THE APPLICATION OF RESOURCE CONSUMPTION ACCOUNTING AND ITS IMPACT ON SUSTAINABLE COMPETITIVE ADVANTAGE IN CEMENT SECTOR AT THE KURDISTAN REGION OF IRAQ

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Abstract
This study investigates the role of Resource Consumption Accounting (RCA) in improving cost accuracy and supporting sustainable competitive advantage (SCA) in the cement industry of the Kurdistan Region, Iraq. Using empirical cost data from a leading cement company, the study compares unit costs of Ordinary Portland Cement (OPC), Sulphate-Resisting Cement (SRC), and Pozzolanic Block Cement (PBC) under traditional costing and RCA systems. The analysis shows substantial differences, with RCA increasing OPC costs while reducing SRC and PBC costs, yielding potential annual savings exceeding 8.6 billion IQD and directly enhancing the cost dimension of SCA. While direct evidence for innovation, quality, and delivery improvements was not captured, managerial insights indicate that these savings can be strategically reinvested to improve production flexibility, quality control, and responsiveness. Framed within the Resource-Based View and Dynamic Capabilities perspectives, the findings highlight RCA's role as a strategic resource, emphasizing its potential to drive broader organizational capabilities, guide pricing and capacity decisions, and strengthen competitiveness across multiple dimensions. These findings demonstrate that RCA is not merely a costing tool but a strategic enabler, capable of transforming financial insights into actionable decisions that enhance efficiency, flexibility, and long-term competitiveness in emerging-market industries.

Keyword: Resource Consumption Accounting, Sustainable competitive advantages SCA, Cement company, Cost, Resource Based View.

INTRODUCTION

Due to intensified global competition and rapid technological advancements in manufacturing, including automation and smart systems, organizations are under increasing pressure to innovate and remain competitive (Wong et al., 2023). As manufacturing overhead costs increase and customer expectations evolve, traditional cost accounting systems are proving inadequate. Traditional cost accounting systems struggle with inefficient cost calculations and delayed financial reporting and posits that informatization and modern technology are essential to achieving real-time cost control and reliable management insights (Liang, 2025).

Modern cost management systems capable of providing accurate, timely data are essential for achieving competitive pricing, quality, and delivery efficiency (Rounaghi, Jarrar & Dana, 2013). To address these limitations, Resource Consumption Accounting (RCA) has emerged as a modern approach that offers precise cost allocation based on actual resource usage and capacity (Kodongo et al., 2023). RCA supports cost control, enhances productivity, and strengthens sustainable competitive advantage (SCA) by aligning cost data with operational realities (Mustafa et al., 2022). RCA is a cost accounting system that centers on the consumption of resources. It builds upon and enhances traditional activity-based costing by incorporating not only internal processes but also external resource factors to strengthen strategic cost management. By treating resources as the primary accounting unit, RCA enables the measurement of idle capacity, thereby increasing the accuracy of cost calculations. Additionally, it supports accountability by offering reliable data for departmental performance evaluation. This, in turn, helps organizations make informed and rational decisions, ultimately improving their competitive advantage. (Lue & Wang, 2017]

In recent years, sustainability has become a strategic priority across industries, driven largely by regulatory demands and stakeholder expectations. Many corporations now issue annual sustainability reports alongside financial statements, reflecting their growing influence on investor decisions. As managerial frameworks increasingly integrate sustainability, embedding it into organizational strategy has become essential for long-term success (Bari et al., 2024). Thus, SCA refers to an organization's ability to maintain a unique position in the market over the long term, by consistently outperforming its competitors. It is achieved through valuable, rare, inimitable, and organizationally integrated resources and capabilities, enabling a firm to secure ongoing profitability and market leadership (Hoang, 2025).

Regarding the current research context, the Kurdistan Region of Iraq, numerous domestic industrial companies operate within strategic sectors such as petrochemicals, construction materials, and textiles (Kurdistan Board of Investment, 2023). However, many of these firms continue to rely on traditional accounting systems, which limit their efficiency, responsiveness, and competitiveness, especially when compared to imported products of similar nature. Moreover, regulatory requirements and environmental taxation have increased operational costs, further weakening their price competitiveness and strategic positioning in the market.

Despite these challenges, RCA has been widely recognized as a powerful and dynamic accounting system that enhances managerial decision-making, resource allocation, and cost transparency (Mustafa et al., 2022; Bari et al., 2024). Yet, its application within the industrial sector of the Kurdistan Region remains largely unexplored. Evidence from comparable Middle Eastern contexts, including Jordanian banks and Iraqi manufacturing firms, highlights RCA’s effectiveness in cost reduction, idle capacity identification, and competitive cost positioning (Al-Rawi & Al-Hafiz, 2018; Alsafar, 2021; Kbelah & Amusawi, 2019). The persistence of traditional accounting systems in Kurdistan-based firms, therefore, represents a significant empirical and practical gap.

This study addresses the gap by introducing RCA into the local industrial context and empirically demonstrating its potential to reduce costs. Furthermore, drawing on the resource-based view RBV. (Barney, 1991) and regional evidence of RCA’s strategic benefits (Al-Rawi & Al-Hafiz, 2018; Alsafar, 2021; Kbelah & Amusawi, 2019), the research advances conceptual propositions for RCA’s role in strengthening dimensions of SCA, including cost reduction, innovation, quality, flexibility, and delivery. Overall, the study not only bridges the theoretical-practical divide but also offers actionable insights for decision-makers in Kurdistan to adopt modern cost management practices that enhance long-term competitiveness.

Thus, this research aims to identify the impacts of implementing the RCA system on SCA within the industrial sector in the Kurdistan Region of Iraq. The research is guided by the following questions: (1) How does RCA adoption improve cost reduction compared to traditional costing systems? (2) To what extent does RCA enhance innovation, quality, flexibility and delivery through optimized resource utilization? (3) How does RCA contribute to SCA?

Based on these questions, the objectives of this research are: (1) To evaluate the extent to which RCA adoption improves cost accuracy and cost reduction compared to traditional costing systems. (2) To examine how RCA can support innovation, quality, flexibility and delivery and through optimized resource utilization. (3) To analyze the contribution of RCA to achieving SCA in the industrial sector. (4) To provide practical recommendations for practitioners and future research.

This research is structured into five main sections. The literature review provides a comprehensive overview of recent studies on cost accounting systems in industrial sectors, highlighting key findings and research gaps. The methodology section explains sample selection, data collection methods, and analytical approach. The results section presents the main findings, which are further interpreted in the discussion within the context of the regional industrial environment and existing literature. Finally, the conclusion summarizes the key insights, outlines practical implications, and suggests directions for future research.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Resource Consumption Accounting

The theoretical foundation of RCA originates from the RBV of the firm (Barney, 1991), which emphasizes that SCA depends on the effective utilization and management of resources. RCA provides a framework for delivering transparent insights into resource consumption, enabling firms to achieve operational excellence and strengthen their strategic position. It is an advanced management accounting system that integrates Activity-Based Costing (ABC) with German cost management concepts (Grenzplankostenrechnung GPK) to enhance cost measurement capabilities (Clinton & van der Merwe, 2006).

RCA also incorporates elements of the Theory of Constraints (TOC), linking resource allocation with operational decision-making in manufacturing environments (Turney, 2005). This integration allows firms to identify and eliminate production inefficiencies while maintaining cost control. Unlike standard costing methods, RCA traces resource costs based on actual cause-and-effect relationships (Paksoy et al., 2022) and accounts for evolving usage patterns, making it particularly suitable for complex manufacturing operations (Mustafa et al., 2022). Through precise resource consumption analysis, organizations can better understand cost behavior and allocate expenses more accurately than through traditional cost drivers.

In developing economies, manufacturing companies often face constraints such as limited resources, volatile market conditions, and outdated cost management systems. RCA addresses these challenges by improving cost evaluation, minimizing waste, and enhancing production performance (Mustafa et al., 2022; Hussein, 2023). It also enables organizations in resource-intensive industries to distribute costs effectively between direct and indirect categories, thereby supporting more competitive pricing strategies. Traditional costing systems in these contexts frequently fail to capture actual resource usage (Clinton & van der Merwe, 2006), whereas RCA provides a flexible structure that aligns production activities with organizational spending needs (Alkhafaji et al., 2020).

Sustainable Competitive Advantage

SCA refers to the ability of a firm to earn returns above the norm and to defend those rents over time (Peteraf, 1993). Beyond simple outperformance, SCA implies that customers perceive the firm's offerings as more valuable than those of rivals and that rivals face barriers to imitation (Saloner, Shepard, & Podolny, 2001; Porter, 1985). SCA is not merely "doing better for a while"; rather, it requires value that is durable in the market and hard for competitors to copy. As Kak and Sushil (2002) argue, the "secret" of SCA lies in performing activities across the value chain in a way that consistently creates superior value for customers, thereby sustaining a dominant market position. (Peteraf, 1993; Saloner et al., 2001; Porter, 1985; Kak & Sushil, 2002.)

SCA is fundamentally grounded in the ability to generate superior value through cost efficiency, innovation, quality, and delivery (Porter, 1985; Barney, 1991). Cost advantage remains a core driver, as firms that optimize resources and achieve accurate costing can reinvest savings into innovation and market expansion, creating hard-to-imitate capabilities (Mahdi et al., 2022; Chakrabarty et al., 2022; Helfat et al., 2023). Quality and innovation complement cost efficiency by embedding superior standards and knowledge into products and processes, generating customer loyalty and reputational capital, which are critical intangible resources within the RBV framework (Hall, 1993; Direkwattana, 2022).

Flexibility and delivery capabilities further reinforce SCA by enabling firms to adapt to changing market conditions while reliably meeting customer expectations (Teece et al., 1997; Popa et al., 2022; Laszlo & Zhexembayeva, 2011). Flexible resource allocation allows firms to respond to operational shocks and market opportunities, while accurate cost tracing through RCA ensures that delivery processes are efficient and customer-centric (Arndt et al., 2017). Together, these dimensions (cost, innovation, quality, and delivery) form a synergistic basis for sustained competitive advantage, consistent with RBV principles that emphasize leveraging valuable, rare, inimitable, and organized resources to achieve enduring performance (Barney, 1991; Helfat et al., 2023).

The Relationship between RCA and SCA

RCA represents an advanced management accounting approach that integrates ABC with KGP principles and elements of the Theory of Constraints (Turney, 2005; Clinton & van der Merwe, 2006; Paksoy et al., 2022). Unlike traditional costing systems, RCA traces costs based on actual cause-and-effect relationships, captures evolving patterns of resource usage, and provides transparent insights into both direct and indirect costs (Mustafa et al., 2022; Özyapıcı Tanış, 2016). In manufacturing contexts, such as cement production in the Kurdistan Region of Iraq, where firms often rely on outdated accounting systems, RCA addresses critical inefficiencies by identifying idle capacity, reducing waste, and enabling more precise resource allocation (Clinton & van der Merwe, 2006; Alkhafaji et al., 2020). This accurate costing and resource transparency create the foundation for cost-based advantages, a core dimension of SCA, consistent with Porter's cost leadership framework (Porter, 1985) and the RBV of the firm, which emphasizes that sustainable advantage arises from resources that are valuable, rare, inimitable, and organized (Barney, 1991; Helfat et al., 2023).

Beyond cost efficiency, RCA has strategic implications for other dimensions of SCA, including innovation, quality, flexibility, and delivery. First, accurate cost and resource data enable firms to redirect resources toward research and development, process improvement, and product innovation, thereby enhancing differentiation and long-term competitive positioning (Mahdi et al., 2022; Direkwattana, 2022). From the RBV perspective, innovation represents a knowledge-based intangible resource that, when combined with precise operational insights, strengthens firm-specific capabilities that are difficult for competitors to imitate (Helfat et al., 2023). Second, RCA supports quality management by ensuring that resources are focused on value-adding activities, eliminating unnecessary expenditure on non-critical processes, and enabling firms to consistently meet or exceed customer expectations (Hall, 1993; Chakrabarty et al., 2022). Quality becomes a sustained advantage when embedded within organizational routines and operational practices, consistent with RBV's emphasis on the strategic use of both tangible and intangible assets.

Flexibility, as a further dimension of SCA, reflects the firm's ability to adapt processes, production volumes, and delivery schedules in response to environmental changes and market demands

(Teece et al., 1997; Popa et al., 2022). RCA provides managers with precise data on resource availability and consumption, facilitating dynamic reallocation of resources and improving responsiveness to customer needs and market volatility. This aligns with the Theory of Constraints, where identifying bottlenecks and optimizing critical resources enhances operational throughput and supports adaptive capabilities (Turney, 2005). Similarly, delivery reliability is strengthened through RCA by ensuring accurate allocation of indirect costs and monitoring production activities, which supports timely fulfillment and robust supply chain performance (Laszlo & Zhexembayeva, 2011). Together, these capabilities (flexibility and delivery efficiency) interact synergistically with cost, innovation, and quality to reinforce the firm's overall SCA.

Finally, RCA's contribution to SCA is particularly relevant in developing economy contexts such as the Kurdistan Region of Iraq, where industrial firms face high resource constraints, market volatility, and competition from imported goods. Traditional accounting systems often fail to capture the true cost of resource consumption or support strategic decision-making, limiting firms' ability to achieve sustained competitive performance (Clinton & van der Merwe, 2006; Mustaf et al., 2022). By adopting RCA, firms can integrate cost management, innovation, quality assurance, and delivery optimization into a single framework that strengthens operational efficiency and strategic positioning. The theoretical foundations of RBV, combined with Porter's cost leadership and differentiation strategies, provide strong justification for hypothesizing that RCA adoption will enhance each dimension of SCA and ultimately improve overall sustainable competitive performance. These theoretical and empirical reasoning drives the development of the following research hypotheses:

H1: RCA adoption improves cost efficiency in industrial firms.

H2: RCA adoption facilitates innovation in product and process development by enabling more effective resource allocation.

H3: RCA adoption improves product and service quality through better alignment of resources with value-adding activities.

H4: RCA adoption strengthens delivery reliability and operational responsiveness by reducing inefficiencies in resource utilization.

H5: RCA adoption contributes to achieving sustainable competitive advantage through improvements in cost efficiency, innovation, quality, and delivery.

METHODOLOGY

Research Design

This study adopts a case study research design to empirically examine the application of RCA in an industrial context and to evaluate its contribution to SCA. A case study approach is appropriate because it enables in-depth exploration of accounting practices, cost behavior, and managerial decisions within their real-life context (Ahmed ae al., 2024). RCA is analyzed in comparison to the traditional costing system currently employed by the selected firm, allowing for a systematic evaluation of cost accuracy, idle capacity identification, and strategic implications for competitiveness.

Sample Selection

The research focuses on Mass Company for Cement Production, one of the largest cement manufacturing companies in the Kurdistan Region of Iraq. The company was chosen because it operates three production lines with multi-process cement manufacturing, making it an ideal case for applying RCA (Perkins & Stovall, 2011). Unlike smaller regional firms producing only a single product, Mass Cement produces three types of cement; Ordinary Portland Cement (OPC), Sulphate-Resisting Cement (SRC), and Pozzolanic Block Cement (PBC), providing the necessary variation for comparing product-level costs under both costing systems.

The company was established in 2006 and currently operates with an annual production capacity of six million tons of cement. Its production scale, financial reporting practices, and multi-line operations provide rich data for testing the relevance and accuracy of RCA in such a developing economy context. The company established with an initial capital of IQD 2 billion and obtained its business license from the Ministry of Trade and Industry in the Kurdistan Region of Iraq. The first production line began operating in 2010 with a capacity of 2 million tons per year. In 2011, a second production line was added with the same capacity, increasing the company's capital by an additional IQD 2 billion. A third production line, also with a 2-million-ton capacity, was launched in 2013. Today, the company operates with a total annual production capacity of 6 million tons of cement, and its paid-in capital has reached IQD 6 billion. The Mass Cement Plant, one of the company's key projects, is located in Bazian, approximately 35 kilometers west of Sulaymaniyah city, in the Kurdistan Region of Iraq.

Data Collection

The study relies on both primary and secondary data sources. Primary data were collected through field visits and structured interviews with key company managers, including the general Manager, financial Manager, and marketing Manager. These interviews provided insights into labor allocation, machine utilization, production processes, and cost driver determination. Secondary data were obtained from the company's audited financial statements and internal cost records for the year 2023, which formed the empirical basis for the analysis.

Variables and Measurement

The independent variable is the application of RCA, operationalized through its seven-step process developed by Ozyapici and Tanis,(2016) and Perkins and Stoval (2011) including: (1) identification of available resources, (2) grouping resources into homogeneous pools, (3) classification into fixed and proportional costs, (4) determination of cost drivers for theoretical and practical capacity, (5) calculation of allocation rates, (6) assignment of resource costs to activities, and (7) allocation of activity costs to products

The dependent variable is SCA, examined through its four commonly recognized dimensions: cost efficiency, innovation, quality, and delivery. Cost efficiency is measured empirically through differences in product-level costs under RCA and traditional costing. Innovation, quality, and delivery are assessed conceptually, drawing on theoretical insights from the Resource-Based View and Dynamic Capabilities perspectives.

Data Analysis

The analysis combines descriptive statistics and comparative cost analysis. A quantitative approach is adopted, utilizing financial and operational data. Production volumes, raw material consumption, labor hours, and machine operating hours were used to calculate costs under both traditional and RCA systems. Allocation of indirect costs was conducted using the RCA framework, which enabled identification of idle capacity and refined assignment of costs to products. The unit costs obtained under each system were compared to quantify cost variations and potential savings.

To ensure reliability, the allocation of resource pools and cost drivers was validated through triangulation of financial data, production records, and managerial interviews. This methodological rigor strengthens the credibility of the empirical findings and their implications for SCA.

RESULTS

In applying RCA, the study focuses on manufacturing costs to determine cost of producing one ton of cement and compare it to the traditional costing system currently used by Mass Iraq Cement Company. The main components of these costs include:

a. **Direct Materials**:

This refers to the raw materials that are directly incorporated into the production of the finished units. The following table presents the direct materials used in the cement manufacturing process at the case study company.

Table 1: breakdown of raw materials consumed in production (all in IQD)

Type of Raw Materials	**Quantity (tons)**	**Unit price (per ton)**	**Total Material Cost**
Ordinary Clay	1,254,721	4000	5,018,884 K
Iron Ore with Iron Slag	230,366	65,000	14,973,790 K
Gypsum Stone	162,478	7,000	1,137,346 K
Local Sand	118,732	6,500	771,758 K
Silica Sand or Glass Sand	98,946	19,000	1,879,974 K
Pure Limestone	5,974,872	4,000	23,899,488 K
Total raw materials used in production	**7,840,115**		**47,681,240 K**

Table 1 presents the breakdown of raw materials consumed in the production process, showing both the quantities used and their respective costs. The results indicate that pure limestone dominates the cost structure, accounting for almost half of the total material expenses at approximately 23.9 billion IQD. This is consistent with the nature of cement production, where limestone serves as the primary input for clinker manufacturing. The second-largest cost contributor is iron ore and slag, representing about 31% of the total at nearly 15 billion IQD. Although consumed in much smaller quantities than limestone, its high unit price of 65,000 IQD per ton makes it a major cost driver. Ordinary clay also appears in large quantities, over 1.25 million tons, but due to its very low unit price, its cost share is only around 10% of the total.

Other inputs such as gypsum stone, local sand, and silica sand make up relatively smaller shares, each contributing between 2% and 4% of the total costs. While their financial impact is limited compared to limestone and iron ore, these materials remain essential for maintaining cement quality, strength, and setting time. Taken together, the table reveals that the company’s cost structure is heavily concentrated in just two materials, limestone and iron ore/slag, which together account for more than 80% of the total expenditure on raw materials. This concentration highlights both a vulnerability and an opportunity: any fluctuation in the price or supply of these key inputs could substantially affect overall production costs, but at the same time, targeted cost management and sourcing strategies in these areas could deliver significant savings.

From a strategic perspective, the interpretation suggests that adopting a refined costing system like RCA provides management with a clearer view of where resources are consumed and where efficiencies can be achieved. Identifying limestone and iron ore as the major cost centers allows the company to focus on optimizing procurement, reducing waste, and considering substitutes or innovations such as industrial by-products to lower dependence on high-cost inputs. Thus, Table 1 not only provides an overview of material consumption but also illustrates how cost transparency can contribute directly to achieving a sustainable competitive advantage through more informed decision-making.

Table 2: itemized statement of raw materials based on the product requirements

Type of Raw Materials	**Ordinary Portland Cement (OPC)**	**Sulphate Resisting Cement (SRC)**	**Portland Block Cement (PBC)**	**Total**
Ordinary Iron	1,658,361,828	2,043,029,341	1,317,492,831	5,018,884,000
Iron Clay	---	13,023,750,000	---	13,023,750,000
Iron slag	1,086,703,738	---	863,336,262	1,950,040,000
Gypsum Stone	375,806,890	462,977,676	298,561,434	1,137,346,000
Local Sand	430,079,474	---	341,678,526	771,758,000
Silica Sand	---	1,879,974,000	---	1,879,974,000
Limestone	7,896,974,427	9,728,727,585	6,273,785,988	23,899,488,000
Total	11,447,926,357	27,138,458,602	9,094,855,041	47,681,240,000
Actual Production Volume	1,614,610	1,989,129	1,282,734	4,886,473
Cost per ton	7,090	13,643	7,090	28,478

Table 2 presents the allocation of specific raw material costs in producing three types of cement products. The data indicate that the raw material costs allocated per product were as follows: IQD 7,090 for Ordinary Cement, IQD 13,643 for Sulphate Resisting Cement, and IQD 7,090 for Block Cement. These figures suggest that each product relies on a distinct combination of raw materials tailored to its technical and functional requirements. However, the materials used in each product are applied in consistent proportions within that product category, reflecting internal consistency in the cost composition of raw materials at the product level, despite the differences observed between products.

b. Direct Labor:

Direct labor includes all wage-related expenses incurred by the company in utilizing its available workforce in producing cement. The labor policy of the case study company can be summarized as follows:

Total available annual direct labor hours = 450 workers × 335 working days[1] × 24 hours[2]
= 3,618,000 hours

(1) 30 days excluded for maintenance
(2) In three working shifts

Therefore, average direct labor hours per ton of cement can be calculated through dividing Total Annual Direct Labor Hours by Total Annual Production Volume. Thus, each ton of cement requires approximately 0.7404 hours of direct labor.

Table 3: direct labor cost breakdown per product

details	**OPC**	**SRC**	**PBC**	Total
Production Volume	1,614,610	1,989,129	1,282,734	4,886,437
× Labor hours per Ton	0.7404	0.7404	0.7404	0.7404
= Total labor hours	1,195,457	1,472,751	949,737	3,617,945
× Hourly wage rate	7,500	10,500	9,750	
= Total direct labor cost	8,965,929,330	15,463,886,672	9,259,928,473	33,689,744,474
Direct labor cost per ton	5,553	7,774	7,219	20,546

The results of table 3 show that SRC recorded the highest labor cost (15.46 billion IQD), followed by PBC (9.26 billion IQD) and OPC (8.97 billion IQD). This indicates clear differences in labor intensity among the three products.

c. Indirect Manufacturing Costs:

It represents expenditures incurred to carry out operational activities, excluding direct material and direct labor costs. From the perspective of individual product units, indirect manufacturing costs are regarded as joint costs, since by their nature they cannot be directly traced to a specific product. Rather, they are expenses incurred for the benefit of the overall production process. Practically, other methods are used to allocate indirect costs. RCA is assumed to rationally allocate indirect costs. RCA enables a more precise distribution of indirect manufacturing costs, ensuring reliable product cost measurement and providing a stronger informational basis for managerial decision-making.

Theoretically, RCA system can accurately allocate costs in seven steps, beginning with the identification and aggregation of resources, followed by their assignment to activities, and ultimately linking those activities to the final products.

Step One: Identify Available Resources

Identifying the available resources represents the fundamental first step in applying the RCA system. RCA emphasizes control and planning at the resource level, considering it a central input in cost calculation. The available resources include all elements of the organization's operational infrastructure, such as human resources (employees), machinery and equipment, buildings, and other material and service-related assets. Accurately identifying these resources allows them to be grouped into similar pools and linked to production activities according to actual use.

Step Two: Create resource pool cost

In this step, resources are grouped into homogeneous pools to enable the tracking of resource flows and costs within the accounting system, thereby ensuring precise cost measurement. Homogeneous resource pools consist of resources that share similar characteristics or functions, which allows for more accurate tracking of their consumption across different activities and improves the reliability of cost allocation. This organization is a critical requirement in the RCA system, as it establishes the foundation for the efficient distribution of resources to both production and service activities.

Table 4 illustrates that resources were classified into major categories: indirect labor, power, depreciation, and other costs, with a total value of 117.1 billion IQD. Power expenses (75 billion IQD) and depreciation (29 billion IQD) represent the largest cost drivers, followed by packaging materials and indirect labor. This categorization provides the structural basis for linking resource consumption to activities in subsequent RCA stages. By grouping costs by their nature, the system improves cost allocation accuracy and helps identify inefficiencies and opportunities for sustainable competitive advantage.

Table 4: the first three steps of RCA

Resource Pool	**Resources (MOH)**	**Fixed cost**	**Proportionality cost**
Indirect Materials	Laboratory & Chemical Materials & Tools		21,458,470
	Grinding Aids Materials		2,718,421,875
	Cement Bags- OPC		3,152,765,900
	Cement Bags-SRC		3,555,557,303
Total			9,448,203,548
Indirect Labor	Indirect Manufacturing Labor		1,944,000,000
	Training Wages – Factory Workers	3,226,250	
	Inspection Wages- Raw Materials & Finished goods		4,358,280
Total		3,226,250	1,948,358,280
Powers	Black Oil		51,978,795,387
	Electric Power		23,403,549,564
	Gas Oil		31,873,776
	Lubricants & Grease		20,890,846
	Gasoline		26,654,988
	Other Fuels		702,735
Total			75,462,467,296
Depreciation	Depreciation of Factory Buildings – All Three Production Lines	9,753,205,650	
	Depreciation of Service Buildings	611,037,134	
	Depreciation of Cooling Equipment & Machinery	201,616,838	
	Depreciation of Sinoma Equipment & Machinery- for all 3 lines	16,899,165,663	
	Depreciation of CDM Equipment & Machinery- for all 3 lines	1,103,372,996	
	Depreciation of HB Packing Equipment & Machinery- for all 3 lines	467,158,914	
	Depreciation of Water injection System	7,915,000	
Total		29,043,472,195	
Other Costs	Materials Transportation & Shipping Wages		94,571,726
	Periodic Maintenance	129,719,849	
	Rental of Equipment & Vehicles for Clinker & Raw Materials Transport	975,299,920	
Total		1,105,019,769	94,571,726
Total	**30,151,718,214**	**86,953,600,850**	

Step three: Classifying resource pool cost to fixed & proportionality cost
To facilitate the implementation of the RCA system, resource groups are classified into fixed and proportional costs. Fixed costs are allocated based on the theoretical capacity of resources, while proportional costs are distributed according to the actual capacity associated with each resource group.
As in table 4, third step of RCA classifies the resource pools into fixed and proportional costs. The results indicate that proportional costs dominate the structure, particularly in power consumption (more than 75 billion IQD) and packaging materials (6.7 billion IQD combined for OPC and SRC bags). However, fixed costs are mainly driven by depreciation, which accounts for more than 29 billion IQD. This step is essential for capacity analysis and for improving the accuracy of cost allocations. By distinguishing resource behavior patterns, managers can better understand cost drivers, use resources more effectively, and design strategies that support sustainable competitive advantage.
Step four: Determent Cost driver for theoretical & practical Capacity
In this step, appropriate cost drivers are assigned to each resource pool according to the activities that consume them. Under the RCA system, cost drivers are measurable quantitative indicators such as direct labor hours, machine operating hours, etc. These drivers are later used as a basis for accurately and objectively allocating resource costs to cost centers or consuming activities.

Table 5: identifying cost drivers for theoretical and practical capacity

Resource pools	Cost Drivers	Theoretical Capacity	Practical Capacity
Indirect Materials	Material Handling	261,337	209,070
Indirect Labor	Direct Labor Hours	3,617,945	2,894,356
Powers	Machine Hours	24,120	19,296
Depreciation	Machine Hours	24,120	19,296
Other Cost	Material Handling	261,337	209,070

There are three cost drivers identified for the sample case: materials handling, indirect labor cost and machine hours, see table 5. Material Handling is used to allocate on the basis used materials quantity, as detailed in Tables (1) and (2), considering that one truckload carries 30 tons of material. Accordingly, the total number of material handling operations was calculated as (7,840,115 tons ÷ 30 tons) ≈ 261,337 operations. Indirect Labor Costs uses the number of labor hours shown in Table (3), reflecting actual labor utilization. Moreover, each machine operates 24 hours per day for 335 days per year, excluding 30 days reserved for annual maintenance. With three production lines, the total theoretical machine hours are: 24 hours/day × 335 days × 3 lines = 24,120 hours.
However, practical constraints reduce this theoretical capacity. Workers do not engage in productive tasks during the entirety of official working hours, as one hour per day is allocated for rest and meals, while employees are also entitled to 24 days of annual leave in addition to sick leave. Furthermore, some machinery requires unscheduled maintenance beyond the planned downtime. Taking these factors into account, and based on the average direct labor cost per ton (Table 3), the effective capacity of the resource pools was estimated at approximately 80% of the theoretical level, leaving an idle capacity of around 20%, consistent with company estimates.
Step Five: Calculate Fixed & proportional rate from Resource pool
At this stage, the allocation rates of indirect manufacturing costs associated with the various resource pools are calculated and assigned to the corresponding activity groups. Specifically, the

total cost of each resource pool (Table 4) is divided by its respective cost driver (Table 5) to determine the allocation rate. In this process, fixed costs are allocated based on theoretical capacity, whereas proportional costs are distributed according to actual capacity. This step represents a critical stage in the implementation of the RCA system, as it facilitates the precise identification of unused (idle) capacity. Consequently, idle capacity costs are excluded from production cost centers and instead treated as period costs, to be reported in the income statement. Budgeted indirect cost rate = Budgeted annual indirect cost/ Budgeted annual quantity of the cost-allocation base

Table 6: calculating fixed and proportionality rate from resource pool

Resource pools	Cost Drivers	Fixed Rate	Proportionality Rate	Total Rate
Indirect Materials	Material Handling	0	45,191.58	45,191.58
Indirect Labor	Direct Labor Hours	0.892	673.158	674.050
Powers	Machine Hours	0	3,910,782.924	3,910,782.924
Depreciation	Machine Hours	1,204,124.055	0	1,204,124.055
Other Cost	Material Handling	4,228.333	452.345	4,680.678

Theoretical capacity was applied for distributing fixed costs, whereas actual capacity was employed for allocating proportional costs, see Table 5.

Step Six: Allocation of Resource Pool Costs to Activities:

This stage involves distributing the costs of resource pools to activities. This distribution is based on resource drivers, which represent the quantity of resources consumed by each activity. Resources such as labor, electricity, and equipment must be allocated to various activities according to actual consumption. The consumed quantities of resources were precisely identified. In general, the main activities at Mass Iraq Cement Company include: material transportation, material blending, raw material grinding, kiln burning, final grinding, packaging and labeling, inspection and quality control, inventory management, shipping and distribution, routine equipment maintenance, human resources management, and clinker cooling. This activity structure forms an operational basis for allocating resource costs and represents a critical foundation for accurate and objective cost assignment under the RCA system.

Table 7: resources consumed by each activity

Activities	Resource pools				
	Indirect Materials	Indirect Labor	Powers	Depreciation	Other cost
material transportation	62,721	347,323	193		204,888
material blending	12,545	28,944	386		
raw material grinding	54,358	231,548	772		
kiln burning		1,186,686	14,279	7,139	
final grinding		144,718	2,315	1,737	
packaging and labeling	60,630	434,153	386	2,894	
inspection and quality control	4,181	86,831		772	2,091
inventory management		173,661			
shipping and distribution	10,454	28,943			

routine equipment maintenance		86,831	579	1,351	2,091
human resources management		86,831		965	
clinker cooling	4,181	57,887	386	4,438	
Total	**209,070**	**2,894,356**	**19,296**	**19,296**	**209,070**

Table 7 illustrates the relationship between resource pools and operational activities, with the allocation bases defined for the case study company. To determine appropriate allocation ratios for each resource pool, in-depth interviews were conducted with the Production Manager, Human Resources Manager, and Accounting Manager. For example, the "Indirect Materials" pool was distributed across several activities including material handling, material mixing, raw material grinding, packaging, and clinker cooling.

Table 8: Calculating cost of activity from resource pool

Activities	Resource pool					Total
	Indirect Materials	Indirect Labor	Powers	Depreciation	Other Cost	
material transportation	2,834,461,089	234,113,068	754,781,104		959,014,549	4,782,369,810
material blending	566,928,371	19,509,703	1,509,562,209			2,096,000,283
raw material grinding	2,456,523,906	156,074,929	3,019,124,417			5,631,723,252
kiln burning		799,885,698	55,842,069,372	8,596,241,629		65,238,196,699
final grinding		97,547,168	9,053,462,469	2,091,563,484		11,242,573,121
packaging and labeling	2,739,965,495	292,640,830	1,509,562,209	3,484,735,015		8,026,903,549
inspection and quality control	188,945,996	58,528,436		929,583,770	9,787,296	1,186,845,498
inventory management	---	117,056,197				117,056,197
shipping and distribution	472,432,777	19,509,029				491,941,806
routine equipment maintenance		58,528,436	2,264,343,313	1,626,771,598	9,787,296	3,959,430,643
human resources management		58,528,436		1,161,979,713		1,220,508,149
clinker cooling	188,945,996	39,018,732	1,509,562,209	5,343,902,556		7,081,429,493
Total	**9,448,203,630**	**1,950,940,662**	**75,462,467,302**	**23,234,777,765**	**978,589,141**	**111,074,978,500**

Table 8 illustrates the calculation of activity costs based on resource pools. The amounts presented were derived by multiplying the total rate of each resource pool (in Table 6) by the quantity of resources consumed by each activity (in Table 7).

Accordingly, the total cost presented in this table amounted to IQD 111 billion, which is lower than the total activity costs under the traditional system, which reached IQD 117 billion—a difference of IQD 6 billion, or approximately 5%. Although the actual capacity utilized was estimated at 80% of the theoretical capacity, the variance is attributed to the nature of the company, which relies heavily on large-scale machinery and equipment, with a relatively limited workforce. This structure results in high indirect industrial costs, particularly fixed costs, while proportional costs remain relatively low. Additionally, under the RCA system, fixed costs are allocated based on theoretical capacity, which explains the difference observed.

Step Seven: Allocation of Activity Costs to Products

Activity costs were assigned to the three products according to the number of cost driver units consumed by each, applying the cause-and-effect principle and relying on actual consumption ratios for each activity. The purpose of this allocation is to determine the precise cost per product. To operationalize this step, the number of cost driver units must first be identified and then distributed across the company's products, as presented in the following table.

Table 9: allocation of cost driver units to products

No.	Activities	Products			Number of Cost Driver Units
		OPC	SRC	PBC	
1	material transportation	83,623	111,280	66,434	261,337
2	material blending	2,508,687	3,338,391	1,993,037	7,840,115
3	raw material grinding	8,040	8,040	8,040	24,120
4	kiln burning	351,704,591	351,704,591	221,443,632	924,852,814
5	final grinding	8,040	8,040	8,040	24,120
6	packaging and labeling	1,614,610	1,989,129	0	3,603,739
7	inspection and quality control	40,200	40,200	40,200	120,600
8	inventory management	2,451,604	4,283,909	1,947,687	8,683,200
9	shipping and distribution	11,319	9187	7299	27,805
10	routine equipment maintenance	8,040	8,040	8,040	24,120
11	human resources management	150	150	150	450
12	clinker cooling	151,917,782	151,917,782	95,651,936	399,487,500

Table 9 presents the allocation of cost drivers across production activities. Material transportation was assigned based on raw material volumes (Tables 1 and 2), assuming 30 tons per truck, while mixed quantities followed the shared input materials used in production. Machine hours and the number of employees were distributed equally across products due to similar operating times and staffing. Fuel consumption and cooled clinker were allocated according to clinker production capacity, with ordinary and sulphate-resisting cement producing 135 tons per hour compared to 85 tons for block cement. Packaging-related costs were assigned only to ordinary and sulphate-resisting cement, since block cement is not bagged. Quality testing was shared equally, storage was based on clinker-related raw material volumes, and sales-related costs were distributed by the number of orders obtained from the sales department.

After completing the allocation of cost driver units to the three products, it became possible to prepare the activity cost assignment for the products, as presented in Table 10.

Table 10: allocation of activity costs to products

Activities	Products			Total M.O.H
	OPC	SRC	PBC	
material transportation	1,530,269,769	2,036,382,573	1,215,717,468	4,782,369,810
material blending	670,680,043	892,495,643	532,824,597	2,096,000,283
raw material grinding	1,877,241,084	1,877,241,084	1,877,241,084	5,631,723,252
kiln burning	24,808,891,686	24,808,891,686	15,620,413,327	65,238,196,699
final grinding	3,747,524,374	3,747,524,374	3,747,524,373	11,242,573,121
packaging and labeling	3,596,353,326	4,430,550,223	0	8,026,903,549
inspection and quality control	395,615,166	395,615,166	395,615,166	1,186,845,498
inventory management	33,049,502	57,750,380	26,256,315	117,056,197
shipping and distribution	200,262,158	162,541,607	129,138,041	491,941,806
routine equipment maintenance	1,319,810,214	1,319,810,214	1,319,810,215	3,959,430,643
human resources management	406,836,050	406,836,049	406,836,050	1,220,508,149
clinker cooling	2,692,937,982	2,692,937,982	1,695,553,529	7,081,429,493
Total	**41,279,471,354**	**42,828,576,981**	**26,966,930,165**	**111,074,978,500**
Production Volume	1,614,610	1,989,129	1,282,734	4,886,473
Cost per unit	25,566	21,531	21,023	68,121

Table 10 shows the allocation of activity costs to the three cement products under the RCA system. The results indicate total costs of IQD 41.28 billion for OPC, IQD 42.83 billion for SRC, and IQD 26.97 billion for PBC, corresponding to unit costs of IQD 25,566, 21,531, and 21,023 respectively. These figures highlight significant differences in product-level cost structures, confirming that RCA provides more precise cost measurement compared to the traditional system.

Moreover, it presents the final stage of RCA implementation by distributing activity costs across OPC, SRC, and PBC. The findings show that OPC incurred a total cost of IQD 41.28 billion with a unit cost of IQD 25,566, whereas SRC and PBC recorded lower unit costs of IQD 21,531 and IQD 21,023 respectively. These results demonstrate that RCA uncovers cost variations that were obscured under the traditional system, particularly by showing that SRC and PBC are less costly per ton while OPC is more resource-intensive.

A closer look at the activity breakdown reveals that kiln burning is the dominant cost driver, accounting for more than IQD 65 billion, followed by final grinding and packaging. This process-level visibility emphasizes how RCA links costs directly to resource consumption, allowing managers to identify high-cost areas and potential efficiency gains. Importantly, this refined cost structure provides a stronger basis for revising pricing policies, reallocating resources, and designing strategies that enhance sustainable competitive advantage.

Table 11: Allocation of Activity Costs to Products

Type of system	Products			Total
	(OPC)	(SRC)	(PBC)	

Traditional Costing System	23,934	24,138	23,736	71,808
RCA System	25,566	21,531	21,023	68,121
Difference between Traditional & RCA System	(1632)	2,607	2,736	3,688

Table 11 compares the unit costs of OPC, SRC, and PBC under the traditional costing system and the RCA system. The results demonstrate notable variations between the two systems, with RCA providing a more refined allocation of costs. Specifically, OPC shows a higher unit cost under RCA (IQD 25,566) compared to the traditional system (IQD 23,934), while SRC and PBC record lower unit costs under RCA (IQD 21,531 and 21,023 respectively) relative to the traditional approach. These differences translate into substantial financial impacts when multiplied by annual production volumes, amounting to –2.64 billion IQD for OPC, +5.19 billion IQD for SRC, and +3.51 billion IQD for PBC.

Such discrepancies highlight the limitations of the traditional system, which tends to obscure product-specific resource consumption patterns. In contrast, RCA captures the true cost structure by linking resource usage to activities, thereby revealing that OPC is more resource-intensive, while SRC and PBC are relatively less costly per ton. This enhanced accuracy not only improves cost visibility but also provides a stronger foundation for strategic decisions concerning product pricing, production planning, and resource allocation. Ultimately, the results underscore RCA's potential to enhance sustainable competitive advantage by offering managers a clearer and more actionable understanding of product-level cost behavior.

Overall, the RCA system indicates that the unit cost of Ordinary Cement is higher than under the traditional system, suggesting the need to revise the company's pricing policy for this product. In contrast, Sulphate-Resisting Cement and Block Cement show lower costs, creating opportunities for strategic advantage. For Sulphate-Resisting Cement, the savings of IQD 5.19 billion could support a pricing adjustment to increase competitiveness, investment in innovation to enhance durability, and possible expansion of production capacity to improve flexibility and delivery performance. For Block Cement, the savings of IQD 3.51 billion provide scope for diversifying product offerings, enhancing quality, strengthening supply chain responsiveness, and improving overall cost efficiency.

Discussion

The empirical findings from RCA demonstrate clear cost reallocations across OPC, SRC, and PBC, which directly support the first dimension of sustainable competitive advantage (cost). To examine how these savings might extend to the other dimensions of quality, flexibility, delivery, and innovation, interviews were conducted with the General, Financial, and Marketing Managers. Their responses reveal how managerial interpretation of RCA outcomes translates into strategic intent. When asked ***how the identified cost savings could be utilized***, the ***General Manager*** emphasized the role of capacity optimization: *"The RCA results clearly show that better use of idle capacity will reduce our total costs and justify investment in a new production line that can serve the three existing lines and switch between SRC and OPC depending on demand."* This response demonstrates management's recognition of RCA as more than a cost-accounting tool; it is viewed as a basis for capital investment decisions that directly support cost reduction and production flexibility. The General Manager further noted that "*We have already moved to a feasibility study for a new line,"* showing concrete action toward converting savings into structural competitive advantage. The ***Financial Manager***, when asked ***how to interpret the numerical savings from SRC and PBC***, highlighted their tangible resource potential: "*The RCA-adjusted figures, IQD 5.19* *billion saved on SRC and IQD 3.51 billion on PBC, are real resources that should be reallocated to quality control, R&D and more frequent testing; however, the increased unit cost of OPC must be reflected in pricing to protect margins."*

At this point, the Financial Manager accepts RCA outputs as decision-grade information, supporting the research hypothesis that RCA improves cost accuracy and provides actionable insights. In response to a follow-up question on ***how the savings should be distributed***, he added: *"I recommend ring-fencing a proportion of the savings (for example 30–50%) for capital expenditure (new line) and setting aside 10–20% specifically for quality/innovation initiatives."* These statements confirm support for the cost dimension and show a clear pathway by which RCA savings could feed into quality and innovation, even though empirical evidence for these outcomes has not yet materialized.

From a market perspective, the ***Marketing Manager*** was asked ***how RCA-based cost changes influence pricing and strategy***. He explained*: "Lower unit costs for SRC and PBC give us tactical options: we can lower price to win market share or keep price and invest margin into improving quality and delivery; for OPC we must re-evaluate pricing or accept squeezed margins."*This aligns with the hypothesis that RCA supports competitiveness by enabling more informed pricing and margin management. Furthermore, in response to a question on ***delivery and responsiveness***, the Marketing Manager stressed operational agility*:"A new line will allow rapid switching of production to meet customer needs, shortening lead times and improving on-time delivery*."

Taken together, these interviews suggest that while the empirical findings validate RCA's role in cost accuracy, managers perceive broader opportunities for flexibility, delivery, and quality improvements through strategic reinvestment of the identified savings. Innovation remains an aspirational dimension, acknowledged by managers as requiring longer-term investment. Thus, the interviews provide partial but compelling support for the research hypotheses. They confirm that RCA adoption can drive not only cost-based competitive advantage but also enable organizational pathways to enhance quality, flexibility, and delivery as dimensions not directly measurable in the current dataset but supported through managerial intent and planning.

The quantitative evidence strongly supports Hypothesis 1, which posits that RCA adoption improves cost efficiency in industrial firms. RCA revealed significant cost variations compared to the traditional system, with substantial savings for Sulphate-Resisting Cement (IQD 5.18 billion) and Block Cement (IQD 3.5 billion). These results confirm that RCA enables more accurate resource tracing, enhances cost visibility, and supports competitive pricing strategies (Clinton & Keys, 2002; Mustafa et al., 2022).

With respect to the other hypotheses, the findings are more nuanced. Hypothesis 2, which proposed that RCA enhances innovation, is not directly supported in the current dataset, as no innovation indicators were measured. Nonetheless, the identified cost savings create opportunities for reinvestment in R&D and product improvements, aligning with the Dynamic Capabilities perspective (Teece et al., 1997).

By contrast, Hypotheses 3 and 4**,** concerning improvements in quality and delivery flexibility, are not validated quantitatively but receive strong support qualitatively from the managerial interviews. Both the General and Marketing Managers emphasized that RCA savings could be redirected to enhance quality control, strengthen customer responsiveness, and justify investment in a new production line to reduce bottlenecks and improve lead times. These insights suggest that while the empirical dataset cannot confirm H3 and H4, managerial interpretations provide credible evidence that RCA adoption can translate cost efficiencies into quality enhancement, delivery reliability, and greater production flexibility. Collectively, the results show that RCA adoption provides clear empirical support for cost efficiency (H1), partial support for innovation (H2), and strong qualitative support for quality and delivery (H3 and H4). Thus, RCA's contribution to sustainable competitive advantage extends beyond cost, demonstrating its potential as both a financial tool and a strategic enabler.

From a theoretical perspective, these findings contribute to the Resource-Based View (RBV) (Barney, 1991; Helfat et al., 2023), which argues that sustainable competitive advantage arises from leveraging valuable, rare, inimitable, and organized resources. RCA enhances this by transforming cost information into a strategic resource, enabling managers to identify idle capacity, evaluate pricing strategies, and allocate savings toward innovation and quality initiatives. The evidence also supports the Dynamic Capabilities framework (Teece et al., 1997), demonstrating how RCA equips firms to sense opportunities (cost savings), seize them (strategic reinvestment), and reconfigure resources (new production lines, R&D investment) to remain competitive.

Moreover, this study aligns with prior regional research (Al-Rawi & Al-Hafiz, 2018; Alsafar, 2021), which highlights RCA's role in strengthening cost efficiency and market positioning in Middle Eastern industries. The Kurdistan cement sector provides further validation, showing that RCA is not only an advanced costing method but also a strategic enabler of sustainable competitive advantage. This results, provides robust empirical support for cost-based advantages and offers theoretical and qualitative pathways for innovation, quality, flexibility, and delivery improvements. While these latter dimensions remain untested empirically in the current dataset, managerial interpretations and intent from the interviews illustrate how RCA can act as a foundation for broader competitive strategies.

Conclusion

This research demonstrates that Resource Consumption Accounting (RCA) offers substantial strategic value for the Kurdistan Region's cement industry. Empirical evidence confirms RCA's superiority over traditional costing systems by providing more accurate cost information, uncovering significant idle capacity, and enabling targeted efficiency improvements. The study further reveals considerable cost savings in Sulphate-Resisting and Block Cement, which, if reinvested, can strengthen competitiveness and long-term sustainability.

By situating these findings within the Resource-Based View (RBV) and Dynamic Capabilities frameworks, the study establishes RCA not merely as an operational tool but as a strategic enabler of sustainable competitive advantage. While Hypothesis 1 on cost efficiency is strongly validated, the dimensions of quality, flexibility, delivery, and innovation receive partial or qualitative support. This highlights RCA's potential to foster broader organizational capabilities when complemented with strategic investments and long-term implementation. In sum, RCA should be recognized as both a costing methodology and a dynamic strategic resource that equips firms in emerging markets with the capacity to enhance efficiency, strengthen market positioning, and contribute to broader industrial development.

Implications and directions for future Research

The findings of this research carry significant implications for both practice and policy. For industrial practitioners, the results highlight the urgency of adopting RCA to refine pricing strategies, achieve cost leadership, and make better use of idle capacity, thereby improving profitability and long-term competitiveness. RCA also provides managers with a continuous tool for reconfiguring resources and identifying opportunities for efficiency gains, while enabling

reinvestment in areas such as quality control, process flexibility, and, over time, innovation. From a policy perspective, there is a clear need to support RCA adoption in emerging economies like Kurdistan through training programs, technical assistance, and investment in digital infrastructure, which would enable firms to maximize the strategic potential of this system. Finally, for the academic community, the study underscores the importance of reconceptualizing costing systems as strategic resources rather than merely accounting mechanisms, opening new avenues for interdisciplinary research at the intersection of management accounting, strategic management, and industrial development.
Future research should move beyond cost efficiency to examine RCA's role in shaping other dimensions of sustainable competitive advantage, such as innovation, quality, delivery, and flexibility. This requires the integration of operational and performance data that can empirically validate RCA's broader impact. Longitudinal research is also needed to capture outcomes that emerge over extended time horizons, particularly in relation to innovation and continuous improvement. Comparative studies across different industries and contexts would further clarify the generalizability of RCA in emerging markets, while research on the intersection of RCA with digital technologies such as ERP systems, artificial intelligence, and big data analytics could provide valuable insights into how strategic costing integrates with contemporary digital transformation efforts. In addition, scholars should pay closer attention to behavioral and organizational aspects of RCA adoption, including managerial attitudes, organizational culture, and change management practices, in order to better understand the conditions under which RCA can be successfully implemented and sustained.

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