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Design and Implementation of College Students' Employment Guidance System Based on Knowledge Graph

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Abstract: *At present, the employment of college students is facing severe challenges, and the difficulty of employment is more prominent. According to the requirements of the Ministry of education, both ordinary colleges and higher vocational colleges should include the course of College Students' employment guidance in the course of students' quality development. However, there are some problems in the current employment guidance mode in Colleges and universities, including the imperfect guidance function and the lack of teachers. In addition, there is also a lack of targeted and personalized employment guidance for students' personal situation. In view of this, this paper puts forward the method of College Students' employment guidance based on knowledge map, designs the model of employment guidance system, and expounds the design ideas and implementation process of the main functional modules of the system. According to the user's resume and learning records, the system provides personalized job recommendation and employment guidance learning resources for them, realizes personalized employment guidance, solves employment problems, and promotes the smooth employment of college students.*

Keywords: *Knowledge mapping, Employment guidance system, Personalized recommendation*

1. Introduction

With the imbalance of labor supply and demand caused by the economic recession in the post pandemic era, as well as the continuous growth of China's college entrance examination population, universities are gradually expanding their enrollment, and the number of graduates is showing an increasing trend year by year. The problem of difficult employment for college students has become a key issue that both the country and society attach great importance to. In the process of popularizing higher education, the phenomenon of employment difficulties for college students will continue to exist. Therefore, the main research content of this article is how to effectively alleviate the employment problem of college students, how to improve their employment rate, and provide personalized employment guidance for them.

2. The Employment Situation of College Students and the Significance of Employment Guidance

2.1. Employment Issues and Situation of College Students

The imbalance in labor supply and demand in the job market has led to a reduction in employment opportunities. The COVID-19 has had a major impact on China's economy and had a widespread impact. The macro economy has been impacted, and various industries have been hit and affected to varying degrees. Market demand has decreased, recruitment plans have been postponed, leading to obstacles in the employment channels of college graduates and restrictions on job hunting, leading to an increase in the unemployment rate of college graduates. At the same time, due to the impact of the epidemic, the number of corporate bankruptcies in many countries has significantly increased. According to a report by the Washington Post, 100000 small businesses in the United States are facing bankruptcy, and the number of European corporate bankruptcies is also increasing[1]. China's economy has also been severely impacted by the epidemic, and many small and medium-sized enterprises are facing difficulties in capital flow, thus facing the risk of layoffs or even bankruptcy. According to a recent research report released by the China Association of Small and Medium sized Enterprises, approximately 86.5% of surveyed small and medium-sized enterprises reported that their operating conditions have been

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significantly affected, with nearly 30% of them reporting that the impact is "particularly severe" and may lead to losses. The business of enterprises has been damaged to varying degrees, with small and micro enterprises being more severely impacted. Small and micro enterprises bear most of the employment pressure, and due to the poor development of their business, their recruitment enthusiasm has also been greatly affected. 63% of enterprises said they would delay or freeze recruitment. Under the impact of the epidemic, there are still some graduates who have left school but have not been employed in 2022, coupled with the number of people in society who are preparing to leave, which has brought employment pressure and challenges to college graduates.

Graduates exacerbate employment difficulties and increase employment pressure. According to relevant data statistics, the number of college graduates in China reached 11.58 million in 2023, setting a new historical record. The employment situation of graduates has attracted attention from all sectors of society[2]. From 1978 to 2019, the total number of various types of returned students exceeded 4.2 million. In 2020, the number of returned students who had completed their studies reached 777000. In 2021, the number of returned students who had returned for employment exceeded 1 million for the first time, with an estimated 1.049 million[3]. In 2022, the number of international students returning to China to seek employment reached a new high, with a year-on-year increase of 8.6%. At the same time, the global epidemic has had an impact and hindrance on international talent mobility, with a clear trend of international students returning in the past two years, while the proportion of graduates choosing to continue studying in China has significantly decreased. The combination of multiple factors has led to a sharp increase in short-term talent supply, making the employment situation for college graduates increasingly severe.

Structural contradictions in the employment market are prominent, and the phenomenon of "slow employment" has increased. The structural contradiction of the employment market is highlighted in that on the one hand, the number of college graduates has been rising year by year[4], while on the other hand, enterprises are still facing the problem of "recruitment difficulty". Especially in recent years, there has been a phenomenon of "slow employment" without employment after graduation, as well as the "Neet group" who do not go to school, do not get employment, and do not participate in employment counseling. Affected by the epidemic situation, facing the further increasing pressure of job competition, the phenomenon of "slow employment" and the "Neet group" have increased instead of decreasing. Under the influence of the epidemic, facing the increasing pressure of employment competition, there has been a phenomenon of "slow employment" and an increasing number of "neet". Mao yufei [5]and others conducted an empirical study using the data from the recruitment website. The data analysis results showed that 62.9% of the graduates thought that employment was difficult due to the epidemic, and 37.1% were not affected. In addition, more graduates affected by the epidemic chose "slow employment".

The employment guidance work in universities is facing challenges, and the employment ability of college students needs to be strengthened. With the rapid development of society and changes in the job market, employment guidance in universities is facing new challenges. Firstly, with the advancement of technology and the continuous popularization of intelligence, traditional career choices and employment models are undergoing changes. Many traditional industries are facing transformation and elimination, while emerging industries and professions are constantly emerging. For students, choosing a career path that suits them becomes more complex and difficult. Secondly, the impact of globalization has also brought new challenges to employment guidance in universities. With the globalization of the economy, there are more job opportunities for multinational corporations and internationalization, and students need to understand and adapt to different cultural backgrounds and employment environments. In addition, the number of students studying abroad is constantly increasing, and they need more professional and targeted employment guidance to help them stand out in international competition. In addition, the uncertainty and fierce competition in the job market have also brought pressure to the employment guidance work of universities. With the fluctuation of the economic situation and the instability of employment opportunities, students are facing uncertainty and pressure in employment. College employment guidance needs to provide more comprehensive and practical guidance to help students understand the current trends and changes in the job market, and enhance their competitiveness in employment.

2.2. The importance and significance of personalized employment guidance

Personalized employment guidance is the process of designing and providing employment guidance services tailored to individual specific needs and resources. It emphasizes developing employment plans based on individual interests, skills, values, and goals, and provides personalized support and advice. The importance of personalized employment guidance is reflected in the following aspects:

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Enhancing individual satisfaction: Personalized employment guidance can help individuals better understand their strengths and interests, and match them with their personal career goals. This matching can increase individual satisfaction with their work, enhance work motivation and happiness.

Improving career adaptability: Personalized employment guidance can help individuals understand their career development goals and provide corresponding career planning support. Through customized career counseling and training, individuals can enhance their professional skills and confidence, thereby better adapting to the workplace environment and changes.

Improving employment success rate: Personalized employment guidance can help individuals identify and utilize suitable employment resources and opportunities. By providing personalized career counseling, resume optimization, and interview preparation services for individuals, they can increase their competitiveness and improve their employment success rate.

Stimulating individual potential: Personalized employment guidance can help individuals discover and develop their potential. By understanding individual interests and talents, personalized employment guidance can provide individuals with corresponding development paths and opportunities, stimulating their potential creativity and innovation ability.

In summary, personalized employment guidance is crucial for individual career development and employment success. It can provide tailored support and advice to enhance individual satisfaction, adaptability, and competitiveness, thereby achieving better career growth.

3. The Employment Situation of College Students and the Significance of Employment Guidance

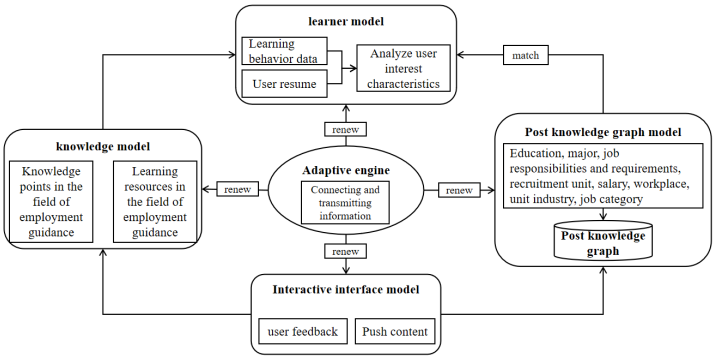

Figure 1: Employment Guidance System Model.

The employment guidance system consists of five parts: learner model, job knowledge graph model, knowledge model, interactive interface model, and adaptive engine , as shown in Figure 1.

The learner model is a model that describes students' learning behavior, cognitive abilities, and learning styles, providing a foundation for achieving adaptive and personalized learning. The amount of content browsed by learners in the system determines the richness of backend data collection, which helps learners to accurately grasp their style and promote the personalization and accuracy of recommended content. When constructing a learner model, both static and dynamic information should be taken into account, with static information users recording their evaluations of project content; Dynamic information refers to the interactive information generated by learners after using an online employment guidance system, which includes aspects such as learners' learning habits, learning styles, historical records, and learning needs. The learner model will continuously adjust and improve according to the progress of online learning activities

The job knowledge graph model and knowledge model are key steps in achieving adaptive learning[6]. They provide a knowledge base for the employment guidance system, and construct a job knowledge graph based on job data on recruitment websites. They also cover job guidance knowledge points and learning resources, including employment policies, recruitment information, job experience, interview skills, resume production, and other learning resources, effectively improving learners' employment knowledge.

The interactive interface model is a human-computer interaction function in a learning system, providing learners with a mechanism to feedback their learning needs and progress to the system. This model presents learning resources in a push mode through an adaptive engine to meet the personalized

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needs of learners and enhance their learning experience. At the same time, the model also provides effective management capabilities for managers.

The adaptive engine is the core component of personalized learning, and its functions are mainly reflected in two aspects. Firstly, based on the learning characteristics and knowledge model structure of learners, adaptive engines can push learning content and adjust learning order, and display learning materials suitable for their personalized needs to learners through interactive interfaces. Secondly, based on the learning situation of the learner in the previous stage, the adaptive engine can update the knowledge model and learner model data to provide more accurate learning recommendations and progress management.

4. System Function Design and Implementation

4.1. Database design

The data storage of the job knowledge graph is represented by a graph structure, where the relationships, nodes, and attributes of the graph relational database correspond exactly to the entity relationship entity structure of the knowledge graph. In order to effectively manage the data of the job knowledge graph, Neo4j was selected as the data management system. Neo4j is a high-performance NOSQL graph database with advantages such as embedded, high-performance, and lightweight.

The Neo4j and SQL Server databases store knowledge point association information and learner information, respectively. This information will be used for updating the knowledge graph, planning and improving personalized learning paths, and also for later improvement and redevelopment of the system.

Neo4j stores job related information, including job category, job name, salary, educational requirements, professional requirements, job responsibilities and requirements, recruitment unit, industry, and work location

SQL Server is mainly used to store learner information and human-machine interaction information, and the main data table design is as follows shown in Table 1, Table 2, Table 3 and Table 4:

Table 1: User table.

field name	data type	character length	Allow null values	Primary key
user_id	int	20	yes	yes
name	varchar	30	no	no
password	varchar	30	yes	no
phone	varchar	11	yes	no

Table 2: Resume table.

field name	data type	character length	Allow null values	Primary key
user_id	int	20	no	yes
name	varchar	30	no	no
age	int	3	no	no
sex	char	1	no	no
politics_status	char	2	no	no
Marital_status	char	1	no	no
address	varchar	255	no	no
email	varchar	50	no	no
school	varchar	255	no	no
subject	varchar	255	no	no
English_lev	char	1	no	no
award_certificate	text	0	no	no
personal_skills	text	0	no	no
compensation	char	255	no	no
work_city	varchar	255	no	no
company_type	char	1	no	no
welfare	char	1	no	no
position	varchar	255	no	no
create_date	datetime	0	no	no
update_date	datetime	0	no	no

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Table 3: Position table.

field name	data type	character length	Allow null values	Primary key
positon_id	int	20	no	yes
positon_name	varchar	50	no	no
marital_status	char	1	no	no
school_lev	varchar	255	no	no
education	varchar	255	no	no
English_lev	char	1	no	no
subject	varchar	255	no	no
position_require	text	0	no	no
company	varchar	255	no	no
company_type	char	1	no	no
compensation	char	255	no	no
work_city	varchar	255	no	no
company_type	char	1	no	no
welfare	char	1	no	no
position	varchar	255	no	no
create_date	datetime	0	no	no
update_date	datetime	0	no	no

Table 4: Match table.

field name	data type	character length	Allow null values	Primary key
resume_id	int	20	no	yes
position_id	int	20	no	yes
match_date	datetime	0	no	no

4.2. Design and implementation of functional modules

The system function module is divided into management module and learning module. The management module is used by the background administrator to manage and maintain the knowledge map, learner registration and learner information. The learning module provides functions such as personal registration, online learning and job matching to meet the needs of students and other learners. The reasonable coordination and operation of these modules will help to improve the management efficiency and learning experience of the system, promote the personal development and career success of learners, and promote the improvement of employment guidance.

4.2.1. Learning module

The learning module first provides the registration function for all users. In order to provide personalized employment guidance services, learners are required to fill in their resume when registering. After the learners log in to the system, they can choose the employment guidance learning resources to study independently, or the system can learn and improve the corresponding job skills according to the job recommendation matching the resume and the job responsibilities and requirements. During the learning process, learners can comment, collect and score learning resources at any time. They can also view the post knowledge map, modify and Figure 2 system learning function module diagram.

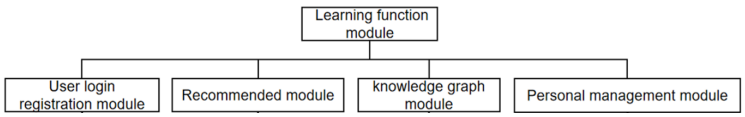

Figure 2: System learning function module diagram.

The main sub functions of the learning module in the figure include user login registration, recommendation module, Atlas module and personal information management. The main functions of each sub module are:

(1)The user login and registration module realizes the login and registration function of the user end

When users register, they need to provide basic personal information such as name, telephone number and nickname. After registration, users also need to fill in the resume provided by the system, including personal education background, work experience, skills and specialties and other details. The purpose of collecting this information is to build the user's initial user model, so that the system can provide personalized job matching and employment guidance according to the user's personal characteristics and

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background, and improve the user's learning effect and employment success rate.

(2) Recommendation module, to achieve job recommendation and employment guidance Resource Recommendation

After the user logs in, the system will first make a preliminary job recommendation according to the user's resume information. Through the analysis of users' personal background, education experience, work experience and skills, and according to users' learning content, collection, evaluation and other behavior records, the system can match potential job opportunities suitable for users, and recommend relevant employment guidance resources to users.

(3) Atlas module, realizing visualization and query of atlas

In the map module, users can visually view and search the position knowledge map. The system provides users with intuitive and interesting learning experience by providing visual maps. Users can deeply understand the structure and association of job knowledge and job requirements through the browsing and searching functions of the visual map, so as to better plan their career development, obtain the required learning resources and improve their employability.

(4) Personal management module to realize the management of user information

In this module, users can modify their basic personal information and improve their resume. In addition, users can also view their own collection records and evaluation records, and the system can use these feedback data to update and optimize the user model. In this way, the system can more accurately understand users' personal characteristics, learning needs and career goals, provide users with more targeted and personalized job matching and employment guidance, and improve users' learning effect and career development opportunities.

4.2.2. Learning module

The management module is a tool for managers to manage the system. Managers can modify the knowledge map through the management module, review or delete learning resources, modify registration information, modify resume and add users, view users, delete user information, etc. The functions of each module are as follows shown in Figure 3:

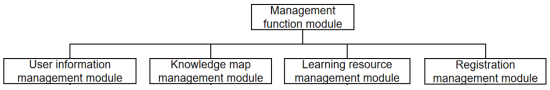

Figure 3: Structure diagram of management module.

(1) User information management module to realize the addition and deletion of users

In this module, the administrator can browse and manage the user's personal information to provide users with support for password reset and logout of user information. Administrators can access and process users' personal information to ensure the security and compliance of the system and ensure that users' needs are met.

(2) The knowledge map management module realizes the improvement of the knowledge map and the modification of the correlation relationship

Through the knowledge map management module, the administrator can add and delete knowledge points in the post knowledge map, and adjust the relationship between knowledge points by using the learning dependency. These operations aim to continuously improve the post knowledge map, so that it can better reflect the latest knowledge and skill requirements in the professional field, provide accurate and reliable learning resources and guidance, and promote learners' career development and learning effect.

(3) Learning management module to realize the management and audit of learning resources

The learning resource management module can delete the existing, unqualified and unreasonable learning resources in the system through the learning resource management module after the administrator reviews the open resources scientifically and correctly, and add the qualified open learning resources outside the system to the system, such as job search skills, interview learning resources, Baidu Encyclopedia and other online open learning resources, Make the coverage of learning resources in the system wider.

(4) Registration management module to achieve better learning effect

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As one of the key functions of the system, the registration management module is mainly committed to the flexible modification of the information that learners fill in during the registration process. The modification of these information is based on the feedback of learners and the in-depth analysis of the system operation, aiming to continuously optimize the content of users' resumes and make them more targeted and efficient in the learning process. This will help learners better display their own characteristics and potential, and improve their learning and employment ability.

5. Conclusions

This paper introduces the idea of constructing the college students' employment guidance system based on the knowledge map, and initially realizes the employment guidance system. By constructing the job knowledge map, and analyzing the user's resume and learning behavior records, the system can deeply understand the user's personal characteristics, career preferences and academic background, provide users with personalized job recommendations, and provide users with relevant employment guidance learning resources, including industry reports, job skills training materials, etc. In order to provide a good user experience, the interactive interface of the system is designed to be simple and easy to operate. Users can easily search and browse job information, collect positions and learning resources of interest, and check personal progress at any time. In a word, the college students' employment guidance system realizes personalized job recommendation and rich employment guidance learning resources through the technology based on knowledge map, and has a simple and easy-to-use interactive interface to provide users with high-quality employment guidance services. In the future, we will continue to improve and expand the system functions to better meet the needs of users and improve the success rate of users' employment.

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