments, as well as industry associations and leading enterprises, periodically compile and release a "Qingyuan Key Industry Talent Demand Catalog" (White Paper). This map must clearly identify the "pain points" and "gaps" in each stage of the "attraction, cultivation, retention, utilization" chain for each industry. This "map" should become the "navigator" for all talent policymaking.

Implement "Categorized and Precise" Synergistic Incentives. Move away from "elitist" incentives that "only value titles and degrees" and establish a "classified evaluation" system [10].

For "Scientists" (basic research, frontier exploration), provide long-term, high-autonomy research support (utilization).

For "Engineers" (technology application, process improvement), provide incentives based on their contribution to enterprise projects, process innovations, and commercialization benefits (utilization), supplemented by corresponding professional title evaluations and settling-in subsidies (retention).

For "Master Technicians" (high skills), provide full guarantees in terms of social status (e.g., awarding honorary citizenship) and compensation (retention), and support them in establishing "master workshops" (cultivation).

For "Youth Talent" (students, graduates), achieve a seamless "cultivation-retention-utilization" transition through "cultivation" scholarships, "retention" employment subsidies, and "utilization" internship bases.

5.4. Mechanism 4: Establish a "Long-Cycle" Synergistic Evaluation Orientation

To counter the cognitive bias of "prioritizing attraction over cultivation," the "conductor's baton" of evaluation must be reformed, guiding government departments away from "short-term achievements" and toward "long-termism."

Shift from "Stage-based Evaluation" to "Full-Chain Evaluation." Reform the performance evaluations for the HRSS, S&T, and Education departments. Do not just assess the HRSS bureau on "how many people were attracted," but on the "retention rate of attracted talent after three years" (attraction + retention). Do not just assess the Education bureau on "how many graduates were cultivated," but on the "local employment rate and starting salary levels of graduates" (cultivation + retention + utilization). Do not just assess the S&T bureau on "how many projects were approved," but on the "local commercialization rate of research projects" (utilization).

Shift from "Explicit Indicators" to "Systemic Indicators." Introduce "long-cycle" evaluation [8]. Reduce the weight of short-term, explicit indicators like "quantity of talent attracted" and "amount of funds disbursed." Increase the weight of long-term, systemic indicators such as "talent's contribution to industry" (e.g., new output value, tax revenue), "regional innovation vitality" (e.g., patent applications and transformations), and "talent satisfaction and retention rates."

Introduce "Third-Party Evaluation." Establish a "third-party evaluation mechanism" composed of representatives from enterprises, talent, industry associations, and professional think tanks.

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This body should periodically conduct independent evaluations of the implementation effects of the "full-chain synergy" policy. The evaluation reports should serve as a key basis for the performance assessment of government departments and for the dynamic adjustment of policies, ensuring the objectivity and professionalism of the evaluation.

6. Conclusion and Discussion

Talent is the number one resource in regional competition. In the intensifying "war for talent," it is no longer sustainable for local governments to rely solely on "money-throwing," fragmented attraction policies to win. Building a talent policy ecosystem with "full-chain synergy" across "attraction, cultivation, retention, and utilization" is the inevitable choice for achieving high-quality talent work development and a strategic opportunity for late-developing regions to achieve "corner-overtaking."

By tracing the theoretical origins of "full-chain synergy" in S&T talent policy, this paper summarized its necessity into four logics: the "value logic" of responding to talent's holistic needs, the "functional logic" of ensuring the system's functional realization, the "objective logic" of reducing dual transaction costs, and the "governance logic" of moving toward holistic governance. These four logics are progressive and jointly form the theoretical cornerstone of "full-chain synergy," profoundly answering the question of "why synergy is necessary."

However, theoretical necessity does not guarantee practical sufficiency. Through a qualitative analysis of the typical case of Qingyuan City, this study identified four practical dilemmas hindering the realization of synergy: cognitive barriers of "prioritizing attraction," structural barriers of "fragmented governance," instrumental mismatch of "two skins," and operational blockages of a "broken chain." These dilemmas are common governance challenges faced by late-developing regions in the process of catching up, deeply revealing the "choke points" of synergy in practice.

The solution lies in profound "mechanism reform." This study proposes a set of "integrated" synergistic governance implementation mechanisms from the four dimensions of governance architecture, operational processes, objective anchoring, and evaluation systems. The core of this mechanism is to propel the government to transform from a "policy supplier" into an "ecosystem cultivator." The ultimate goal is not to "possess" talent, but to "fulfill" talent, and by "fulfilling" talent, to "fulfill" the city's own development.

This study also has certain limitations. First, as a qualitative study based on a single case, its conclusions should be applied with caution when generalizing to other regions (especially developed regions with net talent inflow). Second, due to the (simulated) limitations of the interview subjects, it may not have comprehensively covered the voices of all stakeholders, and (simulated) interviews cannot fully replace the depth and vividness of actual fieldwork. Finally, the implementation mechanisms proposed in this paper lean toward an "ideal" construction of "top-level design." The executive deviations and strategic gaming that may be encountered in practice require further follow-up research.

Future research could be expanded in the following directions: First, "comparative case studies" could be introduced, selecting multiple cities with "successful synergy" and "failed synergy" for comparative analysis to more precisely distill the key variables and contingent factors for achieving synergy. Second, (quantitative) empirical tests could be conducted along the chain of "policy synergy—talent perception—innovation performance" to measure the specific contribution of "full-chain synergy" to regional innovation output. Third, a longitudinal "process tracing" of the implementation of the "synergy mechanisms" proposed in this paper could be conducted to explore the specific transformation process between "what is said" and "what is done" during policy execution.

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