INTERNATIONAL JOURNAL OF

INNOVATIONS IN APPLIED SCIENCES

AND ENGINEERING

e-ISSN: 2454-9258; p-ISSN: 2454-809X

Developing a Smart Financial Management System by Leveraging the Data Dimensionality Reduction Technique

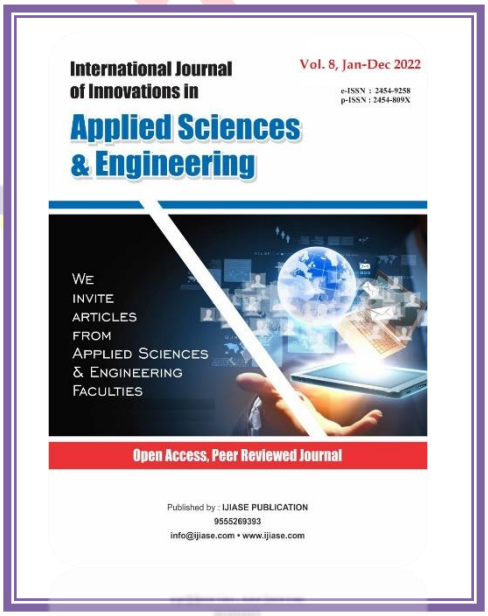
Anika
Export-Import Bank of India

Paper Received: 12th July, 2022; **Paper Accepted:** 02nd September, 2022;

Paper Published: 18th October, 2022

How to cite the article:

Anika, Developing a Smart Financial Management System by Leveraging the Data Dimensionality Reduction Technique, IJIASE, January-December 2022, Vol 8; 109-117



ABSTRACT

The state's introduction of the government accounting system and the development of 'double first-class' housing in higher education have necessitated higher standards for the financial administration of colleges and universities. To meet these standards, colleges and universities must adopt more sophisticated financial management systems. The application of data dimensionality reduction technology in these systems can significantly enhance their intelligence and efficiency, making it a crucial step towards improving financial management.

The study begins by introducing the distributed architecture of data dimensionality reduction, smart contracts, and data encryption technologies. It then proceeds to discuss the viability of applying these associated technologies to smart financial systems.

INTRODUCTION

Financial management within educational institutions often adheres to traditional and passive models rooted in accounting principles, with a predominant focus on cumbersome financial procedures. This approach often impedes relevant staff from engaging effectively. Hence, there's a pressing need for innovation and enhancement in financial management to facilitate its transformation. Improving financial management entails simultaneous control and proactive planning to shift from passive to active management, set achievable goals, enforce higher standards of financial conduct, and ultimately deliver better services to all stakeholders within the institution.

Integrating intelligent systems into financial management processes can significantly enhance efficiency and modernize administrative methodologies, holding considerable practical significance and value [1-6]. Within blockchain and auditing research, scholars such as Xu Jinye et al. assert the advantages of blockchain technology in information management and propose networked auditing frameworks. Similarly, Chen Xu et al. highlight blockchain's potential in enabling real-time, dynamic, and remote auditing. In the context of blockchain and financial sharing, Sun et al. explore applications in corporate finance outsourcing, financial sharing architectures, and preventing accounting information distortion. Despite advancements in blockchain technology within corporate finance, its integration into university

financial management still needs to be explored.

Amidst the increasing demands of government accounting systems, internal controls, and performance evaluations, the need for innovative solutions in university financial management is becoming more pronounced [7-12]. This paper proposes an intelligent financial management framework for universities leveraging blockchain technology, a solution that is not only innovative but also timely, to enhance operational efficiency and meet the evolving needs of the sector.

Both practical and academic researchers recognize the critical challenges facing financial management in higher education institutions, emphasizing that traditional modes of operation are insufficient to meet evolving stakeholder needs or fulfil the functions demanded by the modern era. Addressing common challenges encountered in university financial management, this article delves into the discrepancies between government, administrative, faculty, and student financial needs and the services provided by financial departments. It examines the strategic development dilemmas universities face and issues pertaining to the cost-effectiveness of financial management information systems and data aggregation.

By exploring the concept and practice of financial sharing services, this paper proposes a practical approach to address the aforementioned challenges in university financial management and provide tangible solutions [13-16]. Establishing a regional financial sharing service centre for colleges and universities, utilizing modern information technology and the internet, and deploying cloud-based data management, imaging systems, and professional financial management software can streamline financial operations. This approach not only offloads standardized procedural tasks to the financial shared service center but also integrates original financial personnel into broader industry and financial roles, resolving supply-demand and supervision-service contradictions. Additionally, it maximizes the benefits of scale within the information system and professional expertise, ensuring standardized accounting practices across the industry.

In information retrieval, general document information is typically represented as a feature word vector, denoted as P1, within the vector space.

PROPOSED METHODOLOGY: ENHANCING FINANCIAL MANAGEMENT IN UNIVERSITIES

A. Modernizing University Financial Management

Financial management practices within colleges and universities often adhere to traditional methodologies. However, this approach may contain outdated practices and a lack of innovative management concepts, leading to fragmented management mechanisms and diminished efficiency. The prevailing work culture in financial management tends to be monotonous, with repetitive tasks and frequent communication barriers, hindering timely and effective problem-solving and impeding progress. Although financial management departments may develop specific systems to address emerging issues, these systems often need more cohesion and establish unified standards, resulting in incomplete frameworks. Furthermore, the tendency to devise new management methods in response to immediate challenges overlooks the proactive prevention of existing issues [20-24].

Financial management in higher education institutions has transitioned into the realm of informatization. Traditional paper-based processes have been replaced with computer programs, facilitating the completion of various business tasks through centralized financial management systems. Based on conventional financial management modules, these systems segment operations into income and expenditure, accounting, and budget management categories, with subdivisions including salary, reimbursement, inquiries, and scientific research management.

The existing financial information systems in colleges and universities have laid a strong foundation for the integration of blockchain into intelligent financial management systems. As the college financial information landscape evolves, there's a shift towards discarding outdated systems in favour of a new, more sophisticated architecture. This intelligent financial system, built upon the foundation of the original information system, leverages advanced technologies like blockchain, artificial intelligence, and big data. These technologies play a crucial role in optimizing processes, transforming data management methods, enhancing work efficiency, and reducing development costs, thereby revolutionizing financial management in higher education institutions.

Higher-level department requirements necessitate regular and irregular consolidation of financial data, demanding effectiveness and completeness in information collection and accuracy and timeliness in information transmission.

B. Data Dimensionality Reduction Technology

When it comes to data management, Principal Component Analysis (PCA) technology offers a powerful solution for dimensionality reduction. PCA constructs linear combinations of original variables to generate comprehensive indicators, effectively eliminating data correlations. This technique is particularly valuable for its ease of calculation and interpretability, as it assesses information based on data variance: the greater the variance, the more significant the contained information, and vice versa. By effectively managing data variance, PCA contributes to the overall efficiency and accuracy of the intelligent financial management system.

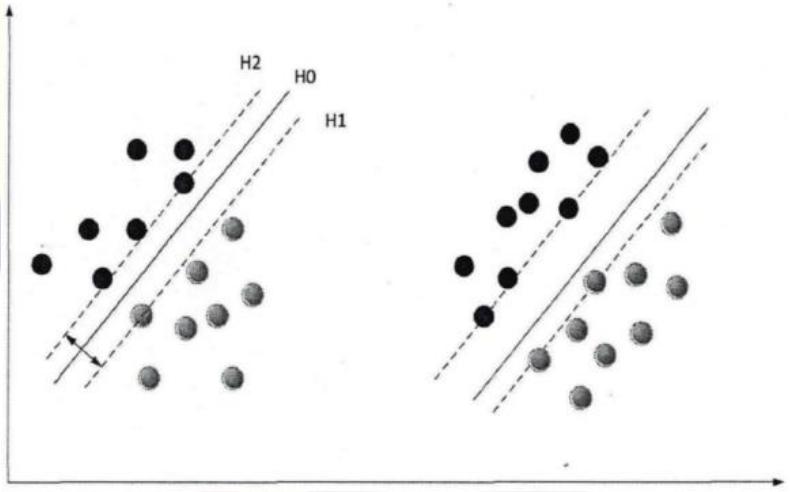


Fig. 1. Data Dimensionality Reduction Technology

Thus, PCA involves projecting and transforming the coordinates of high-dimensional data onto the direction of maximum data variance to construct a new coordinate system for representing the data's transformation. Feature selection, also known as feature subset selection or attribute selection, aims to pick a simplified subset of features from the entire set to enhance subsequent algorithmic modelling. This involves selecting an optimal subset based on specific evaluation criteria or conducting

operations on the original variables to generate new features, constituting a combinatorial optimization problem.

The fundamental objective of feature selection is to achieve dimensionality reduction by choosing an optimal subset of features, typically denoted as selecting a subset of dimensionality \(d\) from the feature set of dimensionality \(D\), denoted as \(W\). Given the intricate relationships among different features, Detailed Component Analysis (Independent Component Analysis), pioneered by Jutten and Herault in the 1990s, emerged as a method to select \(d\)-dimensional features from \(D\)-dimensional features to characterize data. Initially, the ICA algorithm stemmed from blind source signal separation, extracting source signals from mixed ones. Conversely, PCA primarily deals with transforming data to have the most significant variance, tackling a fundamental transformation problem.

In financial management, applying data dimensionality reduction techniques holds significance. For instance, personnel must possess robust financial management knowledge and blockchain technical expertise in a blockchain-based intelligent financial management system. Financial management department personnel in universities typically boast higher education, including master's or doctoral degrees, and exhibit strong learning capabilities. With professional training, they can adapt to new technical demands. Moreover, they often possess scientific research insight, enabling them to delve into bright finance-related areas of blockchain, address system challenges, and comprehend the nexus between finance and computer technology, facilitating research and resolving critical issues.

Application layer terminals encompass both computer terminals and mobile terminals. On the computer side, applications integrate forms with artificial intelligence (AI) technology. Users can input relevant business data through various modules, with [asymmetric encryption, a method of encryption where a pair of keys is used to encrypt and decrypt a message, ensuring data security]. AI technology enhances business efficiency by processing large data volumes or extracting financial data from extensive text documents or reports.

The AI module, a key component of the application layer, utilizes companion and natural language processing (NLP) in deep learning to intelligently segment text, remove

irrelevant elements, and extract financial data using regular expressions. By automating these tasks, manual interventions are minimized, leading to a significant improvement in data entry efficiency. Employing the application layer for financial data submission addresses issues with disparate data exchange standards and facilitates inter-departmental data integration, providing a seamless and reliable experience.

ANALYSIS

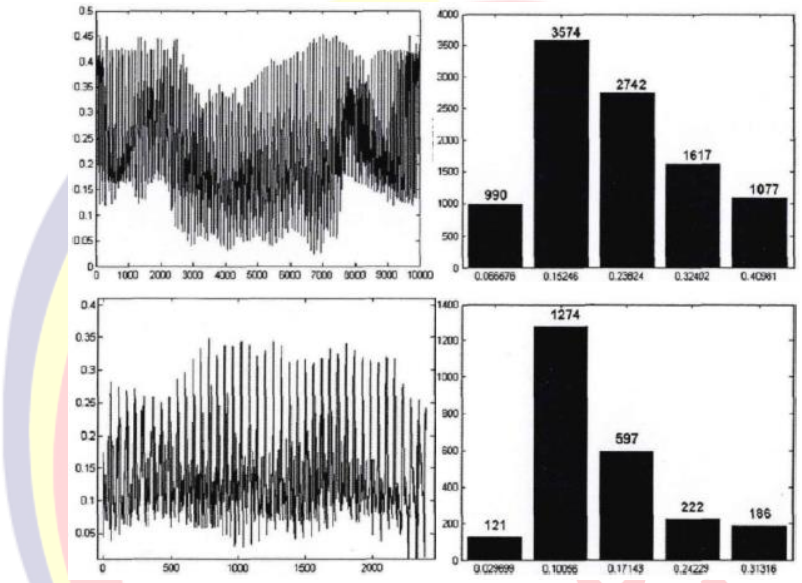


Fig. 2. Efficiency of University Financial Management System

Face image classification, notably face recognition, has a wide range of applications, as demonstrated by products like Alipay's face-scanning login feature. This technology's versatility is further highlighted by its potential to enhance traditional university financial management systems, as illustrated in the figure.

The application of intelligent data dimensionality reduction algorithm to financial management is shown in the figure.

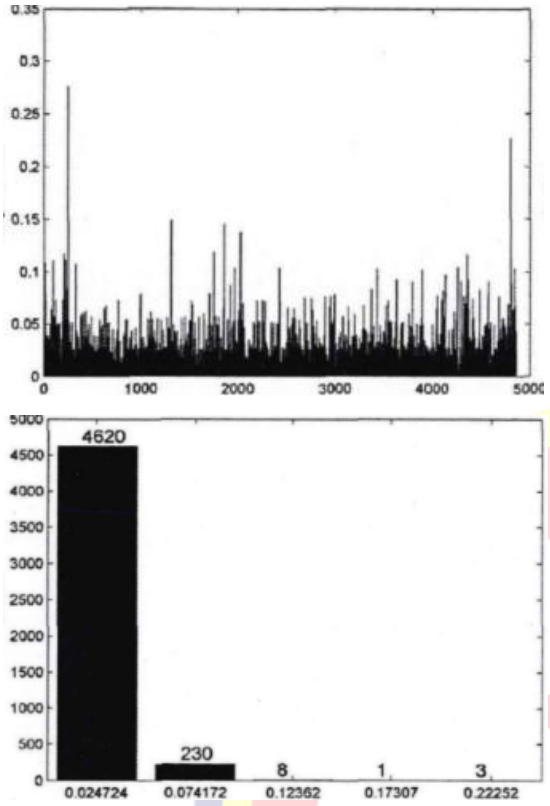


Fig.3. Application of financial management

The figure illustrates how implementing intelligent data dimensionality reduction algorithms enhances financial management efficiency.

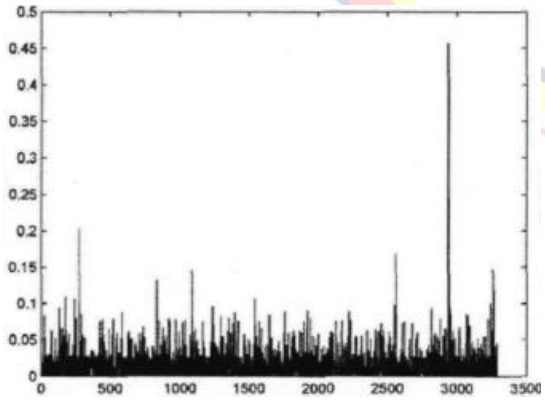


Fig. 4. Improve the efficiency of financial management

CONCLUSION

The conclusion begins by outlining the distributed architecture of data dimensionality reduction alongside intelligent contracts and data encryption technologies. It then evaluates the feasibility of integrating these technologies into innovative financial systems. Following this, a data-driven dimensionality reduction technology tailored to university financial management requirements is developed. The conclusion further elaborates on constructing an intelligent financial system architecture for universities, using specific business scenarios to illustrate the application of data dimensionality reduction technology in relevant processes. Finally, recommendations are provided for leveraging data dimensionality reduction technology to advance university financial management.

REFERENCES

[1] Robert Gunn, Robert Frigo, Stephen Behrens. Shared Services: Major Companies are Reengineering Their Accounting Functions [J]. Management Accounting, 1993, (23):101~106.

[2] Barbara Quinn, Robert Cooke, Andrewkri. Shared Services: Mining for Corporate Gold [M]. Financial Times Prentice Hall, 2000.105-120.

[3] Hirschfield R. Shared services save big money[J]. Datamation. 1996, (15):76-78.

[4] Moller, P. Implementing shared services in Europe[J]. Treasury Management International, 1997, (7).

[5] Ramirez, J. Utilizing Measurement to Drive Continuous Improvement within FSSC. International Journal of Information Management, 2007.9(2):16-28.

[6] Mart in Fahy, Andrew Kris. Shared Services: a leg up on acquisition payoffs [J]. The Dealer-maker's Journal, 2005, 4.

[7] Marijn Janssen, Anton Joha, Arre Zuurmond. Simulation and animation for adopting shared services: Evaluating and comparing alternative arrangements[J]. Government Information Quarterly,2008,26(1).

[8] Fahy, M. The Financial Future. Financial Management, 2005.21(5):210-219.

[9] Brian Bergeron. The Essentials of Shared Services[M]. Beijing: Renmin University of China Press, 2004.

[10] Huang Lei. Discussion on the Problems and Improvement Measures in the Security Management of University Funds[J]. Accounting Study, 2019(12):186-187.

[11] Liu Meiying. Research on the Construction of Financial Shared Services Based on the Intelligent Era[J]. Modern Business and Trade Industry, 2021(9):85-86.

[12] Gu Dan. Thoughts on the implementation of financial shared services from the perspective of big data[J]. National Circulation Economy, 2020(5):69-70.

[13] Hu Ruixue, Gao Fugui. Analysis on the Application of Financial Shared Services in Colleges and Universities[J]. Administrative Undertaking Assets and Finance, 2020(3):96-97.

[14] Zhong Fusheng. Research on the Transformation of University Financial Management Based on the Concept of Financial Sharing[J]. Administrative Business Assets and Finance, 2020(3):94-95.

[15] Gao Zhiyong. Research on the Optimization of University Finance "Decentralization, Management and Service" under Financial Sharing[J]. Northern Economics and Trade, 2019(8):60-62.

[16] Li Eryong. Research on the Construct ion of University Financial Sharing Service Platform[J]. Journal of Langfang Teachers College (Natural Science Edit ion), 2019(4):66-69.

[17] Liu Chao. Research on the Construct ion of Accounting Centralized Accounting System Based on Financial Sharing[J]. China Business Theory, 2018(17):100.

[18] Li Puying, Liang Qiulu. Research on the Construction of Global Financial Shared Service Center under the "One Belt and One Road" Initiative[J]. Chinese Township Enterprise Accounting, 2020(2):154-156.

[19] Liu Ting. Research on University Financial Sharing Platform Based on Analytic Hierarchy Process[D]. Wuhan: Jianghan University, 2019.

[20] Zhou Hanchun, Liu Xiaoyuan. The Application of Financial Shared Service Model in the Financial Management of Higher Vocational Colleges[J]. Chinese Market, 2020(10):158-159.

[21] Shang Xuming, Shang Chunxi, Huang Wenfu. Analysis of the financial management and control path of private colleges and universities from the perspective of information sharing[J]. Education Modernization, 2018(20):178-182.

[22] Cao Yi. Discussion on the Financial Management Mode of Private Colleges and Universities[J]. Times Economics and Trade, 2019(8):35-36.

[23] Cai Qiong, Xu Zhiqin. Discussion on the financial management mode of private colleges and universities[J]. Finance, Trade and Taxation, 2017(5):76-77.

[24] Li Ran, Yuan Lisheng. Analysis on the optimization of financial management in private colleges and universities[J]. Times Finance, 2017(1):156-157.