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Developing a Human-Computer Interaction (HCI) Based Psychosocial Support System for Employment: Empirical Study of Young Public-Sector Employees in Western China

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Abstract: Based on an empirical analysis of factors influencing public-sector employment among young adults in Western China, this study constructs a psychosocial support system that integrates Human-Computer Interaction (HCI) and Artificial Intelligence (AI) technologies. Using data from the China General Social Survey (CGSS) 2021, a sample of laborers aged 18–35 years in Western China was examined through binary logistic regression across two dimensions: human capital and family capital. Results show that undergraduate or higher education and Communist Party membership are key predictors of public-sector employment. Family capital, particularly parental public-sector background, exerts both direct influence and partial mediation through human capital, reflecting a resource-transmission mechanism. Findings also reveal a strong preference for public-sector jobs among youth, where marginal educational returns are modest and family capital plays a more decisive role. Based on the aforementioned empirical insights, this study innovatively proposes a digital support framework for human resource development in developing countries. The core of this framework is the construction of a human-computer interaction platform driven by artificial intelligence algorithms. Its innovation lies in the deep integration of two major modules: first, a personalized job recommendation and skills enhancement planning module aimed at reducing information asymmetry; and second, a pioneering psychosocial support module that utilizes affective computing and interactive dialogue technology to provide young job seekers with real-time anxiety monitoring, cognitive-behavioral interventions, adaptive adjustment strategies, and positive feedback incentives. By combining technological empowerment with managerial support, this framework aims to systematically enhance individuals' adaptability and competitiveness during the job preparation phase. It provides a technological solution with both theoretical basis and practical pathways to address the widespread problem of youth career development management in developing countries, exacerbated by unequal social capital.
Keywords: Human-Computer Interaction (HCI); Psychosocial Support for Employment; Public-Sector Employment; Young Adults in Western China; Affective Computing

1. Introduction

This study focuses on the issue of public-sector employment among young adults in Western China. This topic holds significant practical relevance against the backdrop articulated in the Medium- and Long-Term Youth Development Plan (2016–2025), which explicitly states that "the structural contradictions in youth employment are relatively pronounced, and obstacles affecting employment fairness need to be further eliminated" [1]. Public-sector employment is highly favored by young people due to its stability and comprehensive benefits. In 2025, the number of applicants for the national civil service examination reached approximately 3.1965 million, with a competition ratio of 69.2:1, reflecting a pronounced employment preference [2]. The impact of the pandemic has intensified labor market uncertainties, thereby strengthening the demand for job stability and making public-sector positions the primary choice for an increasing number of individuals.

Within this macro context, the structural imbalance in regional development between Eastern and Western China becomes further accentuated. The eastern region boasts a developed economy and a high density of opportunities, while Western China, despite having substantial demand for talent, faces a dual challenge of brain drain among local youth and intensified competition for public-sector jobs. Provincial-level data from the 2025 national exam [2] indicate that the competition ratios in western provinces generally exceeded the national average (69.2:1), exemplified by Sichuan (69.8:1), Chongqing (67.5:1), Shaanxi (105.7:1), Yunnan (81.5:1), Ningxia (75.7:1), Guizhou (86.7:1), and Tibet (138.7:1). These figures empirically corroborate the strong inclination of young adults in Western China toward public-sector employment.

However, existing research has predominantly focused on empirical analyses of influencing factors, lacking comprehensive technology-driven solutions involving Human-Computer Interaction (HCI) and Artificial Intelligence (AI). There is a notable oversight regarding the psychological support needs of young adults in Western China during their job search process. Consequently, grounded in data from the 2021 China General Social Survey (CGSS), this study employs a binary logistic regression model to identify key factors influencing public-sector employment from the dimensions of human capital and family capital. Based on these empirical findings, we construct an HCI-based system

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that integrates intelligent information recommendation, capability enhancement pathway planning, and affective computing-based psychosocial support functions. This research aims to alleviate structural employment barriers through technological empowerment, offering a novel approach to employment services that addresses both equity and psychological adaptability.

2. Literature Review

The integration of Artificial Intelligence (AI) and Human-Computer Interaction (HCI) has demonstrated significant potential across multiple domains, particularly in driving innovative solutions for providing personalized services, supporting adaptive interactions, and enabling large-scale public service delivery. These technological advancements establish a solid foundation for developing an AI-driven system aimed at delivering psychosocial employment support for young adults in Western China. Within the educational sector, AI has been utilized not only to create personalized learning pathways but also to automate the execution of high-quality educational experiments. Cingillioglu et al. (2024) demonstrated through a fully automated randomized controlled trial (RCT) that an AI system can independently manage participant interaction and group assignment, highlighting its efficiency and rigor in conducting large-scale educational research [3]. Similarly, Baillifard et al. (2025) developed a personalized AI tutoring system that leverages GPT-3 to generate micro-learning questions and employs neural networks to dynamically model students' knowledge states, resulting in improved academic performance [4]. In the realm of psychosocial support, although direct studies remain relatively limited, research by Tomprou & Lee (2022) on how algorithmic management influences psychological contracts and perceptions of trust provides a theoretical basis for designing AI agents capable of delivering emotional support in high-pressure job-seeking scenarios [5]. Furthermore, AI applications in public services—such as intelligent question-answering and virtual assistants—have significantly enhanced the accessibility and efficiency of service delivery. Koskimies & Kinder (2024) emphasized the importance of establishing bidirectional trust and ethical consensus within AI-enabled public services [6], while Kim et al. (2022) proposed a "student–AI collaboration" model that further supports the conception of AI systems designed for guiding and cooperative roles [7]. Collectively, these developments indicate that AI and HCI technologies have accumulated substantial practical experience in personalized interaction, ethical mechanisms, and scalable service delivery. This existing body of work provides strong technical feasibility for constructing psychosocial support systems targeting populations experiencing employment difficulties.

Building upon the established technical feasibility, it is essential to further recognize the actual influencing factors and structural barriers inherent in public-sector employment. Existing studies consistently indicate that public-sector employment is shaped by a dual influence of human capital and family capital: the former, where factors such as educational attainment and political affiliation serve as core predictive variables, and the latter, which significantly impacts young people's job-seeking processes through mechanisms of information and resource transmission. Against a backdrop of digital transformation, this resource disparity rooted in family background has become further intertwined with issues of the "digital divide" and "information gap." Zola (2025) pointed out that the digital divide is manifested not only through disparities in access to information and communication technologies (ICTs) but also through structural inequalities in digital skills and usage efficacy [8]. Szeles & Simionescu (2021) found that higher digital literacy significantly facilitates the school-to-work transition for young people, reduces the risk of becoming NEET (not in education, employment, or training), and may even partially mitigate the negative impact of low educational attainment [9]. Research by Weng & Li (2025) in the Chinese context further revealed that internet use significantly promotes the formation of the middle class by facilitating entrepreneurship, financial participation, and non-agricultural employment—particularly among central and western regions and populations with lower education levels [10]. This finding also indirectly suggests that individuals from advantaged family backgrounds are better positioned to leverage the internet to access high-quality employment information and opportunities, thereby exacerbating intergenerational inequality in competition for public-sector positions. This observation aligns strongly with the "family capital effect" identified in the present study: youth from privileged family backgrounds not only benefit from traditional social resources but also implicitly enjoy additional advantages in information acquisition and digital technology use (Kaba & Said, 2014). Such "digital empowerment" effectively reinforces structural inequalities within the job market [11].

Therefore, in exploring technological solutions to alleviate the employment challenges faced by young adults in Western China in securing public-sector positions, it is imperative not only to leverage AI and HCI technologies for functional innovation but also to directly address the structural barriers exacerbated by the interplay of the digital divide and family capital. The human-computer interaction-based employment support system proposed in this study aims to provide precise information and psychosocial services while actively mitigating these inequities through inclusive design and ethical technology practices. By doing so, it strives to achieve broad accessibility and substantive fairness in employment support.

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3. Empirical Foundation: Analysis of Factors Influencing Public-Sector Employment Among Young Adults in Western China

This study employs a binary logistic regression model, as the dependent variable—whether an individual has entered public-sector employment—is dichotomous, and no linear relationship exists between the independent and dependent variables. The specific form of the model is as follows:

$\ln[P/(1-P)]=\beta_0+\beta_1X_1+...+\beta_{12}X_{12}+\mu$

Here, Prepresents the probability of a young adult entering public-sector employment, $\ln[P/(1-P)]$ is the natural logarithm of the odds ratio, β_0 denotes the intercept term, X_1 to X_{12} are the explanatory variables, β_1 to β_{12} their respective regression coefficients—reflecting the direction and magnitude of each variable's influence on public-sector employment—and μ is the random error term.

To thoroughly examine regional heterogeneity, two comparison groups were established: Group 1 focused specifically on young adults in Western China, while Group 2 was expanded to include young adults across the entire country. For each group, three regression models were constructed: Model 1 included only human capital variables; Model 2 incorporated both human capital and family capital variables; and Model 3 included all variables.

3.1 Sample Selection

This study utilized data from the 2021 China General Social Survey (CGSS), which is the earliest national, comprehensive, and continuous academic survey project in China, administered by the National Survey Research Center at Renmin University of China. The original sample comprised 8,148 individuals. After removing invalid and missing values, 273 samples were retained for Group 1 (young adults in Western China), and 1,178 samples were retained for Group 2 (national youth).

The sample selection process for Group 1 involved the following steps: samples from Western China provinces were selected; age was calculated (2021 minus year of birth); young adults aged 18–35 years were identified; individuals not in the labor market were excluded; and respondents who answered "refuse to answer" or "don't know" were removed. The screening procedure for Group 2 was identical to that of Group 1, except that no restriction was placed on Western provinces.

3.2 Variable Selection and Coding

The dependent variable, public-sector employment status, was coded based on respondents' answers regarding "unit type" and "ownership nature": a value of 1 was assigned if the unit belonged to "government agencies," "public institutions," or "state-owned and state-holding enterprises"; otherwise, 0 was assigned.

Independent variables encompassed two categories: human capitaland family capital(see Tables 1 and 2). First, human capital included: education level, categorized by highest degree as "below college" (0), "associate degree" (1), "bachelor's degree" (2), or "postgraduate or higher" (3); political affiliation: Communist Party members were coded as 1; others as 0. Second, family capital included: parental public-sector employment, coded as 1 if either parent worked in the public sector when the respondent was 14 years old (based on unit type and ownership nature); otherwise, 0. And parental political affiliation, coded as 1 if either parent was a Communist Party member; otherwise, 0. And parental education level: Highest parental education categorized as "junior high school or below" (0), "high school/vocational/technical school" (1), or "tertiary education" (2). And parental family class: Self-rated family social class at age 14 (1–10 scale), recoded as "below average" (0 for levels 1–3), "average" (1 for levels 4–6), or "above average" (2 for levels 7–10). Third, Control variables: Gender: Male = 1; female = 0. And region(Group 2 only): Provinces categorized as eastern (2), central (1), or western (0).

Table 1 Variable Names and Coding

Variable Type	Variable Name	Coding
Dependent Variable	Public-sector employment status	Employed in public sector = 1; Not employed in public sector = 0
Independent Variables	Education level	No tertiary education = 0; Associate degree = 1; Bachelor's degree = 2; Postgraduate = 3
	Political affiliation	Communist Party member = 1; Non-member = 0
	Health status	Continuous variable
	Parental family class	1-3=0,4-6=1,7~10=2
	Parental public-sector employment background	At least one parent (ever) employed in public sector = 1; Neither parent employed in public sector = 0

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Continued Table 1 Variable Names and Coding

Variable Type	Variable Name	Coding
Independent Variables	Parental political affiliation	At least one parent is a Communist Party member = 1; Neither parent is a member = 0
	Parental education level	Junior high school or below = 0; High school / vocational school / technical school = 1; Tertiary education = 2
Other Variables	Gender	Male = 1; Female = 0
	Region (Group 2 only)	Eastern China = 2; Central China = 1; Western China = 0
	Age	Continuous variable

3.3 Empirical Analysis of the Impact of Human Capital, Family Capital, and Other Factors on Public-Sector Employment Among Young Adults

Tables 2 and 3 present the results of binary logistic regression analyses for factors influencing public-sector employment among young adults in Western China and nationwide, respectively, with all models (Models 1 to 3) demonstrating an Omnibus test significance below 0.001, which confirms the statistical significance of the overall model specifications; moreover, Hosmer–Lemeshow test significance levels consistently exceeded 0.05, indicating adequate model fit and sufficient reflection of the underlying data structure, as detailed below:

Table 2 Binary Logistic Regression Results for Factors Influencing Public-Sector Employment (Western China Youth Sample)

Variable			Model 1		Model 2		Model 3	
			B	Exp(B)	B	Exp(B)	B	Exp(B)
Human Capital	Education level	1	1.806***	6.089			1.646***	5.187
		2	2.572***	13.090			2.583***	13.237
		3	1.729	5.635			-0.183	0.833
	Political affiliation	1	1.098**	2.999			1.427***	4.165
	Health status	Cont.	0.087	1.091			0.260	1.297
Family Capital	Parental public-sector employment	1			1.390***	4.017	0976*	2.654
	Parental education level	1			-0.233	0.792	-0.676*	0.509
		2			-0.175	1.192	-0.023	0.977
	Parental political affiliation	1			1.277***	3.586	1.936***	6.931
	Parental family class	1			0.217	1.242	0.250	1.284
		2			-1.158	0.314	-2.633*	0.072
Other Variables	Gender	1	-0.510	0.601	-0.243	0.784	-0.616	0.540
	Age	Cont.	0.073***	1.076	0.049	1.050	0.096*	1.101
Constant			-5.187	0.006	-3.148	0.043	-6.860	0.001

Notes 1 : All variables use 0 as the reference category. (The same applies below).
Notes 2 : *, **, ***indicate significance at the 0.1, 0.05, and 0.01 levels, respectively. (The same applies below).

Table 3 Binary Logistic Regression Results for Factors Influencing Public-Sector Employment (National Youth Sample - Full Model)

Variable			Model 1		Model 2		Model 3	
			B	Exp(B)	B	Exp(B)	B	Exp(B)
Human Capital	Education level	1	1.342***	3.826			1.322***	3.750
		2	2.466***	11.780			2.433***	11.398
		3	3.087***	21.900			2.971***	19.503
	Political affiliation	1	0.659***	1.933			0.598**	1.818
	Health status	Cont.	0.105	1.111			0.131	1.140
Family Capital	Parental public-sector employment	1			0.760***	2.138	0.462*	1.588

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	Parental education level	1			0.441**	1.554	-0.059	0.943
		2			0.543*	1.721	-0.278	0.757
	Parental political affiliation	1			0.452*	1.571	0.333	1.396
	Parental family class	1			0.035	1.036	-0.178	0.347
		2			-0.624*	0.536	-0.710*	0.492
	Gender	1	-0.178	0.837	-0.217	0.805	-0.211	0.810
Other Variables	Region	1	-0.636***	0.529	-0.576**	0.562	-0.611**	0.543
		2	-0.523**	0.593	-0.185	0.831	-0.530**	0.589
	Age	Cont.	0.058***	1.059	0.016	1.017	0.052**	1.054
Constant			-4.728	0.009	-2.255	0.105	-4.599	0.010

This study constructed an empirical model of factors affecting young adults' public-sector employment through binary logistic regression using CGSS 2021 data (results presented in Table 4). This model specifically reveals the mechanisms and effect sizes through which various factors influence entry into public-sector employment among youth in Western China.

Dependent Variable: Public-sector employment (Ismember)

Table 4: Research Model on Factors Influencing Youth Public-Sector Employment

Variable Dimension	Specific Variables and Coding	Hypothesis	Group 1 (Western China) Model 3 Exp(B)	Group 2 (National) Model 3 Exp(B)	Hypothesis Testing and Key Findings
Human Capital	Education level (Ref: No tertiary education)	H1			Supported
	Associate degree (edu=1)		5.187***	3.750***	Education is a decisive factor. The probability of employment for those with a bachelor's degree is significantly higher than for those with an associate degree; the probability for postgraduates is significantly higher than for those with a bachelor's degree.
	Bachelor's degree (edu=2)		13.237***	11.398***	
	Postgraduate (edu=3)		(Not significant)	19.503***	
	Political affiliation (CPC member=1)	H3	4.165***	1.818***	Supported. Communist Party membership significantly increases the probability, with a stronger effect observed in Western China.
	Health status (Continuous variable)	H2	(Not significant)	(Not significant)	Not supported. Minimal health variation within the youth group shows no impact on employment selection.
Family Capital	Parental public-sector employment (Yes=1)	H4	2.654*	1.558*	Supported. However, the effect weakens after controlling for human capital, indicating its

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					influence is partially mediated by enhancing offspring's human capital.
	Parental education level (Ref: Junior high school or below)	H5			Partially supported.
	High school/vocational (parent_edu=1)		(Not significant)	1.544* (Model 2)	A significant positive effect was found in the national sample, but it was not significant in the Western sample.
	Tertiary education (parent_edu=2)		(Not significant)	(Not significant)	
	Parental political affiliation (CPC member=1)	H6	6.931***	(Not significant)	Partially supported. The effect is highly significant in the Western sample but not significant in the national sample.
	Parental family class (Ordinal variable)	H7	(Not significant)	(Not significant)	Not supported. The effect is insignificant, likely due to the subjective nature of the measurement.
	Gender (Male=1)	H8	(Not significant)	(Not significant)	Not supported. No significant gender differences were found.
	Age (Continuous variable)		(Not significant)	(Not significant)	Its influence on employment probability is not significant in the final model.
Control Variables	Region (Ref: Western China)	H10	(Not applicable)		Supported.
	Central China (region=1)			0.562**	The probability of entering public-sector employment for young adults in central and eastern China is significantly lower than for those in Western China.
	Eastern China (region=2)			0.831 (Not significant)	
	Constant		0.043*	0.105	

This study systematically reveals the multifaceted factors and underlying mechanisms influencing public-sector employment among young adults in Western China through empirical analysis. The results demonstrate that: first, human capital constitutes the core element of employment competitiveness, wherein educational attainment and political affiliation serve as rigid entry conditions whose impact exhibits significant consistency nationwide; second, family capital primarily functions as a facilitator rather than a determinant—parental public-sector backgrounds may confer advantages, yet their influence is predominantly mediated indirectly through improved conditions for offspring's human capital investment, with its direct effects diminishing as individual human capital increases, reflecting progressive standardization and transparency in the labor market; finally, regional disparities emerge as critical contextual variables, with Western China's employment ecosystem characterized by three distinct features: the strongest preference for public-sector positions among youth, more pronounced practical utility of family social capital, and relatively lower returns on human capital investment—a pattern suggesting potential "crowding-out effects" of social capital on human capital that are intrinsically linked to regional industrial structures and resource distribution patterns.

These findings provide robust empirical evidence and theoretical support for the development of a human-computer interaction (HCI) based psychosocial employment support system targeting young adults in Western China.

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Informed by these empirical conclusions, the proposed system is designed to directly address the structural challenges faced by young job seekers in the region. It leverages HCI technologies to bridge information gaps, provide alternative social capital support, and efficiently enhance users' human capital. The system intentionally incorporates mental health support features to alleviate psychological pressure and anxiety during employment preparation. This research not only deepens the understanding of the mechanisms behind public-sector employment among youth in Western China but also offers an innovative solution and practical pathway for applying artificial intelligence (AI) to promote employment equity and psychological empowerment.

4. System Design: An Evidence-Based AI and Human-Computer Interaction System

Building upon the empirical findings regarding factors influencing public-sector employment among young adults in Western China, this study aims to construct a data-driven and user-centered AI-powered human-computer interaction (HCI) system. By integrating key parameters and weights derived from empirical research, the system is designed to mitigate inequalities in employment opportunities arising from disparities in human and family capital through intelligent technological interventions. Closely aligned with the actual needs of youth in Western China, the system incorporates four core functions—information aggregation, capability enhancement, simulated training, and psychosocial support—to form a comprehensive and personalized employment assistance platform. This approach provides both a theoretical foundation and a technical pathway for achieving precise and intelligent employment services.

4.1 Design Philosophy and Objectives

Grounded in the empirical findings on factors influencing public-sector employment among young adults in Western China, the system is constructed with a dual orientation toward authentic data and user needs, defining its core design philosophy and objectives. The design philosophy centers on addressing the unique challenges faced by youth in Western China, leveraging artificial intelligence (AI) and human-computer interaction (HCI) technologies to mitigate inequalities in employment resources and opportunities resulting from disparities in human and family capital. Moving beyond mere information provision and skill development, the system emphasizes psychosocial support, reflecting inclusive design principles of "ethical technology" and "empowerment through intelligence." The system's objectives focus on tackling the core difficulties encountered during public-sector job seeking and are structured as follows: first, to provide accurate and comprehensive public-sector employment information resources—using intelligent aggregation and recommendation algorithms to integrate real-time data on recruitment announcements, position requirements, and competition dynamics—thereby eliminating information asymmetry caused by geographical and familial disadvantages and promoting more equitable access to opportunities; second, to deliver personalized capacity-building and pathway planning functions—by constructing dynamic individual competency models based on users' educational background, political affiliation, and professional expertise—enabling tailored learning plans and examination preparation routes that facilitate efficient human capital accumulation and alleviate structural disparities in educational resources and family support; third, to offer simulated training and real-time feedback mechanisms—through virtual interviews, automated essay grading, and situational interactive Q&A—compensating for the lack of practical resources and hands-on training opportunities among Western youth, while incorporating psychological state recognition and adaptive support via affective computing to enhance users' comprehensive competencies and psychological resilience in realistic employment settings. In summary, the system aims to establish an intelligent HCI environment that integrates information, capacity development, and psychosocial support, serving as both a technological response to the real-world employment challenges faced by Western youth and an innovative application of evidence-based design thinking in the domain of public employment services.

4.2 Core Functional Modules (Integrating HCI and Parameter Frameworks)

Building upon the empirical findings and system design objectives established earlier, this study developed an HCI-based psychosocial employment support system featuring four integrated core functional modules tailored to the practical needs of young adults pursuing public-sector employment in Western China. Beyond defining each module's functional role, the system innovatively incorporates a quantifiable parameter framework to ensure interventions are data-driven, process-monitorable, and outcome-verifiable. The core design logic and operational mechanisms are structured as follows:

First, the system adheres to a user-centric data flow design. All interaction processes begin and end with young users in Western China, who engage in bidirectional interactions with the four core modules: they input personal information and goals while receiving real-time, personalized feedback and support from the system. The data and interface layer at the base of the system serves as a central storage unit, integrating a real-time updated multi-source

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employment information database and dynamic user profile archives, ensuring that all functional modules operate based on the latest and most targeted data.

Second, the system emphasizes inter-module collaboration and parameterized operation.Modules achieve functional synergy through a shared user database: the intelligent recommendation engine invokes parameters such as political affiliation (P_party) and education level (L_edu) from user profiles and performs position matching based on empirical regression weights (e.g., β_party= 0.598); the personalized planner generates development paths according to the gap value (Gap_score) between user capabilities and target positions; the virtual interviewer records behavioral data (e.g., eye contact rate > 60%), based on which the psychosocial support module triggers proactive interventions (e.g., issuing rest reminders after >3 hours of continuous learning); meanwhile, community behavior data monitored by the psychosocial module (e.g., check-in rate > 85%) can feed back into the learning module to optimize task compliance.

Finally, the system achieves deep integration of empirical research and its parameter framework. Key parameters embedded within the system—such as the regression coefficient in the job matching algorithm (β_party= 0.598), information coverage rate (≥98%), matching threshold (>70%), and interview performance indicators (e.g., eye contact rate > 60%)—are all directly derived from empirical research findings, thus ensuring that the system's construction is not merely conceptual but grounded in solid empirical evidence and operable, verifiable engineering frameworks.

This architecture systematically integrates empirical evidence, human-computer interaction technology, and psychosocial support mechanisms from the data layer to the interactive front end, forming a comprehensive support platform tailored to public-sector employment for young adults in Western China and providing a clear technical pathway and theoretical foundation for subsequent engineering implementation and effectiveness evaluation.

4.2.1 Intelligent Information Aggregation and Recommendation Engine (AI Algorithm-Driven)

This module aims to enhance the accuracy of job matching and the interpretability of algorithmic recommendations by introducing a quantitative parameter system to ensure the process is scientifically reliable and the results are explainable. The parameter design is as follows: First, comprehensive information coverage. The system integrates and continuously updates public-sector job information from three administrative levels (province, city, and county) across all 12 western provinces, with an information coverage rate ≥ 98% and an information update delay < 12 hours set as performance thresholds to guarantee the timeliness and completeness of the underlying data. Second, algorithm weights based on empirical parameters. The recommendation algorithm deeply incorporates the empirical results of the binary logistic regression model from this study, transforming regression coefficients of significant influencing factors into matching weight parameters to ensure alignment between the recommendation logic and research findings. Specific parameters include: weight of Communist Party membership (β_party) = 0.598 (converted from Exp(B) = 1.818 in National Model 3); weight of undergraduate education (β_undergrad) = 2.433 (converted from Exp(B) = 11.398 in National Model 3); weight of parental public-sector employment (β_parent) = 0.444 (converted from Exp(B) = 1.558 in National Model 3). Third, matching threshold management. To improve recommendation quality and user focus, the system sets a matching threshold > 70% as the push criterion and implements a priority strong-push strategy for positions with a matching degree > 90%. Fourth, interpretability emphasized in human-computer interaction. After users input their personal characteristics, the system not only returns a list of positions but also provides quantitative explanations based on empirical weights to enhance user trust and decision-making engagement. For example: “This position shows a significant preference for Communist Party membership; this factor contributed to a +20.4% increase in your matching degree (calculated based on β_party)”; “Your undergraduate degree meets the core requirements of this position, contributing +78.5% to the matching degree.”

4.2.2 Personalized Learning and Development Planner (AI + Interaction)

This module establishes a balance between personalized adaptation and goal achievability by leveraging a multidimensional parameter system to assist young adults in Western China in efficiently enhancing their human capital. The parameter system is designed as follows: First, initial parameters for capability assessment. The system constructs a user digital profile through an initial parameter set to provide a data foundation for personalized planning, including: current education level (L_edu): [0-3]; political affiliation (P_party): {0, 1}; baseline score in administrative aptitude tests (S_aptitude): [0-100]; baseline score in essay writing (S_essay): [0-100]; daily available study time (T_daily): [hours]. Second, target gap parameters. The system calculates the capability gap value (Gap_score) between the user’s current status and the requirements of the target position through quantitative assessment methods, with Gap_score< 10 set as the threshold for achieving the goal. Third, human-computer interaction and plan generation. Based on the Gap_scoreand T_dailyparameters, the system dynamically generates a structured learning plan on a weekly basis and clearly explains it to the user through natural language interaction. For example: “Your current capability gap value (Gap_score) is 45. If you maintain a daily study input of T_daily= 3 hours, it is estimated to take 15 weeks to reach the goal. Key tasks for this week: complete specialized practice in the graphical reasoning section of the aptitude test (target accuracy rate ≥ 80%); memorize 5 model essays for essay writing; total weekly study time should not be less than 21 hours.”

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4.2.3 Virtual Interviewer and Intelligent Writing Evaluation (Deep Integration of HCI and AI)

This module addresses the lack of practical resources resulting from geographical or familial disparities by providing objective and refined feedback through a multimodal perception and evaluation system for young adults in Western China. The interview scoring framework utilizes a 100-point evaluation system structured across four dimensions with specified weights: content logic (40 points), assessed via NLP analysis of structural coherence and keyword coverage; verbal fluency (20 points), evaluated by ASR measuring speech rate (excellent standard: <200 words/minute), pauses, and repetitions (fewer than 3 pauses/minute); non-verbal performance (20 points), analyzed by computer vision for eye contact rate (>60%), smile frequency, and extraneous movements; and overall impression (20 points), assessed by an affective computing model for confidence and nervousness levels. The writing evaluation framework assesses essays across four core dimensions—theoretical depth of policy comprehension, sufficiency of argumentation, structural completeness, and linguistic standardization—each rated on a 1–5 scale to enable multi-faceted quantitative assessment. Through HCI, the system generates a structured evaluation report upon interaction completion, delivering data-driven diagnostics and improvement suggestions based strictly on the above parameters, such as: “Your total interview score is 72. Main areas for improvement: eye contact rate only 45% (-8 points); insufficient coverage of policy keywords when responding to ‘rural revitalization’ (-5 points). Recommended actions: eye-tracking training and memorization of policy terminologies.”

4.2.4 Psychosocial Support and Peer Motivation Module (HCI-Driven)

This module addresses psychological stress and loneliness experienced by young adults in Western China during exam preparation by implementing proactive, preventive psychosocial support through behavioral trigger parameters and enhancing persistence through community mechanisms. First, stress monitoring and alert parameters utilize user behavior data to activate interventions when thresholds are exceeded: the learning fatigue threshold triggers reminders after >3 hours of continuous study or >8 hours of daily cumulative study; the performance fluctuation thresholdinitiates supportive dialogues when recent mock exam scores decrease by >15% month-on-month. Second, community interaction and motivation parameters foster sustained engagement and mutual aid: when the community-wide daily check-in rate exceeds >85%, the system issues group praise; users earn mutual assistance creditsby answering peers’ questions or sharing materials, redeemable for virtual/physical rewards. Third, HCI-driven emotional support activates intelligent companionship based on these parameters—e.g., when the learning fatigue threshold is breached, the chatbot proactively displays: “Detected 3h12m of continuous study, exceeding recommended eye-health duration. Initiate a 15-minute break with guided breathing exercises?”

The structured parameter framework transitions this system from theoretical conception to a technical solution characterized by modelability, implementability, and verifiability. All parameters are rigorously rooted in prior empirical findings and meticulously aligned with the practical needs of young adults in Western China, ensuring maximal coherence between system design and research objectives—thereby establishing a robust empirical and methodological foundation for subsequent prototype development and intervention efficacy evaluation.

5. Discussion

This study provides a comprehensive discussion on public-sector employment challenges among young adults in Western China and its technological support system from three dimensions: theoretical innovation, policy application, and future directions. Theoretically, it reveals the interaction mechanism between human and family capital under regional imbalances, proposes a "digital empowerment inequality" framework, and constructs a tripartite support model integrating technology, psychology, and capability, thereby advancing the theoretical development of human-computer interaction research. From a policy perspective, it suggests concrete pathways including establishing intelligent employment service platforms, implementing digital literacy enhancement initiatives, and developing technology-enabled psychological services, offering evidence-based policy recommendations for alleviating structural employment difficulties. At the research level, it identifies the need for continued deepening through empirical evaluation, multimodal data fusion, application scenario expansion, and ethical governance to construct a more robust and reliable intelligent employment support system.

5.1 Theoretical Implications

This study deepens the theoretical understanding of the mechanisms driving public-sector employment among young adults in Western China, revealing the complex interplay between human capital and family capital under regional imbalances. It specifically uncovers the distinctive phenomenon of “high dependence on family capital coupled with low returns on education”, critically extending traditional human capital theory’s explanatory power in geographically unequal contexts. Innovatively integrating digital inequality theory with capital transmission theory, we propose the Digital Empowerment Inequality framework to elucidate how family capital reshapes employment

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opportunity distribution through advantages in digital skills and information access. Methodologically, the research achieves a profound synthesis of social science empiricism and AI modeling. By embedding empirical parameters (e.g., regression coefficients) into the human-computer interaction (HCI) system architecture, we establish a Technology-Psychology-Capability Tripartite Support Model, advancing HCI research from instrumental applications toward paradigm-shifting theoretical construction. Concurrently, the incorporation of affective computing and cognitive-behavioral intervention modules expands the applicability of psychological capital theory in the digital era. This pioneering integration provides new pathways for exploring the theoretical foundations of psychosocial support mechanisms within intelligent systems.

5.2 Policy Implications

Based on empirical findings regarding the mechanisms influencing public-sector employment among young adults in Western China, we recommend integrating digital employment support systems into public employment service frameworks. This includes establishing provincial-level intelligent employment information platforms to centralize recruitment information and enable targeted distribution, coupled with initiatives to enhance digital literacy and promote intelligent career planning tools. Furthermore, exploring technology-enabled employment psychological services and fostering a collaborative government-university-enterprise service ecosystem would effectively address issues such as information asymmetry, the digital divide, and psychological stress, thereby promoting high-quality employment and social integration for Western youth.

5.3 Future Research Directions

Although the human-computer interaction-based employment support system developed in this study has undergone preliminary validation, future research should explore four key areas: First, conducting empirical studies such as randomized controlled trials (RCTs) to quantitatively evaluate the system's effectiveness in improving employment success rates, particularly among disadvantaged groups. Second, integrating multimodal data (e.g., eye-tracking, physiological signals) to develop reinforcement learning-based adaptive interaction mechanisms for enhanced precision. Third, extending the system's application to central and eastern regions, non-public-sector employment, and other vulnerable populations to examine its generalizability and adaptability. Fourth, conducting in-depth investigations into ethical issues such as algorithmic fairness and privacy protection, while assessing long-term societal impacts to build more robust, reliable, and responsible intelligent employment support systems.

6. Conclusion

This study, utilizing CGSS 2021 data and binary logistic regression analysis, reveals the significant influence of human capital and family capital on public-sector employment among young adults in Western China and identifies the region-specific phenomenon of "high dependence on family capital coupled with low returns on educational investment," as well as the mechanism through which family capital exacerbates employment inequality via digital empowerment. Building on these insights, an employment psychosocial support system integrating human-computer interaction (HCI) and artificial intelligence (AI) technologies was constructed; this system incorporates empirical parameters (e.g., $\beta\_party = 0.598$) into its algorithmic design and encompasses four core modules—information recommendation, capability planning, simulated training, and psychosocial support—thereby addressing the employment challenges faced by Western youth across technological, competency, and psychological dimensions. Theoretically, this research proposes the concept of "Digital Empowerment Inequality," promoting a shift in HCI research from instrumental application to theoretical modeling, while practically, it offers intelligent and human-centered policy insights for employment services in Western China; future efforts should focus on empirical validation of efficacy, cross-regional applicability, and ethical governance to further refine the system for supporting employment equity.

Data sharing agreement

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

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