Research on Optimization of Lean Cost Accounting for Power Grid Enterprise Projects: From the Perspective of WBS-Aided Accounting of Power Company A

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Abstract: Power grid engineering projects have diverse categories and complex construction processes, making precise cost accounting critical. Taking Power Company A as the research object, this paper explores the practical application of WBS-aided full-process accounting. It summarizes prominent problems including inconsistent grassroots accounting standards, front-end data deviations and incompatible WBS architecture for multi-caliber management. Corresponding optimization measures containing differentiated WBS templates, business-finance dual control and intelligent system audit are proposed. This study provides effective references for power grid enterprises to realize lean project cost management.

Keywords: Power Grid Engineering; Project Cost; Lean Accounting; WBS; Business-Finance Integration

1. Introduction

With the continuous advancement of the new power system construction, investment in power grid construction keeps expanding, and the number of projects such as main-grid capital construction, distribution-grid upgrading and production-oriented technical renovation keeps growing. Power grid projects are characterized by wide-ranging voltage levels, various categories, variable construction cycles and multiple participating entities. Projects of different voltage grades and construction types differ greatly in management modes and asset formation logic, which further raises the difficulty of project cost accounting and control. Under the traditional financial accounting mode, business data is isolated from financial data. On-site information from the business side cannot be efficiently transmitted to financial systems, easily resulting in misaligned cost collection, inconsistency between book progress and physical construction progress, and low efficiency of completed-project final accounts, which restricts the improvement of lean project financial management.

As a mature tool for project scope management, Work Breakdown Structure (WBS) has been introduced by power grid enterprises as an auxiliary accounting dimension for project costs. It bridges data channels between physical construction and financial accounting and serves as a critical starting point for business-finance integration [1]. WBS decomposes projects progressively into work packages and transfers the management granularity of engineering business to financial accounting, providing a carrier for budget estimate control, process-oriented cost collection and asset apportionment upon project completion [2]. As a provincial power grid enterprise, Company A has built a tiered project financial management framework spanning its headquarters, professional subsidiaries, prefectural branches and county-level affiliates. It uses WBS codes to support auxiliary accounting for construction costs. Nevertheless, drawbacks have emerged in practical operation, such as execution deviations caused by multi-level administration, poor business-financial data interaction, WBS architecture failing to adapt to the triple calibers of budget estimate-settlement-final accounts, and broken points in process control [3]. Taking Power Company A as the research object and combining its practical business data, this paper analyzes existing problems from the perspectives of organizational management, accounting procedures and WBS coding application. Drawing on practical experience in industrial intensive management and adopting the “budget estimate-settlement-accounting” tripartite management logic, this paper proposes optimization schemes for lean project-cost accounting, so as to offer references for similar

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provincial power grid enterprises.

2. Current Status of Project Cost Accounting Management in Power Company A

2.1 Current Status of Project Financial Management Organization

Power Company A, a provincial-level power enterprise, has built a multi-level project financial management system covering headquarters, specialized subsidiaries, prefectural-level companies and county-level companies. The project finance department at corporate headquarters formulates overall project financial management systems, cooperates with business departments of development and construction, and conducts supervision and guidance for subordinate entities. The Construction Company takes charge of 220 kV and above extra-high-voltage main-grid capital-construction projects; the Extra-high-voltage Company undertakes 220 kV and above main-grid technical-renovation projects; prefectural-level companies are responsible for local main-grid and distribution-grid capital-construction as well as technical-renovation projects. All subordinate units carry out daily work such as project budget preparation, cost control and fund management, and regularly report project financial performance to the headquarters (e.g., Figure 1. Project Financial Management Organization Structure of Power Company A).

The multi-tier organizational structure realizes full coverage of project finance across the province. Management entities are divided according to project categories and voltage levels to achieve specialized administration of engineering projects. However, business management foundations differ among prefectural- and county-level subsidiaries. The headquarters lacks homogeneous implementation measures for management standards and encounters obstacles in realizing unified standardized management. Accounting execution effects vary across entities, and grassroots departments may interpret identical business rules differently, which compromises the consistency of overall project financial management and control.

2.2 Business Mode of WBS-Aided Project Cost Accounting

Power Company A sets the first-level account "Construction-in-Progress", with secondary sub-accounts for construction works, installation works, equipment procurement costs and other expenses. A transitional account "Project Construction Costs" is additionally established, and WBS codes are adopted as the core auxiliary accounting dimension. Project costs are collected and decomposed by work packages, establishing correspondence between actual project expenditures and project budget estimates.

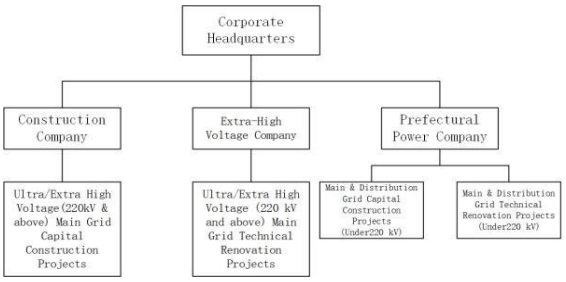


Figure 1. Project Financial Management Organization Structure of Power Company A

WBS, namely Work Breakdown Structure, decomposes projects progressively into work packages in accordance with project contents. In light of revisions to power grid engineering budget codes, Power Company A formulates standardized WBS templates according to project types and voltage classes. Coding labels are set up according to construction costs, installation costs, equipment procurement expenditures and other related expenses. Additional subdivisions are made at finer levels, including civil works, installation works and individual projects. The hierarchy of WBS architecture can be flexibly adjusted according to management requirements: main-grid projects adopt more detailed tiers with fine granularity, while distribution-grid and technical-renovation projects are appropriately simplified. Each WBS sub-item can correspond to entries in project budget estimates (*e.g.*, Table 1. Comparison of WBS-hierarchy settings for main-grid and distribution-grid projects of Power Company A). Real-time comparison between actual expenditures and budget estimates helps prevent over-budget risks. This mode extends financial accounting to the business front-end, connects the whole workflow including material supply, on-site construction and asset transfer-in-place. It unifies the language for business and finance, promotes the integration of business flow, value flow and data flow, and lays a solid foundation for completed-project final accounts and asset value allocation [4].

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Table 1. Comparison of WBS-Hierarchy Settings for Main-Grid and Distribution-Grid Projects of Power Company A

Project type	Maximum WBS hierarchy	Typical characteristics of WBS setting
Main-grid project (Substation)	Level 7	Multi-layer subdivision; detailed division for civil and installation works; suitable for complex asset apportionment
Distribution-grid project (10 kV)	Level 3	Simplified framework; only retains construction, installation and equipment procurement categories; reduces business operation burden

From the perspective of business logic, WBS-aided accounting directly introduces project decomposition results from the business side into financial systems. It changes the traditional mode where financial departments account project costs merely via general-ledger accounts, enabling finance to track cost occurrence of specific work packages and providing data support for in-process project control, investment analysis and asset transfer upon completion [5].

2.3 Full Business Process of Project Cost Accounting

Company A performs project cost accounting across the full business process, including site construction, quantity verification, settlement review and approval, and invoice entry. First, in the on-site construction phase, contractors perform construction in compliance with design drawings and project milestone plans, allocate manpower, materials and machinery, and implement on-site process supervision, while supervision institutes oversee field operations. Second, for engineering quantity confirmation, contractors prepare quantity schedules according to completed physical works, recording material consumption, labor hours and machine shifts. Supervisors check and validate these quantities to generate original supporting documents for follow-up settlement. Third comes settlement examination and approval. The project owner, together with supervisors, checks quantity lists and audits material prices, labor costs, machine-operation fees, administrative expenses and other items to finalize settlement. Suppliers issue formal invoices against approved settlement results, and business personnel initiate service cost confirmation within the information system to finish data submission on the business side. Fourth is financial posting. The finance department reviews invoices to confirm their authenticity and compliance, examines settlement papers and service confirmation records, prepares accounting vouchers for accounts payable, and releases project funds as required by contracts. This process creates a closed loop linking on-site physical construction to accounting entries [6].

2.4 Differences in Management Positioning Among Budget Estimate, Settlement and Accounting

Estimation, settlement and project financial final accounts are three both interrelated and independent links across the full lifecycle of power grid project management. As part of pre-project activities, estimation is prepared based on the preliminary design before construction starts. Aimed at investment control, it adopts a relatively perspective and supports project approval. Settlement takes place during construction execution. It verifies completed contractual work, reflects actual on-site progress at the same detail level as the contract bill of quantities, and determines payments due to contractors and suppliers. Project financial final accounts, as part of financial management, converts business and settlement data into standardized accounting information. Serving book-keeping, financial statement preparation and completed-project final accounts, it requires refined granularity for asset apportionment and expense collection. The three segments differ in management objectives and requirements for WBS hierarchy and detail granularity, which constitutes the core contradiction to be reconciled in the implementation of WBS-aided accounting [7].

3. Major Problems Existing in Project Cost Accounting of Power Company A

3.1 Difficulty in Realizing Unified Standardized Management via Multi-Tier Organization

Company A implements tiered management. Its subordinate units show obvious gaps in project management capability, and the headquarters has

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not introduced unified rules to standardize management practices. Grassroots teams may interpret accounting standards differently. As a result, similar projects across its subsidiaries are accounted for under inconsistent criteria. Some prefectural and county-level branches hold divergent understandings of WBS allocation rules and expense collection standards, so the same business transactions are recorded in different ways. This hinders comparative analysis of provincial-wide power grid investment data and impedes lean project-cost accounting [8].

3.2 Deficient Business-Financial Information Interaction and Front-End Data Entry Deviations

Under the WBS-aided accounting mode, the quality of accounting information heavily relies on data input from business departments. Business personnel are responsible for WBS code selection, engineering quantity filling and business information submission. Some staff cannot fully comprehend WBS code definitions, leading to incorrect WBS assignment, delayed data entry and false information submission. Consequently, project costs are recognized prematurely or belatedly, resulting in discrepancies between book progress and actual construction progress. The finance department mainly performs ex-post book-keeping without pre-control over business links and conducts invoice review only after business submission, failing to intercept errors at the source. Inaccurate data flows directly into financial systems, distorting project cost accounting information and affecting investment analysis and project decisions [5].

3.3 Incompatibility of WBS Coding Structure with Multiple Calibers of Budget Estimate, Settlement and Completed-Project Final Accounts

The current WBS structure is established mainly based on project estimation. Estimation supports pre-investment assessment in the pre-project phase and delivers control at an aggregated level. Settlement checks completed contractual work during construction. Project completion final accounts consolidate all expenses across the full project lifecycle and allocate values to the corresponding assets [9]. More detailed coding rules are thus needed to satisfy these requirements [7]. These three tools differ in management objectives and control granularity.

Further refinement of WBS tiers to satisfy final-account asset-apportionment requirements multiplies code options and raises error risks for front-end business staff when assigning WBS items. Yet a streamlined WBS framework built around estimation cannot support the detailed asset allocation required for completion final accounts. Main grid, distribution grid and technical renovation projects also vary widely in construction complexity. Main grid substations and transmission lines involve intricate workflows and a broad range of asset types. By contrast, distribution grid and technical renovation projects are smaller in scale and have simpler asset structures. A single standard template fails to accommodate the management needs of such diverse projects, which creates compatibility issues in the WBS coding system.

If distribution-grid simplified templates are mechanically applied to main-grid projects, assets cannot be split in a refined manner. If multi-level main-grid WBS templates are directly adopted for distribution-grid projects, business personnel will suffer heavy operational burdens with rising assignment error rates. How to design differentiated WBS architecture for various project types and balance multiple objectives of budget-estimate control, settlement confirmation and final-account apportionment constitutes a practical problem urgently to be solved for Power Company A.

4. Optimization Path for Lean Project Cost Accounting of Power Company A

4.1 Promote Intensified Project Accounting and Unify Provincial-Wide Accounting Execution Standards

Drawing on practical experience in industrial financial-sharing intensive management, information-based platforms shall be leveraged to realize intensified project accounting management. Standardized businesses including project-cost accounting, invoice verification and fund payment shall be centrally regulated to unify accounting calibers across the province and mitigate execution discrepancies stemming from uneven management capacity among prefectural and county-level units. Centralized data storage and process monitoring help the headquarters better supervise accounting work at its subordinate units. WBS allocation rules and expense collection standards should be

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formalized as system operation guidelines. This reduces inconsistent manual interpretation, ensures uniform accounting rules and processing logic for similar projects, and improves the comparability of project financial data [1].

Intensification does not mean simply centralizing all businesses to the headquarters. Instead, it narrows grassroots implementation gaps through unified systems, templates and system logics and realizes province-wide penetration of business standards.

4.2 Implement Differentiated Standard WBS Architecture Management by Project Category

Differentiated WBS templates shall be designed according to construction characteristics of main-grid, distribution-grid and technical-renovation projects. For main-grid projects such as substations and long-distance overhead transmission lines featuring long construction cycles, complex working procedures and diverse asset types, multi-level detailed WBS architecture shall be retained following power-grid engineering budget specifications to fulfill demands for budget-estimate control and fine-grained asset allocation in final accounts [7]. For distribution-grid and production-oriented technical-renovation projects with small individual scale and simple asset composition, WBS hierarchy shall be appropriately condensed under the premise of guaranteeing budget control, financial reporting and other-expense collection, so as to reduce operational burdens for business users [11].

Main-grid projects may adopt multi-level detailed WBS architecture subdivided into sub-work packages under construction and installation works. Distribution-grid and technical-renovation projects only retain primary classifications for construction, installation and equipment procurement, while necessary detailed items are kept for other expenses [10]. Differentiated templates reconcile multi-caliber requirements of budget estimate, settlement and completed-project final accounts and realize accurate cost collection for different types of projects, satisfying asset apportionment in final accounts while lowering operational difficulty for front-end business personnel [8].

4.3 Construct Two-Way Management-Control Process of "Business Initiation-Financial Review"

Business-finance collaborative workflows shall be reshaped to assign primary data-quality accountability to business departments. As data originators, business divisions are responsible for engineering-quantity confirmation, WBS code selection and information submission, and shall guarantee the authenticity and accuracy of business data. Finance shall move its control node forward, abandoning merely post-entry review. Pre-checks take place before invoice entry. Reviewers verify the reasonableness of WBS allocation, the timing of cost recognition, and consistency between invoices and settlement papers [10]. A two-way control chain is put in place to stop faulty data from feeding into financial systems [5].

Business staff verify the accuracy of WBS codes, engineering quantities and cost recognition timing before submitting service confirmation forms to the system. Any submission that fails financial review is sent back directly to the business department for revision. This prevents flawed data from entering the bookkeeping workflow and strengthens in-process control.

4.4 Add Systematic Logical Audit Rules and Strengthen Process Control via Informatization

Automatic audit-verification rules shall be configured within the ERP system to exert rigid system constraints. Verification logics include matching checks between WBS codes and project categories, consistency validation between cost-recognition timing and project milestones, early-warning alerts for abnormal expense-ratio fluctuation, and reminders for excessive budget-estimate execution. Where business personnel select incorrect WBS codes or cost-recognition timing is abnormal, the system triggers interception or pop-up warnings for revision. Human-originated errors are filtered at the business source to ease manual-review workload and enhance the authenticity and accuracy of project-cost accounting through information-based technologies [5].

As a technical supplement to process control, system audit adopts pop-up reminders for minor anomalies and direct submission interception for severe errors [12,13]. Rules previously dependent on human judgment are solidified into systems to reduce workload for both business and finance teams [9].

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5. Conclusions

Against the backdrop of expanding power-grid investment, advancing lean project-cost accounting serves as a vital measure for power grid enterprises to strengthen investment governance and achieve business-finance integration. Taking Power Company A as a case, this paper analyzes its WBS-aided accounting practice, sorts out relevant business modes and the complete workflow from on-site construction to invoice posting, and distinguishes positioning differences among budget estimate, settlement and accounting. It identifies problems including inconsistent standards under hierarchical management, poor business-financial data quality, and mismatched WBS frameworks for multi-caliber management of budget estimate-settlement-final-accounts.

Lean project cost accounting cannot be achieved through financial bookkeeping after the fact alone. Improvements need to be made across multiple dimensions, including organizational arrangements, coding standards, business workflows and information systems. Specific actions are as follows: strengthen standardized project accounting and align implementation rules; apply tailored WBS structures for different types of power grid projects; build two-way control workflows linking business and finance, define data responsibilities for business teams and move financial checks to earlier stages; set up automated system audit rules to cut manual errors through hard system controls. These steps close the end-to-end data chain between business and finance, lower human mistakes, and ensure project cost accounting data remains accurate and reliable. The findings offer practical guidance for provincial power grid enterprises to carry out lean project cost accounting using WBS.

References

[1] Feng L F, Yang F Z, Cao H D, et al. Exploration and Practice of State-grid Digital-intelligent Financial Management Mode of “Open Collaboration and Smart Sharing”. Finance & Accounting, 2021(23):12-16.

[2] Wu P, Li M Y, Song Y, et al. Practice of Smart Completed-project Final-accounts Management System for State Grid Engineering. Finance & Accounting, 2021(24):33-37.

[3] Liu Q, Wang M L, Liu T, et al. Research on Standardized Technical-economic Management Mode for Power-grid Engineering Construction. Project Management Technology, 2019, 17(01):136-140.

[4] Zhang D, Lu M H. Analysis on Financial Completed-project Final-accounts Management of Capital-construction Projects — A Case Study of State Grid Jiangsu Electric Power Company. Fiscal Supervision, 2016(22):95-97.

[5] Wang M X. Exploration and Practice of Digital Transformation of Power-grid Enterprise Finance Based on In-depth Business-finance Integration. Journal of Jiangxi Vocational & Technical College of Electricity, 2024, 37(08):81-85.

[6] Chu D K, Xie R C, Li T. Research on Construction Method of Automatic Completed-project Final-accounts System for Power Grid Projects. China New Telecommunications, 2017(19):151-153.

[7] Wan Z D, Wu L Z, Huang Y. Concept, Connotation and Realization Path of Digital Cost-estimation System for Power-grid Engineering. Construction Economy, 2022, 43(08):65-70.

[8] Xu J, Yan J D, Zhou Y. Business Improvement and Optimization of Phased Asset Transfer for Power-grid Capital-construction Projects Based on Data Sharing. China Chief Accountant, 2022(12):112-114.

[9] Wang Y X. Research on Financial Management Risk Control Strategies of Power Engineering under Electric Power Reform. Financial News, 2025, (5): 154-156.

[10] Zheng R. Research on Cost Control in Financial Management of Power Engineering Construction Enterprises. Chinese and Foreign Corporate Culture, 2024, (11): 48-50.

[11] Luo Y B. Research on Digital Empowerment System for Whole-process Cost Estimation of Power Engineering Construction. Construction Economy, 2023, 44(12):87-92.

[12] Jin X H. Analysis of Construction Cost Control and Project Financial Management of Power Engineering under the New Situation. Market Outlook, 2025, (17): 115-117.

[13] Liang L, Yang F S, Zhang X, et al. Exploration of Digital and Intelligent

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Financial Management and Control for the Full Value Chain of Grid Information Capital Projects . Fiscal Supervision, 2024, (1): 99-104.

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