Research on the data driven intelligent employment information service system for college students

Hui Du*
School of Business Administration, Wuhan Business University, Wuhan, China

ABSTRACT

At present, the total employment of college graduates is under great pressure and the structural contradictions are very prominent. The State Council of China clearly proposes to strengthen the employment service and career guidance for college graduates. It is of great significance to fully integrate the information of campus teaching management and student ability evaluation system and improve the level of campus data governance for realizing personalized employment and career planning services. This paper comprehensively uses the methods of educational and psychological measurement, multivariate statistics and web technology, and establishes a multi-dimensional student information database and all-round talent portrait through the construction of data analysis model, which lays the foundation of quantitative analysis for the realization of two-way accurate matching of talent supply and demand.

Keywords: Employment information service, psychological measurement, educational measurement, talent pool

1. INTRODUCTION

At present, the total employment pressure of college graduates nationwide continues to increase, the structural problems are very prominent, and the employment task has become more onerous. In the government work report for 2020, it is proposed that we should do everything possible to stabilize and expand employment, promote the market-based and socialized employment, and both universities and local governments should provide continuous employment services[1]. The report of the 19th CPC National Congress also clearly pointed out that the realization of high-quality employment depends on the optimization of all-round public employment service, and the professionalization and informatization of public employment service must be promoted[2]. Based on the above background, it is imperative to research and develop employment and career planning information service system to promote the two-way connection between supply and demand. By building a data-driven information service platform for talent supply and demand matching in the field, the quantitative analysis and multi-dimensional talent portrait in terms of cognitive ability and non-cognitive ability are realized, and the job recommendation model is constructed through talent portrait and online recruitment data to realize the accurate matching and seamless docking between talent supply and demand. Through the continuous accumulation and in-depth development of relevant information resources, we can provide accurate and personalized information analysis and recommendation services for all parties, which has important social and economic value[3]. Among them, the construction of multi-dimensional talent pool based on education and psychometric theory, including the system of cognitive ability and non-cognitive ability, is the top priority.

2. RESEARCH STATUS

Currently at home and abroad about the talent pool and employment information service research mainly focus on National economic industry talent pool construction(construction principle and implementation way)[4], Talent management in specific fields under the global talent management crisis[5], Construction of expert database in the field of science and technology management (including expert selection method and the comprehensive evaluation index system)[6], Post competency model (based on the theory of human resource management)[7] and quantitative analysis of personality traits (the application of psychometric scales)[8]. In-depth study needs to multidimensional describe the characteristics of the talent supply and demand and optimize configuration, which requires us to take full theory of psychology and education measurement and the Labour market and personality subjects such as economics theory, and USES the large-scale real-time network of supply and demand information collection and analysis technology, to complete accurate matching talent supply and demand[9]. Among them, psychological measurement (building multi-dimensional talent model) is the basis of

*33526559@qq.com

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realizing the two-way connection between supply and demand. Psychology believes that behavior samples are a few representative behaviors, and only a few behaviors selected by science can be measured to infer the psychological characteristics of individuals indirectly. Therefore, a certain number and representativeness of behavior samples must be ensured. Only through the collection of a large number of standardized behavior sample data of college students and the analysis in accordance with the international standardized psychological measurement and analysis model[10], such as John L. Holand's career interest model, R.B.Cattel's 16PF personality trait theory and Edgar H. Schein's career anchor theory, etc. Based on the above work, a comprehensive and in-depth multi-dimensional talent model can be extracted. At the same time, by referring to the theories related to human resource management and human capital[11], we should establish the position quality model of enterprises in the industry. Finally, by studying the corresponding matching theory, we can achieve the optimal matching of talents and positions, and provide personalized information recommendation, so as to achieve the goal of two-way seamless connection between supply and demand.

3. RESEARCH FRAMEWORK

3.1. Theoretical basis

Focusing on the purpose of improving the university's employability and improving the optimal allocation of human resources, this paper will provide precise quantitative basis for vocational guidance and professional course ability cultivation in colleges and universities in order to achieve the optimal matching of talent supply and demand, according to the large amount of data accumulated from the multi-dimensional talent pool. The basic premise of psychometric measurement is to recognize individual trait difference and its important influence on individual behavior. This paper will build the talent pool from the non-cognitive ability (personality traits) and cognitive ability of college students, in which the non-cognitive ability will be mainly realized by psychological measurement, cognitive ability is mainly realized by educational measurement. The research framework is shown in Figure 1.

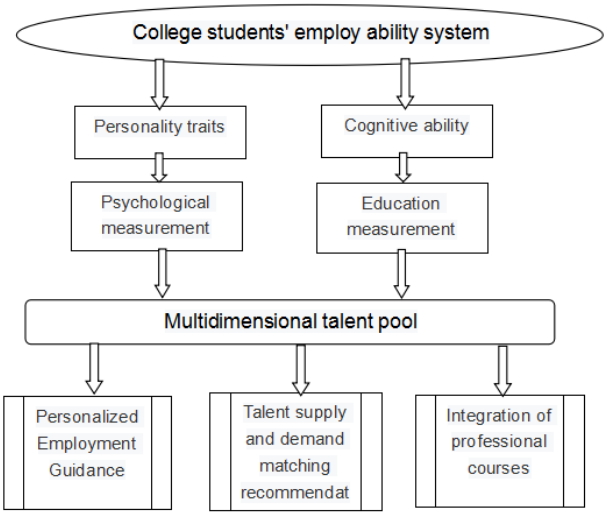

Figure 1. Research framework.

3.2. Architecture design

In order to solve the problem of two-way connection between university talent supply and industrial talent demand, based on the theory and method of psychological and educational measurement, we build a multi-dimensional talent pool through the accumulation and deep development of information resources of college students' urgently needed cognitive ability (e.g. logical ability, data thinking) and non-cognitive ability (personality traits, professional values, professional aspirations). At the same time, through network big data collection and extensive investigation, the industry classification system and enterprise post quality model are constructed. Reference international psychology theory, this article from the values match, the types of interest in matching and personality traits, such as Angle of view to build the people job matching recommended model, which can implement the talent supply and demand both sides of the precise matching and seamless docking, at the same time we can provide related management department with the talent demand, regional, compensation,

professional distribution, and can provide the research conclusion to the relevant employment management department. The system is based on B/S architecture, and multi-terminal access is realized through mobile terminal, desktop browser or WeChat public account. LAMP (Linux + Apache + MySQL + PHP) open-source development combination technology for the Internet is used to realize function development, and the deployment of the platform is realized through commercial cloud service[12].

4. DATA MEASUREMENT AND TALENT POOL CONSTRUCTION

Through various cognitive ability tests, personality tests, professional values tests, occupational interest type analysis, occupational choice intention investigation and analysis of college students, a comprehensive talent portrait covering individual cognitive ability system, non-cognitive ability system (personality traits, professional interests and values), as well as regional, industry and position orientation is established.Based on the previous work, a multi-dimensional talent pool was created.The talent pool data can be used as an important quantitative basis for decision-making analysis in employment distribution law, students' psychological characteristics research, career planning guidance, industry-education integration evaluation and other aspects.

4.1. Cognitive ability system

At present according to the college of applied business major is given priority to the practical application, has realized the logical thinking and business data processing ability of on-line testing, including the most basic question bank information management, online publishing, automatic scoring and ranking, the basic function such as statistics and graphics analysis, the ability to test data to save dimension indicators as a cognitive ability of talent pool. The applied business major especially emphasizes business insight and network application research and development ability, so business data analysis ability and logical thinking and analysis ability became the measurement module of our initial launch. The measurement module has passed the Kronbach reliability, content validity and structure validity tests of SPSS software to ensure that the measurement results are stable and can reflect the measurement objectives[13]. Based on the "group factor theory" proposed by the famous American psychologist Thurston and the "three-dimensional structure theoretical model of intelligence" proposed by Guilford[14], we continuously improve the modern vocational cognitive ability assessment system. In the later stage, it will be refined and expanded to include: speech understanding and reasoning, mathematical operation and numerical reasoning, graphic reasoning, spatial perception, abstract reasoning, data analysis and thinking strategies and other aspects of the evaluation functions[15.]

4.2. Non-cognitive ability system

The system of non-cognitive ability mainly includes three aspects: personality trait, career interest and professional values. Among them, personality traits are analyzed by 16PF personality theory of famous psychologist R.B. Katell.Vocational interest is analyzed by the Hexagon Model of Vocational Interest (RIASEC) of American psychologist John L. Holland. The evaluation of 13 professional values is used in this system[10]. Psychology understands personality traits as psychological traits (such as intelligence, interest, attitude and personality) that are relatively stable and have a lasting regulating effect on individual behavior. Psychological traits are implicit and can only be measured and inferred indirectly by measuring an individual's explicit behavior (behavior sample) in a given situation. The measurement tool is the standardized test gradually formed by scholars in the field of psychology after long-term trial, revision and improvement[14]. Scientific selection of behavioral samples, standardized operation of measurement (measurement process, scoring, interpretation), and compilation of norms (the actual distribution level of relevant group characteristics) are all important guarantees to ensure scientific measurement.

4.2.1. Personality trait measurement. Based on the 16PF test, a total of 16 source traits standardized scores (original scores) were obtained. By referring to the research of Cater, a number of common factors were extracted based on the 16 source traits and the vast majority of information of the retained variables by using factor analysis method on the talent pool data. A multivariate regression equation is obtained to calculate the common factor from the original variables. These common factors are second level personality factors that combine 16 source traits information, including a set of second level personality factors (personality and mental health) and a set of predictors (predict future development), respectively. Second level personality factors include: adaptation and anxiety, introversion and extroversion, emotional and serene alertness, cowardice and decisiveness; Predictors included four common factors: mental health, professional achievement, creativity and adaptability.

4.2.2. Occupation interest measurement. Motivation determines one's development direction and is the root cause of one's behavior. Motivation tests include values, motivations, and interests[10]. Interest is a kind of persistent tendency about liking or not, which is manifested as a selective attitude and positive emotional reaction to some things or activities. American psychologist John L. Holland's occupational interest hexagon model reflects the matching relationship between six types of interests and occupational environment types. Holland's Occupational Interest Hexagon Model in action is shown in Figure 2. Career interest assessment is a kind of motivation test. At present, we have realized Holland career interest assessment, and through the question bank management and assessment process, we assign a career type code for each interviewee, which can be used for accurate job matching and personalized recommendation service. This code is known as Holland code, a total of 216, taking the first three letters of the six interest types in descending order of score.

4.2.3. Measurement of professional values. This paper tests the distribution of a person's 13 professional values through 52 test questions, the professional values include altruism, aestheticism, intellectual stimulation, achievement motivation, autonomy and independence, social status, power control, economic reward, social interaction, social stability, ease and comfort, interpersonal relationship and the pursuit of novelty. Professional values are an important reference basis for long-term career planning of college students.

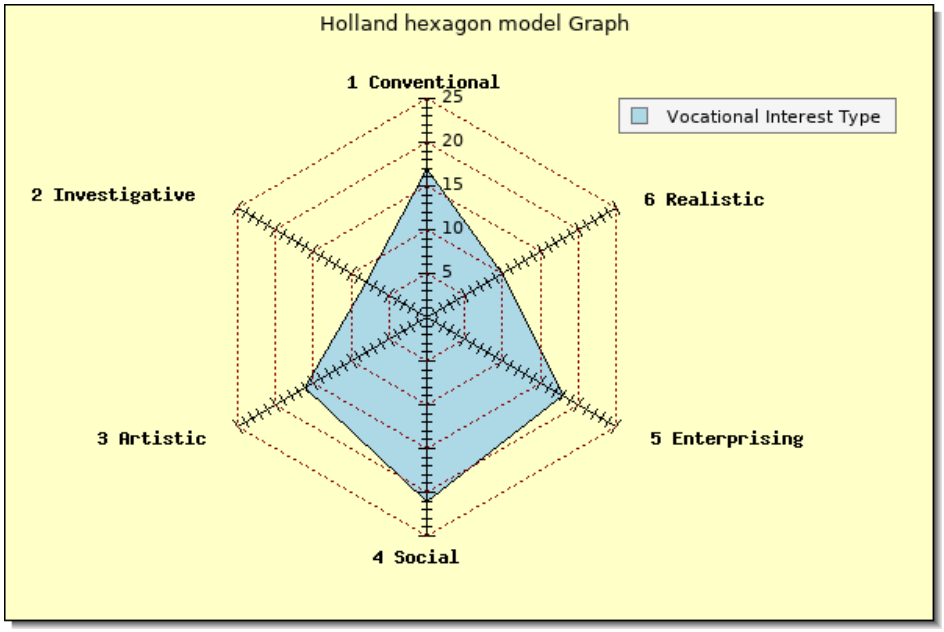

Figure 2. Example of types of occupational interest.

5. TALENT MATCHING AND RECOMMENDATION

This paper provides a comprehensive query interface service for the job recruitment of enterprises from the aspects of vocational interest, personality traits and professional values.

5.1. Matching and recommendation based on type of occupation interest

In the process of talent discovery or recommendation service based on talent pool, the mapping relationship table between the three-level position system of enterprise recruitment and Holland code is called to realize the precise and personalized push of talent information and relevant position information. Push can be in the form of in-station notification, WeChat official account message template or email and other common ways. The type of vocational interest of each student in the talent pool is coded, and then the corresponding position and web link suitable for the student are matched through the model of occupation type matching, and the corresponding position and web link are recommended to the job seeker. The mapping between the position system and the Holland code is essentially a classification in which tens of thousands of jobs are assigned different Holland codes. Bayesian classification algorithm is a supervised machine learning algorithm. The classification principle of Bayesian classification algorithm is to calculate the posterior probability, that is, the probability that the object belongs to a certain class, through the prior probability of an object, and select the class with the maximum posterior probability as the class that the object belongs to. The classification rules are generated according to

the training sample data, and the classification rules are applied to the analysis data for prediction. This paper drew on the widely used automatic book classification method (combining TF-IDF algorithm with Naive Bayes algorithm)[16]. First, we use the network to crawl the job data of various industries from well-known recruitment websites, collect the text information of the three-level category name of the job, work content and responsibility requirements of the job, and then carry out word segmentation and cleaning based on the Chinese subject glossary. The TF-IDF algorithm is used to extract the features, and then the Naive Bayes algorithm is used to classify the positions by using the existing training data sets. Finally, combining with manual inspection and optimization processing, the matching model of employment positions and Holland code is realized. The implementation Process of Recommendation Service Process Based on Occupational Interest is shown in Figure 3.

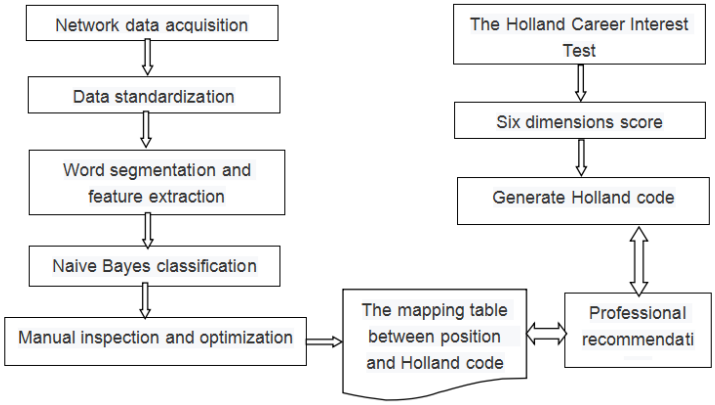

Figure 3. Recommendation service process based on occupational interest.

5.2. Matching and recommendation based on personality traits

A total of 16 source traits standardized scores were obtained based on the 16PF test, as well as a set of second level personality factors (personality and mental health) scores and a set of predictors (predicting future development) scores based on factor analysis. This function is mainly based on the above data and provides data interface service for recruitment enterprises. Enterprises can combine the needs of their own post system to set personalized personality parameters (the system provides the known numerical distribution range of tested people for reference), and can match and recommend talents according to the 16 source traits and second level personality traits of talents in the talent pool, so as to obtain accurate talent positioning and recommendation information services.

5.3. Matching and recommendation based on professional values

This function is mainly based on the evaluation and analysis results of professional values. After calculation, the quantitative distribution of individuals in 13 professional values is obtained, and the data interface service is provided for the recruitment enterprises. Enterprises can combine their own corporate culture and values as well as the demand of recruitment positions by setting talent characteristic parameters to obtain accurate talent positioning and recommendation information services in line with corporate values, which is also an important value-added service content to promote the two-way docking of talent supply and demand.

6. Conclusions

Based on the theory of education and psychometry, this paper mainly focuses on the informatization and intelligentization of college employment service, and realizes the multi-dimensional talent pool system based on cognitive ability and non-cognitive ability system. At present, the system can collect, store and analyze college students' data thinking and logical analysis ability comprehensively, and has accumulated rich data on vocational interest, professional values and personality traits. Moreover, it can provide talent matching and recommendation services based on multivariate statistical and psychological measurement methods, providing important value-added services for promoting the two-way docking of talent supply and demand. Future research will further enrich the evaluation function and data collection range of cognitive ability system based on educational measurement theory, and integrate and develop students' behavioral data (such as social network, learning behavior, sports and entertainment behavior, etc.) on the basis of existing campus digital

governance. At the same time, on the existing basis, the talent pool should further strengthen the collection and in-depth analysis of the Internet recruitment data for the major system of colleges and universities.

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