Budget Management Digitization Status and Issue Analysis of Expressway Company

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Abstract. It is of great significance to actively explore the digitization of budget management and empower the intelligence of expressways in response to the requirements and needs of national budget reform and expressway intelligence. This paper adopts the case study method, selects the typical case enterprises in the expressway industry, and takes the expressway company A as the specific research object. Based on the current situation of A expressway company in budget management digitization, this paper combs the problems of low automation and efficiency of budget management process, low quality of budget data in the budget module of the financial sharing service information system, and low efficiency of engineering cost budgeting. In addition, RPA (Robotic Process Automation) technology has the advantages of cross-system non-invasive integration, intelligent identification, business process automation and other value advantages, the analysis results of this paper can provide support for the feasibility study of combining RPA technology with budget management.

Keywords: Expressway company, digitization of budget management, Robotic Process Automation, budget management process, shared service information

1 Introduction

With the goal of building a digital China proposed by the country, the proportion of the digital economy in China's economy is also increasing. The application of digital technology can maximize the role of data as a new production factor and promote the transformation and upgrading of traditional industrial management. As an important part of enterprise management, budget management digitization has become a research hotspot[1-5]. Yang proposes to share financial information among departments by digital means, increase communication channels for employees, and improve management efficiency[6]. In Reference [7], Ezeanyim presents to realize the digital transformation of budget management by means of information planning, nucleic acid, transformation and budget control. Kliestik encourages enterprises should promote the integrated development of budget management and management information system, and rationally allocate the resources owned by enterprises to promote the value added of enterprises[8].There is no single model for digitization, different methods have been used in different studies.In Literature [9], Cottrel holds that by combining

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budget management with the strategic objectives of enterprises, enterprises should build budget management software suitable for their own management characteristics to promote the reform of overall budget management of enterprises. However, inReference [10], Nambisan tends to argue that digital platforms are the essential elements for successful digital transformation of enterprises.

In view of the many problems in the application of comprehensive budget management in enterprises, experts and scholars at home and abroad have recognized the necessity of digital transformation for comprehensive budget of enterprises, mainly through the application of digital technology to improve the efficiency of enterprise budget management. However, the key to digital transformation is to first sort out and analyze the current status and existing problems of budget management, so as to adopt a more scientific and reasonable method for digital promotion. In this paper, Expressway Company A is selected as the research object to deeply analyze its current situation and existing problems in the digitization of budget management.

The structure of the paper is as follows. The digital status of expressway company A is given in Section 2. In Section 3, three digital issues of expressway company A are established, and analyzed in depth. The conclusions are described in Section 4.

2 Digital Status in Budget Management of Expressway Company A

2.1 Introduction to Expressway Company A

Expressway Company A (hereinafter referred to as the "Company A"), is an integral subsidiary of a large provincial state-owned transportation conglomerate, serving as an exemplary model of the transportation industry. The core responsibilities of Company A revolve around the investments, financing, operations, and management of transportation (e.g., expressways) construction. Its main characteristics include: Firstly, it boasts a significant asset base, with total assets surpassing RMB 200 billion and net assets exceeding RMB 100 billion, cementing its status as the primary contributor to ongoing expressway projects. Secondly, it oversees a diverse portfolio of road section projects that span various complex construction environments. Thirdly, it manages a substantial volume of investment and financing activities, supervising more than 23 expressway projects, collectively stretching over 2,000km and requiring an investment of over RMB 250 billion. Fourthly, it has embraced digitization early on, featuring a well-established Shared Financial Center and multiple information systems, demonstrating a high level of information technology application and informationization.

2.2 Digital Status of Company A's Budget Management

Company A implements all-encompassing budget management (including business and financial budgets) and mandates the active involvement of all departments, including the General Department, Engineering Department, and Tolling Department across the company and its subsidiary units, in all aspects of business budgeting, review, execution, control, analysis, and assessment. The company's headquarters and its subsidiary units boast a well-structured budget management organization characterized by a clearly defined hierarchy of responsibilities. Each department diligently fulfills its designated duties. This budget

management organization of the company's headquarters and its subsidiary units comprises the Budget Management Committee, the Budget Management Office, diverse business departments, the Financial Management Department, and the Shared Financial Center. Based on the allocation of responsibilities for budget organization and control, the decision-making entity is the Budget Management Committee. Its main role involves overseeing annual budgeting, conducting budget reviews and adjustments, and addressing significant issues related to budget management. The management entity is the Budget Management Office, which carries out day-to-day budget management efforts, including the issuance of budget decisions, consolidation, control, analysis, and assessment. As for the executive entity, it comprises various business departments within the company, subsidiary management units and their relevant departments, the Shared Financial Center, and the Financial Management Department. The specific organizational duties of each are delineated in Table 1.

Table 1 Main Responsibilities of Budget Management Organization in Company A

Level / Organization	Headquarter	Subsidiary Unit
Budget Management Committee	Set budget targets, review and adjust the budget, address significant issues related to budget management, and assess company budget	Review and adjust the budget and report it, break down budget targets to various business departments, resolve significant issues in budgeting and execution, and assess unit budget
Budget Management Office	Carry out decision issuance, budget aggregation, control, analysis, routine supervision, etc.	Organize the unit's budgeting, supervise its execution, review, and reporting
Various Business Departments	Main entities responsible for budgets, responsible for budgeting, execution, and analysis	Responsible for compiling and reporting their respective department's budget, budget execution and control, budget analysis, and rectification
Financial Management Department	Review budgets, merge business budgets and report them, and implement budget control, and analysis	Responsible for all budgeting tasks of subsidiary units not included in the Shared Financial Center
Shared Center	Responsible for the preparation, review, and consolidation reporting of temporary organizational budgets, as well as the preparation, consolidation, and reporting of financial budgets	Compile, review, aggregate, and report the Shared Financial Center's business budget, execute and analyze the budget of subsidiary units

The budget management process of Company A follows closed-loop management of "Budget Target Setting - Budgeting and Review - Budget Execution and Control-Budget Adjustment - Budget Analysis-Budget Evaluation". Its process management is in a semi-manual, semi-automated state. The basic process of budget target setting is that the Budget Office manually collects a vast amount of internal and external data to forecast the annual budget targets. The Budget Management Committee approves the annual budget targets. The Budget Management Office organizes the breakdown of budget targets and issues sub-budget targets to various budget executing entities. The basic process of budgeting and review is that the budget management organization arranges an annual budgeting and review meeting and sends out a significant number of budget preparation documents. The company's main business

departments report on the shared financial platform's budgeting subsystem. Subsidiary units' business departments report through business budgeting software. Business budgets are aggregated by subsidiary units and entered into the budget system. Budget management personnel review several budget details submitted by functional departments and subsidiary units. Approved budgets are included in the consolidated sheet, while those that are not approved are sent back and notified for revisions until they pass review. Budget management personnel preliminary aggregate the budgets and submit them for the General Manager's approval. If approved, they go to the Board of Directors for review. If not approved, they are sent back, undergoing revisions at each level until they pass.

The basic process of budget execution and control is that departments make funding applications based on business needs. The Shared Financial Center reviews and approves based on authority levels. Departments conduct business, and the Shared Financial Center carries out business accounting calculations. This process is repeated for every business budget execution. The basic process of budget adjustment is that departments requiring budget adjustments fill out and initiate adjustment applications. These undergo a level-by-level review process. The budget management organization reviews, aggregates, and prepares budget adjustments. The budget decision-making body then deliberates and approves the budget adjustments. The basic process of budget analysis is that the budget analysis module at the company's Shared Financial Center automatically assesses budget execution, analyzing discrepancies and issues between the budget and actuals. It regularly sends out budget execution statuses to budget executing entities for communication, and then the confirmed budget execution statuses are reported to the budget decision-making body. The basic process of budget evaluation is that the budget management organization formulates evaluation plans and sends out notifications, collects budget execution data, and computes budget target accomplishments. They then aggregate the evaluation results and prepare an evaluation report.

When it comes to informationizing and digitalizing budget management, the company has integrated modules for a comprehensive budget (i.e., annual budget), budgeting, budget execution, control, and analysis into its Shared Financial Service Information System (as shown in Fig. 1). Leveraging digital technology and the shared financial platform, the synchronization and automatic transfer of basic data, budget data, and financial data are achieved online. This ensures the automatic conversion and transfer of data between budget modules and facilitates online and mobile budget approvals. The construction of the Shared Financial Service Information System is primarily based on a financial perspective, without comprehensively integrating business systems. Given the complex characteristics of expressway construction and maintenance project budgeting for subsidiary units, such as individuality, multiplicity, and sub-item nature, they employ specialized project cost budgeting software (e.g., Zongheng Project Cost Software). This software meticulously logs detailed business data on project estimates, budgets, and final accounts, offering dynamic management throughout the entire engineering process of "estimates-budgets-final accounts". However, the business budget systems of subsidiary units lack a direct data connection with the Shared Financial Service Information System.

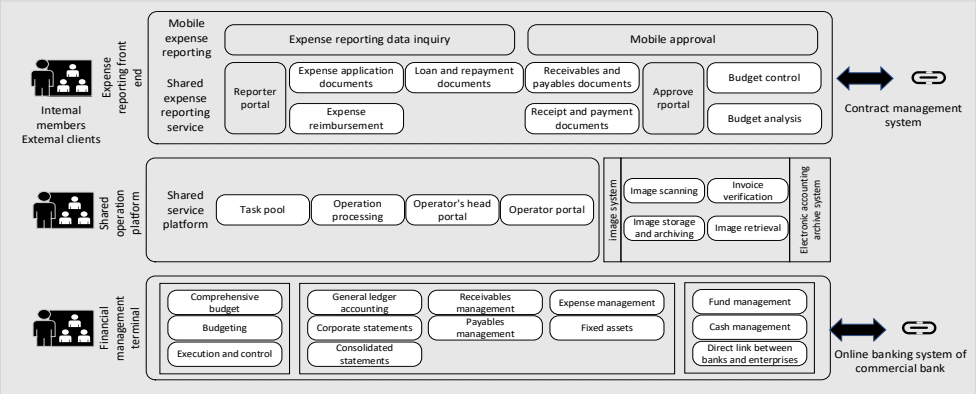

Fig. 1 Overall Architecture of Company A's Shared Financial Service Information System

3 Digital Issues in Budget Management of Expressway Company A

Based on research and analysis of budget management digitization current status of Company A, it was found that the company's establishment of the Shared Financial Service Information System has promoted the digitization and intelligence of budget management, achieving certain positive results. However, the digitization and intelligence of budget management are still in the preliminary stage, not yet realizing comprehensive coverage across all employees, all processes, all business areas, and all items. Several issues were identified: Firstly, the budget management process is not highly automated and lacks efficiency. Secondly, there is fragmentation among business, budget, and finance, resulting in poor-quality system budget data. Thirdly, the manual operation involved in the project cost software used by subsidiary units is labor-intensive and susceptible to errors.

3.1 Inefficient Automation and Low Efficiency of Budget Management Process

The budget management process operates in a hybrid online and offline statuses, with budget management personnel facing a multitude of cross-interface operations. Routine budget management processes, while explicit and highly repetitive, are time-consuming and inefficient. In the budget target setting phase, there is a heavy reliance on financial caliber budget data and historical data. The lack of intelligent predictive algorithm models for budget targets poses a challenge in accurately allocating these targets to grassroots business departments. This, in turn, hinders the active involvement of subsidiary units and various departments in the overall budget target setting process. In the budgeting and review phase, budget reporters manually input budgeting data into the system's budgeting module. Budget management personnel frequently log into the budget management system to review and approve dozens of detailed budget forms based on specified rules. If approved, they click to aggregate in the system; if not approved, they click to send back within the system. In the budget execution and control phase, the existing Shared Financial Service Information System cannot automatically compare business data where accounting items and budget items are inconsistent. The budget control and execution for such business transactions require a significant amount of manual intervention, which is time-consuming and inefficient. In the

budget adjustment phase, the existing budget management system does not inherently support budget adjustments. The company must request budget adjustments through the OA system, and adjustment data is not promptly updated in the budget management system. In the budget analysis phase, while internal system data achieves automatic analysis and visualization, external data requires manual transformation and processing. There is a lack of depth in business analysis, and the budget analysis results are insufficient to facilitate refined business budget controls. In the budget evaluation phase, the Shared Financial Center generates formal monthly budget reports based on system data. However, annual budget assessments and evaluations are manually conducted offline, resulting in suboptimal quality and efficiency.

3.2 Low Data Quality in the Budget Modules of the Shared Financial Service Information System

Budget control and financial personnel are centralized within the company's Shared Financial Center. The company-level budget control relies on system data information and reports from various budget departments. It is geographically separated from the subsidiary units' business budgets, making it challenging to control financial budgets for technically intensive engineering businesses. The Shared Financial Service Information System is primarily built from a financial perspective. Financial data adheres to accounting standards, and it has not integrated all business systems of the subsidiary units. The subsidiary units' business systems set budget items according to the specific characteristics of actual engineering projects. Budget data is measured based on project quantities. The data sources, data calibers, data granularity, and data dimensions of the company and subsidiary units are inconsistent. Moreover, there is a lack of data standards and conversion rules. The business departments of the subsidiary units exhibit disparities in data measurement, nomenclature, attributes, and other aspects. This leads to reduced credibility and accuracy when conducting horizontal comparative analysis of the subsidiary units' business data. Therefore, there is a need for enhancements in the budget data quality within the Shared Financial Service Information System.

3.3 Inefficient Labor Cost in Project Cost Budgeting

The basic process of project cost budgeting in subsidiary units involves gathering construction drawings, and understanding site conditions, design data, and technical specifications. This is followed by listing out project items, calculating project quantities and pricing, drafting baseline direct costs, and compiling standard computation sheets. Then, materials and labor are analyzed, and unit project cost budgets are computed. Data is then entered into project cost software, and budget reports are extracted. Lastly, personnel log into the OA system to submit the project cost budget application for review and approval. Project cost budgeting personnel not only have to manually handle construction drawings, compute project quantities, direct and indirect costs, but also need to manually input data into the software, consolidate budgets, extract budget reports, and log into the OA system to submit applications. With each construction project involving a plethora of intricate details, inputting multiple projects becomes a tedious, time-consuming, repetitive task, and vulnerable to human error. Furthermore, during the implementation of engineering projects, there are frequent changes that lead to adjustments in the project cost budgets. This requires the project cost budgeting personnel to repeatedly spend a significant amount of time and effort on data entry in the cost

estimation software, and frequently switch between the cost software and the OA system, resulting in low efficiency and a higher likelihood of errors.

4 Conclusions

This paper primarily employs a case-study approach, focusing on the current digital status of Company A's budget management. It identifies several issues, including the inefficient automation and low efficiency of the budget management process, the low data quality in the budget modules of the Shared Financial Service Information System, and the inefficient labor cost in project cost budgeting. This results will provide A foundation for strengthening company A research on budget management automation and digitization, and also provide valuable references and insights for other highway companies and the broader transportation industry to pursue budget management automation and digitization. It aims to provide solutions and ways for the digital and intelligent practice of enterprise budget management.

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