Analysis and Prediction of Job Demand of Enterprise Informatization Talents Based on Big Data

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Abstract: This paper analyzes the recruitment information of enterprise information technology jobs in Dalian located on recruitment websites, in order to predict the future demand for enterprise information technology jobs in Dalian. This paper uses the Python programming language to write a crawler program to process and analyze the acquired data, from the distribution of job industries, company size, the position requirements of different companies for the talents, and the relationship between the salary and the job information educational requirements and work experience. This paper establishes the GM (1, 1) differential equation model, uses the least squares method to calculate the development coefficient and the gray role quantity, and obtains the prediction equation. Through in-depth understanding of the law of the change of information technology job demand, exploring the influencing factors, and forecasting the future job demand and prospects of the industry, it has certain reference significance for job seekers who wish to engage in the industry in the future as well as colleges and universities that offer related majors.

1. Introduction

   With the progress of science and technology and the booming development of information technology, all enterprises have deeply felt the importance of information, and felt that information technology has great benefits for enterprise development. As the foundation of enterprise construction, the demand for information talents is also increasing day by day. Dalian, as a digital and innovative city that takes city intelligence as its development strategy, has vigorously developed informatization. Dalian is one of the earliest cities in China to start the development of software and information service industry, which has a good foundation for development and many related industries. In recent years, it has been oriented to the construction of digital Dalian and intelligent society, and comprehensively coordinated the development of informatization, and the informatization industry has been developing rapidly in recent years, which brings a large number

of positions for related job seekers. By analyzing the recruitment information of informatization positions in Dalian enterprises located on recruitment websites, we can gain a deeper understanding of the pattern of changes in the demand for informatization positions[1], explore the influencing factors, and make predictions on the future demand for positions in the industry and its prospects, which is of some significance to job seekers who wish to engage in the industry in the future as well as to colleges and universities that offer related majors[2].

2. Data Acquisition and Processing

First of all, it is clear that the research object of this paper is the recruitment information of enterprise informatization-related positions on the third-party recruitment website, MileagePlus Recruitment. Through the Python programming language to write a crawler program, using the crawler program located in the recruitment website in line with the information technology talent recruitment information content in the information link, job title, company name, salary, location, educational requirements, the number of recruitment, the nature of the company, the company's size, the company's industry, the job description, and other data fields to capture; after capture, the data are summarized and combined and exported to EXCEL file for subsequent viewing and data preprocessing[3].

This paper chooses network recruitment as the data source, mainly selects the recruitment information related to information technology in Dalian City contained in the third-party recruitment website, and acquires the demand for talents from enterprises on the network recruitment platform through technology. By running the program, a total of more than 5000 recruitment information data were collected, and the collected data were stored in the form of EXCLE through the program.

The data obtained by the web crawler is not processed and may include a large number of duplicated or invalid information. Because this kind of recruitment information is not helpful for the analysis of this paper, the data cleaning operation is carried out through EXCEL on the collected information. The main steps are: delete duplicate values, through EXCEL on the unique field "Link" of the recruitment information to repeat the matching, to find out the duplication of recruitment information for de-weighting operations; missing value processing, through Excel's data filtering function, to delete the key information is seriously missing recruitment data; anomalous value processing, filtering on the crawl will not be relevant to the enterprise information technology[4]. After fetching the jobs that will not be related to enterprise information technology, the deletion operation is carried out directly; data format standardization, through the Pandas library to import EXCEL files into the data processing program[5].

Collected recruitment information data using Python to organize and screen, remove duplicate data and invalid data. Crawl the different positions of the recruitment information for the summary of the unit format of different data for the unity of the data of a unit and format, the data will be sorted out using EXCEL for drawing, through the distribution of recruitment positions in the industry statistics, to produce a more intuitive chart[6].

3. Data Results Analysis

3.1 Recruitment position analysis

In the process of data analysis, according to the industry category field of the recruitment information to make a chart of the proportion of different industries recruiting information technology talents, after analysis, the demand for enterprise information technology talents spread throughout the city of Dalian in the computer services industry, professional services,

pharmaceutical / bioengineering, machinery and equipment, the financial industry and other various industries. Among them, the computer software and services industry occupies half of the demand for information technology jobs, indicating that information technology talents need to have solid knowledge of professional courses[7]. At the same time, when seeking employment in the non-computer industry information technology positions, not only need to have information technology-related professional knowledge, but also need to be familiar with the relevant business processes of the applicant company to a certain extent, so as to achieve the role of improving their competitiveness.

3.2 Company data analysis

According to different company sizes, the size of companies with demand for information technology jobs will be analyzed, 50-150 people and 150-500 people accounted for a total of 58%, indicating that the demand for information technology jobs mainly exists in small and medium-sized enterprises, information technology talent in the private sector is the most prominent demand for information technology talent, and private enterprises provide the most opportunities for information technology talent to take up employment. This reflects that private enterprises have become an important part of the national economy, in line with the status quo of China's socialist market economy.

3.3 Analysis of job requirements

According to the recruitment information of the academic requirements of this indicator, the Dalian information technology job requirements for academic qualifications are analyzed as follows: information technology job requirements for academic qualifications are mainly bachelor's degree and college, indicating that these two levels of academic qualifications are the mainstream academic requirements of the information technology industry in Dalian City, which can be derived from the information technology positions of enterprises to enter the academic threshold is not high, and there are no special requirements.

According to the indicator of work experience requirement in the recruitment information, the positions of information technology jobs generally require a certain amount of experience. Jobs requiring a certain amount of experience accounted for 96% of all job postings, of which three to four years of experience is the most popular, accounting for 34%, followed by "one year of experience" accounted for 20% and "two years of experience" accounted for 19%. It can be concluded that enterprise informatization-related positions are highly practical, and students who expect to work in informatization positions can start to accumulate relevant industry work experience during their college internships, so that they can use it as a knock on the door to enter the industry after graduation, and enhance their competitiveness in the recruitment market. Colleges and universities that offer information technology-related majors can offer practical courses geared towards corporate business to increase students' work experience and enhance their professionalism. The remaining "more than 10 years of experience", "eight to nine years of experience" and "five to seven years of experience" are basically the top positions in the information technology industry, accounting for a total of 23%, indicating that the information technology positions can rely on their own accumulation of experience. This indicates that information technology practitioners can rely on their accumulated work experience to enhance their value in the recruitment market, and look for job upward mobility through the accumulation of their own work experience.

3.4 Salary Data Analysis

Salary is the compensation that an organization pays to an employee according to the time pattern in a fixed working relationship. Because salary itself is a quantitative unit, analyzing the salary level of recruitment information can, to a certain extent, directly reflect the value of talent from the company's perspective. After analyzing, the average salary of "fresher" is 5.92k, the average salary of "college" is 8.93k, the average salary of "bachelor" is 10.3k, the average salary of "master" is 10.3k, the average salary of "college" is 8.93k, the average salary of "bachelor" is 10.3k, and the average salary of "master" is 10.3k. The average salary of "master" is 14.13k, which shows that the salary of informatization positions in Dalian basically rises with the increase of education. This means that the higher the education level of informatization talents in Dalian, the more competitive they are.

The comparative analysis of work experience and education for salary package is as follows. Firstly, the salary level of three kinds of academic qualifications, namely high school, middle technology and junior college, basically has no significant increase with the growth of work experience, which indicates that the development prospect of too low academic qualifications in the information technology industry in Dalian City is very poor. Secondly, the salary level of college degree, bachelor's degree and master's degree shows an overall upward trend with the increase of work experience. This indicates that the information technology talents with these three degrees have certain development space in their career path. Under the condition that no experience is required, the salary level of master's degree is higher than that of bachelor's degree and college degree, which indicates that talents with higher education have certain advantages in job hunting. Within the range of two years of work experience, the salary level of college degree is the highest, followed by bachelor's degree and finally master's degree. This indicates that with some but insufficient work experience, information technology positions in Dalian enterprises prefer college degree holders whose education is more oriented to employment. In more than two years of work experience, the rate of increase of salary pending level of informatization positions with master's degree starts to be significantly larger than that of bachelor's degree, and finally that of college degree. It shows that on the basis of accumulating certain work experience, the higher the education, the more room for growth.

3.5 Other Text Analysis

By analyzing the frequency of keywords, we analyzed the word frequency of job description fields and the competencies required in job descriptions.

In terms of language ability, "Japanese" appeared 1,125 times and "English" appeared 427 times, indicating that more enterprises attach importance to Japanese language ability in the information technology positions in Dalian enterprises, which is in line with the current situation of the demand for Japanese-language talents in Dalian, which is caused by the large number of Japanese enterprises in the technology category. This is in line with the status quo of the large number of technical Japanese enterprises in Dalian, which generates a large demand for Japanese-speaking talents.

In terms of job functions, the keyword "implementation" appears 873 times, "finance module" appears 356 times, "procurement module" appears 297 times, "production module" appears 302 times, indicating that the implementation of the various directions of the demand for more average, there is no certain module hot some modules cold situation "travel" keyword appears 332 times, indicating that some positions face the situation of travel work.

In terms of technical skills, through the word frequency summarized "ERP" 748 times, "ABAP" 247 times, "Oracle" 181 times, "server" 212 times, "ERP" 748 times, "ABAP" 247 times, "Oracle"

181 times, "ERP" 748 times. "Server" 297 times, "JAVA" 148 times, "Linux" 162 times and other technical ability requirements, indicating that as information technology personnel, the first thing to be familiar with mastering the ERP system. For the development of enterprise information technology-oriented talents, according to the specific needs of the company to master ABAP or JAVA programming language, should also master a certain degree of computer network knowledge, database knowledge.

In terms of personal spiritual qualities of talents, communication ability is the most valued, "communication" keyword appeared 1080 times, followed by "responsibility" appeared 262 times and "logical thinking" appeared 162 times. 162 times. This shows that enterprises value the communication ability of information technology talents, and expect job seekers to be responsible for their own work and have certain logical thinking ability when dealing with business processes.

4. Demand Forecasting

GM(1,1) model is a kind of gray prediction model, which is widely used in social aspects, such as national economy, environment and ecology, engineering prediction and control and other fields. Because the GM(1,1) model can adapt to barren information and has strong noise resistance in the prediction process, the model shows greater superiority than traditional prediction methods. Where G denotes Grey, M denotes Model, and (1,1) denotes 1st order equation and 1 variable   Secondly, the GM(1,1) model is built and the columns of predicted values are calculated. Third, validate the posteriori difference ratios based on the calculation results, and the values of the posteriori difference ratios correspond to the model accuracy. Fourth, use the established model to make predictions, according to the number of information technology-related talents demanded each month from January to April in the crawling data, create the original sequence in the program, determine the target prediction value, and pass the original sequence as a parameter into the gray prediction function to make predictions.

Through the recruitment information data captured by the crawler program, the time series-based talent demand is summarized to establish the information technology talent demand in Dalian City from January to April to establish the original sequence

Based on the number of information technology-related talent demand per month from January to April in the crawling data, the original sequence is created in the program, the target prediction value is determined, and the original sequence is passed as a parameter into the gray prediction function for prediction.

Through the recruitment information data captured by the crawler program, the time series-based talent demand is summarized to establish the information technology talent demand in Dalian City from January to April to establish the sequence,Predictions are made based on the prediction equation and the comparison of predicted and true values is shown in Table 1.

As shown in the table, the predicted values of the GM (1,1) model established according to the recruitment information fit well with the real observations, and the talent demand for information technology positions in Dalian City shows an upward trend with the growth of the month.The posteriori difference ratio test through the ratio of the original series variance to the residual variance yields p= 0.10122102999368125, with a p-value of $\leq$ 0.35, and the model accuracy level is good, so the model prediction feasibility is high. The above modeling shows that the demand for enterprise information technology talents in Dalian located in MileagePlus Recruitment Information Network is on an upward trend from January to May in 2024.

Table 1. Sequential list of Z(1) near-neighborhood means

month	real value	forecast value
1	1985	1546
2	1890	2237
3	3757	3235
4	4567	4679
5	-	6767

5. Conclusions

The perspective of colleges and universities needs to cultivate compound talents with information technology and business knowledge. Dalian city's enterprise information technology is more popular, information technology talent needs across various industries, in the talent market is mainly computer software and services industry and other industries distribution, indicating that information technology talents not only need to have information technology-related professional knowledge, but also need to interview the enterprise is located in different industries, to a certain extent, to understand its business processes, so as to improve their own competitiveness. For colleges and universities that offer informatization-related majors, they should offer some practical projects and courses to increase students' work experience and enhance their employment competitiveness, and they should also offer in-depth courses to help students who are willing to continue their studies to fully master their knowledge.

Job seeker perspective, experience plus learning plus comprehensive quality, enhance their own value. According to the salary and treatment analysis for the treatment of information technology talents in Dalian City, it is concluded that for information technology position talents, generally speaking, work experience is more valued compared to education, and when work experience is accumulated to a certain extent, high education can help information technology talents rise better in the enterprise. Therefore, from the perspective of long-term career development, job seekers should not ignore the importance of their own education because the information technology position is an industry that emphasizes work experience. In addition, students majoring in informatization-related majors should take the initiative to master a foreign language. Through analysis, in Dalian City, the demand for Japanese talents in information technology is greater than the demand for English talents.

This paper crawls and analyzes the recruitment information, and comes up with objective analysis results. For universities, by analyzing the recruitment information of the industry, so as to find out the key factors valued by enterprises, they can adjust the personnel training policy and curriculum arrangement in a targeted manner, and keep up with the changes in demand related to the information technology industry, so as to achieve the purpose of cultivating more talents who can adapt to the information technology demand of modern enterprises. For job seekers, the results of job seekers analyzing online recruitment information can be targeted to train their own professional skills to achieve the purpose of improving the success rate of job search, but also can be beneficial to the development of this industry.

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