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Developing an Employment Quality Evaluation Indicator System for Higher Education Institutions in Guangzhou: A New Quality Productive Forces Perspective

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Abstract

The development of new quality productive forces is transforming industrial technologies, job competency requirements, and forms of work organization. These changes require the evaluation of employment quality in higher education to shift from quantitative reporting to quality diagnosis, from an exclusive focus on initial employment to sustainable career development, and from institutional self-evaluation to multi-stakeholder collaboration. Grounded in the role of higher education institutions in Guangzhou in serving regional development, this study draws on outcome-based education and integrates triple helix theory, stakeholder theory, and synergy theory. Using literature analysis and theoretical deduction, it develops a four-dimensional evaluation framework comprising organizational coordination and institutional support, educational processes and competency gains, employment outcomes and job quality, and sustainable career development and regional contribution. Innovation, green development, integration, and shared development are incorporated throughout the talent cultivation and employment processes. The resulting indicator system comprises four first-level dimensions, fourteen second-level indicators, and corresponding third-level observable measures. The study further proposes multi-wave follow-up surveys, combined weighting, separate reporting of threshold indicators, and category-based comparisons, with evaluation results informing program

adjustment, curriculum reform, career services, and collaboration among government, universities, industries, and enterprises. The proposed framework provides a reference for monitoring employment quality and improving talent cultivation in Guangzhou's higher education institutions, as well as for future empirical research.

1. Introduction

1.1 Problem Statement

Employment is a critical stage at which the outcomes of talent cultivation enter the system of social production, and it provides an important lens through which to examine the alignment between higher education and economic and social development. Conventional employment administration has often relied on the graduate destination implementation rate to answer the question of whether graduates are employed. However, the technological advances, industrial integration, and organizational changes associated with new quality productive forces have made it equally important to ask what kinds of work graduates perform, what capabilities they bring to production, and whether they can achieve sustainable development. Job titles and initial destinations capture only static employment outcomes. They cannot reveal whether academic learning has been transformed into occupational competence, whether labor rights are protected, whether graduates can adapt to technological change, or whether the supply of talent from higher education institutions meets the needs of regional transformation and upgrading. Employment quality evaluation must therefore move beyond end-point statistics toward a comprehensive assessment spanning educational objectives, educational processes, employment outcomes, and career development.

New quality productive forces are led by scientific and technological innovation and are fundamentally characterized by the advancement of workers, means of labor, and objects of labor, as well as their optimal combination. High-quality workers are both an essential condition for their development and beneficiaries of technological transformation. High-quality employment provides sustained human capital for technological innovation and industrial upgrading by enhancing human capabilities and improving their allocation. Conversely, new quality productive forces create new opportunities for improving employment quality by generating new jobs, transforming conventional occupations, and improving the tools of labor. Existing studies have examined this reciprocal relationship and emphasized that the evaluation of high-quality employment should integrate macro- and micro-level perspectives, objective conditions and subjective experiences, and labor processes and outcomes [1]. Nevertheless, technological substitution, skill obsolescence, and platform-based employment may also produce structural mismatches and new employment risks. The growth of emerging industries therefore cannot be equated automatically with a simultaneous improvement in employment quality for all graduates.

Higher education institutions in Guangzhou vary in type and level of talent cultivation. They undertake not only knowledge innovation and the education of high-level talent, but also the cultivation of applied

and technical-skilled personnel and service to regional industrial development. Evaluating employment quality from the perspective of new quality productive forces does not entail creating a separate "emerging-industry employment rate" detached from job quality, nor does it entail substituting the rate of graduates remaining in Guangzhou or salary levels for educational outcomes. Rather, it requires a diagnostic framework that simultaneously reflects student development, the value of labor, and regional contribution. The central questions are how to translate the requirements of new quality productive forces into observable, comparable, and trackable indicators, and how to ensure that evaluation results genuinely inform improvements in talent cultivation and regional employment governance.

1.2 Literature Review

First, the evaluation of employment quality has shifted from single quantitative indicators to multidimensional measurement. Research on combined evaluation emphasizes the integration of individual, employer, and societal perspectives into a unified analysis to avoid bias arising from reliance on a single stakeholder or method [2]. From the perspective of evaluation modeling, indicator selection, quantification, and weighting must be aligned with the purpose of evaluation and with its subjects and objects, because employee well-being, student development, and public governance involve different priorities [3]. Multi-stakeholder evaluation systems further suggest that assessments by graduates, higher education institutions, employers, families, and society should be synthesized so that subjective and objective indicators, qualitative and quantitative information, and macro- and micro-level outcomes can corroborate one another [4]. These studies provide a foundation for multidimensional evaluation. Nevertheless, excessive indicators, conceptual overlap, and limited data availability may weaken the explanatory power and feasibility of an evaluation system.

Second, evaluation has expanded from initial employment to longitudinal tracking. Research on graduate tracking in the European Union combines administrative records with questionnaire surveys and emphasizes the value of long-term follow-up for feedback in educational governance [5]. A study of master's graduates in first-tier Chinese cities incorporated major–job compatibility, salary, job-search processes, and satisfaction into its evaluation, demonstrating the importance of human capital accumulation, career planning, and faculty–student interaction for employment outcomes [6]. Multimodal evaluation research has further connected job searching, initial employment, and career development, advocating the integration of structured records, textual and behavioral data, and subjective perceptions [7]. These studies have broadened the temporal and data boundaries of employment quality evaluation, while presenting new challenges: longitudinal information on post-graduation development is costly to obtain, and definitions, authorization, and algorithmic bias across data sources require coordinated governance.

Third, outcome-based education provides a process-improvement logic for evaluating employment quality in higher education. Its principal contribution lies not in the direct transfer of samples, indicators, or weights from technician colleges, but in conceptualizing employment quality as the extent to which educational outcomes are realized externally, incorporating organizational support and

educational processes into evaluation, and establishing a closed loop of objectives, implementation, outcomes, and improvement[8]. If evaluation examines only graduate destinations without considering how capabilities are formed, how resources are used, and how outcomes inform cultivation, it becomes difficult to distinguish short-term labor-market fluctuations from problems that institutions themselves can address.

Fourth, regional and digital-intelligence research has expanded the contexts in which employment quality is evaluated. Provincial-level studies indicate relationships among the regional distribution of employment, program structures, and institutional missions, demonstrating the practical significance of coordinating admissions, education, and employment [9]. In the digital-intelligence era, job creation, flexible forms of work, and rapid skill iteration coexist, while mismatches between talent cultivation and sociotechnical change and between employment perceptions and social capital have become more prominent [10]. The intelligent economy can facilitate employment by reducing information asymmetry, improving person–job matching, and expanding access to skills learning, but these effects are conditioned by industrial and regional circumstances [11]. Research on institutional resources also suggests that resource inputs do not automatically translate into employment quality; student perceptions, resource utilization, internship experience, and competency gains are important mediating factors [12].

Overall, existing studies have developed a broad range of employment quality indicators covering employment outcomes, labor rewards, major–job compatibility, subjective satisfaction, and employer evaluation, with increasing attention to the integration of subjective and objective measures, multi-stakeholder evaluation, and graduate tracking. Three areas nevertheless warrant further development. First, some studies focus primarily on employment outcomes and pay insufficient attention to organizational support, educational processes, and competency gains. Second, feedback mechanisms linking evaluation results to program adjustment, curriculum improvement, and career services require further specification. Third, graduates' sustainable development and regional contribution need to be incorporated into a unified analytical framework in response to regional industrial transformation and the requirements of new quality productive forces. Accordingly, this study develops a four-dimensional evaluation system encompassing institutional support, educational processes, employment outcomes, and sustainable development.

2. Theoretical Foundations and Analytical Framework for Employment Quality Evaluation in Guangzhou Higher Education Institutions from the Perspective of New Quality Productive Forces

2.1 Definition of Core Concepts

In essence, the quality of employment measures the extent to which workers, as human beings, realize their labor rights, develop their capacities, and achieve subjectivity in the process of integrating with the means of production. It reflects both the adequacy of the conditions for the reproduction of labor

power—remuneration, social security, and occupational safety—and, as a comprehensive manifestation, the degree to which education is integrated with productive labor and human all-round development is promoted.

The perspective of new quality productive forces does not simply add several technology-related indicators to conventional employment quality; rather, it requires a reconsideration of what constitutes desirable employment outcomes. From this perspective, employment quality encompasses both graduates' access to relatively sufficient, stable, secure, and capability-matched employment and their capacity for continuous learning, innovative development, and the realization of labor value amid technological progress and industrial transformation. Evaluation should consider not only whether graduates enter emerging occupational fields, but also whether they can use digital technologies, green knowledge, and collaborative capabilities to transform existing jobs. It should examine both contributions to regional industrial development and whether opportunities and benefits are shared equitably. New quality productive forces thus provide a context and value orientation for understanding changes in employment quality, rather than an overarching score that replaces employment quality itself.

In this study, "employment quality in Guangzhou higher education institutions" refers to the extent to which the outcomes of talent cultivation are realized in graduates' working lives and in regional social development. The evaluation encompasses three interrelated levels. At the student level, it addresses employment opportunities, working conditions, person–job matching, subjective experiences, and sustainable development. At the institutional level, it addresses organizational support, educational alignment, resource conversion, and feedback-based improvement. At the regional level, it addresses the alignment of talent supply with industrial demand, innovation activities, and public services. These levels are not interchangeable: a high level of regional contribution does not necessarily imply adequate protection of individual labor rights, nor does substantial institutional investment necessarily produce student competency gains.

Employment quality and high-quality full employment are related but distinct concepts. The former emphasizes employment structures, conditions, experiences, and development, whereas the latter additionally requires sufficient employment opportunities and coordination between quantity and quality. Systems-engineering research emphasizes the integration of full employment, person–job matching, job stability, rights protection, and sustainable career development [13], while research on youth employment likewise demonstrates that quantity and quality are not substitutes [14]. Accordingly, this study treats employment sufficiency as a foundational dimension and separately reports threshold conditions such as labor contracts, social security, and employment equity, preventing high salaries or composite scores from offsetting deficiencies in labor rights.

2.2 Theoretical Foundations

New quality productive forces represent the development of Marxist theory of productive forces in the Chinese context in the new era. Marx explained productive forces through the labor of workers, the

means of labor, the objects of labor, and their mutual combination. The “basic connotation” emphasized by new quality productive forces—“led by scientific and technological innovation and characterized by the leap in workers, means of labor, objects of labor, and their optimized combination”—is precisely the contemporary form of the theory of the three elements of productive forces. Accordingly, the employment issue is essentially a matter of combining labor power with the means of production and combining education with productive labor; the evaluation of employment quality is therefore a systematic examination of the adequacy, safeguarding, and sustainability of this combination. On this basis, this paper takes Marxist theories of the value and reproduction of labor power, labor process theory, the doctrine of human all-round development, and the idea of combining education with productive labor as its value layer, and takes the OBE concept, Triple Helix theory, stakeholder theory, and synergy theory as its tool layer. The former answers “why evaluate and what the value of evaluation lies in,” while the latter answers “how to evaluate and how evaluation can be implemented.”

Triple helix theory explains interactions among government, universities, and industry. The competencies required by new quality productive forces often extend beyond individual organizations and disciplinary boundaries. Universities cannot anticipate changes in job requirements solely on the basis of internal experience, and enterprises cannot remain passive recipients of talent only at graduation. Government provides institutions, public information, and collaborative platforms; universities translate advances in industry and research into educational content; and industries and enterprises contribute to competency standards, practical projects, and quality feedback. Sustained interaction among these actors thus takes shape around talent cultivation. Evaluating organizational coordination and regional contribution provides a means of assessing whether such interaction has developed from ad hoc cooperation into a stable educational mechanism.

Stakeholder theory defines who should participate in evaluation. Graduates directly experience educational outcomes and working life; employers can assess job competence and occupational performance; universities possess information on educational and career-service processes; government is concerned with equity, full employment, and regional development; and families and society reflect educational choices and developmental expectations. Stakeholder assessments may diverge, and such divergence is itself diagnostically meaningful. For example, low graduate satisfaction combined with favorable employer evaluations may indicate problems with working conditions or occupational expectations, whereas positive institutional self-evaluations combined with weak external assessments of adaptability may reveal a disconnect between curricular content and changing job requirements. Multi-stakeholder data should therefore be triangulated rather than simply averaged.

Synergy theory explains how evaluation can be translated into systemic improvement. Employment quality is jointly shaped by program design, curriculum and teaching, internships and practical learning, career guidance, recruitment services, and labor-market conditions; no single department can improve it independently. Shared objectives, information exchange, allocation of responsibilities, and feedback-based adjustment are required to connect these fragmented elements into a closed loop.

Collaboration does not require all stakeholders to use identical indicators. Rather, it requires clarification of the evidence each actor provides and the improvement responsibilities each assumes, while establishing effective connections that protect student autonomy and privacy.

2.3 Analytical Framework

On this basis, the study develops an analytical model of "demand orientation–collaborative support–capability formation–employment realization–sustainable development–feedback and improvement." Regional industrial and technological changes generate demand for talent, and government, universities, industries, and enterprises translate this demand into educational objectives through organizational coordination. Curricula, practical learning, innovation activities, and career guidance promote competency gains. Capabilities and labor-market conditions jointly shape employment opportunities, job matching, working conditions, and satisfaction. Graduates continue learning through occupational activity and generate innovation and regional contributions. Multi-wave evaluation results then inform adjustments to programs, curricula, admissions, and career services. This model is not a unidirectional causal chain; labor-market demand, student choice, and public policy may moderate each stage.

Table 1. Conceptual Model for Evaluating Employment Quality in Guangzhou Higher Education Institutions from the Perspective of New Quality Productive Forces

First-level dimension	Second-level indicator	Third-level indicators and key observation points	Primary data sources
External context	Demand orientation	Regional industrial and technological change; occupational competency standards; public employment policy; students' diverse developmental needs	Public sources; industries and enterprises
Conditions and processes	Collaborative support → capability formation	Organizational institutions and resource inputs → curricula, practical learning, guidance, and collaborative education → gains in knowledge, skills, and occupational literacy	Institutional records; student surveys
Direct and longitudinal outcomes	Employment realization → sustainable development	Employment sufficiency, matching, remuneration and protection, stability and satisfaction → learning and development, innovative and green practices, regional contribution and shared development	Graduates; employers

First-level dimension	Second-level indicator	Third-level indicators and key observation points	Primary data sources
Governance loop	Evaluation and diagnosis → feedback and improvement	Category-based diagnosis and threshold reporting → program and curriculum adjustment, career-service improvement, and collaborative-mechanism improvement → objective calibration for the next cycle	Integrated multi-stakeholder data

Note: Innovation, green development, integration, and shared development are cross-cutting value orientations. Arrows indicate theoretical relationships rather than empirically verified causal effects.

Innovation, green development, integration, and shared development function as cross-cutting orientations throughout the model. Innovation is reflected primarily in the integration of digital and disciplinary knowledge, complex problem solving, and innovative practice. Green development is reflected in green occupational literacy, responsible production, and sustainable career choices. Integration encompasses interdisciplinarity, industry–education integration, and collaboration between technology and the humanities. Shared development encompasses equal opportunities, support for disadvantaged groups, labor rights, and inclusive access to developmental benefits. These orientations are operationalized through observable learning experiences, employment performance, and longitudinal outcomes, avoiding the conceptual unmeasurability that would arise from using a generic "contribution rate to new quality productive forces."

3. Logic of Constructing an Employment Quality Evaluation Indicator System for Guangzhou Higher Education Institutions

The preceding analysis has clarified the theoretical relationships among new quality productive forces, high-quality full employment, and talent cultivation in higher education. This section translates the analytical framework into principles for indicator construction and specifies the indicator hierarchy, evaluation objects, and scope of application, thereby providing a basis for the selection of specific indicators.

3.1 Construction Principles

The first principle is to integrate value orientation with a labor-centered approach. Evaluation should serve students' all-round development and high-quality full employment while responding to regional innovation and industrial upgrading. Regardless of changes in industrial forms, lawful employment, reasonable remuneration, social security, occupational safety, and human dignity remain fundamental to employment quality. These requirements cannot be lowered in the name of "new employment forms," "flexibility," or "regional contribution." Innovative and shared development should be unified through the sustainable development of individuals.

The second principle is to integrate outcome orientation with process diagnosis. Outcome indicators assess whether educational outcomes have been achieved, whereas process indicators explain how those outcomes were produced. The system examines not only graduate destinations and job quality, but also curricular renewal, the quality of practical learning, competency gains, and resource utilization, thereby identifying aspects amenable to intervention. Process indicators should capture actual implementation and student gains rather than using the number of policy documents or activities as substitutes for implementation quality.

The third principle is to integrate a common foundation with category-specific adaptation. Graduate destinations vary legitimately across institutional types, disciplines, and levels of education in Guangzhou. Research-oriented universities, application-oriented institutions, vocational undergraduate institutions, and higher vocational colleges should therefore not be ranked directly according to an identical standard. Common definitions may be established for employment rates, rights protection, and satisfaction, whereas indicators of research and innovation, application of technical skills, entrepreneurship, and regional service should be selected according to institutional type and discipline. Further study, flexible employment, entrepreneurship, and delayed employment should be interpreted by category in light of students' intentions and actual quality, rather than being inherently classified as desirable or undesirable.

The fourth principle is to integrate objective records with subjective perceptions. Salary, contracts, social security, job positions, and follow-up status can be supported by administrative records or documentary evidence, whereas satisfaction, alignment with occupational expectations, and work–life balance require graduate self-reports. Employer evaluations can supplement information on job competence. Subjective evaluation is not subordinate to objective data, and objective indicators cannot replace individual experience. Discrepancies between the two should prompt examination of the sample, measurement definitions, and underlying mechanisms.

The fifth principle is to integrate scientific comprehensiveness with conciseness and feasibility. Indicators require clear definitions, distinct observation points, and accessible data. Their levels and number should be controlled to avoid assigning different names to the same construct. Long-term innovation contributions and green performance, which are not yet widely measurable, may initially serve as longitudinal or optional indicators and later be incorporated into common evaluation when data conditions permit. The system should also be revised periodically in response to technological and industrial change, while core definitions and temporal conventions remain stable enough to support longitudinal comparison.

3.2 Hierarchical Structure and Scope of Evaluation

The indicator system comprises an objective level, a criterion level, an element level, and an observation level. The objective is employment quality and its continuous improvement in Guangzhou higher education institutions. The criterion level comprises four first-level dimensions: organizational coordination and institutional support; educational processes and competency gains; employment

outcomes and job quality; and sustainable career development and regional contribution. The element level contains fourteen second-level indicators, while the observation level comprises third-level indicators and operational questions. The first two dimensions primarily explain the conditions and processes of institutional education and employment governance, while the latter two measure direct and longitudinal outcomes, respectively. Presenting the four dimensions in parallel does not imply equal weights; specific weights require subsequent expert consultation and validation using sample data.

The scope of evaluation must be explicitly defined. First, the indicators measure employment quality and its supporting mechanisms in higher education institutions rather than ranking students' personal worth. Family background and individual differences should serve as grouping and explanatory variables rather than grounds for penalty. Second, regional contribution is not equivalent to remaining in a particular location. Graduates who move across regions may also realize the value of their human capital; remaining in Guangzhou or working in the Greater Bay Area is used only to examine alignment with regional service. Third, salary should be interpreted in relation to industry, occupation, location, and living costs, and absolute values should not be compared directly across disciplines. Fourth, aggregated institutional results cannot replace the diagnosis of individual-level rights and equity.

4. Components and Interpretation of the Employment Quality Evaluation Indicator System for Guangzhou Higher Education Institutions

Tables 2–5 operationalize the framework described above. Third-level indicators are presented as key observation points so that they can subsequently be converted into questionnaire items, administrative data fields, or interview protocols. Institutional records primarily capture institutions and processes; graduate surveys capture employment outcomes and experiences; employer surveys capture job competence and external alignment; and public and industry sources are used to contextualize demand and regional conditions. Specific indicators may be added or removed during empirical research according to data quality, but the removal of threshold content concerning rights and equity requires explicit justification.

4.1 Organizational Coordination and Institutional Support

This dimension corresponds to the enabling conditions emphasized by OBE. It evaluates whether institutions have established employment governance structures with clearly defined responsibilities, adequate and accessible support resources, and sustainable systems for tracking and feedback. The focus is not the formal existence of organizations and policies, but cross-departmental operation, substantive participation by industries and enterprises, the perceived accessibility of resources, and whether feedback generates closed-loop improvement.

Table 2. Indicators of Organizational Coordination and Institutional Support

First-level dimension	Second-level indicator	Third-level indicators and key observation points	Primary data sources
Organizational coordination and institutional support	A1 Organizational coordination and accountability	Coordination among career services, academic affairs, student affairs, and research units; participation by program directors and faculty; depth of industry and enterprise participation in education and employment evaluation; implementation and review of collaborative tasks	Institutional records; industries and enterprises
Organizational coordination and institutional support	A2 Resource allocation and service accessibility	Professionalization and stability of career-guidance staff; funding and job-resource support; availability of digital employment services; students' awareness and use of resources; accessibility of support for disadvantaged groups	Institutional records; graduates
Organizational coordination and institutional support	A3 Longitudinal evaluation and quality improvement	Standards for verifying graduate destinations; coverage and representativeness of post-graduation tracking; data authorization and security policies; proportion of identified employment problems converted into educational improvements and completed feedback actions	Institutional records; graduates

4.2 Educational Processes and Competency Gains

This dimension evaluates whether institutions can translate regional needs and the requirements of new quality productive forces into student learning outcomes. Its indicators shift attention from which courses are offered to how curricular content is updated, which authentic tasks students undertake, and how their capabilities change. Innovation and digital competence are not confined to technological disciplines, and green and integrative literacy cannot be equated with the number of additional courses.

These constructs should be assessed through projects, portfolios, practical performance, and a combination of self- and external assessments.

Table 3. Indicators of educational processes and competency gains

First-level dimension	Second-level indicator	Third-level indicators and key observation points	Primary data sources
Educational processes and competency gains	B1 Alignment between industrial demand and talent cultivation	Responsiveness of program objectives to regional needs; integration of occupational competency standards into curricula; dynamic curricular renewal; information links among admissions, education, and employment; graduates' evaluations of curricular relevance	Institutional records; graduates; industries and enterprises
Educational processes and competency gains	B2 Development of innovation and digital capabilities	Participation in research, innovation, or authentic problem-solving projects; digital-tool and data literacy; interdisciplinary collaboration and complex problem solving; competency gains and portfolio quality before and after learning	Institutional records; graduates; employers
Educational processes and competency gains	B3 Development of green and integrative literacy	Green knowledge and sustainable production practices; learning that integrates disciplines with industry and technology with the humanities; professional ethics and social responsibility; quality of courses or projects jointly delivered by institutions and enterprises	Institutional records; graduates; industries and enterprises
Educational processes and competency gains	B4 Practical experience and career-development support	Relevance of internships and practical learning to academic and career goals; authentic job tasks and quality of supervision; initiation of career planning and continuing guidance;	Institutional records; graduates

First-level dimension	Second-level indicator	Third-level indicators and key observation points	Primary data sources
		job-search skills, employment-information literacy, and autonomous decision-making	

4.3 Employment Outcomes and Job Quality

This dimension represents the direct outcome level of employment quality. It retains foundational indicators such as employment sufficiency, major–job compatibility, salary, social security, and satisfaction, while giving greater attention to labor processes, equity, and subjective experience. For graduates pursuing further study, entrepreneurship, or flexible employment, measures appropriate to their destinations should be used rather than mechanically applying employment-specific indicators, such as labor contracts, to all graduates. Employment sufficiency and job quality are examined in parallel so that the availability of employment does not conceal deficiencies in job quality.

Table 4. Indicators of Employment Outcomes and Job Quality

First-level dimension	Second-level indicator	Third-level indicators and key observation points	Primary data sources
Employment outcomes and job quality	C1 Employment sufficiency and person–job matching	Employment realization among those seeking work; job-search duration and valid job offers; major–job relatedness; match between knowledge and skills and job requirements; suitability of further-study or entrepreneurship choices	Institutional records; graduates; employers
Employment outcomes and job quality	C2 Labor remuneration and social security	Starting salary and changes relative to industry and region; labor contracts or lawful employment agreements; social insurance and benefits; working hours, rest and leave, and occupational safety	Graduates; employers
Employment outcomes and job quality	C3 Employment stability and labor relations	Job retention six months and one year after graduation; involuntary departure and frequent involuntary job changes;	Graduates; employers

First-level dimension	Second-level indicator	Third-level indicators and key observation points	Primary data sources
		stability of occupational expectations; communication and grievance channels; violations of labor rights (negative indicator)	
Employment outcomes and job quality	C4 Subjective experience and employment equity	Overall graduate employment satisfaction; alignment between job content and occupational expectations; employer assessments of graduate competence; work–life balance; perceived fairness in recruitment and development opportunities and differences among groups	Graduates; employers

4.4 Sustainable Career Development and Regional Contribution

This dimension extends evaluation to post-graduation career development and examines whether initial employment outcomes translate into sustained capabilities and social responsibility. Evidence of innovative contribution is differentiated by type and may include not only research outputs but also process improvements, the application of digital tools, optimization of service procedures, and entrepreneurial practice, thereby avoiding an exclusive focus on publications or patents. Regional contribution emphasizes the alignment between talent supply and actual job requirements rather than imposing a moral judgment on geographical mobility.

Table 5. Indicators of Sustainable Career Development and Regional Contribution

First-level dimension	Second-level indicator	Third-level indicators and key observation points	Primary data sources
Sustainable career development and regional contribution	D1 Occupational learning and sustainable development	Continuing education and skills updating after graduation; opportunities for promotion or professional growth; job autonomy and utilization of capabilities; adaptability and resilience during career transitions; long-term career satisfaction	Graduate tracking; employers

First-level dimension	Second-level indicator	Third-level indicators and key observation points	Primary data sources
Sustainable career development and regional contribution	D2 Innovative and green practices and value creation	Participation in technological, managerial, or service innovation; use of digital technologies to improve workflows; green jobs or greening practices within jobs; high-quality entrepreneurship and business continuity; practical application of innovative outputs	Graduate tracking; employers
Sustainable career development and regional contribution	D3 Regional alignment and shared development	Alignment of graduate service with industrial and public-service needs in Guangzhou; employer assessments of regional talent supply; participation in grassroots services and alumni collaboration; long-term developmental gaps among groups	Public sources; graduates; employers

Note: D3 is used to diagnose regional service and group equity; institutions and graduates are not evaluated solely by the rate at which graduates remain in Guangzhou. Indicators should be applied selectively according to institutional type, discipline, and graduate destination.

5. Evaluation Implementation, Data Governance, and Application of Results

The procedures for indicator quantification, combined weighting, and composite evaluation discussed in this section constitute an implementation plan for applying the indicator system in practice; they do not imply that empirical measurement has already been completed in this study. Before formal application, indicator definitions, weighting schemes, and evaluation results must be tested and refined in light of the institutional types, disciplinary structures, and data conditions of higher education institutions in Guangzhou.

5.1 Category-Based Implementation and Longitudinal Tracking

Evaluation implementation can be divided into five stages: contextualizing indicators, collecting data, assessing quality, conducting comprehensive diagnosis, and providing feedback for improvement. Common and optional indicators should first be identified according to institutional type, educational level, and disciplinary characteristics. Cognitive interviews should then be used to examine item interpretation, followed by a small-scale pilot. Formal surveys should focus primarily on graduates and link institutional administrative records and employer evaluations on the basis of informed and

voluntary participation. Samples should cover different institutional types, disciplines, qualification levels, genders, and groups experiencing employment difficulties. Response rates and sample composition should be reported to prevent selection bias arising from disproportionate responses by groups with better employment outcomes.

Four interconnected time points can be established. At graduation, data are collected on destinations, job-search processes, evaluations of education, and initial employment. Six months after graduation, the focus shifts to job adaptation, contracts and social security, first job departures, and satisfaction. One year after graduation, stability, salary changes, utilization of capabilities, and feedback on education are examined. Three years after graduation, career progression, continuous learning, innovative and green practices, and regional contribution are assessed. Anonymous personal identifiers should be used where possible to maintain cohort continuity, while supplementary cross-sectional samples help distinguish actual career changes from sample attrition. Comparisons across graduating cohorts should be accompanied by accounts of economic conditions and industry cycles.

In subsequent empirical research, item analysis, internal consistency testing, and construct validation can be conducted for subjective scales, while objective fields can be screened for missing, anomalous, and duplicate values. Cross-checking multi-stakeholder data can reduce common-method bias. Reliability, validity, and model-fit results must be derived from actual samples and cannot be inferred directly from a theoretically constructed indicator table. For programs with small samples, data can be pooled across years or supplemented with qualitative case studies rather than used to produce unstable annual rankings.

5.2 Indicator Quantification and Combined Weighting

Indicator quantification should begin by standardizing directionality and measurement conventions. For positive indicators, larger values indicate higher quality, whereas negative indicators require directional transformation. Variables with substantial industry differences, such as salary, can be expressed as relative positions within disciplines or industries. For proportional indicators, the numerator, denominator, and survey time point should be explicitly defined. Min–max normalization can be used for quantitative indicators, while subjective items such as satisfaction should employ consistent scales and retain their original distributions. Let x_{ij} denote the i-th observation of the j-th indicator and z_{ij} its normalized value. A positive indicator can then be expressed as:

$$z_{ij} = (x_{ij} - \min x_j) / (\max x_j - \min x_j)$$

When the maximum and minimum values are equal, the indicator has no discriminatory power in the current sample and should be treated separately rather than assigned a value arbitrarily. Outliers can be addressed using robust methods, with the rules disclosed. Normalization addresses differences in measurement units; it does not imply that indicators are equally important.

Weights can be determined through a combined procedure comprising Delphi-based screening of content, analytic hierarchy process (AHP) representation of value judgments, entropy weighting to capture sample discrimination, and sensitivity analysis to assess robustness. AHP is suitable for

representing hierarchical judgments but requires consistency testing[15]. Fuzzy comprehensive evaluation can accommodate linguistic ambiguity in assessments of satisfaction and competence[16], but computational complexity cannot compensate for poorly defined indicators. If subjective and objective weights are combined, the procedure can be expressed as:

$w_j = \lambda w_j^A + (1 - \lambda) w_j^E$, $Q_i = \sum_j w_j z_{ij}$

Here, w_j^A and w_j^E denote subjective and objective weights, respectively; λ is the combination coefficient; and Q_i is the composite evaluation value. The value of λ should not be specified arbitrarily. Multiple scenarios can be defined according to the evaluation purpose, and the stability of the results can then be compared. When composite scores are used for overall diagnosis, the four dimensions, key third-level indicators, and confidence intervals should also be reported. Conclusions that reverse markedly after changes in weights or samples should be interpreted cautiously. This study does not prespecify weights or calculate scores for any institution.

To avoid full compensation, the results should comprise a composite index, a threshold checklist, and an assessment of quantity–quality coordination. Threshold indicators—including labor contracts, social security, occupational safety, recruitment discrimination, and standards for verifying graduate destinations—should be reported separately. Employment sufficiency and job quality should be indexed independently before examining whether they improve simultaneously. Even when the composite index is high, salient threshold deficiencies should take priority in the improvement agenda. Spillover indicators such as regional contribution can be analyzed separately to prevent them from obscuring individual employment quality.

5.3 Data Governance and Quality Control

The governance of multisource data should follow the principles of informed consent, data minimization, purpose limitation, and tiered authorization. Graduates' employment status, salary, social security, and career trajectories are sensitive. Before collection, participants should be informed of the purposes, retention periods, and procedures for withdrawal. Linked research data should use anonymous codes in place of direct identifiers, while published results should be aggregated and small-cell disclosure controlled. Students must not be compelled to provide personal information unrelated to evaluation purposes, nor should participation in tracking be improperly linked to graduation, awards, or other entitlements.

Digital platforms can support job-text analysis, skill-demand identification, and longitudinal tracking, but algorithmic outputs should undergo human review. Similar job titles do not necessarily entail identical competency requirements, and text models may amplify historical biases relating to gender, institution, or discipline in recruitment. The data integration emphasized by multimodal intelligent evaluation must proceed alongside algorithmic fairness, explainability, and student autonomy[7]. Platforms should provide channels through which students can correct erroneous records and should retain documentation of measurement conventions, model versions, and anomaly handling to ensure auditability.

5.4 Feedback and Application of Results

Evaluation results should be presented through an overall profile, dimensional weaknesses, group differences, temporal trends, and an improvement agenda rather than through a single total score. The overall profile describes the four dimensions; dimensional weaknesses identify organizational, educational, or outcome-related problems; group differences assess equity; temporal trends capture changes between initial employment and long-term development; and the improvement agenda specifies responsible actors, deadlines, and evidence for review. Research-oriented institutions may place greater emphasis on innovative capabilities and long-term development, whereas application-oriented and higher vocational institutions may emphasize practical alignment and the application of technical skills. All institution types, however, must report labor rights and employment equity.

Feedback should operate in two directions. Internally, it should inform program early warning, curricular renewal, practical teaching, career guidance, and resource allocation. Externally, it should provide evidence for government to improve public employment services and for industries and enterprises to improve jobs and employment practices. Feedback does not mean frequently closing programs in response to short-term employment fluctuations; foundational disciplines and fields of long-term strategic importance must also be assessed in relation to the public interest. Systemic improvement can follow a closed loop of monitoring, diagnosis, decision-making, implementation, and review[13]. Each evaluation cycle should examine whether the previous cycle's improvements were implemented, transforming employment quality evaluation from an exercise in documentation into a capacity for governance.

6. Collaborative Pathways for Improving Employment Quality in Guangzhou Higher Education Institutions from the Perspective of New Quality Productive Forces

Improving employment quality cannot rely solely on isolated efforts by institutional career-services departments. Government demand transmission, institutional improvement in talent cultivation, collaborative education by industries and enterprises, category-based evaluation, and digital-intelligence governance must be incorporated into interconnected improvement mechanisms. Accordingly, this section proposes collaborative pathways in five areas: demand transmission, educational feedback, collaborative education, category-based improvement, and digital-intelligence safeguards.

6.1 Improving Demand Transmission and Public Employment Services

Government should align employment quality monitoring with forecasts of industrial demand for talent and promote the orderly sharing of public information held by education and human resources and social security departments with industry-demand information, subject to legal compliance and consistent definitions. The priority is not to establish a platform encompassing all data, but to develop comparable core indicators, stable time series, and clear data responsibilities. In fields characterized by

rapid technological renewal and extensive industrial integration, universities, industries, enterprises, and graduates can be convened regularly to assess changes in competencies and translate job shortages, skill mismatches, and labor risks into agendas for talent cultivation and employment services.

Public policy must also address both sufficient opportunities and equitable development. For graduates experiencing employment difficulties, support should shift from one-off job referrals to occupational diagnosis, skills development, transitional internships, and follow-up assistance. For graduates in flexible and new forms of employment, access to information on labor rights and public services should be improved. Financial and program evaluation should not reward only the number of contracts signed. Longitudinal improvement, developmental gaps among priority groups, and the quality of employers' employment practices can be incorporated into policy monitoring, thereby discouraging institutions from engaging in strategic reporting to meet short-term targets.

6.2 Establishing Continuous Improvement through Feedback between Education and Employment

Higher education institutions should first translate employment quality objectives into differentiated learning outcomes. Research-oriented education may emphasize originality, research methods, and complex problem solving, whereas application-oriented and vocational education may emphasize technological application, workplace improvement, and occupational transferability. Green literacy, digital literacy, professional ethics, and autonomous learning should be required across institution types. Program directors, course instructors, and career-services staff should jointly interpret longitudinal evidence and disaggregate problems such as low major–job compatibility, insufficient utilization of capabilities, and frequent early-career transitions into issues concerning curricula, practical learning, and guidance, rather than simply attributing them to inadequate student effort in job searching.

Second, institutions should improve the efficiency with which resources are converted into outcomes. The effects of institutional resources on employment depend not only on objective inputs but also on student perceptions and utilization and on mediating processes such as internships and competency gains [12]. Institutions should shift from increasing the number of activities to improving service quality: introducing career awareness earlier and providing staged career education; using authentic projects to increase the relevance of practical learning; offering optional modules for interdisciplinary study, digital-skills updating, and green practice; and strengthening faculty–student interaction and individualized guidance. Employment quality evaluation should assess whether students actually access and use these resources.

Finally, evaluation results should be used judiciously. Programs experiencing persistent declines in demand and inadequate matching can undergo comprehensive review, followed by adjustments to enrollment capacity or educational content. For programs experiencing short-term fluctuations but possessing foundational or strategic value, adaptability should instead be strengthened through interdisciplinary curricula and broader capability development. When employment feedback informs admissions and program adjustment, the views of faculty, students, industries, and enterprises should all be considered. A productive balance must be maintained among educational principles, student

interests, and labor-market demand, preventing immediate job numbers from dominating university education.

6.3 Deepening Industry–Education Integration and Collaborative Education

Industries and enterprises should communicate their talent requirements earlier in the educational process and participate in assessing competency standards, designing authentic projects, guiding practical learning, and evaluating graduate performance. The quality of university–enterprise cooperation cannot be measured by the number of partner organizations. It should instead be assessed by whether students undertake substantive tasks, receive qualified supervision, engage in practice relevant to program objectives, and generate demonstrable evidence of competence. For occupations undergoing rapid technological change, enterprises can provide short modules, workplace mentors, and opportunities for faculty practice, helping institutions anticipate future competencies rather than merely reiterating current recruitment requirements.

Employers are also directly responsible for employment quality. Universities cannot unilaterally resolve excessive working hours, inadequate social protection, or unclear promotion pathways through educational improvement. Enterprises should improve the accuracy of job information, fairness in recruitment, and compliance in employment practices, while providing graduates with necessary training, constructive feedback, and opportunities for advancement. Joint analysis of graduate satisfaction and employer assessments of competence can distinguish between students' difficulties in adapting to jobs and jobs' failure to support employee growth, enabling collaborative governance to improve both the supply of talent and the quality of available jobs.

6.4 Implementing Category-Based Evaluation and Differentiated Improvement

Employment quality governance in Guangzhou higher education institutions should combine common threshold requirements, institution-type modules, and discipline-specific features. Common thresholds cover employment sufficiency, labor rights, equity, and standards for longitudinal tracking. Institution-type modules select innovation, technological application, and practical-learning indicators according to research-oriented, application-oriented, and vocational-technical missions. Discipline-specific features address differences in industry salary levels, occupational qualifications, traditions of further study, and employment cycles. Comparisons within categories should identify opportunities for improvement rather than converting disciplinary differences into judgments of institutional hierarchy.

Category-based approaches should also address student groups. Family resources, gender, disability status, and prior educational experience may affect job-search opportunities and career choices. Evaluation should use disaggregated results to assess whether support is accessible and opportunities are equitable, rather than converting background differences into fixed labels of ability. For graduates choosing further study, entrepreneurship, freelance work, or deferred employment, their autonomy should be respected while the informational basis, actual progress, and risk protection associated with those choices are examined. Only by placing student development at the center can category-based

evaluation avoid creating new stratification pressures.

6.5 Strengthening Digital-Intelligence Enablement and Data-Ethics Safeguards

Digital-intelligence technologies can integrate dispersed information, identify skill requirements, and provide personalized services. With lawful authorization, institutions can link curricular learning, practical outputs, and graduate feedback in anonymized form to identify educational experiences that contribute most to competency gains. Government departments and industry organizations can monitor skill iteration through changes in job advertisements and provide institutions with forward-looking information. System-generated recommendations, however, should inform rather than automatically determine decisions by faculty and students concerning program continuity, job referrals, or individual career pathways.

Technological governance must simultaneously establish clear boundaries: data availability must not justify unlimited collection; algorithmic scoring must not eliminate human interpretation; historical data must not be used to reproduce existing biases; and composite evaluation must not lead to the disclosure of personally identifiable information. Mechanisms should be established for students to access, correct, and appeal records, and regular reviews of algorithmic fairness and security should be conducted. Offline services should remain available to groups with limited digital capabilities. Only under these conditions can digital-intelligence enablement simultaneously serve efficiency, precision, and human agency.

7. Conclusions and Future Research

From the perspective of new quality productive forces, the evaluation of employment quality in Guangzhou higher education institutions must expand beyond whether graduate destinations have been secured to whether talent cultivation develops sustainable capabilities, whether graduates attain dignified working lives with opportunities for development, and whether the institutional supply of talent aligns effectively with regional transformation. Drawing on integrating triple helix, stakeholder, and synergy theories, this study develops a four-dimensional framework comprising organizational coordination and institutional support, educational processes and competency gains, employment outcomes and job quality, and sustainable career development and regional contribution. Innovation, green development, integration, and shared development are embedded in specific observation points. The four-dimensional structure retains the fundamental labor attributes of employment quality while incorporating new requirements arising from technological change, long-term development, and regional collaboration.

The value of evaluation lies not in producing an apparently precise total score, but in establishing a trackable, interpretable, and feedback-oriented chain of evidence. Accordingly, this study proposes multi-wave tracking at graduation and six months, one year, and three years after graduation; triangulation of multi-stakeholder data; combined subjective and objective weighting; and separate reporting of a threshold checklist. It also advocates category-based implementation that combines

common thresholds, institution-type modules, and discipline-specific features. Government, universities, industries, and enterprises should share responsibilities for demand transmission, capability formation, job improvement, and outcome review, enabling evaluation results to inform program and curriculum adjustment, career-service improvement, and public governance.

This study is limited to theoretical analysis and indicator-system construction. It has not empirically tested the framework using data from graduates, employers, or administrative records in Guangzhou and therefore cannot establish indicator weights, reliability or validity, institutional differences, or policy effects. Future research should select institutions of different types through stratified sampling, conduct cognitive interviews and pilot studies, refine the indicators through Delphi consultation, test construct validity and weighting robustness using actual samples, and compare longitudinal trajectories across cohorts and groups. Data availability, tracking costs, algorithmic bias, and privacy risks should also be evaluated continuously. Only through repeated evidence-based testing and stakeholder consultation can the framework progress from a project outcome to a transferable tool for monitoring employment quality.

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