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The Application of Robotic Process Automation in University Financial Management

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Abstract

Against the backdrop of rapid information technology development, artificial intelligence (AI) technologies are being increasingly applied across various fields, including finance and accounting. Owing to the growing complexity of economic activities and other contributing factors, traditional financial management methods are no longer adequate for university settings. Consequently, universities have begun introducing AI technologies to optimize and enhance their financial management operations. This paper focuses specifically on Robotic Process Automation (RPA). Drawing on the current challenges faced by university finance departments, it systematically investigates the application scenarios of RPA in university financial management and summarizes the associated advantages and potential challenges.

Keywords

Artificial Intelligence, Financial Management, Robotic Process Automation (RPA).

1. Introduction

AI technologies are currently being deployed across a wide range of industries and domains, achieving significant improvements in efficiency and cost reduction. The field of finance is no exception. In 2008, the establishment of the XBRL (eXtensible Business Reporting Language) China Region Organization marked the entry of China's accounting informatization into a standardization phase [1]. In 2016, Deloitte and Kira Systems jointly announced the integration of AI into accounting workflows, heralding the beginning of China's intelligent accounting era [2, 3]. Since then, digital and intelligent finance has become increasingly prevalent.

As front-line institutions integrating scientific research, education, and talent cultivation, universities have actively responded to the mission entrusted by the state by introducing various technologies to drive innovation and upgrading in financial digitalization and intelligence. The concept of RPA was first proposed in 2012 by Pat Geary, Marketing Director of Blue Prism, a British process automation vendor; however, from a technical perspective, its origins can be traced back to the 1990s [4]. RPA can assist accounting personnel in handling highly repetitive and standardized tasks, thereby effectively improving overall accounting efficiency [5]. It is particularly well-suited for university financial management, which typically involves large volumes of structured data and well-defined rules. By operating on the basis of predefined rules, RPA enables university finance departments to work 24/7, efficiently processing and transferring data. This reduces the burden on financial staff, improves financial work efficiency, and promotes the high-quality development of university financial management.

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2. Current Problems in University Finance

2.1. Prominent Information Silos

University finance departments commonly face the structural problem of fragmented information system construction. Administrative units such as academic affairs, research administration, human resources, and asset management often procure or develop their own systems independently, lacking unified data standards and interface specifications. This results in poor data integration between these systems and the financial system. Cross-system data are not genuinely shared, information transmission relies on manual entry, and automated data capture capabilities are limited. This situation not only increases collaboration costs but also weakens the effectiveness of decision support.

2.2. Time-Consuming and Error-Prone Manual Repetitive Activities

As university business volumes continue to grow and business types become increasingly complex, the work pressure on financial personnel continues to rise. Under traditional manual processing modes, repetitive tasks such as reimbursement auditing, voucher entry, and reconciliation consume substantial time and energy and are prone to errors. The financial system places greater emphasis on accounting than on management, with simple statistical functions that cannot meet the needs of personalized analysis. This necessitates manual secondary data processing, further increasing the workload. This state of affairs not only affects service quality but also constrains the transition of financial personnel toward management accounting.

2.3. Cumbersome Business Processes in Need of Optimization

The sources of university funding are becoming increasingly diversified, with multiple funding channels — including government appropriations, research funds, and social service income — being managed in parallel. This imposes higher demands on the level of refinement in financial management. However, the mainstream reimbursement model still primarily follows a unified workflow and has not yet achieved digitalization, self-service, or intelligence. To address this, many universities are actively advancing digital transformation by redesigning business processes through information technology, thereby comprehensively improving management efficiency and service satisfaction.

3. Application Scenarios of RPA in University Financial Management

In the accounting and finance field, RPA technology can be applied to areas such as tax management, fund management, procurement-to-payment processes, and financial reimbursement [6]. In university financial management, the application of RPA has already covered core scenarios including reimbursement auditing, fund payments, bank reconciliation, individual income tax declaration, and electronic archive management. Driven by AI technologies, RPA demonstrates broad application prospects in financial data classification, processing, transmission, voucher auditing, entry, and bookkeeping [7]. This paper focuses primarily on the application of RPA in financial reimbursement and intelligent financial customer service.

3.1. Financial Reimbursement

Traditional financial reimbursement processes are notably cumbersome and error-prone. Their operational mechanisms rely heavily on manual auditing and data entry, leaving considerable room for improvement in financial work efficiency. RPA technology is applied to streamline financial reimbursement processes. By embedding RPA robots into financial systems and deeply integrating them with Optical Character Recognition (OCR) technology, the

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entire reimbursement process can be made automated, convenient, and intelligent, providing a smooth reimbursement experience for all university faculty and students.In daily reimbursement operations, embedded RPA robots can handle tasks such as receiving reimbursement documents, scanning documents, intelligent auditing, and automatic voucher generation. Specifically, OCR technology is used to automatically extract information from invoices. The combination of OCR and RPA enables the automatic generation of expense details, calculation of subsidies and deductible taxes, one-click completion of reimbursement forms, and submission. Based on a set of predefined reimbursement auditing rules, RPA performs intelligent auditing: if a case is approved, it is forwarded to financial personnel for secondary review; if rejected, it is returned to the applicant with reasons for rejection. In the voucher generation stage, by scanning QR codes on documents, the RPA robot automatically creates accounting vouchers based on information from the reimbursement form, including project, account, summary, amount, counterparty, and product name. Furthermore, for reimbursement progress tracking, deep integration of RPA with the reimbursement system enables real-time updates and timely notifications to faculty and students via email or SMS, allowing them to stay promptly informed and effectively reducing communication and coordination costs. Through the automated processing enabled by RPA and OCR, the speed and accuracy of document handling are significantly improved, the quality of financial services is enhanced, the workload of financial personnel is reduced, and university financial management is continuously driven toward intelligence and convenience. The intelligent reimbursement process integrating RPA and OCR is illustrated in Figure 1.

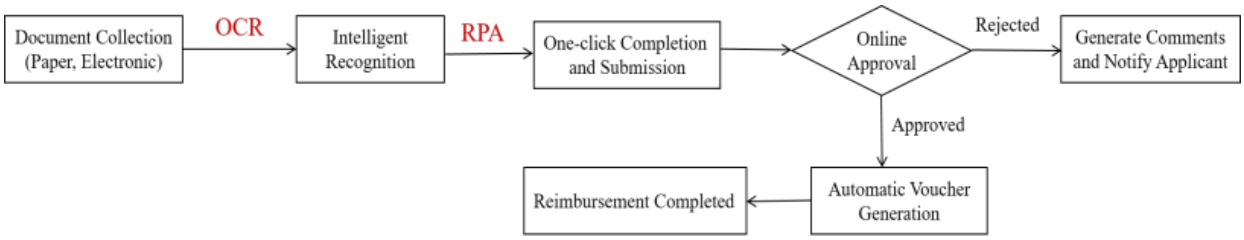

Figure 1. Flowchart of RPA+OCR Intelligent Reimbursement

3.2. Intelligent Financial Customer Service

Under traditional models, faculty and students often face long queues, difficulties in obtaining consultations, and high barriers to understanding financial policies, while financial personnel are consumed by numerous repetitive inquiries. The introduction of intelligent customer service enables 24/7 service delivery, effectively diverting high-frequency inquiries and improving service efficiency. Intelligent customer service operates as follows: based on natural language understanding and intent recognition performed by large AI models, RPA bridges the data silos among financial, human resources, research, and other systems, enabling data sharing and transmission to collaboratively address the inquiries of reimbursing personnel. Specifically, one of the main functions of intelligent financial customer service is to convert lengthy policy documents into structured Q&A, providing real-time answers to reimbursement-related inquiries. It can even offer personalized services based on inquiry history. For example, by leveraging the identities of university faculty, students, and staff, as well as important project milestones, the system can accurately identify user needs and provide tailored services. Additionally, intelligent financial customer service can offer features such as intelligent form-filling guidance and business progress tracking. In summary, under the development trend of “people-centeredness” and “service optimization,” intelligent financial customer service represents a new service model that enables a leap from “manual consultation” to “intelligent interaction” in financial services. It can more accurately understand the financial service needs of university faculty and students, provide precise and efficient responses and

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services, drive the automation and intelligent transformation of customer service processes, and thereby enhance the organizational efficiency and service levels of universities. The workflow diagram of the intelligent financial customer service is shown in Figure 2.

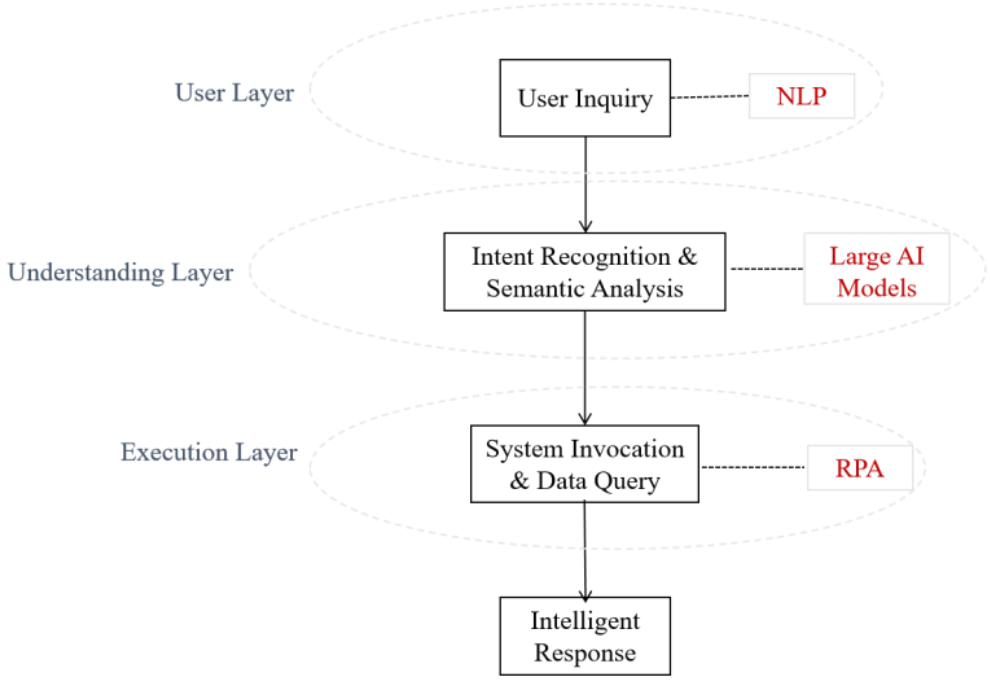

Figure 2. Workflow Diagram of AI+RPA Intelligent Financial Customer Service

4. Advantages and Challenges of RPA Application in University Financial Management

As university funding scales continue to expand and funding sources become increasingly diversified, traditional manual processing modes can no longer meet the demands for efficient and accurate management. RPA technology is gradually penetrating various aspects of university financial management, becoming an important tool for promoting digital transformation in finance. However, while the application of RPA improves the quality of university financial management, it also presents various challenges.

4.1. Advantages of RPA Application in University Financial Management

First, replacing high-frequency repetitive labor and significantly improving operational efficiency. University financial operations are characterized by large volumes and high repetitiveness, covering payroll distribution, tax declaration, document processing, fund payments, and other tasks. By simulating manual operations, RPA reduces manual intervention and cross-departmental communication costs, increasing batch processing efficiency several-fold and effectively alleviating the pressure of centralized work on financial personnel. At the same time, based on highly standardized process handling, RPA can achieve nearly 100% operational accuracy, effectively ensuring the quality of financial work.

Second, breaking down data silos and improving information accuracy and timeliness. University financial systems are typically independent of human resources, research, asset management, and other systems, with inconsistent data standards and closed interfaces. RPA, with its non-invasive characteristics, can be rapidly deployed without extensive modifications to existing systems and platforms [8]. Leveraging its outstanding cross-system compatibility and flexible scalability, universities can achieve automated processing using RPA while retaining their existing system architectures. This not only effectively addresses practical

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problems such as repetitive and cumbersome business processes, heavy manual operation burdens, and difficulties in real-time dynamic data transmission, but also enables management to detect anomalies and identify risks more promptly, providing reliable data support for budget adjustments and strategic decision-making.

Third, unlocking human value and promoting the transformation of financial functions. With its capabilities of 24/7 operation, high tolerance, and outstanding peak processing capacity, RPA can replace manual labor in handling standardized, repetitive, and periodic financial tasks within universities. Therefore, RPA liberates financial personnel from tedious mechanical tasks, allowing their focus to shift toward high-value areas such as financial analysis, performance evaluation, and risk warning, thereby driving the finance team's transformation toward "value creators."

4.2. Challenges of RPA Application in University Financial Management

First, lagging development of supporting policies and regulations. Improving relevant financial regulations to provide a rule-based framework for RPA operation is a prerequisite for optimizing financial processes. Currently, most universities have not yet established management systems covering the entire lifecycle of RPA, leaving gaps in areas such as authority definition, exception handling, and responsibility allocation. Without standardized guidance, automated processes may fall into a state of improper handling or lose proper measures when failures or conflicts occur, leading to compliance risks.

Second, prominent data security risks. Financial information is of extremely high importance and complexity. While RPA enables cross-system data interaction, it also introduces security risks such as data leakage and loss of access control. Robots frequently access core systems involving sensitive data such as payroll and research funds. If authentication mechanisms are weak or systems are attacked, information leakage can easily occur. Balancing automation efficiency with information security is a primary challenge for universities.

Third, significant resistance to process reengineering. Achieving efficient RPA application requires the optimization of business processes. However, process changes involve the interests of multiple departments, making coordination difficult. University financial processes are embedded in collaborative networks across multiple departments. If implemented hastily without systematic review, conflicts in approval logic or inconsistent data standards may lead to process chaos or even system loss of control. Furthermore, RPA's heavy reliance on rules makes it less flexible when policies are adjusted. If maintenance is not timely, it may instead become a new obstacle.

Finally, insufficient reserve of interdisciplinary talent. The application of RPA cannot be separated from interdisciplinary talent who understand both finance and technology. Currently, financial personnel lack technical capabilities such as script development, while information technology personnel find it difficult to accurately understand financial rules. This fragmentation of capability structures results in projects relying heavily on external vendors, with universities lacking sufficient capacity for independent operation and maintenance. Strengthening the cultivation of interdisciplinary talent and building a sustainable intellectual support system are key guarantees for the digital transformation of finance.

5. Conclusion

Against the backdrop of expanding university scale, increasingly diversified funding sources, and growing economic complexity, the efficiency and effectiveness of traditional financial work can no longer meet the needs of rapid university development. The application of RPA technology facilitates the transition from traditional finance to intelligent finance. It not only achieves cost reduction, efficiency gains, and improved service quality but also drives the

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transformation of the finance function from a record-keeping and accounting type to a value-creation type. In the future, driven by the wave of digital transformation, the development of RPA technology in university financial management will break through traditional automation boundaries, evolving toward intelligence and collaboration to handle more complex financial processes. The application of RPA in university financial management is a process of technology empowerment, helping to build a new ecosystem for university financial management that is intelligent and efficient, thereby promoting the high-quality development of university financial work.

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