Research on Innovative Practice of Financial Management of Power Grid Enterprises Based on RPA Technology

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Abstract: With the remarkable progress of modern science and technology, the application of a series of new technologies, such as big data, information technology, science and technology smart city, has been expanding, making people's daily life This work is more convenient. In the financial management of power and digital companies, transformation should be achieved. The technology of RPA, such as automated software tools, has been widely used in the field of financial management. It can realize intelligent management through application scenarios, improve automation level and financial management efficiency, and reduce the financial risk of enterprise power. Therefore, based on the technology of RPA, this paper proposes Analyze and discuss the digital transformation of financial management of electric power enterprises, hoping that it will help improve the financial management level of electric power enterprises.

Keywords: RPA, Electric Power Enterprises, Financial Management, Innovate.

1   INTRODUCTION

Under the trend of economic globalization, China's economic development is gradually moving towards digital and intelligent reform, and various new intelligent technologies are used to improve the speed of economic and social development. It is necessary for power companies to promote the digital transformation of relevant service fields in the new era [1]. Among them, financial management is one of the basic departments of power companies [2]. In order to avoid too much duplication. The basic work in the work process is that RPA technology can be used to realize the digital transformation of the financial management of power companies. Therefore, this paper analyzes the digital financial management of energy conversion. Electric company based on RPA technology.

2   OPTIMIZATION OF FINANCIAL REIMBURSEMENT OF POWER ENTERPRISES BASED ON RPA TECHNOLOGY

2.1   Digital Management of Financial Reimbursement of Electric Power Enterprises

The reimbursement process of power enterprises optimized by RPA technology is shown in

Figure 1.

Electric power enterprises use accounting software to directly extract relevant information from electronic invoices, and generate accounting vouchers and statements directly, which avoids mistakes that often occur in the process of manual operation. Promote the use of electronic invoices to accelerate the development of financial integration, digitalization, automation and informatization of power enterprises, and solve the problems related to financial management from the source [3].

Figure 1 Reimbursement Process of Power Enterprises Optimized by RPA Technology

2.2 Reimbursement Violation Prediction Based on Decision Tree

Suppose that the preprocessed data is the training data set G, a series of tests are carried out on the reimbursement related content, and the number of iterations is set, that is, all scores can reach the leaf node and the decision tree results can be entered. The whole operation process is shown in Figure 2.
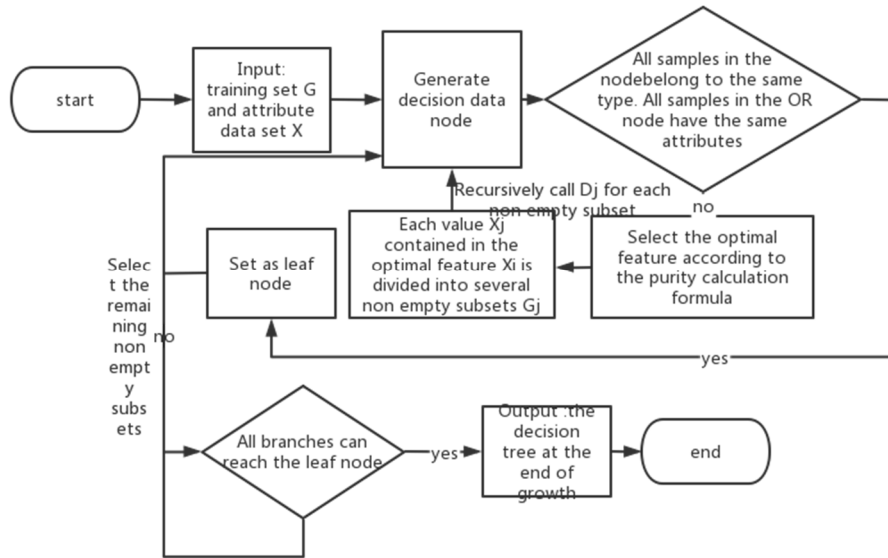

Figure 2 Algorithm operation process

The process is described as follows:

(1) The pre processed violation prediction data object is set as the data set G, X Property set for violation or not:

$$G = \left\{ g_m \middle| g_m = (g_{m1}, 8_{m2}, ..., 8_{mn}), m = (1, 2, ..., k) \right\}$$ （1）

Where, g_m Represent the data set m Data, n It indicates that each piece of data has n Attributes, that is, the input data attributes of the violation data. data set X It includes two target attributes to determine whether it is a violation. Violation and non violation are represented by 1 and 0 respectively.

(2) Test condition division. The degree of uncertainty and confusion of information is described by information entropy. Set sample set G Memory in m Class samples, and the probabilities are $p_k (k = 1, 2, .., m)$, Define the set using equation (2) G Information entropy：

$$Ent(G) = \sum_{k=1}^{m} p_k \log_2 \frac{1}{p_k} = -\sum_{k=1}^{m} p_k \log_2 p_k \qquad (2)$$

Where, $0\log_2 0$ Defined as 0, at this time $Ent(G)$ The higher the value of, the higher the purity of the set G, which leads to higher uncertainty and confusion of information. If the partition condition is variable C, partition the set G by n Subsets, use formula (3) to represent each subset G_i Information entropy of:

$$Ent(G|C) = \sum_{i=1}^{n} \frac{N(G_i)}{N} Ent(G_i) \qquad (3)$$

Where, N And n They respectively represent the number of samples in the parent node and the number of test condition groups, $N(G_i)$ Indicates the sample quantity of each grouping subset.

The purpose of the information gain is to compare the purity difference between the child node and the parent node, and measure the effect of the test conditions. If the test conditions are good, large differences are required. Equation (4) represents the information gain:

$$Gain(G,C) = En(G)\text{-}Ent(G|C) = Ent(G)\text{-}\sum_{i=1}^{n} \frac{N(G_i)}{N} Ent(G_i) \qquad (4)$$

The information gain is used to partition. The small information entropy is due to the large number of subsets. The purity of the subset is reduced by merging multiple classification attributes, that is, the secondary classification. The gain rate evaluation condition of the decision tree algorithm is used to avoid excessive classification. The result of the combined partition is as follows:

$$Gain_{ratio}(G,C) = \frac{Gain(G,C)}{Ent'(C)} \qquad (5)$$

$$Emt'(C) = \sum_{i=1}^{k} \frac{N(G_i)}{N} \log_2 \frac{N(G_i)}{N} \qquad (6)$$

Use of deviation caused by multiple partitions $Ent'(C)$ Correction, that is, the cost of selecting partition attribute C.

A decision tree with high accuracy is obtained by continuously dividing the original data. The decision tree is pruned to reduce over fitting. The pruned decision tree is used to predict violations of employee reimbursement data.

3 RESEARCH ON THE APPLICATION OF RPA TECHNOLOGY IN THE INNOVATIVE PRACTICE OF FINANCIAL MANAGEMENT OF POWER GRID ENTERPRISES

3.1 Application of daily work of financial management

3.1.1 Application of settlement professional pilot

In order to avoid the capital payment risk of power grid enterprises, RPA technology is applied to the settlement professional pilot. The advanced "payment monitoring process interception tracking and notification instruction" function can automatically intercept funds according to the rules specified in the payment process, and then send the relevant information to the financial personnel Regularly. After receiving the system information, the financial personnel constantly update the payment system to check in real time for interception. In the process of updating the information, the RPA media can automatically filter the instructions that have not responded for a period of time very long. At this time, the system will send the relevant notice to the customer according to the set contact list of the payer to ensure the smooth completion of the fund settlement business [4].

3.1.2 Application of invoice verification pilot

In the new era, in order to meet the challenge of the extensive development of the electric ticket business, the "industrial chain invoice verification" function developed by RPA technology can automatically verify invoices, so as to ensure the effectiveness of the electric ticket business, and automatically enter the invoice information after inspection into the system database. Before technical optimization, financial personnel need to constantly refresh invoice query information to judge whether the data is effectively used. This link is time-consuming and inefficient. After using RPA technology, The robot automatically logs into the company's grid financial management system, and records the inspection results in the form of transmission according to the relevant provisions of invoice management and financial management methods. At the same time, the robot will automatically complete Log in to the VAT invoice verification platform of the State Administration of Taxation, and automatically generate the corresponding electronic files for the inspected invoices.

3.1.3 Application of customer service pilot

In order to further improve the utilization efficiency of data and information resources of resources and ensure the accuracy of customer information, RPA technology is applied to optimize the original financial management work. The "customer information screening and verification" function developed can automatically compare customer information, establish good contact with the industrial and commercial registration system externally, test the internal customer information of the system, and promote the continuous improvement of

system data. Under the traditional financial management mode, employees need to manually compare customer data of complex types and large quantities, which inevitably leads to data omissions, errors and other problems. After the application of RPA technology, the robot can lock customers in advance according to the data stored in the system, and collect customer data according to the data information comparison results, which not only improves customer experience and satisfaction, but also fundamentally solves the problems of inaccurate manual verification, untimely information update, and incomplete information collection, Lay a solid foundation for the digital transformation of enterprise power grid financial management.

3.1.4 Application of data statistics pilot

Under the original financial management mode, power grid enterprises need special financial personnel to integrate and process reports in different financial systems, Then the comprehensive results will be transmitted to different departments to support administrative decision-making. In order to further improve the data quality and the efficiency of providing information, the RPA has introduced the function of "automatically generating statistical reports", which can be linked. The validity of data from different systems, replace manual operation with automatic generation of reports, and promote the improvement of business processing efficiency and financial management information level of power grid enterprises[5].

3.2 Risk Control of Application

3.2.1 Operational risk

The operational risk of RPA technology application is closely related to the operation of financial personnel. In order to avoid the occurrence of operational risks, on the one hand, targeted training will be carried out to strengthen the ability of financial personnel to master and apply the standardized process; on the other hand, at the beginning of designing RPA, each standardized scenario will be reasonably set, so as to delay the business black box trend of long-term application of RPA, achieve stable and smooth financial operation procedures, and ensure the digital transformation of financial management of power grid enterprises.

3.2.2 System risk

RPA robot usually works in coordination with the original financial system and server. If the system updates and upgrades abnormally or the system is incompatible, RPA will have the problem of program termination in serious cases [6]. If RPA is unable to automatically adjust the abnormal response in a short time or stops running suddenly, it will have an unpredictable impact on the financial management of the enterprise. Therefore, it is necessary to take timely prevention and control measures to avoid system risks. System users should pay attention to the preservation of daily financial management records and logs, and do a good job of data backup, so as to avoid the sudden interruption of RPA and affect the smooth development of enterprise business.

3.2.3 Personnel management risk

The application of RPA technology means that the number of posts involved in repetitive operations in power grid enterprises will decrease, which will change the labor structure of financial management in enterprises. In order to give better play to the advantages of RPA

technology application, enterprises should formulate corresponding financial personnel learning plans for RPA technology application goals, and establish an IT department that coordinates with the financial department to avoid business operation risks caused by adverse team operations.

3.2.4 Information security risks

Personal information and confidential information are important components of the financial data information of power grid enterprises. The financial management system that uses RPA technology innovation will be affected by malicious access and wrong use, resulting in the risk of information leakage. In response to such risks, enterprises should set up a strong information security inspection organization and effectively improve the information security protection mechanism to deal with information security risks. When executing the RPA process, the system will program the ID and password into the files to be processed by the terminal in advance to avoid the risk of information theft caused by malicious operations.

3.3 Technical Application Benefits

3.3.1 Management benefits

As the power grid enterprises shoulder more social responsibilities and obligations, the application of RPA technology is of great significance for enterprises to improve business processing efficiency and resource utilization efficiency. After deeply combining RPA technology with artificial intelligence technology, we will develop an artificial interactive intelligent robot to automatically manage enterprise material data, which will help further improve the enterprise material data management system. The intelligent robot can fully perceive the situation and efficiently use RPA technology to handle the operation business of power grid enterprises, so as to shift the focus of enterprise work to a new management mode that uses data for analysis and decision-making, and realize the improvement of traditional management mode and system process.

3.3.2 Economic benefits

After the introduction and application of RPA technology in enterprise financial management, it can complete a variety of types and a large number of tasks in a short time, and can operate all day without interruption and negative emotions, so as to meet the needs of power grid enterprises for multi platform processing of financial management. It has high stability and greatly saves the operating costs of various resources of the enterprise [7]. Because the business systems of power grid enterprises have different caliber, the application of RPA technology has effectively solved the problem of industry finance integration, effectively reduced the cost of later integration and transformation, and achieved the goal of connecting industry finance data of all businesses and systems.

4   APPLICATION OF DIGITAL OPERATION MODE FOR FINANCIAL MANAGEMENT OF POWER GRID ENTERPRISES

4.1 Business Demand Analysis And Assessment

Based on the process maturity evaluation, frame the application scope of the company's financial process automation, form a priority framework for the application of financial process automation and an expansion path for industrial and financial process automation, define the application scope, and form a three-level standard [8]. First, financial foundation, unifying process and data standards, forming financial process automation, and giving priority to implementation; The second is operation upgrading. After the process is automatically completed, the operation of key links will be upgraded to deepen the integration of industry and finance; The third is to support decision-making, business planning and analysis, decision-making and support.

4.2 Application Scenario Practice

4.2.1 Basic Financial Management - General Ledger Management

In order to ensure the accuracy and rationality of the group's accounting, ensure the basic financial data, liberate financial personnel, and improve the efficiency of industry finance integration, the company needs to collect the engineering projects, entry accounts, entry amount, cash flow and other information of each unit one by one in the system according to the "consolidated cross tier company list", which takes a long time, and may lead to collection errors due to the large amount of data, The rule robot is used to clarify the rules based on the three table data of "project settlement", "product purchase, labor service acceptance" and "cash flow", and automatically complete the cross secondary unit consolidation and offset data collection, which has improved the efficiency by nearly 9 times [9] (see Figure 3).
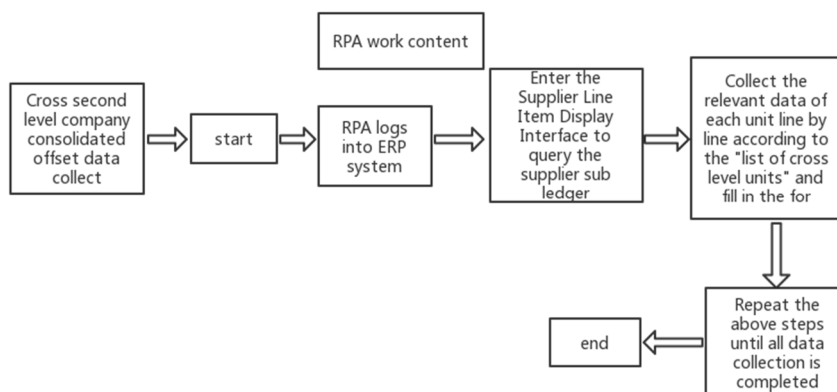

Figure3   Data Collection of Cross secondary Unit Consolidation and Offset

4.2.2 Basic financial management - fixed assets accounting

For power grid enterprises with large assets and many projects under construction, in the process of completing project asset transfer and carrying out fixed asset accounting, rule robots are used to establish rules around data query, amount verification, settlement rule maintenance, asset card creation and other scenarios, effectively solving the process work of multiple data types, large data scale, high repeatability, and long time consumption, and ensuring the consistency of fixed asset information, The workload of 18 days per month can be replaced by labor (see Figure 4).
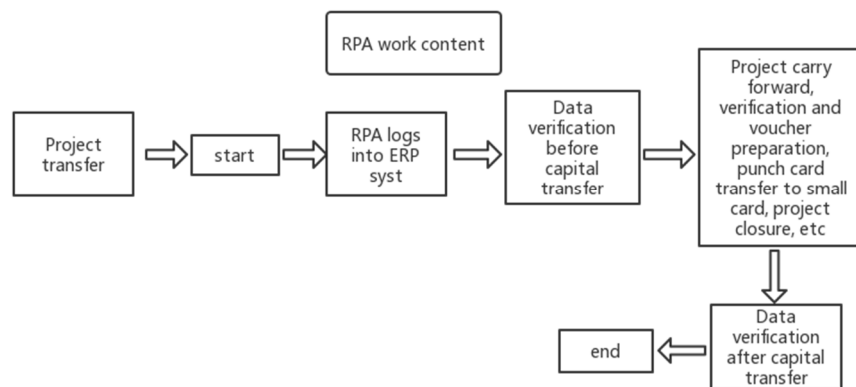

Figure 4 Project transfer

4.2.3 **Financial intelligent** management - industry finance integration analysis

In order to promote the deep integration of industry and finance, further advance the management of financial expertise [10]. Taking photovoltaic new energy settlement as an example, business personnel need to have a lot of professional financial knowledge in the process of processing, review relevant business information manually, coordinate business personnel to solve problems after finding them, use knowledge robots to complete problem business identification, and rule machine people to complete automatic adjustment of errors, effectively solving the business scenarios with high repeatability in the settlement and payment stages, The accuracy and efficiency of work have been greatly improved(see Figure 5).
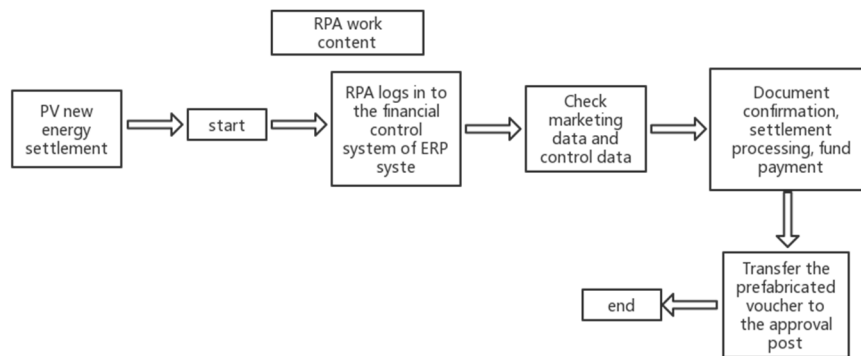
Figure 5 Settlement of photovoltaic new energy

In the data verification stage, the rule robot is used to automatically export the system data if there is a difference in the data according to the predetermined judgment logic, compare it with the original EXCEL table line by line, find out the difference lines and mark them, and notify the business personnel for further processing through the interactive robot. If the data is correct, the rule robot will analyze the difference between the actual amount of the project and the cash flow plan, and the rule robot will summarize and generate a settlement document, which will be automatically transferred to the approval post to generate settlement vouchers. In the payment processing stage, the rule robot cooperates with the interactive robot to initiate payment, generate a payment application form, and generate a prefabricated payment voucher for the settled documents, which are automatically transferred to the review post for review and posting.

5   SUMMARY

To sum up, the global acceleration has brought new opportunities and challenges to the operation and management of power grid enterprises. In order to avoid the shortage of financial management and increase the probability of enterprises confronting risks, It is urgent to combine the technology of the RPA with the internal financial control, standardize the financial information of the RPA, improve the financial management system, improve the quality of personnel, and achieve The goal of improving financial management automation, It provides continuous power for the digital transformation of financial management of power grid enterprises.

REFERENCES

[1]   Bing Z ,   Ji S . A research on theory and practice of the innovative talent training mode in mechanical specialties: Illustrated by the example of the School of mechatronics Engineering, Harbin Institute of Technology[C]// International Conference on Fluid Power & Mechatronics. IEEE, 2015.

[2]   Chen Q , Chen L , Li R , et al. Optimizing Supply Chain Management System Based on SCOR Model[C]// Springer, Singapore. Springer, Singapore, 2022.

[3]   Chu R, Li Y X, Zhang XS. Application of RPA technology in the cost accounting of a single vehicle in power grid enterprises [J]. China New Communications, 2021,23 (16): 2.

[4]   Ge W, Hang C. The application practice of RPA technology in the digital transformation of financial management in power grid enterprises [J]. Management Accounting Research, 2020 (5): 11.

[5]   Junfeng H U , University N . Research on Innovative Ways and Support Policy for Small and Medium-Sized Technology-Based Enterprises in Nantong[J]. Journal of Jiangsu College of Engineering and Technology, 2018.

[6]   Pang X , Yang H , University G N . Research on Innovative Mode and Path of Financial Management Informatization in High-tech Enterprises based on Cloud Computing[J]. The Journal of Shandong Agriculture and Engineering University, 2018.

[7]   Wang S. Application practice of RPA technology in financial management of power grid enterprises [J]. 2021.

[8]   Yu Q . Innovative Practice of Digital Audit Management Mode for Power Grid Enterprises[C]// 2021 International Conference on Control Science and Electric Power Systems (CSEPS). 0.

[9]   Yu L Q , Guo F X . Research on Cost Management Optimization of Financial Sharing Center Based on RPA - ScienceDirect[J]. Procedia Computer Science, 2020, 166:115-119.

[10]   Zhang Y S. Exploration of lao'gthe application of RPA technology in the financial management of power grid enterprises [J]. Economic and technical Cooperation Information, 2022 (30): 3.