

The Application of Big Data Technology in the Design of College Students' Mental Health Service Systems

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ABSTRACT

This paper analyzes the potential role of big data technology in enhancing mental health services at colleges, aiming to provide theoretical support and practical guidance for improvements and innovations. It explores the prospects, significance, current status, and challenges, as well as specific application pathways of big data technology in the design of college students' mental health service systems. By examining how big data can optimize mental health services, the paper proposes pathways for integrating big data technology into these systems to improve efficiency and quality, thereby better serving the mental health needs of college students.

Keywords: *Big Data Technology, College Student Mental Health, College mental health service systems, System design.*

1. INTRODUCTION

The mental health of college students is receiving increasing attention in society today. With the rapid development of the economy and the proliferation of higher education, students' mental health significantly impacts individual development, the quality of higher education, and social stability. Research indicates that mental health issues not only affect students' academic performance and social skills but can also lead to more serious psychological disorders. Therefore, effectively promoting college students' mental health has become a focal point for universities and society. Meanwhile, as an important achievement of the information age, big data technology is gradually penetrating various aspects of social life. By collecting, storing, analyzing, and applying large volumes of data, big data technology can reveal patterns behind complex phenomena and provide a scientific basis for decision-making. While significant effects have been observed in fields such as healthcare, finance, and transportation, the application of big data technology in the realm of mental health, particularly in college mental health services, is still in its infancy, necessitating further exploration and empirical research. Big data makes contributions to innovation, competition and

productivity in different fields, which has brought more benefits to humans. The data shows that nearly 300 billion dollars has been spent on the potential annual value to the global health care, as a way of promoting global healthcare sectors [1].

In light of the above, this paper aims to explore the application of big data technology in the provision of psychological health services for university students. By conducting an in-depth analysis of the potential roles of big data technology in psychological health services, this paper aims to provide theoretical support and practical guidance for improving and innovating university psychological health services. The study first reviews the current state of psychological health services and the basic principles of big data technology application. It then analyzes the significance and current status of big data technology in university psychological health services, discusses challenges and difficulties in the current service system design, and proposes specific application pathways based on big data technology.

This paper employs various research methods, including literature review, case analysis, and theoretical exploration. By analyzing relevant research findings from both domestic and international sources and incorporating specific cases,

this paper aims to propose feasible application solutions for integrating big data technology into the design of university student psychological health service systems.

2. THE SIGNIFICANCE AND CURRENT STATUS OF BIG DATA TECHNOLOGY APPLICATION IN UNIVERSITY PSYCHOLOGICAL HEALTH SERVICES

Big data is widely used in health care by using analytics to identify and manage high-risk and high-cost patients[2]. The application of big data technology in university psychological health services can not only enhance the efficiency and quality of the university psychological health service system but also better meet the psychological health needs of college students through personalized and predictive interventions. In the future, with further technological development and deepening application, big data is expected to play a more crucial role in the field of university psychological health services.

2.1 Basic Concepts of Big Data Technology and Its Application in the Field of Psychological Health

Big data technology refers to the techniques and methods used to process large, complex datasets that typically exceed the capabilities of traditional database software. The core characteristics of big data can be summarized as volume, variety, velocity, and value. In the field of psychological health, big data technology assists in identifying patterns and risk factors related to psychological issues by collecting and analyzing data on individual behavior, social interactions, psychological test results, and more, thus providing support for psychological health services. The research by Liang et al (2019) shows that big data has promoted people's exploration of people's mental health. People's psychological health has become a major issue, but it is still in its starting point, and it lacks accurate diagnosis and treatment. Under this condition, big data and social media have helped people's psychological health improved with efficiency[3].

2.2 Current Status of University Psychological Health Services and the Impact of Big Data Technology

Currently, university psychological health services face challenges such as a shortage of human

resources, limited service coverage, and a lack of diverse intervention methods. The application of big data technology offers new possibilities for addressing these issues. By analyzing students' online behaviors, academic performance, social networks, and other information, it becomes possible to identify students at risk of psychological health problems at an earlier stage and provide timely interventions. In this condition, a number of scholars conduct studies on the role of big data on psychological health treatment and solution. Because of the rapid development of big data and other technological development, college students' psychological health education encounters the new challenges and opportunities. The advent of big data can help offer the positive guidance for college students in solving this problem[4]. University students' psychological health issues should be solved with the help of big data via cultural communications[5]. Additionally, big data analysis helps mental health professionals gain a better understanding of the overall psychological well-being of the student population, enabling the optimization of service strategies and resource allocation.

2.3 Case Analysis of the Application of Big Data in University Psychological Health Services in China and Foreign Countries

Internationally, some universities have already begun utilizing big data technology for innovative psychological health services. For example, certain universities in the United States identify psychological stress and depressive tendencies among students by analyzing their online usage behavior and social media activities. In China, universities have also established psychological health databases to collect data on students' psychological assessments, classroom performance, and daily behaviors, enabling early identification and intervention for psychological risks.

2.4 Significance of Big Data Application in University Psychological Health Services

The application of big data technology in university psychological health services is significant in several ways. Firstly, it enhances efficiency in identification and intervention: through big data analysis, students in need of psychological assistance can be identified quickly, enabling early intervention and preventing problems from worsening. Secondly, it enables personalized services: based on data analysis results, mental health professionals can

provide more personalized services and intervention plans for each university student. Thirdly, it facilitates risk prediction and prevention: by analyzing large datasets, trends in psychological health issues can be predicted, allowing for timely measures to mitigate potential risks.

3. CURRENT CHALLENGES AND DIFFICULTIES IN THE DESIGN OF COLLEGE MENTAL HEALTH SERVICE SYSTEMS

When exploring the application of big data technology in college mental health services, the researchers currently face a series of challenges and difficulties. These challenges encompass technical and operational issues as well as legal, ethical, and resource allocation aspects. To overcome these challenges, universities need to adopt a comprehensive strategy, including strengthening the protection of data privacy and security, improving data processing quality and accuracy, optimizing resource allocation, and also paying attention to student needs and acceptance to ensure the effectiveness and sustainability of the mental health service system.

3.1 Challenges in the Current Design of College Mental Health Service Systems

The current design of college mental health service systems faces various challenges that directly affect the system's effectiveness and service quality. The following briefly discusses these challenges and their strategies:

3.1.1 Data Privacy and Security

Protecting the privacy and data security of college students during the collection and processing of their mental health data is a significant challenge. Data security and privacy has become the major issue that affects the sustainable development of big data application in psychological health of college students. Data security and privacy protection are the two principal factors of user's concerns about the advanced technology[6]. Sun, et al (2020) argue that most people are fearful for the use of big data, because of their privacy and personal data disclosure[7]. Ensuring data security is of paramount importance. Schools need to establish robust data privacy protection mechanisms, including data encryption, access control, and compliance reviews. Additionally, compliance with relevant data privacy

regulations and legal requirements such as HIPAA is essential to reduce legal risks.

3.1.2 Data Quality and Accuracy

The accuracy and reliability of big data analysis rely on high-quality data. However, data may have biases, be incomplete, or contain errors, which can lead to inaccurate analysis results. To address this challenge, schools should ensure that data collection methods are scientific and standardized to minimize data errors. Data cleaning and validation techniques should be used to identify and correct errors and biases in the data. Establishing a data quality monitoring mechanism to regularly assess and verify data accuracy and quality is crucial.

3.1.3 Resource Allocation

To ensure the effective operation of the mental health service system, resources, including technological investments, human resources, and financial support, need to be allocated reasonably. Inadequate resource allocation may result in decreased system performance and service quality. To improve resource allocation, schools can adopt data-driven approaches. Through data analysis, they can gain a better understanding of students' mental health needs and service requirements, allowing for targeted resource allocation. Cost-effectiveness analysis can be used to evaluate the effectiveness and costs of different service strategies to optimize resource utilization. Additionally, establishing an effective resource management mechanism ensures the rational allocation and supervision of resources to improve system efficiency and performance.

3.2 Current Issues in the Design of College Mental Health Services

There are several issues in the design and implementation of college mental health services that directly affect the quality and efficiency of these services. The following briefly discusses these issues and their strategies:

3.2.1 Service Scope

Many colleges have limited coverage in their mental health services, making it challenging to reach all students in need. To address this issue, universities can establish a broader service network, including on-campus and off-campus resources, to meet diverse needs. Additionally, offering online counseling and remote support can expand the coverage of services.

3.2.2 *Human Resources*

The number of professional mental health service providers is often limited and unevenly distributed. To address this issue, schools can increase the training and recruitment of mental health professionals to meet student needs. The resources of big data used in healthcare service are limited, so that most people are unable to have access to this service. Therefore, this has become the major issue that negatively affects the sustainable and long-run development of science and technology[8]. This may include attracting volunteers and peer counselors to provide basic psychological support and alleviate the workload of professional staff.

3.2.3 *Lack of Funding*

Maintaining mental health services and big data systems requires ongoing financial support. Big data technologies are widely adopted in biomedical and healthcare informatics research. However, some studies on it are stopped due to the lack of funds to some extent. This is why the application of big data on psychological health service is not sufficient and enough[9]. To address this issue, universities can actively raise funds from the government, alumni, donations, foundations, and other channels to support the development and maintenance of mental health services. Additionally, conducting cost-effectiveness analysis, optimizing resource utilization, and ensuring that each fund maximally supports student well-being are essential.

Through effective strategies to address these issues, college mental health service systems can better meet student needs, improve service quality and efficiency, and when combined with big data technology, further optimize resource allocation and personalize services to provide more comprehensive support for students' mental health.

3.3 *Limiting Factors in the Application of Big Data Technology*

While big data technology has tremendous potential in college mental health services, its application is still subject to some limiting factors.

3.3.1 *Technological Level*

Although big data technology is advancing rapidly, its application in the mental health field is still relatively early-stage. Technological limitations may impact service effectiveness and data accuracy. For example, data collection and processing may

have errors, and algorithm accuracy needs continuous improvement. Therefore, it is necessary to continually enhance the level of relevant technologies to ensure the reliability and accuracy of data analysis.

3.3.2 *Legal Regulations*

When using big data to process personal information, compliance with relevant legal regulations, especially those related to personal privacy protection, is essential. These regulations may vary in different countries and regions, so the complexity of legal regulations must be considered during system design and operation. To ensure compliance, universities' mental health service systems need to establish robust legal teams or compliance departments to adjust system design and data processing methods promptly to meet legal requirements.

3.3.3 *Student Acceptance*

Student acceptance of big data technology varies from person to person. Some students may be concerned about personal privacy infringement, which can affect their trust and participation in the system. To overcome this limitation, universities can conduct awareness and education campaigns to explain the benefits of big data technology and privacy protection measures to increase student acceptance. Furthermore, system design should prioritize user-friendliness and transparency, making it easier for students to understand and use the system, thus increasing their satisfaction.

These limiting factors need to be addressed appropriately in the application of big data technology in college mental health services. Through continuous technological innovation and improvement, compliance with legal regulations, and active involvement and understanding of students, these limitations can gradually be overcome to realize the maximum potential of big data technology in mental health services.

4. **SPECIFIC PATHWAYS FOR THE APPLICATION OF BIG DATA TECHNOLOGY IN COLLEGE MENTAL HEALTH SERVICE SYSTEM DESIGN**

Big data technology holds the potential to play a significant role in college mental health service systems. It can enhance service efficiency and quality while better meeting students' mental health needs

through personalized and predictive interventions. Big data can make a huge impact in different field, especially in the college mental health service system designing. Big data has its potential to revolutionize the art of management in many aspects[10]. However, achieving this goal requires collaborative efforts from universities, government agencies, technology companies, and society as a whole to drive innovation and development in mental health services.

4.1 Data Collection and Processing

4.1.1 Ensuring Data Quality

The effective operation of college mental health service systems relies on high-quality data. To ensure data reliability and accuracy, standardized methods and tools must be used during data collection. This includes employing rigorous psychological assessment tools, standardized data recording processes, and professional training for data collectors. Additionally, regular data cleansing and validation are critical steps in maintaining data quality. Identifying and correcting errors, omissions, or outliers improves data quality, making it more useful for analysis and decision-making.

4.1.2 Compliance

When handling sensitive data related to student privacy, strict adherence to relevant data protection regulations and ethical guidelines is essential. This includes obtaining clear consent from data subjects, specifying the purposes of data use, and implementing appropriate security measures to protect data. Compliance involves not only legal compliance but also ethical considerations. In the design of college mental health service systems, an ethics review body or committee should be established to review and monitor the ethical compliance of data collection and processing, ensuring the protection of students' rights and interests.

4.1.3 Integration of Multi-source Data

Mental health data comes from diverse sources, including academic records, participation in activities, and social media behavior. To gain a more comprehensive understanding of students' mental well-being, effective integration of data from these various sources is necessary. Data integration can be achieved by establishing a unified data storage and management system to ensure data consistency and interoperability. By integrating multi-source data,

mental health professionals can better comprehend students' life backgrounds, behavioral patterns, and needs, allowing for more targeted support and intervention.

In summary, data collection and processing are crucial components of college mental health service system design. Only by ensuring data quality, compliance, and multi-source data integration can the system provide a reliable data foundation to support precise analysis and personalized services. Additionally, it is important to stay updated on the latest data processing technologies and regulatory requirements to continually refine data processing workflows to adapt to changing needs and challenges.

4.2 System Design Principles

4.2.1 User-friendliness

User-friendliness is a critical principle in the design of college mental health service systems. The system should have an intuitive interface and user-friendly features to increase the usage and satisfaction of both students and mental health professionals. Achieving user-friendliness can involve user experience (UX) design for the user interface, ensuring that the system is easy to navigate and operate. Additionally, user training and support should not be overlooked. Providing training and help documentation to users can enhance their proficiency in using the system's functionalities.

4.2.2 Privacy Protection

Privacy protection is an essential principle when designing college mental health service systems. The system design should incorporate elements of privacy protection, including but not limited to data encryption, anonymization, and access control. These measures aim to ensure the full protection and security of students' personal information. Furthermore, the system should clearly inform users about data usage and privacy policies, obtaining their explicit consent for the lawful processing of sensitive data.

4.2.3 Ease of Maintenance and Upgrades

As technology advances and user demands change, college mental health service systems need regular maintenance and upgrades. Therefore, system design should consider sustainability and flexibility. This includes using a modular architecture that allows individual components of the system to be independently maintained and upgraded without

affecting the overall system's stability. Additionally, the system should have automated maintenance and monitoring functions, along with regular security vulnerability scans to ensure its security and reliability.

In summary, system design principles play a crucial role in the development of college mental health service systems. By ensuring user-friendliness, privacy protection, and ease of maintenance, a secure, reliable, and user-satisfactory system can be created to provide high-quality mental health services to students. These principles not only contribute to the successful implementation of the system but also facilitate its continuous development and improvement in a changing environment.

4.3 Case Studies

To better understand the potential and effectiveness of big data in mental health services, let's analyze some successful application cases that provide valuable insights and experiences for universities. These case studies highlight how big data technology plays a key role in improving the efficiency and quality of mental health services in universities.

4.3.1 Case Study 1

Comprehensive Student Data Platform Some renowned international universities have adopted comprehensive student data platforms that monitor not only students' academic performance but also their participation in extracurricular activities and social media behavior. By integrating data from various sources, including academic records, social media activity, psychological test results, and more, these platforms can provide more comprehensive mental health support to students. The platform uses big data analysis to identify behavioral patterns and mental health risk factors, enabling the timely detection of potential issues and the implementation of personalized interventions. These personalized intervention plans can be tailored to each student's needs and response patterns, enhancing the effectiveness of interventions and student satisfaction.

4.3.2 Case Study 2

Social Media Analysis and Emotion Recognition Some universities leverage big data technology to analyze students' activities on social media platforms and attempt to identify signs related to emotions and mental health. By monitoring students' content and interaction patterns on social media, the system can

automatically identify potential mental health issues, such as depression, anxiety, or social isolation. Once issues are identified, the system can automatically provide support to students, including recommending mental health resources, offering online counseling, or connecting them with professional mental health personnel. This social media-based analysis provides universities with a cost-effective and efficient way to monitor and intervene in students' mental health issues.

These case studies emphasize the tremendous potential of big data technology in university mental health services. Through the integration of data from different sources, personalized interventions, and timely interventions, universities can better meet students' mental health needs. However, this also requires addressing challenges related to technology, privacy, and ethics, requiring a comprehensive consideration of various factors to ensure the successful implementation and operation of the system. These case studies provide valuable experiences and insights to guide universities in harnessing big data technology to improve mental health services.

4.4 Policy and Planning Recommendations

To further promote the application of big data technology in university mental health services, the researchers propose the following policy and planning recommendations to facilitate system development and enhance service quality:

4.4.1 Establishing Data Sharing Mechanisms

Universities are encouraged to establish data sharing mechanisms among themselves to facilitate mutual learning and the exchange of successful experiences. By sharing data and experiences, not only can redundant efforts be reduced, but the development and optimization of systems can also be accelerated. Establishing suitable data sharing platforms helps universities better understand the commonalities and differences in students' mental health issues, allowing for more targeted intervention plans and service strategies.

4.4.2 Strengthening Talent Development and Technical Support

The application of big data technology requires professionals with relevant skills and knowledge. Therefore, it is recommended to enhance the training

of mental health professionals and data analysts to improve their understanding and application of big data technology. Training can include topics such as data analysis, data privacy regulations, and ethical guidelines. Additionally, providing technical support and consulting services to help universities effectively select, implement, and maintain big data systems will be a critical support measure.

4.4.3 Formulating Sound Policy Frameworks

To ensure the compliance and effectiveness of big data applications in mental health services, policies related to big data applications should be formulated and refined. This includes but is not limited to data protection policies, service standards, and quality monitoring mechanisms. The policy framework should clearly define the legal and regulatory requirements for data collection and processing, specify the purposes and scope of data usage, and incorporate relevant ethical principles. Additionally, it is advisable to establish independent regulatory bodies responsible for overseeing and assessing the application of big data in mental health services, ensuring service quality and safety.

4.4.4 Promoting the Integration of Technology and Services

Universities are encouraged to collaborate with technology companies to apply the latest big data technology to mental health services while ensuring that technological solutions align with students' actual needs. Collaboration can encompass technology research and development, customized system design, and service provision. Universities can leverage the technical support and resources of technology companies to expedite innovation and application of big data technology in mental health services.

4.4.5 Focusing on Long-term Sustainability and Development

In policy planning, it is essential to consider the long-term sustainability of mental health service systems. This includes ongoing financial support, technological updates, and the training of professional personnel. Ensuring that the system can adapt to evolving technology and needs and address potential challenges and issues is crucial. Long-term planning and strategic investments are key factors in

ensuring the system's continued development and the provision of high-quality services in the future.

By implementing these policies and planning recommendations, universities can better utilize big data technology to enhance mental health services, improve student well-being, and increase satisfaction. These recommendations also contribute to advancing the development and application of big data technology in the field of education, providing more possibilities and opportunities for higher education in the future.

5. CONCLUSION

This paper explores the application of big data technology in the design of college mental health service systems and reveals the key challenges and opportunities within this field. By analyzing the practices of big data technology in data collection and processing, analysis applications, and system design principles, this study uncovers the significant potential of big data technology in enhancing the quality and efficiency of mental health services. Particularly in areas such as personalized services, risk prediction, and intervention strategy formulation, big data technology demonstrates its unique advantages. Furthermore, through case analysis and policy recommendations, this paper provides practical guidance and insights for optimizing college mental health service systems.

Looking to the future, the prospects for the application of big data technology in college mental health services are promising. With continuous technological advancements and the maturation of data analysis methods, this technology is poised to provide robust support for more precise and effective mental health services. Big data can not only help universities better understand the psychological conditions of students but also serve as a basis for implementing more personalized and timely intervention measures. However, to fully harness the potential of big data technology, further research and practical exploration are needed.

Regarding future research directions, attention should be paid to technological advancements and innovations, particularly in improving data processing accuracy, privacy protection, and user acceptance. Additionally, broader areas such as policy frameworks, resource allocation, and personnel training should also receive ample consideration. Furthermore, interdisciplinary collaboration should be encouraged, combining expertise from fields such as psychology, data

science, and education to gain a more comprehensive and in-depth understanding of and response to the complex issues within mental health services. Through these efforts, the application of big data technology in college mental health services will mature and better serve the health and well-being of a wide range of students.

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