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The impact of integrating capacity-based cost approaches on strategic cost reduction during the product design and implementation phases

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ABSTRACT

This study proposes an integrated costing approach that combines the advantages of Time-Driven Activity-Based Costing (TDABC) and Resource-Consumption Accounting (RCA). The proposed method, referred to as Time-Driven Resource-Consumption Accounting (TDRCA), integrates the single time-driver concept of TDABC with the resource-based activity structure of RCA. The aim is to overcome the limitations of each individual method and provide a more effective tool for strategic cost reduction. The study is mainly theoretical and descriptive, focusing on how the integrated approach can support cost reduction during the product design and implementation stages. The proposed framework identifies costs based on resource consumption and links them with strategies that reduce unnecessary resource usage and improve capacity utilization. The findings suggest that integrating TDABC and RCA can provide more accurate cost information and help organizations implement effective cost-reduction strategies across the product life cycle.

1. Introduction

All business organizations, regardless of their size or legal status, have profit maximization as their primary objective. Organizations constantly reevaluate their manufacturing methods and production systems to provide high value to clients at the lowest possible cost, despite the current highly competitive business environment, market-oriented production, short product life cycles, and constant economic fluctuations. Businesses make efforts to minimize expenses that do not offer value from the customer's perspective, or that may be lowered without sacrificing this value, with a primary focus on their cost structure. Thus, they can provide their customers with products at competitive costs, and businesses frequently turn to internal cost-cutting measures. Shivajee et al. (2019) contend that the feasibility and efficacy of competition initiatives are contingent on the capacity to curtail costs. Al-Hibari and Al-Matari (2019) stated that reducing costs is not always a straightforward procedure because it depends on the organization's definition of cost, its control over its drivers, and the timing of the reduction. The term "cost reduction" has been used with many definitions that consider the purpose and nature of the task, even in accounting theory. A decrease in waste or an increase in output are just two interpretations of cost reduction as a deliberate and constructive approach to enhancing efficiency. The act of cutting expenses while preserving effectiveness and achieving goals is known as cost reduction. Although reduction can bring about benefits such as cost savings, if its definition does not focus on delivering value to the customer and employs a cost-reduction methodology that involves accurately identifying costs, it may be seen as merely an accounting exercise, and the reduction efforts may deviate from the strategic goals of the organization.

The full product life cycle, from concept to launch, is covered by a cost-reduction process. The potential to reduce costs at each of these phases differs depending on how costs are identified at the pertinent level, from both operational and strategic standpoints. The capacity of the cost method to measure reduction attempts precisely and easily is another crucial aspect of cost reduction (Senan and

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Al-Hibari, 2020). When examining conventional cost techniques in accounting theory, these approaches fall short of the requirements for cost reduction because they are primarily dependent on volume as a cost driver and are unable to identify the true cost drivers. Although Activity-Based Costing (ABC) explores the analysis of cost drivers by activity and offers pertinent, accurate, and crucial information for cost reduction, it is characterized by rigidity and is useless in complex production processes that are continuously modified and changing. This is in addition to the drawbacks related to using all available resource capacities for cost. Based on the combination of the foundations of GKP and ABC, Resource-Consumption Costing (RCA) explains cost behavior primarily through the use of the work principle, which is highly disciplined and oriented for ABC, in addition to the principles of causality and responsiveness inherent in GKP. The use of activities is limited to situations in which resource drivers are insufficient or when more information is needed about the factors driving resource usage in resource pools. Nonetheless, to obtain data on utilized capacity levels, activity drivers must be clearly defined in this context (White, 2009; Wang et al., 2009).

Consequently, in contrast to all other conventional cost methodologies such as ABC, RCA provides managers with essential information by highlighting idle capacity, enabling them to exclude the cost of these capabilities from their cost estimates (Ozyapici and Tanis, 2016). However, this method has some shortcomings, such as difficulties in comprehending cost behavior when working with several consumers of resource pool outputs and distinct and varied resources. It also has problems calculating allocation rates for fixed costs based on theoretical capacity and problems with the long-term appropriateness of information because it eliminates fixed costs that are unjustifiable. RCA bears the brunt of criticism directed at ABC owing to its dependence on the activity model. If RCA's focus of RCA is shifted from providing information on resource consumption to mechanisms and ways to consume resources in a way that makes it easier to deal with fixed costs and allocate them logically for cost purposes, then the problems associated with the large number of resource pools can be addressed, issues with the large number of resource pools can be resolved, and the complexity of the activity model can be avoided. RCA criticisms are refuted by simplifying the activity model and directing it toward resources through quantitative interactions based on consumption quantity. Similar to Kaplan and Anderson (2007), Hoogendoorn (2023), and Oliveri et al. (2022) in Time-Driven Activity-Based Costing (TDABC), time drivers can be used in RCA to simplify and orient the activity model by explaining resource consumption in situations where there is no causal relationship between resources and resource pool outputs.

Consequently, this study focuses on the hybrid costing technique, which can handle cost-reduction activities across the course of the product life cycle. This study aims to apply cost techniques to help firms attain a competitive edge through intentional cost reduction. This study includes the idea and foundations of Time-Driven Resource-Consumption Accounting (TDRCA), notions of cost reduction, the function of TDRCA in cost reduction, results, study limits, and recommendations to accomplish this aim. An introductory section was also included in the study.

2. Literature review

2.1. TDRCA concept

TDRCA is a hybrid cost approach that combines the philosophies of TDABC and RCA. This approach is based mainly on the allocation principles of RCA in terms of identifying resource pools and determining causal relationships between resources and the outputs of these resource pools. The activity principle is used as an addition in the case of insufficient resource-consumption relationships. When using the activities principle to allocate and track resource consumption, the approach relies on the TDABC philosophy based on the single cost driver represented by capacity expressed in time, while identifying all the drivers of capacity consumption by building consumption equations specific to each resource consumed by the activities. Thus, it can be said that TDRCA is an approach resulting from the integration of RCA with TDABC, and this integration is highlighted in the reliance on RCA in the management and definition of resource consumption relationships while using the capabilities of TDABC in the management and translation of cost in the form of consumed capacity.

Al-Hibari and Al-Matari (2019) asserted that TDRCA, like RCA, offers an explanation of cost from the perspective of resources because resources are the reason for costs, and because these resources have capacity, getting capacity is the cause of the cost. Resources are the cause of costs because of their capacity. However, it surpasses RCA in terms of fixed costs by intentionally altering fixed costs by transforming them into the capacity consumed by activities that assist in producing these outputs, when RCA is unable to identify a connection between resources and the output of resource pools.

The application of TDRCA overcomes the disadvantages of both capacity-based cost approaches and generates many advantages.

- The number of resource pools in RCA can be reduced because the resource capacity can now be allocated for cost purposes at the individual resource level within the pool.
- Improved accuracy in measuring the cost of specific purposes, along with a more transparent identification of underutilized resources.
- More simplicity and flexibility than the previous two cost approaches, as the proposed approach may not need all the complexities of the activity

model in the case of sufficiency of the causal relationships of consumption of resources in RCA; however, in the case of inadequacy and the need to use the activity model, this use will be made according to TDABC, which has flexibility and simplicity in terms of construction and upgrading.

- Interpreting consumer behavior in terms of both goals and actions results in excellent opportunities to assist strategic cost reduction through a unique technique associated with production capacity, which is sometimes referred to as the production capacity methodology.

The concept of cost as a resource utilized to accomplish certain goals is stressed by both the American Institute of Certified Public Accountants (AICPA) and the American Accounting Association (AAA). This is a collection of things given to accomplish a certain objective. Although accounting and cost thinking integrate the concept of cost as consumed resources, traditional cost approaches and ABC are unable to track resource flows for various cost purposes and determine the used and unused quantities of resources, which prevents them from explaining cost behavior from the perspective of resource consumption. This incorrect interpretation of cost behavior in cost management systems based on these approaches has led to the concept of cost reduction being defined as a process whose goal is to move the cost from one level to a lower level in light of the project strategy, regardless of the impact of this transition on resources. This definition results in limited prospects for cost savings and a form of cost accounting recalculation. The notion of cost as a consumable resource has been idealized by RCA, but the issue of accounting recalculation of non-causeless fixed costs has imprisoned it.

Since cost is nothing more than the amount of resources utilized, White (2009) contended that it is crucial to comprehend the nature of resources and how they should be modeled. True cost reduction should be accompanied by a decrease in the amount of resources consumed. This necessitates a careful examination of two crucial factors: the productivity and efficiency of resource usage as well as the intensity of resource use (i.e., the quantity and mix of capabilities employed). The effective utilization of project resources is closely connected to cost reduction. Additionally, while cost management tends to focus on value, it is important to pay attention to the resources that created this value and to keep an eye on the incidence of cost at the resource level. The employment of cost-cutting strategies unrelated to the preservation of resource capacity constitutes the challenge of cost reduction.

The orientation of the cost reduction process towards reducing the amount of resources consumed highlights two important points in the field of cost reduction: the timing of the commitment to resource consumption and the drivers of resource consumption. Regarding the first point, most of the resources are committed to the product design stage, where all the components of the product are identified, and all the activities and processes necessary to deliver the product are characterized (Shehab and Abdalla, 2001). 60-80% of the cost of a product is bound at the design stage, a stage that consumes no more than 5% of the resources needed to produce and deliver the product. Regarding the second point, cost reduction requires a capacity-driven cost approach, which has the ability to provide drivers of resource consumption according to the nature of the resource and how it is consumed for cost purposes in a framework that has accuracy, flexibility, and simplicity, which are the characteristics available in TDRCA.

The notion of cost reduction from the standpoint of the resources utilized according to the stage in the product lifecycle is supported by the TDRCA-based cost reduction mechanism. This mechanism offers a precise technique for tracking resource capabilities during the design or redesign phase, tying them to all the activities and processes required to deliver the product, with an identification of the capacities needed for all possible product provisioning options. This approach can offer a precise assessment of idle capacities and capacities linked to non-value-adding activities, as well as highlight the possible influence of resource interrelationships when viewed in the context of the enterprise's value chain analysis during the product introduction stage.

2.2. Cost reduction under TDRCA

Within the framework of TDRCA, the cost reduction methodology is presented based on the design and implementation stages of the product. Many organizations have turned to directing cost-reduction efforts at the design or redesign stage, focusing on minimizing costs to a minimum. Cost reduction efforts are based on many methodologies at this stage, perhaps the most prominent of which is the Design for Manufacturing and Assembly (DFMA), which seeks to provide all available alternatives for manufacturing a product at the required quality level and differentiate between alternatives in terms of cost. Harlalka et al. (2016) believed that DFMA is one of the most important methodologies to support process reengineering to reduce costs and provide competitive prices for the product. Other studies (Isanaka et al., 2016; Annamalai et al., 2013; Suresh et al., 2016) confirmed DFMA's ability to make positive changes in product cost through simple redesign procedures. Focusing on the resources used and the time required for the activity, Pinheiro et al. (2018) maintained that DFMA has brought about cost-effective results by reducing the time required for the process and using fewer resources to deliver the product. Subbaiah and Antony (2021) added that DFMA enables more efficient use of available resources by rethinking processes and activities as well as assembly and manufacturing times.

Despite previous assertions on the role of DFMA in achieving cost reductions, there is an essential point regarding future cost reduction estimates, that

is, those of resource cost estimates that may negatively affect the cost of the product upon release. This, in turn, needs to direct the reduction efforts in DFMA towards the amount of resources consumed in the alternatives to the product instead of focusing on cost, and in such a way that the trade-off of choosing the most appropriate alternative is based on the amount of resources that the alternative can provide. The orientation of DFMA towards the quantities of resources consumed makes it imperative to provide accurate information about the drivers of resource consumption and consumption quantities in a simple and adjustable framework through which it is possible to quickly obtain information about any proposed modification to the production method, which can be provided by TDRCA. The integration process between DFMA and TDRCA stands out through DFMA's introduction of the mechanisms of product implementation and all the activities and processes necessary for production, as well as the resources necessary for manufacturing. In contrast, TDRCA groups resources into pools according to the homogeneity of resources and the nature of the processes and activities that have been structured, identifying all the causal relationships of resource consumption and the drivers (i.e., activities consuming the resources), and highlighting the necessary amount of each resource to provide the product. In the event that DFMA proposes any amendment, this will be reflected directly in the resource pools, resource consumption relations, and the drivers of resource consumption by activities; therefore, the result will appear in the form of different quantities of resources needed to provide the product as per the amendment proposal.

In this way, TDRCA will provide information about the quantity needed to provide the product from all project resources according to each of the alternatives offered for the manufacture of the product. Thus, the process of calculating the cost and reduction quantities will be clear and resource-oriented.

Despite the importance of reduction at the design/redesign stage according to the DFMA, estimates may change in such a way that a reduction in the manufacturing phase is necessary. According to Hervas-Oliver et al. (2014), this is achieved by introducing innovative cost-cutting technologies adapted to the nature of product manufacturing, processes, and the activities necessary to provide it. However, the impact of these technologies must be resource-oriented and measurable in terms of reducing the amount of resources used, which TDRCA does in such a way that it is able to direct the cost reduction towards capacity instead of focusing on the final cost figures. Directly dealing with resource capacity, the TDRCA aims to reduce costs by lowering these energies. Classifying capacities in accordance with how they contribute to the provision of the product is required to accomplish strategic cost reduction from the standpoint of the resources used. The Advanced International Manufacturing Group (CAM-I), which offered three capacity groups—productive capacities linked to product manufacturing activities, non-productive capacities uniquely suited to support the provision and manufacture of the product, and idle capacities that are not in use—performed this (Anselmi et al., 2022; White, 2009).

In the framework of the previous classification of capacity, any cost-reduction process directed by resource capacity should focus on the quality of capacity and identify possible efforts for reduction in light of the type of capacity. The following is a detailed explanation of how to reduce costs from the perspective of resource capacity within the TDRCA framework.

Many factors determine the production capacity of an organization, the most important of which are the amount of resources available and the efficiency of use, the extent of consistency and balance between the uses of resources, and the methods used to manage these resources. The issue of productive capacity for organizations is how to manage these capacities and continually work to eliminate idle ones to avoid incurring final cost purposes with capacity costs that are higher than those used in the production of cost purposes. A cost approach that is capable of accurately measuring the capacities of the resources used, allocating them for cost purposes, and excluding the costs of idle energy is necessary for the efficient management of an organization's resources. Traditional cost approaches, including ABC, have been unable to achieve this because they are predicated on the hypothesis of full capacity utilization when allocating these resource capacities for cost purposes. This theory holds true for resources with infinite capabilities, but is invalid for resources with fixed capacities (White, 2009). Although these methods acknowledged unused capacity, they did so in the form of estimated percentages, allowing management to conceal these capacities by manipulating the ratios of allotted resources. For two reasons, TDRCA is superior to traditional approaches when it comes to allocating idle capacities: first, it moves the analysis of resource capacities from the aggregate level of analysis to the individual level of each resource or homogeneous group of resources, allowing idle resources to be identified at the level of each resource and managed separately from the rest of the other resources; and second, it offers recommendations on how to allocate idle capacities.

The Backward Method of Allocation is a characteristic of TDRCA for assessing idle capacity. Using the concepts of causality and relativity, it starts with a cost purpose and identifies the resources that may be used directly. It then looks for indirect consumption for these purposes by centralizing activities to monitor the amount of resource consumption. As a result, it highlights how activities are interconnected and how resource consumption is affected. This, in turn, makes the connection between changes in output volume, resource volume, and costs more obvious on the one hand and creates a visible idle capacity estimated by

resources that have not been used at all for cost purposes on the other.

The initial step in reducing expenses during the production and implementation of a product is to measure and eliminate idle capacity. This action influences the following stages, focusing on reducing the capacities necessary for value chain activities. By removing these idle capacities, the overall cost reduction becomes evident, and it is crucial to measure and manage them precisely until the desired cost savings are achieved.

In terms of costs, efficiency improvement refers to using fewer resources to create the same volume of output while still adhering to the organization's goal and maintaining the value delivered to the customer (Silvi and Cuganesan, 2006). The integration of these two tools is necessary to reduce costs based on the concepts of efficiency and cost. The first tool analyzes organizational activities and categorizes them based on the value they provide to customers. The second tool calculates the resources required to complete the activity. Value chain analysis, in relation to the first tool, is the most well-known tool of strategic thinking for examining the influence of activities on value from a strategic viewpoint. The second tool, TDRCA, provides information on the number of resources used by each value-chain activity. The application of these two methods supports Hutaibat's (2011) argument that a cost leadership strategy in resource management requires a value chain analysis that links resources to the value provided to customers.

The capabilities of TDRCA to create integration with value chain analysis are due to its special capacities in achieving the goals of strategic reduction of value chain analysis, which the traditional and ABC approaches are unable to achieve, that is,

- TDRCA influences activity costs by pinpointing adaptable and variable cost drivers that can modify fixed costs. As stated by Hutchinson (2007), the sole factor that can be controlled and reduced is the duration required to finish an activity, as this is the most critical indicator of capacity and the primary source of cost. Dekker (2003) contends that cutting the expenses of value chain activities should be carried out by considering the resources they consume. This suggests the need to connect the costs of value chain activities with time, as this is the driver capable of altering the resources they utilize.
- TDRCA ensures that the client receives the intended value at the lowest possible level as per Sharan et al. (2015). The aim of value chain analysis is to guarantee that all activities create value for the customer, either directly or indirectly, and that this value is created at the lowest cost. However, achieving the lowest cost is not feasible under cost approaches that treat fixed costs as binding resources and cannot introduce flexibility into these costs. Therefore, it is necessary to recognize that the cost is imposed and cannot be improved or reduced from an operational perspective that does not consider the strategic perspective of the business, which is the reduction of TDRCA, was able to address this issue by defining the cost in terms of the value delivered to the client and then altering the fixed expenses associated with this value.
- TDRCA transforms value addition into capacity by initially maximizing the produced capacity, which refers to the portion of the capacity that adds practical value to the customer. Subsequently, the remaining capacity is categorized into non-productive and necessary practical capacities (i.e., capacities for activities that do not add necessary value) and unproductive and unnecessary practical capacities.

Based on prior integration capabilities, the following value chain analysis approach can be used to reduce costs by enhancing resource efficiency:

- Reduction of unproductive capacities: These are classified into unproductive and unnecessary capacities, in which effort is made to remove the activities that consume them and to reduce the quantity of unproductive capacities that are necessary.
- Enhancing the effectiveness of the generated capacities is a key objective of TDRCA. To achieve this goal, resource efficiency is boosted twofold with the aim of reducing costs. The first step involves optimizing the relationship between inputs and outputs such that the same level of output can be produced with fewer inputs. The second and most critical stage involves managing the factors that influence capacity consumption and shifting the focus of cost reduction efforts from reducing the number of drivers to reducing the capacity consumed by each cause. This approach simplifies the process of cutting costs for value-added activities and supports the improvement of capacity utilization efficiency.
- Reducing the number of resources required to carry out tasks and avoiding squandering these resources on pointless cost-cutting initiatives. Regarding the capabilities required to carry out tasks, TDRCA accurately converts them into timeframes. These periods are separated into compressible, optimizable, and fixed periods, which are challenging to change.
- The management and regulation of constraints throughout the value chain are facilitated by TDRCA. This approach provides comprehensive data regarding activities that may impede a chain's smooth functioning by ascertaining the capacity required by an activity to achieve a specific production volume and the resources assigned to it. Based on this information, value-added activities are categorized as constrained or unconstrained. The TDRCA plays a role in waste reduction by identifying constraints and devising strategies to overcome them, or scheduling resources for activities within the resource capacities of the

restricted activity. The TDRCA methodology for constraint management outperforms the conventional constraint theory methodology by precisely identifying bottleneck points for individual processes or groups of processes with similar characteristics rather than simply identifying a general constraint that affects the performance of the entire system. This approach enables a more comprehensive and efficient analysis of constraint management, which surpasses the limitations of the total analysis provided by constraint theory.

- The effectiveness of resource utilization is contingent upon the project management team's comprehension of the interconnections and associations within the value chain. These connections are crucial for identifying prospects for enhancing productive capabilities and optimizing customer value. TDRCA proposes the incorporation of driver interactions into the TDABC methodology, which pertains to the impact of one-time drivers on another. This concept establishes connections and associations between value chain activities and facilitates the minimization of capacity utilization.

3. Conclusion

The TDRCA technique combines the principles of TDABC and RCA into a hybrid approach. This is accomplished by integrating the time-driver principle, the cornerstone of TDABC, into the RCA activity analysis approach. Through the combination of these two approaches, TDRCA now has the capacity to manage and examine resources using a dual viewpoint on their consumption. Resources are distributed through indirect connections created by TDABC, which centralizes operations as consumers of fixed resource capacity, or through direct causal linkages between the input and output of each resource pool. When indirect linkages are established, fixed costs are modified, which improves the accuracy of measuring resource consumption and identifying the variables that influence it. In turn, depending on the degree of capacity utilization, this generates opportunities for cost reduction. By precisely measuring the resources used for cost reasons and properly recognizing expenses as consumed resources, the TDRCA technique contributes to the strategic reduction of costs. Moreover, this methodology can be integrated with strategic cost-reduction techniques in both the product design and implementation stages. The exact evaluation of resource consumption for each alternative in product production during the design phase and the calculation of resource conservation for reduction initiatives during the implementation phase are the key components of the integration in question. The procedure entails first identifying the variables that lead to the use of resource capacity and then putting the right policies in place to adjust or limit each factor's consumption levels. The choice of metrics depends on the type of component, how much influence it has, and how processing occurs over time. Table 1 presents the relationship between strategic cost-reduction techniques and TDRCA integration from the perspective of resource capacity consumption drivers.

A flexible strategic tool, TDRCA may be used for many corporate processes and industries. Optimizing cost-cutting tactics and managing supply networks successfully: Total Delivered Cost Analysis, or TDRCA, offers the ability to save costs significantly and be a great help with supply chain management. RCA employs a single flexible time-driven driver instead of many fixed drivers for its operations. The primary objective of this program was to mitigate complaints related to RCA. This is done by concentrating on cost reduction through the production capacity mechanism, with secondary support given to supply chain management.

4. Study limitations and future research

The difficulty in obtaining secondary data from industrial and service companies in developing nations is one of the main barriers to converting theoretical analyses into practical studies that might be advantageous to both firms and researchers, and to validating theoretical analyses. This procedure is made more difficult because these firms often handle cost data with a high degree of security.

Table 1: Drivers of capacity consumption and the scope of the impact of cost reduction at the stages of the product life cycle

Type of driver	Description of impact on cost	Product life cycle stage	Cost reduction tool
Organizational time drivers	Strategic drivers that influence long-term cost structures and future resource commitments	Design or redesign stage	DFMA
Structural time drivers	Drivers related to organizational structure and production system design that determine long-term cost behavior	Design or redesign stage	DFMA
Executive time drivers	Strategic and managerial drivers that affect both current and future operational costs through managerial decisions	Implementation stage	Value chain analysis
Operational time drivers	Operational drivers affecting short-term efficiency and immediate resource utilization	Implementation stage	Value chain analysis

If information about the application mechanisms and results within a particular industry or service sector is available, this research offers academics with organizational access an opportunity to investigate the concepts discussed here through case studies or in-depth research. This study can provide a solid foundation for surveys and questionnaires designed to determine whether management accountants or strategic managers are inclined to adopt hybrid cost techniques. Depending on the goals and parameters of the planned study, primary data may come from one or more categories.

Implementing TDRCA in an organization might be difficult owing to several issues. The effectiveness of

TDRCA implementation is heavily contingent on the company's leadership. A lack of comprehension or endorsement from leaders may result in opposition and unsuccessful execution. Hence, it is important to possess unwavering leadership dedications and active participation in the execution process. Furthermore, inadequate communication may impede the effective execution of TDRCA. Ensuring unambiguous and uniform information on the advantages and procedures of TDRCA for all parties involved is of utmost significance. Frequent updates and accessible methods for input can assist in this regard.

The absence of motivation and feelings of ownership among employees may also be difficult. To overcome this challenge, firms may engage workers in the implementation process, offer essential training, and acknowledge their contribution. To summarize, although the implementation of TDRCA may be difficult, these obstacles may be surmounted by meticulous strategy, robust guidance, proficient correspondence, staff engagement, and streamlined resource allocation. It is crucial to consistently monitor and assess the implementation process to make any necessary modifications or enhancements.

List of abbreviations

AAA	American accounting association
ABC	Activity-based costing
AICPA	American institute of certified public accountants
CAM-I	Consortium for advanced management international
DFMA	Design for manufacturing and assembly
GKP	Grenzplankostenrechnung (German marginal cost accounting system)
RCA	Resource-consumption accounting
TDABC	Time-driven activity-based costing
TDRCA	Time-driven resource-consumption accounting

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Compliance with ethical standards

Conflict of interest

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References

Al-Hibari AA and Al-Matari EM (2019). Role of time-driven resource-consumption accounting in strategic cost reduction and support of supply chain management. International Journal of Supply Chain Management, 8(2): 771-783.

Annamalai K, Naiju CD, Karthik S, and Prashanth MM (2013). Early cost estimate of product during design stage using design for manufacturing and assembly (DFMA) principles. Advanced Materials Research, 622: 540-544. https://doi.org/10.4028/www.scientific.net/AMR.622-623.540

Anselmi N, Rocca P, Feuchtinger S, Biscontini B, Barrera AM, and Massa A (2022). Optimal capacity-driven design of aperiodic clustered phased arrays for multi-user MIMO communication systems. IEEE Transactions on Antennas and Propagation, 70(7): 5491-5505. https://doi.org/10.1109/TAP.2022.3161550

Dekker HC (2003). Value chain analysis in interfirm relationships: A field study. Management Accounting Research, 14(1): 1-23. https://doi.org/10.1016/S1044-5005(02)00067-7

Harlalka A, Naiju CD, Janardhanan MN, and Nielsen I (2016). Redesign of an in-market food processor for manufacturing cost reduction using DFMA methodology. Production and Manufacturing Research, 4(1): 209-227. https://doi.org/10.1080/21693277.2016.1261052

Hervas-Oliver JL, Sempere-Ripoll F, and Boronat-Moll C (2014). Process innovation strategy in SMEs, organizational innovation and performance: A misleading debate? Small Business Economics, 43: 873-886. https://doi.org/10.1007/s11187-014-9567-3

Hoogendoorn JA (2023). A capacity-driven due date assignment and workload spreading approach in a make-to-order production environment. M.Sc. Thesis, University of Twente, Enschede, Netherlands.

Hutaibat KA (2011). Value chain for strategic management accounting in higher education. International Journal of Business and Management, 6(11): 206-218. https://doi.org/10.5539/ijbm.v6n11p206

Hutchinson R (2007). The impact of time-based accounting on manufacturing performance. Ph.D. Dissertation, University of Toledo, Toledo, USA.

Isanaka SP, Sparks TE, Liou FF, and Newkirk JW (2016). Design strategy for reducing manufacturing and assembly complexity of air-breathing proton exchange membrane fuel cells (PEMFC). Journal of Manufacturing Systems, 38: 165-171. https://doi.org/10.1016/j.jmsy.2015.10.004

Kaplan RS and Anderson SR (2007). Time-driven activity-based costing: A simpler and more powerful path to higher profits. Harvard Business Press, Boston, USA.

Oliveri G, Gottardi G, Anselmi N, and Massa A (2022). Capacity-driven low-interference fast beam synthesis for next generation base stations. IEEE Transactions on Antennas and Propagation, 70(6): 4472-4484. https://doi.org/10.1109/TAP.2022.3140512

Ozyapici H and Tanis VN (2016). Improving health care costing with resource consumption accounting. International Journal of Health Care Quality Assurance, 29(6): 646-663. https://doi.org/10.1108/IJHCQA-04-2015-0045 **PMid:27298062**

Pinheiro NMG, Ordoñez REC, Barbosa GLL, and Dedini FG (2018). Computational simulation applied in choosing the best solution in a product development using design for manufacturing and assembly approach. Brazilian Journal of Operations and Production Management, 15(4): 618-628. https://doi.org/10.14488/BJOPM.2018.v15.n4.a15

Senan NA and Al-Hibari AA (2020). Role of resource consumption accounting in supporting the practices of value-maximizing and cost-reduction in strategic thought: A theoretical study. Talent Development & Excellence, 12(1): 3731-3743.

Sharan AD, Schroeder GD, West ME, and Vaccaro AR (2015). Understanding a value chain in health care. Journal of Spinal Disorders and Techniques, 28(8): 291-293. https://doi.org/10.1097/BSD.0000000000000319 **PMid:26356585**

Shehab EM and Abdalla HS (2001). Manufacturing cost modelling for concurrent product development. Robotics and Computer-Integrated Manufacturing, 17(4): 341-353. https://doi.org/10.1016/S0736-5845(01)00009-6

Shivajee V, Singh RK, and Rastogi S (2019). Manufacturing conversion cost reduction using quality control tools and digitization of real-time data. Journal of Cleaner Production, 237: 117678. https://doi.org/10.1016/j.jclepro.2019.117678

Silvi R and Cuganesan S (2006). Investigating the management of knowledge for competitive advantage: A strategic cost management perspective. Journal of Intellectual Capital, 7(3): 309-323. https://doi.org/10.1108/14691930610681429

Subbaiah A and Antony KM (2021). Integration of DFMA and sustainability - A case study. International Journal of Sustainable Engineering, 14(3): 343-356. https://doi.org/10.1080/19397038.2020.1871443

Suresh P, Ramabalan S, and Natarajan U (2016). Integration of DFE and DFMA for the sustainable development of an automotive component. International Journal of Sustainable Engineering, 9(2): 107-118. https://doi.org/10.1080/19397038.2015.1096313

Wang Y, Zhuang Y, Hao Z, and Li J (2009). Study on the application of RCA in college education cost management. International Journal of Business and Management, 4(5): 84-88. https://doi.org/10.5539/ijbm.v4n5p84

White L (2009). Resource consumption accounting: Manager-focused management accounting. Journal of Corporate Accounting and Finance, 20(4): 63-77. https://doi.org/10.1002/jcaf.20501