



Exploration of Teaching Reform of Business Big Data Analysis Course

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Abstract. In the context of the deep integration of big data and business, society has more urgent and high-intensity needs for students of economics and management colleges, which highlights the necessity of offering the course "Business Big Data Analysis." In response to the changes in the theory and analysis tools needed for business analysis in the era of big data, this paper discusses the teaching reform plan of the course from the aspects of course differences, market demand, core theory, and technology, teaching material module design, teaching methods and assessment methods. Using Python + Hadoop + spark + NoSQL + X as the ecological environment through case-driven education is expected to improve economic management undergraduates' business data analysis ability.

Keywords: business analysis · big data teaching reform · education

1 Introduction

The new business requires the cross-integration between engineering, science, and traditional business and deep integration between business education and industry. Business application talents in the new era need to master the leading technologies and models of big data and artificial intelligence and combine knowledge in the business field to discover and solve business problems.

"Business Big Data Analysis" is an emerging interdisciplinary subject of mathematics and economics. It introduces big data technology into business data analysis, aiming to enhance the commercial value of data. This course collects, describes, analyses, predicts and guides various economic issues through extensive mathematical modeling, statistical analysis, and computer software to study business fields such as finance, marketing, health management, and the Internet. Therefore, how to effectively carry out the teaching and learning of this course in economics, statistics, computer science, and other disciplines in economics and management colleges is of great and positive significance.

The traditional teaching of "Business Data Analysis" emphasizes the importance of mathematical models and explains three major categories of techniques: descriptive analysis, predictive analysis, and prescriptive analysis, focusing on the use of probabilistic and statistical tools and quantitative methods to make decisions, while It does not pay attention to accurate economic case analysis and computer software guidance. When

teaching liberal arts students with a relatively weak mathematics background, complicated mathematical models and knowledge of probability and statistics often make students feel bored, affecting their enthusiasm for learning. To thoroughly combine the teaching of mathematical theory with the practical application of business and improve the teaching effect of big data technology in economic and management colleges and universities, some colleges and universities have included "Business Big Data Analysis" in the professional courses of finance, computer science, and statistics.

The traditional "Business Data Analysis" course uses software such as SPSS, Excel, and lingo, while the "Business Big Data Analysis" course combines Python with a big data platform. The main features of the course are using big data software to realize all aspects of large-scale commercial data processing and enhance the retail value of data. The key to teaching "Business Big Data Analysis" is to combine case analysis and market demand-oriented, bring mathematical statistics and computer technology theory into real economic life, cultivate practical business talents in the new era, and better adapt to society's demands.

With the popularization of computer applications and the improvement of statistical software, the commercial application of big data technology has developed rapidly. Typical cases include epidemic monitoring and prevention, public opinion analysis, quantitative investment in securities, personalized e-commerce malls recommendation, big data credit reporting, and Internet consumer finance risk control.

Combining the actual situation of students in economics and management colleges, the characteristics of finance and computer majors, and the teaching experience of this course, the teaching reform proposed in this paper mainly has the following innovations:

- (1) Use "glue language" -- python and big data platform (Hadoop + spark + NoSQL) to realize the whole process of large-scale commercial data processing and analysis;
- (2) According to the market demand for business data analysis talents, develop a corresponding course knowledge system; the content including but not limited to economics, statistics, and computer science;
- (3) Empirical research on classic cases, solving various business analysis problems, and realizing industry crossover and innovation.

2 Related Researches

2.1 The Difference Between Business Analysis and Data Analysis

Business and data analytics involve working with and manipulating data, extracting insights from data, and using that information to enhance business performance. While the two are different terms, there is a significant overlap between them. Big data analytics tools can perform business analytics. Business analytics is the iterative exploration of an organization's data, focusing on applying statistical analysis techniques to reveal information that can help drive innovation and financial performance. Big data analytics is the blanket term for processing large quantities of data. For what purpose is irrelevant: it can be used to discover the market, customer, social media, traditional media, geospatial and other trends, and subsequent outliers. It can focus on internal data or environmental.

Business analysts need to be proficient in business models and requirements analysis. Data analysts need vital business intelligence, data mining skills, and hot technologies like machine learning and artificial intelligence. The process of business analysis and data analysis is different. The cycle of business analytics, as shown in Fig. 1, utilizes each of the four types of data analytics: diagnostic and descriptive in steps three and four, and predictive and prescriptive in step five for use in step six [1].

Data goes through several stages during its entire life. As shown in Fig. 2, a data analytics architecture maps out such steps (Requirements Analysis; Data Acquisition; Data Management; Data Processing; Model Building; Measuring Effectiveness; Data Deployment, and Application) for data science professionals [2].

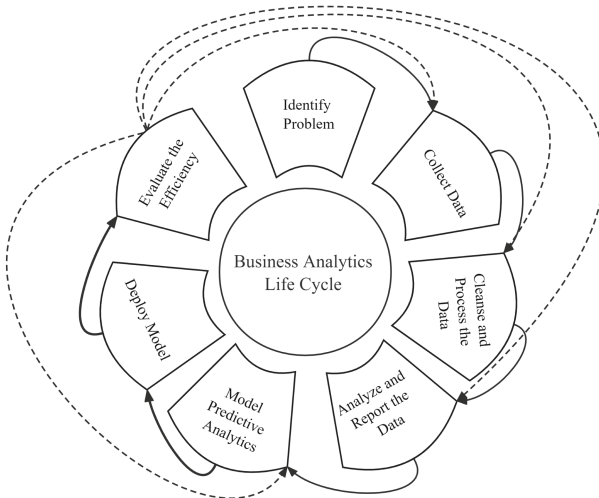


Fig. 1. Business analytics lifecycle

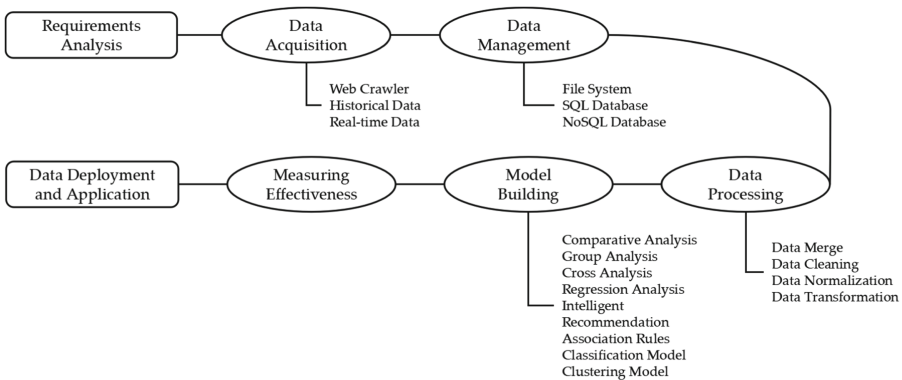


Fig. 2. Process of data analysis

2.2 Market Demand for Business Data Analysts

What kind of business data analyst does a company need?

Logical thinking ability: clear thinking, effectively dismantling problems, promoting decision-making, having a knowledge of basic management models:

- (1) 5W2H: What? Why? Where? When? Who? How? How much?
- (2) PEST [3]: political, economic, socio-cultural, and technological;
- (3) 4Ps [4]: Product – Price – Place - Promotion;
- (4) 4Cs [5]: Consumer – Cost - Convenience - Communication;
- (5) 4Rs [6]: Relevance - Reaction - Relationship – Reward;
- (6) SWOT [7]: strengths - weaknesses - opportunities – threats;
- (7) Porter's Five Forces [8]: the threat of new entrants, the threat of substitutes, the bargaining power of customers, the bargaining power of suppliers, competitive rivalry.

Familiar with various auxiliary software: good at finding problems from massive data. Proficient in using SQL (Structured Query Language), SAS (Statistical Analysis System), R, Python, SPSS (Statistical Product Service Solutions), and other software.

Familiar with various analysis methods: cluster analysis, classification analysis, linear regression analysis, predictive analysis, comparative analysis, grouping analysis, correlation analysis, hypothesis analysis, attribution analysis, trend analysis, Cohort analysis [9], heat map, A/B Test [10], sensitivity test, etc.

Business understanding ability: have business awareness, be familiar with business and business indicators, and capture business problems.

Industry research ability: use desk research, field research, and expert interviews to understand the industry quickly and extract valuable insights.

User research ability: always pay attention to user needs, accurately grasp user behavior with data, determine consumer needs and pain points, and guide business development accordingly.

Report writing ability: able to write business analysis reports, familiar with PPT production and beautification ability.

Ability to express and answer questions: flexibly adjust the expression and direction of critical and challenging points; guide the audience's thinking.

2.3 Concepts and Techniques of Business Big Data Analytics

Business big data analytics analyzes large business data sets to reveal several functional, hidden patterns and information like market trends, customer preferences, and operational strategies to make decisions.

Business analysis needs to solve five stages of analytics:

- (1) Descriptive analytics: describing data features and characteristics, answers the question: What happened?
- (2) Diagnostic analytics: determining the factors and events that contributed to that event, answers the question: Why? or Why did that happen?
- (3) Predictive analytics: getting real insights to predict what will happen.

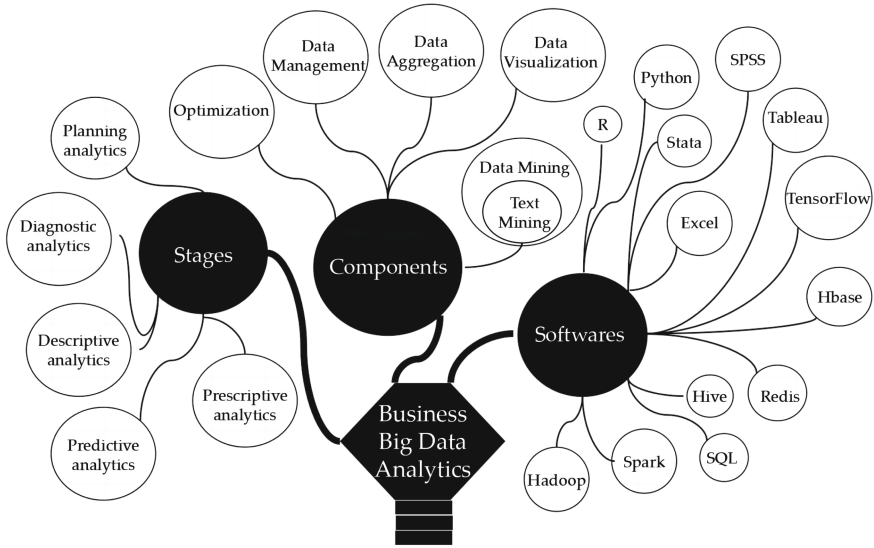


Fig. 3. Concepts and techniques of business big data analytic

- (4) Prescriptive analytics: guiding companies What to do?
- (5) Planning analytics: this typically answers three critical business questions: How are we doing? Why? What should we be doing?

Data analysis mainly consists of six components: data collection; data management; data transformation; data mining (such as applied statistical methods, case-based reasoning, decision trees, rule-based reasoning, fuzzy sets, neural networks, genetic algorithms, etc.); data visualization; data application/optimization.

With the advancement of science and technology, there are many tools for big data analysis on the market, as shown in Fig. 3. Their typical applications are listed below.

- (1) Programming languages: R, Python;
- (2) Database languages: SQL, HBase (Hadoop Database), Redis (Remote Dictionary Server), hive;
- (3) Data mining software: SPSS clementine, Excel, Stata, KNIME, TensorFlow;
- (4) Distributed computing engine: Hadoop, Spark;
- (5) Data visualization software: Tableau.

3 Design of Teaching Modules

3.1 Textbook Selection

There needs to be unified planning teaching material for the big business data analysis course. Most colleges and universities mainly focus on translated works when compiling textbooks, supplemented by some knowledge related to mathematical statistics and computer software. The content involved in the book focuses on ensuring the systematization

and integrity of subject knowledge. However, it ignores the development of students' abilities and market demand. A good textbook requires moderate difficulty in content, clear structure, reasonable structure, and thorough empirical analysis. General business big data analysis textbooks are mainly for students majoring in finance, e-commerce, etc. They involve a lot of related knowledge, such as regression analysis, time series analysis, model optimization, decision analysis, etc. Knowing these mathematical theories is more difficult for liberal arts students of economics and management. Business management knowledge, such as data analysis project processes, business analysis models, etc., has become problematic for students majoring in statistics and computers.

The textbooks listed above have their strengths. The book "Business Analysis: Analysis, Mining, and Application of Business Data" explains the thinking framework, process, method tools, and specific implementation process of data analysis, focusing on data mining. "Essentials of Business Analytics" covers basic statistical knowledge and rich case studies and comes with a wealth of practice questions of moderate difficulty. "Business Big Data Analysis" explains the complete process of big data processing but lacks business analysis knowledge, and the number of cases is small and not typical. "Business Intelligence and Analytics" involves data mining, decision analysis, network analysis, natural language processing, etc. It suits majors such as e-commerce and management but needs a more practical operation. "Business analytics principles, concepts, and applications what, why, and how" has the problem that the knowledge points are not divergent enough, and the content is single. "Business Data Analysis with Python" focuses on solving optimization problems with simple cases.

The course requires students to process, model, and analyze big commercial data from the application's perspective, with the help of computers and statistical software, to explain economic phenomena and make business decisions. Therefore, the textbook should include classic business analysis models, big systematic data processing techniques, and simple mathematical statistics. Specifically, the book should use real cases to illustrate the application of business analysis models and big data processing technologies to combine theory and practice. We can learn from the theoretical part of the two textbooks, "Essentials of Business Analytics" and "Business Big Data Analysis," to

Table 1. List of textbooks

Textbook	Software
Business Analysis: Analysis, Mining, and Application of Business Data [11]	SPSS CLEMENTINES
Essentials of Business Analytics [12]	EXCEL
Business analytics principles, concepts, and applications what, why, and how [13]	SPSS/ EXCEL/ LINGO
Business Intelligence and Analytics [14]	EXCEL
Business Data Analysis with Python [15]	PYTHON
Business Big Data Analysis [16]	KNIME

write the basic framework of the textbook. The practical operation must combine Python and big data platforms and fully use Hadoop, Spark, HBase, Hive, and other software functions. In the fundamental teaching of Python programming, we can refer to “Python for Data Analytics: Data Wrangling with Pandas, NumPy, and IPython” [17]. This book explains the fundamentals of manipulating, processing, cleaning, and manipulating data using Python. It also covers various sample codes for time series, plotting, creating models, etc. To use the main technical framework of the big data platform, we can refer to the books “Python Big Data Analysis from entry to mastery” [18] and “Data Analytics with Spark Using PYTHON.” [19].

3.2 Teaching Module Setting

Around the setting of teaching content, the course constructs the teaching module, as shown in Fig. 4. The course content is divided into four main parts: basic theory, data conversion & storage, descriptive statistical analysis, and forecasting & decision analysis. The entire course teaching is based on the Python language, with the Hadoop + X big data platform as the environment. It is equipped with corresponding Python function libraries for different teaching contents.

4 Exploration of the Teaching Method

Based on carefully studying the teaching materials, teachers should try their best to contact students’ actual ability and deal with the teaching materials flexibly according to the requirements of talents needed by the market. In the teaching of the “Business Big Data Analysis” course, the following points should be made:

4.1 Sort Out the Systematic Knowledge of Business Data Analysis

The course’s main objective is to guide students in describing business situations and modeling them to predict business activities or make decisions. In terms of content scheduling, first of all, various business management models should be introduced to cultivate students’ logical thinking ability; secondly, the complete process of extensive data analysis should be explained so that students can start from demand analysis, data collection, data management, data preprocessing, to data analysis. Analysis, model evaluation, model deployment, and application; the business data is processed through the big data software platform, and the business analysis model is systematically described.

4.2 Explore Classroom Teaching Methods

The course involves economics, management, mathematics, computer science, statistics, and other disciplines. Unlike the traditional “business data analysis,” the data processing involved in this course is solved through big data platforms and related software. This course has the limitation of teaching objects. Its students are mainly from economic and management colleges. Their knowledge of mathematics, computer, probability theory,

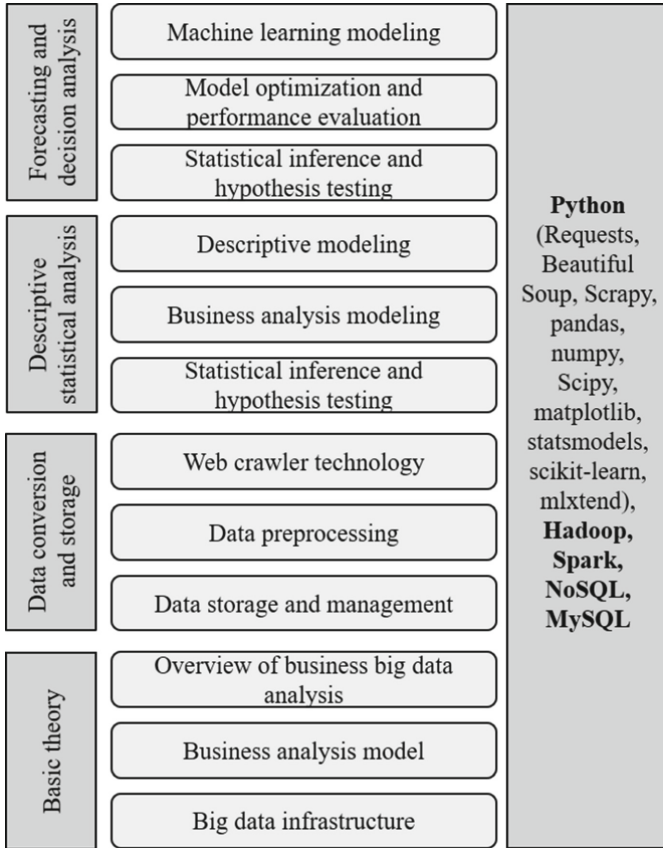


Fig. 4. Teaching module settings

and mathematical statistics approach is generally weaker than that of science and engineering students. Therefore, teachers should not only carry out demonstration operations such as business analysis, model description, and data processing but also let students take the initiative to learn knowledge and master methods through computer operation, group discussions, and business writing to analyze and solve practical problems. The following points should be noted in classroom teaching:

- (1) Set up a variety of classroom interaction links, and focus on analyzing the problematic points of each chapter for students;
- (2) Arrange an appropriate amount of in-class exercises, homework, and stage tests to consolidate students' theoretical knowledge and methods;
- (3) Increase the teaching time of the experimental part so that students can master the method of big data processing in computer operation.
- (4) Enrich teaching resources, and the teaching content can be made into a video, which is convenient for students to watch.

4.3 Combined with Case Analysis

In the teaching, case analysis should be highlighted. Students should be guided to discover, analyze, and solve problems from various business data cases to make innovative economic decisions. The examples closely related to the teaching content should be chosen according to teaching progress when selecting business cases. The business case must be typical and natural. Here are a few things to keep in mind when selecting an instance:

- (1) The selected case should be systematic and contain as many important concepts, principles, and methods as possible in the textbook so that students can deepen and consolidate the learning of theoretical knowledge in the process of exploring it;
- (2) The selected case should contain complex, ambiguous, or urgent problems that allow students to develop divergent thinking.
- (3) The selected case should be realistic and authentic, reflecting its reflections and interpretations of hot economic topics.

In teaching, the following cases are arranged, such as cinema box office data visualization, analysis of influencing factors of shared bicycle rental, news, and public opinion analysis, auto industry market data report analysis, business data information collection and storage, NetEase Cloud Music user portrait analysis, stock quantitative investment analysis, risk management and control of the insurance industry.

4.4 Make Full Use of Statistical Software

Since economics majors have a solid economic background, if they can use statistical software to analyze business data and get results, then the explanations they get will be more comprehensive and standardized. Therefore, through software-assisted teaching, students' learning enthusiasm can be mobilized so that they no longer feel empty and bored with the business models and mathematical theories in the textbooks. In addition, it can also improve students' ability to analyze practical economic problems and lay a good foundation for future scientific research and work.

In the teaching reform plan, in addition to using Excel, SPSS, etc., to process data, it is also necessary to teach the use of Python, Stata, SPSS Clementine, tableau, Spark, HDFS platform, etc.

4.5 Combination of Teaching and Research

Teachers should actively apply the knowledge accumulated in scientific research to teaching. Currently, the teaching team of colleges and universities in China needs to be more balanced. Forming a high-level teaching team is difficult, indirectly affecting students' practical and innovative abilities. Participating in scientific research can help teachers broaden their horizons, promote the seamless integration of teaching and scientific research, improve scientific research ability and teaching level, and promote students' practical and innovative knowledge.

Research projects similar to the following are available for reference, such as research on critical technologies of business data processing platforms and their applications;

research on critical technologies of business data aggregation management and mining and their applications; research on e-commerce reputation scoring and fake rating detection models; research on the identification of counterfeit e-commerce commenters.

5 Assessment Methods

In teaching assessment, teachers must evaluate the initiative and innovation in the course learning process, academic testing, and teaching ability training. The diversified assessment methods can promote the cultivation of students' practical and competitive abilities and arouse students' enthusiasm and initiative in learning. The course assessment must examine students' ability to apply statistical knowledge and computer software. The traditional "closed-book exam" to evaluate students' mastery of course learning is unreasonable and will also increase students' bad study habits of having a cram exam session.

Teaching assessment needs to reflect diversity. The specific assessment methods after the reform are attendance, impromptu questions, in-class tests, discussions, and other classroom performances, and chapter video learning, which account for 10% of the total score. Homework (10 times in total) accounts for 10% of the total score, and experiments (8 times in total) account for 30%. The usual homework and experiments mainly hone the data preprocessing skills and proficiency in data mining algorithms. The final exam, accounting for 50% of the total grade, is an online closed-book exam with open-ended comprehension questions.

6 Conclusions, Limitations, and Future Research

As an emerging multidisciplinary course, "Business Big Data Analysis" has broad application prospects. This paper starts from the market's demand for the ability of business analysis and data analysis talents, combines the current deficiencies in the teaching of this course and my own teaching experience, and puts forward a teaching reform plan from the teaching content, teaching methods, and evaluation methods of the course. Teachers should teach relevant theories and skills in a targeted manner based on the training requirements of different majors to cultivate compound talents with a "thick foundation and wide caliber" for society.

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