

Reshaping Enterprise Cost Accounting under the Background of New Quality Productive Forces: Logic and Practical Pathways

Sofia Cabezon Wang

United World College of South East Asia

098016, Singapore

sc.sofiacabazon@gmail.com

Abstract.

The emergence of new quality productive forces has begun to change the way firms understand production, value creation and resource use. In many enterprises, cost is no longer concentrated only in materials, labour and manufacturing overhead. A growing share of expenditure is now linked to research and development, digital platforms, data processing, algorithmic work, energy consumption, carbon management, cybersecurity and compliance. These changes place pressure on conventional cost accounting systems, especially those that still rely heavily on product-centred costing and broad allocation bases. This study discusses how enterprise cost accounting can be reshaped under the background of new quality productive forces. Rather than treating cost accounting as a purely financial recording activity, the paper views it as a management mechanism that connects business processes, data governance and sustainability concerns. The discussion suggests that enterprises should broaden cost objects, update cost drivers, improve data integration, build more flexible accounting platforms and make green cost visible in routine management. The contribution of the paper is to provide a practical and moderately structured framework for firms that are attempting to improve the usefulness of cost information during digital and green transformation..

Keywords:

New quality productive forces; Enterprise cost accounting; Digital transformation; Activity-based costing; Green cost; Management accounting

1. Introduction

Cost accounting has always been close to the everyday decisions of enterprises. Managers need to know whether a product is profitable, whether a process is too expensive, whether a customer consumes too many resources, and whether a price can cover the real cost of delivery. In a traditional industrial setting, these questions were usually answered through a relatively stable accounting logic. Direct materials, direct labour and manufacturing overhead formed the core of cost calculation. Overhead was commonly allocated through labour hours, machine hours or output volume. Although this approach was never perfect, it was workable when production was standardised and when most costs could be observed within the workshop. The business environment in which firms operate is now less straightforward. The idea of new quality productive forces has drawn attention to a form of productivity driven by technological innovation, data resources, intelligent equipment, green development and more efficient factor allocation. Recent studies on China's new quality productive forces show that policy support, new energy development and public data openness may strengthen innovation capability and improve the

allocation of productive factors [1][2]. These changes are not limited to macroeconomic policy or industrial planning. They also enter the firm through concrete operational activities: digital production lines, platform-based services, cloud systems, energy monitoring tools, automated decision systems and more demanding compliance requirements. For this reason, enterprise cost accounting is becoming more complicated. A product may look inexpensive if only its manufacturing cost is counted, but the same product may require high spending on design, software support, system maintenance, after-sales service or environmental treatment. A digital service may appear highly profitable when its marginal delivery cost is low, yet it may depend on heavy investment in data cleaning, algorithm training, cybersecurity and cloud infrastructure. A customised order may generate high revenue, but it may also consume disproportionate engineering time, coordination effort and customer service resources. These costs are real, but they are not always visible in conventional cost reports. Digital transformation research has already shown that digital technologies change business models, organisational routines and value propositions, rather than simply improving existing processes [3][4]. The same argument can be applied to cost accounting. If business activities are being reorganised around data, platforms, intelligent systems and low-carbon requirements, then the cost accounting system must also change. Otherwise, the enterprise may continue to produce cost information that is formally correct but managerially weak. It may know the accounting cost of a product, but not the cost of a customer segment; it may know the total IT expense, but not the cost of a platform module; it may report energy expenditure, but not the carbon-related cost of different production lines. The problem is not only technical. Many enterprises already have ERP systems, manufacturing systems, customer systems, cloud records or energy monitoring platforms. The difficulty is that these data sources often remain separated. Finance departments may have one set of classifications, production departments another, and IT departments a third. When these systems are not connected, cost accounting remains a backward-looking exercise. It records expenditure after the event but cannot explain how specific activities, orders or processes have created that expenditure. This paper therefore examines the reshaping logic and practical pathways of enterprise cost accounting under the background of new quality productive forces. The aim is not to build a complex quantitative model. Instead, the paper offers a practical discussion suitable for ordinary enterprises, including those with limited digital maturity. The central argument is simple: cost accounting needs to move closer to actual value-creating activities. It should become more process-oriented, more data-informed and more useful for decisions related to pricing, resource allocation, process improvement and green governance.

2. Why Conventional Cost Accounting Becomes Less Sufficient

The limitations of traditional cost accounting become clearer when the cost structure of contemporary firms is examined more carefully. In many sectors, the share of indirect, digital and knowledge-based costs has increased. Research and development expenditure, data acquisition, algorithm testing, cloud computing, platform operation and system security do not behave like direct materials. They cannot always be traced to a single unit of output, yet they may determine whether the product or service can exist at all. This is particularly visible in technology-intensive and service-oriented firms. A smart manufacturing enterprise may invest in sensors, industrial software and digital twins before production begins. A logistics company may rely on routing systems, data dashboards and carbon monitoring tools. A medical software firm may spend substantial resources on regulatory documentation, security testing and continuous version updates. These activities are not peripheral. They are part of the value creation process. If they are recorded only as general period expenses, managers lose the ability to understand which products,

projects or customers are actually consuming resources. The second limitation concerns timing. Traditional cost reports are often prepared after the end of a month, quarter or production cycle. Such reports are useful for financial control, but they do not always help managers intervene in time. In a digital production environment, managers may need to know immediately whether a batch is using more energy than expected, whether a customised order is causing excessive rework, or whether one customer group requires unusually high service support. Delayed reports provide answers too late. New quality productive forces require cost accounting to support monitoring and adjustment during the process, not only summary after the process. A third limitation lies in cost allocation. Conventional cost systems often depend on a small number of allocation bases. Labour hours and machine hours are still useful in some settings, but they cannot explain many modern resource consumption patterns. Two products may require the same number of machine hours, but one may involve more design changes, more quality tests, higher cloud usage or stricter compliance review. Two customers may buy the same product, but one may generate more technical support, more delivery complexity and more after-sales coordination. If the cost system does not capture such differences, it may produce misleading profitability analysis. Activity-based costing has long been used to reduce such distortions by linking costs to activities and cost drivers [5]. Under the new quality productive forces background, this idea remains important, but it needs to be extended. Activities now include not only production tasks but also data processing, system maintenance, algorithmic work, platform operation and environmental governance. Time-driven and cognitively informed approaches also become relevant. Pashkevich, von Scheele and Haftor argue that cognitive time should be considered in activity-based costing in the digital economy because knowledge work and human attention are important resources [6]. This is a useful reminder. In many innovation-driven firms, the most expensive activity is not always machine operation; it may be expert judgement, coordination, learning or problem solving. Finally, conventional cost accounting often separates financial information from sustainability information. Environmental costs may be recorded as utilities, treatment fees or compliance expenses, but not connected to products, processes or orders. Yet green development is part of the logic of new quality productive forces. Enterprises increasingly need to know not only how much a product costs financially, but also how much energy it consumes and what carbon or environmental burden it carries. Research on environmental accounting and sustainability accounting suggests that accounting information can support managerial decisions when it is connected to operational and environmental realities [9][10]. This connection is still weak in many enterprises.

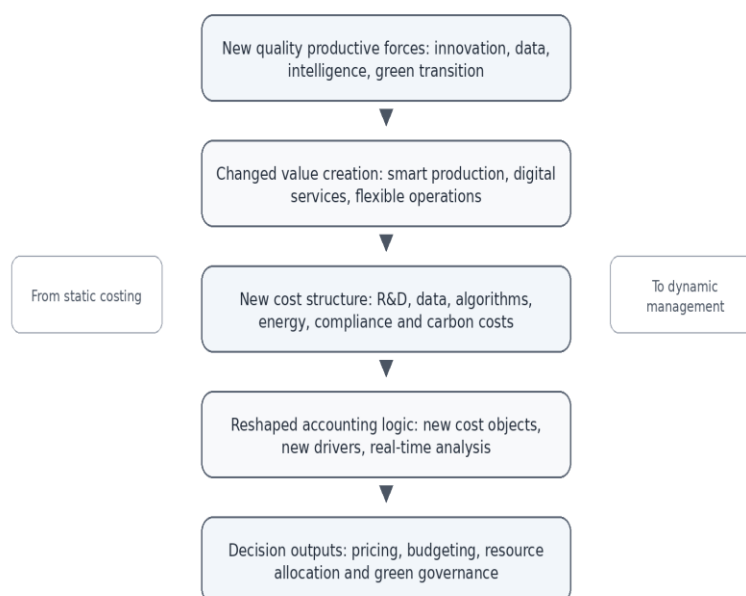


Figure1. Reshaping logic of enterprise cost accounting under new quality productive forces

3. Practical Pathways for Reshaping Enterprise Cost Accounting

3.1 Building an integrated data foundation

The first practical pathway is to build an integrated data foundation. Without reliable data, any reshaping of cost accounting will remain a formal slogan. Enterprises need to identify where cost-related data are generated, how they are recorded, and how they can be connected with financial accounts. For manufacturing enterprises, key data may come from ERP, MES, warehouse systems, equipment sensors, quality inspection systems and energy monitoring platforms. For service and platform enterprises, key data may come from order systems, customer service systems, cloud resource records, user behavior logs and data compliance systems. The purpose of data integration is not to collect all available data without selection. The purpose is to create a consistent and traceable cost data chain. This chain should connect resource inputs, operational activities, cost objects and management outputs. In practice, enterprises can start with a small number of high-value cost scenarios. A firm does not need to build a complete digital cost accounting system at once. It can select one production line, one product family, one project type or one platform module as a pilot. The pilot should clarify data standards, responsible departments, cost collection frequency and reporting format. After the pilot becomes stable, the model can be extended to other business units.

3.2 Redefining cost objects according to value creation

The second practical pathway is to redefine cost objects. A cost object is anything for which cost is separately measured. In traditional accounting, the most common cost objects are products, batches, departments and projects. Under the new quality productive forces background, these objects are still useful but not enough. Enterprises should add cost objects that reflect their actual value creation process. These may include processes, activities, customers, data assets, platform modules, algorithms, service contracts and green governance tasks. Redefining cost objects helps managers see the real profitability of different activities. A product may appear profitable when only manufacturing cost is considered, but it may become less profitable after after-sales service,

customization, energy use and compliance costs are included. A customer may bring high revenue but also high service workload and frequent changes. A data product may seem inexpensive if only storage cost is counted, but it may be costly when data acquisition, cleaning, labeling and compliance review are included. Therefore, cost object redesign is a basic step in cost accounting reshaping.

3.3 Updating the cost driver system

The third practical pathway is to update the cost driver system. Cost drivers are the factors that cause costs to change. Traditional drivers such as labor hours, machine hours and material consumption should not be abandoned, because they are still relevant in many industries. However, they should be combined with new drivers that reflect digitalization, intelligence and green development. This mixed driver system can improve the accuracy and usefulness of cost allocation. Possible new cost drivers include data storage volume, number of data cleaning tasks, algorithm training time, cloud computing usage, number of API calls, equipment operating time, energy consumption, carbon emissions, order complexity, number of design changes, customer service frequency and regulatory review workload. The choice of drivers should depend on the enterprise's business model. A manufacturing firm may focus on energy, equipment utilization, process complexity and quality failure. A software firm may focus on development workload, testing time, cloud resources and maintenance tickets. A logistics firm may focus on route complexity, fuel consumption, delivery frequency and carbon emission intensity. A useful cost driver system should satisfy three conditions. First, the driver should have a logical relationship with resource consumption. Second, the driver data should be collectable at reasonable cost. Third, the driver should be understandable to managers and business staff. If a driver is too complex or cannot be measured reliably, it will reduce the usability of the system. Therefore, enterprises should balance accuracy and practicality. This is one reason why activity-based costing and time-driven activity-based costing are still valuable. They provide a practical method to connect activities, time and resource consumption [5] [6].

3.4 Developing an intelligent cost accounting platform

The fourth practical pathway is to develop an intelligent cost accounting platform. Such a platform does not have to be a completely new system. It can be built on existing ERP and financial systems, combined with BI tools, RPA tools, data warehouses, AI analysis modules and visualization dashboards. The key is to move cost accounting from manual spreadsheet work to automated data collection, dynamic analysis and exception warning. An intelligent cost accounting platform should have at least four functions. The first is automatic cost collection. The system should collect cost-related data from financial and operational systems according to defined rules. The second is dynamic cost calculation. The system should allocate and analyze costs according to updated cost objects and drivers. The third is exception warning. If the cost of an order, process, product or project exceeds the normal range, the system should generate a warning and help managers trace the cause. The fourth is visual reporting. Managers should be able to see cost trends, profitability differences, cost driver changes and green cost indicators through simple dashboards. Business intelligence and analytics research in management accounting suggests that data analytics can improve the decision value of accounting information [11]. This finding is directly relevant to enterprise cost accounting. When cost information is visualized and linked with business indicators, it becomes easier for managers to understand why cost changes and how they should respond. If the cost dashboard shows that the unit cost of a product rises because of energy consumption rather than material price, the enterprise can focus on equipment efficiency and

process optimization. If the dashboard shows that a customer group has high revenue but low profit due to high service workload, the enterprise can adjust pricing or service standards.

3.5 Embedding green cost into the accounting system

The fifth practical pathway is to embed green cost into the accounting system. Green cost includes energy cost, carbon emission cost, environmental protection investment, pollution treatment cost, green certification cost, recycling cost and environmental compliance cost. In traditional accounting, many of these costs are recorded as general expenses and are not linked to products, processes or customers. This makes it difficult for managers to evaluate the environmental and economic performance of different business activities. Enterprises can start by establishing a green cost account or a carbon cost sub-account. Energy consumption and emissions can be collected at the level of factories, workshops, production lines or products where data are available. The cost of environmental treatment and compliance can be linked to the products or processes that generate the need for such treatment. This does not require perfect accuracy at the beginning. The main goal is to make green cost visible and comparable. Once green cost becomes visible, managers can include it in product pricing, investment evaluation, supplier selection and process improvement. Green cost accounting also supports external communication. Investors, customers and regulators increasingly pay attention to environmental performance. If an enterprise can explain how green cost is measured and managed, it can improve credibility and reduce compliance risk. More importantly, green cost information can help enterprises identify opportunities for cost reduction. Energy-saving technologies, process redesign and waste reduction may reduce both environmental impact and total cost. In this sense, green cost accounting is not only a compliance tool but also a productivity improvement tool.

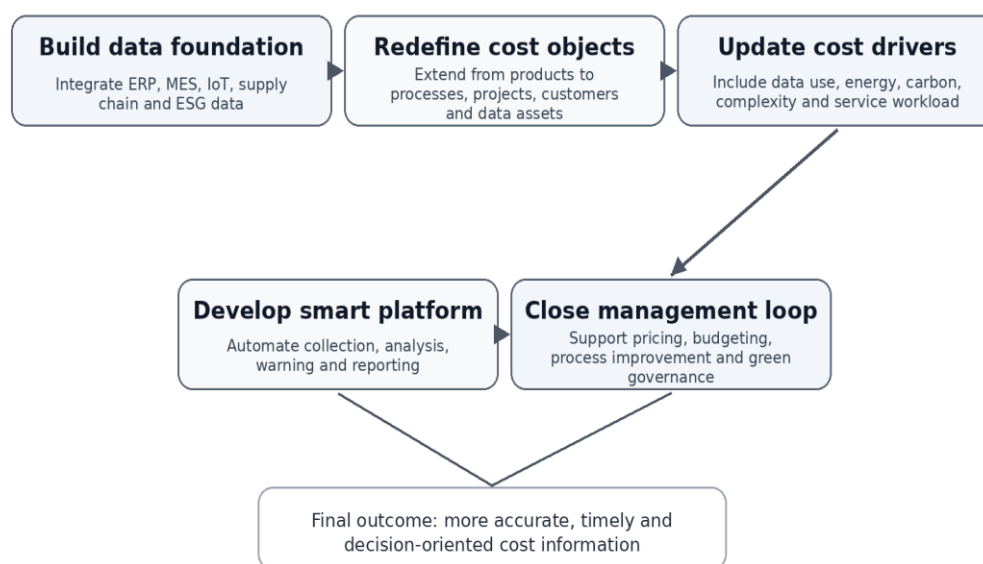


Figure2. Practical pathway for enterprise cost accounting reshaping

4. Comparison between Traditional and New-Quality-Oriented Cost Accounting

The differences between traditional cost accounting and new-quality-oriented cost accounting can be summarized from several dimensions. Traditional cost accounting is relatively stable, standardized and easy to operate. It is still useful for basic financial reporting and product costing. However, it has limitations when the cost structure becomes more indirect, digital, flexible and green. New-quality-oriented cost accounting does not reject traditional methods. Instead, it extends them by adding new objects, new drivers, new data sources and new management objectives.

The table below presents a concise comparison. It can be used by enterprises as a checklist when assessing whether their current cost accounting system is suitable for digital and green transformation.

Dimension	Traditional cost accounting	New-quality-oriented cost accounting
Main cost object	Products, batches and departments	Products, activities, processes, projects, customers and data resources
Cost drivers	Labor hours, machine hours and output volume	Data use, algorithm workload, order complexity, energy, carbon and service workload
Data source	Financial vouchers and manual reports	ERP, MES, IoT, cloud platforms, supply chain systems and ESG data
Accounting mode	After-the-event collection and periodic allocation	Real-time collection, dynamic attribution and exception warning
Management purpose	Product costing and reporting compliance	Pricing, budgeting, resource allocation, process improvement and green governance
Organizational logic	Finance department as the main actor	Collaboration among finance, business, IT, data and ESG departments

Table 1. Comparison between traditional and new-quality-oriented cost accounting

Dimension	Traditional cost accounting	New-quality-oriented cost accounting
Main cost object	Products, batches and departments	Products, activities, processes, projects, customers and data resources
Cost drivers	Labor hours, machine hours and output volume	Data use, algorithm workload, order complexity, energy, carbon and service workload
Data source	Financial vouchers and manual reports	ERP, MES, IoT, cloud platforms, supply chain systems and ESG data
Accounting mode	After-the-event collection and periodic allocation	Real-time collection, dynamic attribution and exception warning
Management purpose	Product costing and reporting compliance	Pricing, budgeting, resource allocation, process improvement and green governance
Organizational logic	Finance department as the main actor	Collaboration among finance, business, IT, data and ESG departments

5. Conclusion

New quality productive forces are reshaping enterprise value creation by strengthening technological innovation, data resources, intelligent production and green development. Under this background, traditional cost accounting faces limitations because it often focuses on product-level production cost, relies on static allocation bases, and provides information mainly after business activities have already occurred. It cannot fully reflect new cost elements such as data cost, algorithm cost, digital platform cost, R&D cost, energy cost, carbon cost and compliance cost.

This paper argues that enterprise cost accounting should be reshaped through four main logical transitions. First, it should move from production cost to full value-chain cost. Second, it should move from static allocation to dynamic cost attribution. Third, it should move from financial recording to business-finance-data integration. Fourth, it should move from internal cost control to green and sustainable cost governance. These transitions are consistent with the development direction of new quality productive forces and with the broader transformation of management accounting in the digital economy. The paper further proposes five practical pathways: building an integrated data foundation, redefining cost objects, updating cost drivers, developing intelligent cost accounting platforms and embedding green cost into the accounting system. These pathways are practical and gradual. Enterprises do not need to complete all reforms at once. They can start from key products, key processes, key projects or key cost problems, and then expand the system step by step. For many ordinary enterprises, this progressive approach is more feasible than a large-scale one-time transformation. The contribution of this paper is to provide a simple and applicable framework for understanding cost accounting reshaping under the new quality productive forces background. The discussion is suitable for conceptual research and can also guide enterprise practice. However, the paper has limitations. It is mainly based on literature discussion and logical analysis, and it does not conduct empirical testing with firm-level data. Future studies may collect case data from manufacturing, digital service, logistics or healthcare software enterprises to test how new cost objects and cost drivers influence cost accuracy, profitability analysis and green performance. Future research may also develop quantitative models for data cost allocation, algorithm cost measurement and carbon cost tracing. In summary, cost accounting under the background of new quality productive forces should no longer be viewed as a passive reporting tool. It should become a dynamic management mechanism that connects financial accounting, business operations, data governance and sustainable development. Enterprises that can build such a system will be better able to improve resource allocation efficiency, support innovation, reduce waste and strengthen long-term competitiveness.

References

- Zhang, Z., Li, P., Wang, X., Ran, R., & Wu, W. (2024). New energy policy and new quality productive forces: A quasi-natural experiment based on demonstration cities. *Economic Analysis and Policy*, 84, 1670-1688. DOI: 10.1016/j.eap.2024.10.039
- Zhong, Y., Lai, H., Zhang, L., Guo, L., & Lai, X. (2025). Does public data openness accelerate new quality productive forces? Evidence from China. *Economic Analysis and Policy*, 85, 1409-1427. DOI: 10.1016/j.eap.2025.01.025
- Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, 28(2), 118-144. DOI: 10.1016/j.jsis.2019.01.003
- Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*, 122, 889-901. DOI: 10.1016/j.jbusres.2019.09.022

- Quesado, P., Silva, R., & Ribeiro, A. (2021). Activity-Based Costing (ABC) and its implication for open innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, 7(1), 41. DOI: 10.3390/joitmc7010041
- Pashkevich, N., von Scheele, F., & Haftor, D. M. (2023). Accounting for cognitive time in activity-based costing: A technology for the management of digital economy. *Technological Forecasting and Social Change*, 186, 122176. DOI: 10.1016/j.techfore.2022.122176
- Varzaru, A. A. (2022). Assessing digital transformation of cost accounting tools in healthcare. *International Journal of Environmental Research and Public Health*, 19(23), 15572. DOI: 10.3390/ijerph192315572
- Abdullah, A. A. H., & Almaqtari, F. A. (2024). The impact of artificial intelligence and Industry 4.0 on transforming accounting and auditing practices. *Journal of Open Innovation: Technology, Market, and Complexity*, 10(1), 100218. DOI: 10.1016/j.joitmc.2024.100218
- Burritt, R., & Christ, K. (2016). Industry 4.0 and environmental accounting: A new revolution? *Asian Journal of Sustainability and Social Responsibility*, 1, 23-38. DOI: 10.1186/s41180-016-0007-y
- Schaltegger, S., & Burritt, R. L. (2010). Sustainability accounting for companies: Catchphrase or decision support for business leaders? *Journal of World Business*, 45(4), 375-384. DOI: 10.1016/j.jwb.2009.08.002
- Rikhardsson, P., & Yigitbasioglu, O. (2018). Business intelligence and analytics in management accounting research: Status and future focus. *International Journal of Accounting Information Systems*, 29, 37-58. DOI: 10.1016/j.accinf.2018.03.001