

THE TALENT DEMAND STRUCTURE OF BIG DATA MANAGEMENT AND APPLICATION MAJOR UNDER THE BACKGROUND OF NEW-QUALITY PRODUCTIVE FORCES

TongTong Sun, Pan Ou, Hao Pan*

School of Economics and Management, Beijing Institute of Petrochemical Technology, Beijing 102617, China.

**Corresponding Author: Hao Pan*

Abstract: With the accelerated development of new-quality productive forces, the talent demand structure for the Big Data Management and Application major is being reshaped. Based on 2403 valid job postings collected from mainstream recruitment platforms and surveys on graduates' professional competencies, this paper adopts statistical analysis and the LDA (Latent Dirichlet Allocation) topic model to explore the characteristics of industrial talent demand. The study finds that bachelor's degree serves as the mainstream academic threshold for the industry, and talent requirements are shifting from single-task technical execution toward compound "technology-plus-business" capabilities. Accordingly, this paper proposes constructing a curriculum system by leveraging the interdisciplinary strengths of economics and management.

Keywords: New-quality productive forces; Big data management and application; Talent demand structure

1 INTRODUCTION

The Third Plenary Session of the 20th Central Committee of the Communist Party of China emphasized deepening comprehensive educational reform, advancing reform of the science and technology system, and perfecting the talent development system and mechanism. The Fourth Plenary Session of the 20th Central Committee of the Communist Party of China further pointed out that we should seize the historical opportunities brought by the new round of scientific and technological revolution and industrial transformation, advance the integrated development of the education, science, technology, and talent strategies for building a strong country in these three fields, achieve high-level self-reliance in science and technology, and foster new-quality productive forces. Talent cultivation for the Big Data Management and Application major needs to break the boundaries of traditional disciplines, dismantle institutional barriers among education, science, technology, and talent development, and directly respond to real-world industrial demands arising from the Digital China initiative [1].

The Big Data Management and Application major (hereinafter referred to as the BDMA major) has been established to serve Chinese national big-data development strategy [2-3]. It acts as a critical link connecting data and information, revealing market trends and optimizing decision-making processes, and its strategic importance keeps growing. The Action Plan for Accelerating the Cultivation of Digital Talents to Support the Development of the Digital Economy (2024-2026), jointly issued by the Ministry of Human Resources and Social Security and eight other government departments, calls for cultivating compound talents proficient in both industrial expertise and digital technologies in close alignment with corporate demands, improving digital literacy and professional competence among practitioners, and facilitating industrial digital transformation and high-quality development. Therefore, from the perspective of new-quality productive forces, it is urgent to systematically sort out the talent demand structure for the BDMA major and identify key priorities for talent cultivation.

2 STRUCTURAL CHARACTERISTICS OF THE DEMAND FOR DIGITAL MANAGEMENT PROFESSIONALS IN THE CONTEXT OF NEW-QUALITY PRODUCTIVE FORCES

2.1 Research Data Sources

Recruitment postings have become an important channel for acquiring research data [4]. A total of 2931 job postings matching the BDMA major were collected in compliance with research norms, covering 21 dimensions including job title, job ID, employment type, work experience, city, administrative district, enterprise name, enterprise scale, educational requirement, financing stage, industry sector, job description, enterprise nature, salary range and job tags. After deduplication, irrelevant-post elimination and text segmentation and cleaning, 2403 valid records were retained for text mining via the BERTopic topic model [5].

2.2 Sectoral and Spatial Distribution Characteristics of Job Demand

In terms of sectoral distribution, the software and IT service sector accounts for the largest share of recruitment postings (628 postings, accounting for 26.1%). Other leading sectors include human resource services (137 postings) and industrial

internet platforms (107 postings), while postings in finance and manufacturing sectors are relatively scattered, as shown in Figure 1.

From the spatial perspective, first-tier and new first-tier cities together account for 74.1% of total recruitment postings and form core agglomeration zones for job demand, as shown in Figure 2. The top three cities by recruitment postings are Beijing (188 postings), Nanjing (159 postings), and Zhengzhou (158 postings). The sample exhibits cross-regional agglomeration characteristics. As a central city in central China, Zhengzhou has a volume of recruitment postings close to that of Beijing, reflecting the rapid growth of digital talent demand in new first-tier cities.

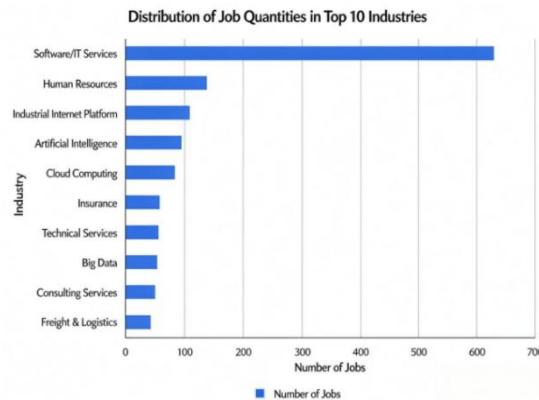


Figure 1 Distribution of Job Quantities in the Top 10 Industries

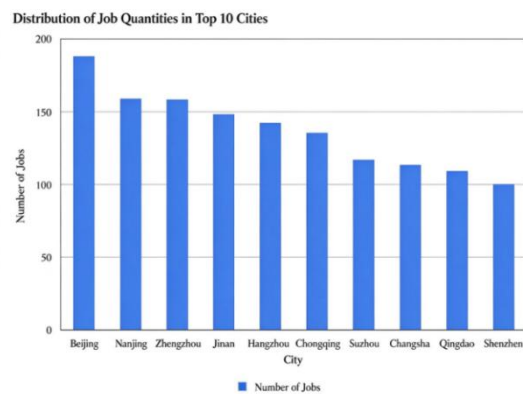


Figure 2 Distribution of Job Quantities in Top 10 Cities

2.3 Educational and Work Experience Requirements

In terms of educational requirements, 72.3% of recruitment postings require a bachelor's degree or above, among which 6.8% explicitly require a master's degree or higher, as shown in Figure 3. This indicates that a bachelor's degree represents the mainstream educational threshold, while postings from leading enterprises see growing demand for master's degree holders.

Regarding work experience requirements, entry-level postings requiring no prior experience or less than one year's experience jointly make up 31.3% of postings, as shown in Figure 4. It suggests ample employment space for bachelor's degree graduates. The market mainly demands seasoned professionals with 1–5 years of working experience (53.3% in total). Enterprises generally value relevant industry internships and project experience.

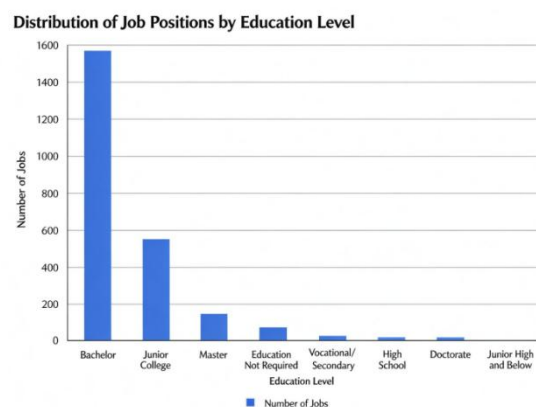


Figure 3 Distribution of Job Positions by Education Level

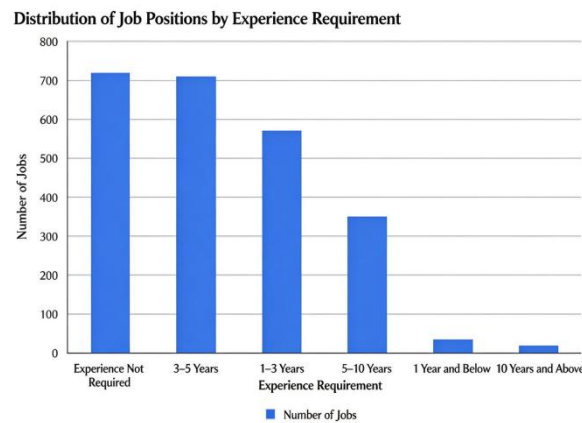


Figure 4 Distribution of Job Positions by Experience Requirement

In terms of compensation, the average monthly salary for bachelor's degree postings reaches 17.7k RMB, and 21.0k RMB for master's degree postings, approximately 38% higher than the average salary for bachelor's degree graduates across all industries, demonstrating the market premium for digitally skilled talents.

2.4 Content Upgrading of Competency Requirements

As shown in Figure 5, this paper employs the LDA topic model for analysis [6-8]. Based on topic coherence scores, the optimal number of topics is 11. Detailed results are presented in Table 1.

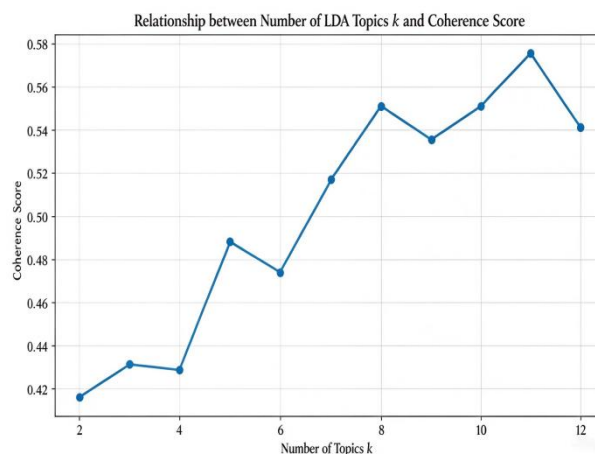


Figure 5 Relationship between Number of LDA Topics k and Coherence Score

Table 1 Top 10 Core Keywords for Each Topic

Topic	Top 10 Core Keywords	Posting Share
Topic 1	data, business, development, analysis, data analysis, requirements, data processing, tools, modeling, utilization	17.7%
Topic 2	data, analysis, business, data analysis, operations, report, output, optimization, indicator, operations management	15.9%
Topic 3	database, development, system, operation and maintenance, technology, performance, optimization, troubleshooting, coding, platform	13.6%
Topic 4	data, annotation, completion, content, foundational, sorting, problem-solving, assistance, coordination, professionalism	12.0%
Topic 5	data, technology, implementation, product, business, model, platform, design, optimization, architecture	8.2%
Topic 6	training, five social insurances, internship, a one housing fund, paid leave, performance bonus, weekend-off, employee welfare, allowance, base salary	7.1%
Topic 7	client, sales, industry, product, market, requirement, cooperation, enterprise, provision, service	6.4%
Topic 8	data, governance, quality, standard, data management, construction, administration, asset, compliance, data security	6.0%
Topic 9	equipment, data center, system, on-site, professionalism, management, design, operation and maintenance, technology, engineering	5.4%
Topic 10	project, delivery, management, workflow, solution, coordination, requirement, formulation, technology, implementation	5.0%
Topic 11	technology, learning, research, professionalism, algorithm, application, artificial intelligence, competence, teaching, master's degree	2.7%

Interpretation of Topics:

Topic 1: Business-oriented data analysis and modeling competencies, the most essential competency requirement for such postings. Graduates are expected to conduct data cleansing, statistical analysis, and modeling aligned with business needs, and deliver actionable analytical conclusions.

Topic 2: Operational analysis and decision-support competencies, candidates shall build business indicator systems, generate operational analysis reports, and support business optimization and managerial decision-making.

Topic 3: Database development and system operation and maintenance competencies, proficiency in database development, system operation and maintenance, performance tuning, and troubleshooting to guarantee stable operation of data systems.

Topic 4: Foundational data annotation and sorting competencies, corresponds to entry-level postings covering data annotation, content collation, and basic data processing, serving as the primary career starting point for new graduates.

Topic 5: Data product design and architectural implementation competencies, capabilities in data model design, technical architecture planning, and end-to-end delivery of data products from requirement design to engineering implementation.

Topic 6: Basic internship postings. These general internship postings impose no demanding high-skill requirements and function as transitional roles for new graduates entering the industry.

Topic 7: Data-driven client service and sector expansion competencies, identifying client demands, delivering data solutions for vertical industry scenarios, and conducting business communication and client development.

Topic 8: Data governance, security, and compliance competencies, expertise in data quality management, data standard formulation, data asset operation, and data security compliance.

Topic 9: Infrastructure operation and maintenance for data centers, oriented toward on-site data center and IT infrastructure scenarios, requiring competencies in hardware and system engineering operation and maintenance.

Topic 10: Data project delivery and management competencies, skills in project administration, cross-departmental coordination, and solution execution, leading full-cycle delivery of data-related projects.

Topic 11: AI algorithm and research and innovation competencies, targeting algorithm research and development and AI application research postings, which generally require a master's degree or above together with algorithm model development capabilities.

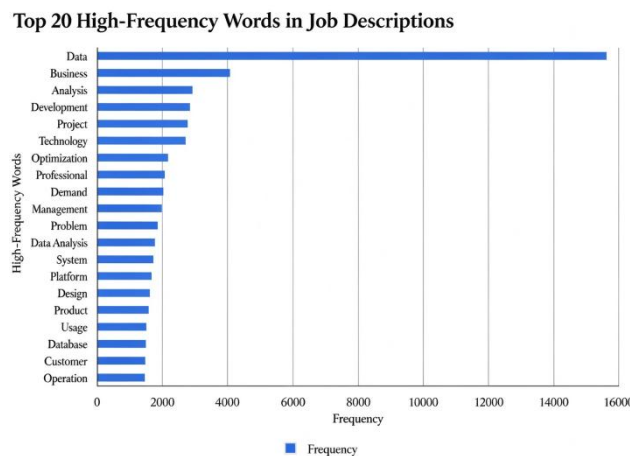


Figure 6 Top 20 High-Frequency Words in Job Descriptions

As shown in Figure 6, the high-frequency word statistics of recruitment postings reveal that the top six terms are data, business, analysis, development, project and technology. This highlights that these postings place emphasis on data analysis and technical capabilities within business scenarios.

3 KEY PRIORITIES FOR RESTRUCTURING THE CULTIVATION SYSTEM FOR NEW-QUALITY PRODUCTIVE FORCES

3.1 Strengthening the Distinctive Core Layer Integrating Technology and Business

Against the changing demands brought by the development of new-quality productive forces, and in response to the competency requirements identified in Topic 1 and Topic 2 (with a combined posting share of 34% for business-oriented analytical modeling and operational decision-making), as well as the pain point reflected in graduate surveys that students find it difficult to combine analytical models with business scenarios, economics, management and quantitative methodology courses need to be restructured.

First, it is necessary to break the fragmented delivery of standalone courses including statistics, management, econometrics and data mining. Course content should be organized around the full workflow of business problem decomposition, data processing, modeling analysis and delivery of actionable conclusions. Priority is placed on training core capabilities including indicator system construction, operational analysis report writing and data-driven decision-making.

Second, launch modular elective courses oriented toward vertical industry scenarios, such as financial big data, manufacturing industrial big data, digital commerce and government affairs data. Embed industry domain knowledge into technical teaching to realize targeted competency cultivation.

Third, establish an annual curriculum update mechanism to incorporate cutting-edge knowledge alongside technological development.

3.2 Building a Full-Chain Practical Teaching System Based on Real-World Scenarios

At the practical teaching level, a full-cycle hands-on training system should be constructed.

First, replace the original verification-oriented and exercise-based laboratory experiments with desensitized real enterprise datasets. Shift the goal of experimental training from merely "running algorithm codes" to "completely solving practical business problems", covering the full workflow of data cleansing, analytical modeling, report generation and actionable recommendations.

Second, carry out regular cross-disciplinary joint practical projects. Form mixed teams of big data majors and students majoring in marketing, accounting, finance and industrial engineering to complete real projects such as "big data empowered marketing" and "big data enabled supply chain management". These activities help train students' understanding of cross-departmental requirements and teamwork capabilities, and address the pain points of cross-departmental communication barriers.

Furthermore, deepen the university-enterprise collaborative implementation mechanism. Jointly build practical training bases with technology enterprises, sector internet platforms, and specialized, sophisticated and innovative enterprises. Carry out a supervised internship of a minimum of six months for relevant posts, with clear standards for internship content to prevent internships from turning into trivial clerical work. Meanwhile, regularly invite front-line enterprise experts to deliver classroom lectures with real corporate cases.

Systematically incorporate data mining competitions, innovation and entrepreneurship activities, and research projects into the practical credit system. Graduate surveys show that these experiences are the most helpful element for their future work during university study. Such hands-on outputs can partially replace traditional written assignments, forming an integrated closed-loop training system connecting in-class experiments, cross-disciplinary practical projects, corporate internships, competitions and scientific research.

4 CONCLUSION

Against the backdrop of new-quality productive forces development and the Digital China strategy, aligned with the requirements of integrated reform of education, science and technology, and talent development, this paper systematically analyzes talent demand characteristics of the Big Data Management and Application major based on 2403 targeted recruitment records and graduate professional competency surveys. The research finds that a bachelor's degree serves as the mainstream academic threshold in the sector, and sector talent requirements are shifting from isolated technical execution toward compound "technology plus business" capabilities. Leveraging interdisciplinary strengths in economics and management, universities should redesign curricula and build a full-chain closed-loop practical education system to dynamically cultivate compound big data management talents and provide talent support for high-quality development.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

FUNDING

This work is supported by Beijing Higher Education Association (Project No. MS2024064).

REFERENCES

- [1] Guo J L. Research on the training mode of innovative talents in big data technology majors in higher vocational colleges based on the integration of CDIO and BAG concepts. *The Theory and Practice of Innovation and Entrepreneurship*, 2026, 9(15): 80-83.
- [2] Ye G H, Cao G H, Xia L X. Research on the joint construction path of Big Data Management and Application major among Chinese university information-management schools. *Journal of the China Society for Scientific and Technical Information*, 2023, 42(02): 231-240.
- [3] Sun X, Yu Y W. Research on talent-training and practical-training modes for Big Data Management and Application major from the finance-economics perspective: a case study of Jilin University of Finance and Economics. *Journal of Jilin Provincial Institute of Education*, 2024, 40(10): 113-117.
- [4] Sun Z, Li J X, Lu X M, et al. Analysis of competency requirements for Big Data Management and Application major and optimization strategies for talent cultivation: text mining based on recruitment information. *Digital Library Forum*, 2026: 1-10. <https://link.cnki.net/urlid/11.5359.G2.20260921.1416.002>.
- [5] Grootendorst M. BERTopic: Neural topic modeling with a class-based TF-IDF procedure. *arXiv preprint arXiv:2203.05794*, 2022.

- [6] Li L L, Jiao J L, Yang R R. Research on curriculum-system construction for Big Data Management and Application major under the emerging liberal-arts initiative. *Library Science Research*, 2023(10): 2-12.
- [7] Blei D M, Ng A Y, Jordan M I. Latent Dirichlet allocation. *Journal of Machine Learning Research*, 2003, 3: 993-1022.
- [8] Li Y, Huang T, Li X. Training path of big data management and application talents based on BERTopic-TOPSIS model. *PLoS ONE*, 2025, 20(12): e0334127.