


THE ROLE OF GREEN ACTIVITY-BASED COSTING IN ACHIEVING SUSTAINABILITY DEVELOPMENT: EVIDENCE FROM IRAQ

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ARTICLE INFO	ABSTRACT
<p>Article history:</p> <p>Received 31 January 2023</p> <p>Accepted 06 April 2023</p>	<p>Purpose: This study aimed to assess the effects of applying green activity-based costing (GABC) on the Sustainability Development of companies.</p> <p>Theoretical framework: The theoretical framework included highlight on environmental issues, and the role of Modern methods of Cost and managerial accounting in reducing the harmful effects of industrial waste.</p> <p>Design/methodology/approach: there are variety of reasons to carry out the study; including regulatory compliance, sustainable consumption, public perception, potential competitive advantages, and the impact of Sustainability Development on economic performance, stakeholders are urging or requiring organizations to be more ecologically conscious with regard to their products and operations. In order to accomplish the study's goals, it was implemented at the Basra Oil Refinery and based on actual data from the study sample's activity. method was relied upon distribution of costs based on green activity, the identification of its effects on the facility's Sustainability Development, and the creation of a model for the use of GABC.</p> <p>Findings: According to the results of the experimental study, the study's findings that GABC may be used to assign expenditures based on green activity and to show how it affects both economic and Sustainability Development.</p> <p>Research, Practical & Social implications: Because all manufacturing and consumption activities have some sort of negative impact on the environment during the creation, use, and disposal phases of their respective value chains, environmental management issues have recently been linked to the economy.</p> <p>Originality/value: The research value of our current study, by employ modern methods of commissioning accounting in Iraqi manufacturing companies.</p>
<p>Keywords:</p> <p>Green Activity-Based Cost; Sustainability Development; Activity Based Cost.</p> <div data-bbox="172 920 480 1160">  </div>	<p>Doi: https://doi.org/10.26668/businessreview/2023.v8i4.1276</p>

O PAPEL DO CUSTEIO VERDE BASEADO EM ATIVIDADES PARA ALCANÇAR O DESENVOLVIMENTO SUSTENTÁVEL: EVIDÊNCIAS DO IRAQUE

RESUMO

Objetivo: Este estudo teve como objetivo avaliar os efeitos da aplicação do custeio baseado em atividades verdes (GABC) no Desenvolvimento da Sustentabilidade das empresas.

Referencial teórico: O referencial teórico incluiu destaque sobre questões ambientais, e o papel dos métodos modernos de custos e contabilidade gerencial na redução dos efeitos nocivos dos resíduos industriais.

Desenho/metodologia/abordagem: existem várias razões para realizar o estudo; incluindo conformidade regulatória, consumo sustentável, percepção do público, potenciais vantagens competitivas e o impacto do

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Desenvolvimento da Sustentabilidade no desempenho econômico, as partes interessadas estão insistindo ou exigindo que as organizações sejam mais ecologicamente conscientes em relação a seus produtos e operações. Para atingir os objetivos do estudo, ele foi implementado na Refinaria de Petróleo de Basra e baseado em dados reais da atividade da amostra do estudo. O método contou com a distribuição de custos com base na atividade verde, a identificação de seus efeitos no Desenvolvimento Sustentável da instalação e a criação de um modelo para o uso do GABC.

Resultados: De acordo com os resultados do estudo experimental, os resultados do estudo mostram que o GABC pode ser usado para atribuir gastos com base na atividade verde e mostrar como isso afeta o desenvolvimento econômico e sustentável.

Pesquisa, implicações práticas e sociais: Como todas as atividades de fabricação e consumo têm algum tipo de impacto negativo no meio ambiente durante as fases de criação, uso e descarte de suas respectivas cadeias de valor, as questões de gestão ambiental foram recentemente vinculadas à economia.

Originalidade/valor: O valor de pesquisa de nosso estudo atual, por empregar métodos modernos de contabilidade de comissionamento em empresas manufatureiras iraquianas.

Palavras-chave: Custo Baseado em Atividades Verdes, Desenvolvimento Sustentável, Custo Baseado em Atividades (ABC).

EL PAPEL DEL COSTEO BASADO EN ACTIVIDADES ECOLÓGICAS PARA LOGRAR EL DESARROLLO SOSTENIBLE: EVIDENCIA DE IRAK

RESUMEN

Propósito: Este estudio tuvo como objetivo evaluar los efectos de la aplicación de costos basados en actividades verdes (GABC) en el Desarrollo de la Sostenibilidad de las empresas.

Metodología: hay variedad de razones para realizar el estudio; incluyendo el cumplimiento normativo, el consumo sostenible, la percepción pública, las posibles ventajas competitivas y el impacto del desarrollo sostenible en el rendimiento económico, las partes interesadas instan o requieren que las organizaciones sean más conscientes ecológicamente con respecto a sus productos y operaciones. Para lograr los objetivos del estudio, se implementó en la refinera de petróleo de Basora y se basó en datos reales de la actividad de la muestra del estudio. El método se basó en la distribución de costos basada en la actividad verde, la identificación de sus efectos en el Desarrollo Sostenible de la instalación y la creación de un modelo para el uso de GABC.

Conclusiones: De acuerdo con los resultados del estudio experimental, los hallazgos del estudio de que GABC se pueden usar para asignar gastos basados en actividades verdes y para mostrar cómo afecta tanto el desarrollo económico como el sustentable.

Implicaciones de la Investigación: debido a que todas las actividades de fabricación y consumo tienen algún tipo de impacto negativo en el medio ambiente durante las fases de creación, uso y eliminación de sus respectivas cadenas de valor, los problemas de gestión ambiental se han vinculado recientemente a la economía.

Palabras clave: Costo Basado en Actividades Verdes, Desarrollo Sostenible, Costo Basado en Actividades (ABC).

INTRODUCTION

The term "environmental performance" is used to describe how well a company, or its goods protect the environment from the negative impacts of things like resource depletion, waste production, and pollution (Flayyih et al., 2022). Now this dimension has changed to climate change issue all around the globe (Al-Mawali, 2021). Protecting environment against industrial pollution and waste materials, government and nonprofit organizations are making policies and laws to protect environment against such adverse effect of these issues on natural resources and society (Constantin et al., 2019). Today organizations are focusing on tools and techniques to deal with environmental issues along with financial visibility of the firm. In order

to be successful, organizations are now focusing both at financial and economic factors as well as social factors, such as environmental management and waste management (Mobarez, 2018). This success can be achieved by the best combination of leadership and systematic process at organization level. The environmental sustainability issue is getting famous in leaders in the organizations and in policymaking, thus leaders are now focusing on green activity-based costing, while still some of the corporate leaders are unaware of this issue (Mobarez, 2018). Environmental management issues have been connected to the economy in recent years due to the fact that all manufacturing and consumption activities have some sort of negative effect on the environment during the creation, use, and disposal phases of their respective value chains (Abass et al., 2022). Stakeholders are urging or requiring organizations to be more ecologically conscientious with respect to their products and operations for a variety of reasons, including compliance with regulations, sustainable consumption, public perception, and potential competitive benefits (Hsieh et al., 2020). Many facility owners and managers are looking into using aqueous degreasers and powder coatings as alternatives to traditional cleaning solvents and paints in an effort to cut down on harmful air emissions and manage the costs associated with treating contaminated effluent (Nikkeh et al., 2022). That is to say, initiatives are being taken to eliminate pollution during production by switching to greener processes (Ali et al., 2023). Yet, a barrier to GMS adoption is the absence of convincing reasoning for green manufacturing practices (Al-khoury et al., 2022). Recent studies have examined the material and immaterial gains made possible by activity-based costing (ABC) methods. Based on the findings of these analyses, it is clear that the identification of intangible benefits is an essential part of the Sustainability Development of cutting-edge manufacturing technology (Al-Mawali, 2021).

The adoption and implementation of green management strategies and environmental management in corporate policies has increased in recent years (Flayyih & Khiari, 2023). As businesses have expanded to a global scale, the economy has shifted from a conventional financial and economic system to a modern capacity-based economic system that has ties to green management and green economics (Raqeeb Omar, 2020).

Ecological awareness is gaining prominence in contemporary literature and permeates every aspect of the workplace and daily life. On a personal and professional level, the impact of the environment is so negative that it cannot be allowed unchecked. Either the living standard must alter, or the negative effects of this situation must be endured. The role of corporations in environmental issues is growing, and there is a need to address this issue from this platform.

Green activity-based costing is a credo that focuses on creating organisations that encourage green culture and comprehend environmental challenges (Thongrawd et al., 2019; Hussein et al., 2023). Consequently, the purpose of this study is to emphasise the impact of green activity-based costing on the performance evaluation of Iraqi manufacturing companies. To identify manufacturing companies in Iraq that use Green ABC shows higher Sustainability Development than those companies which do not use Green ABC? To examine Sustainability Development raise after Green ABC implementation.

In all sorts of businesses that manage daily transactions using operational and financial information systems, the goal of this study is to identify the practical issues that arise while implementing a Green ABC system. The technique that delves beyond operating profits and into the true economics of all dimensions of profitability and cost including customer service, is called GREEN ABC. Many of the crucial business problems that the manufacturing sector is currently dealing with can be resolved using the analysis offered by Green ABC (Yang, 2018).

More manufacturers attribute their implementation of advanced accounting management approaches to the rise or preservation of high production and Sustainability Development. The information obtained via the application of sophisticated accounting management techniques is utilized to influence business Sustainability Development based on the company's past and in comparison, to market performance (Rakeem Omar, 2020).

Green ABC is a useful solution that can be used to improve the flaws in earlier costing methods. It is a technique for creating a framework that, in the end, directs an organization's spending to the goods and services that need it. Because it offers a cross-functional, integrated perspective of the business, its operations, and its work processes, Green ABC can be used in this way. Green ABC has therefore advanced passed the stage of creating more precise and pertinent product, process, service, and activity prices in many organizations (Tsai, 2018a). Green ABC is used by many organizations because it improves Sustainability Development by controlling the activities that lead to costs. So the research questions are: Does manufacturing companies which use Green ABC shows higher Sustainability Development than those companies which do not use Green ABC? Does Sustainability Development raise after Green ABC implementation?

LITERATURE REVIEW

ACTIVITY BASED COST

In the 1980s, ABC was developed in the United States in response to the rising demand for a strategically oriented instrument for cost management to supplement the traditional ways

of managerial accountancy (Flayyih and Khiari 2022). What began as a method of calculation has evolved into a sophisticated strategy for running a business. A significant contribution to the codification of the concepts and dissemination of ABC was made by the American Consortium for Advanced Management (Zheng & Abu, 2019).

ABC is a "methodology that measures the cost and performance of activities, resources, and cost objects," as defined by CAM-I (2000). First, we allocate resources to activities, and then we allocate activities to cost objects. ABC understands how different actions affect costs. In this context, the term "cost objects" refers to any entity that the manager wants to measure costs for, such as a product, customer, division, department, product line, area, or a combination of these. The term "Activity Based Management," or ABM, is occasionally used independently of "Activity-Based Costing" (ABC) and refers to the practise of incorporating ABC data into corporate decision-making (Tsai et al., 2019).

Categorizing costs according to specific activities aims to represent as exactly as possible the connection between expenses and their cause, especially when that cause is not a rise in the volume of final outputs (Král et al., 2010). Conventional cost centres' expenses oversimplify the internal processes and procedures that result in such costs. Therefore, ABC deconstructs these processes (and the resources put into them) into activities, with the costs associated with completing these activities clearly marked (Al-tae & Flayyih, 2022; Saeed et al., 2022). Activities' costs are subsequently allocated to their respective outcomes (cost objects). Another key distinction between the ABC calculation model and more conventional approaches is the emphasis placed on the interdependence of processes and activities rather than on separate functional silos within an organization (Jalalabadi et al., 2018).

GREEN ABC

Green costs should be recognised, allocated, and measured in accounting. The accounting system is the key source of information regarding green costs. In the standard accounting system, however, it is linked with other cost initiatives rather than independently verified and measured (Tsai & Lai, 2018). In contrast to other nations, where environmental expenditures are often accounted for as "manufacturing costs," they are typically accounted for as "management fees" and other initiatives in the United States, rather than being independently recognized and assessed (Hsieh et al., 2020). In the past, environmental awareness was not taken seriously, and there were no internal or external transparency requirements for environmental costs (Al Mashkoo, 2022). In this circumstance, it makes sense for

environmental expenses to be allocated to other costs. However, as a result of social and economic development and deteriorating environmental conditions, such accounting practices cannot meet the requirements of current environmental management, revealing various flaws: First, the inability to provide timely and comprehensive information on environmental costs to meet the needs of environmental management decision-making due to the absence of individually displayed environmental costs. The second alternative simply incorporates the green cost into production expenses, severing the important links between environmental actions and the related costs; nevertheless, we still cannot determine whether the green cost is suitable (Phan et al., 2018).

One of the goals of green accounting is to improve the financial and environmental efficiency of a firm, and the other is to assess the organization's impact on the environmental system. Green accounting must be incorporated into the management system of the firm in order to improve its environmental and economic performance. Due to the stakeholders' lack of information regarding the additional cost expenditures and implementation effects, it is still difficult to execute this style of accounting in a number of countries (Mobarez, 2018).

MATERIAL AND METHODOLOGY

This quantitative study explores the effect of green activity-based cost (Green ABC) on environmental performance evaluation of manufacturing companies.

One of the biggest refineries in Iraq, the General Company for South Refineries/Basra Refinery is situated in the province of Basra in the south of the country. Producing of liquid gas, fuel, and gasoline at the moment. The process of applying GABC as bellow:

First Step.

Defining the production activities. The four processes that make up the production process shall be regarded as its activities, and they are as follows:

1. Separation process uses crude oil as an input and produces naphtha, light naphtha, heavy naphtha, and liquid gas as outputs.
2. Cracking activity: the first stage's liquid gas and heavy naphtha are its inputs, and the second stage's hydrogen and liquid gas are its outputs.
3. Treatment activity: Its inputs are liquid gas (the second stage's output) and liquid gas first stage's output).

4. Blending activity: its inputs come from a mixture of naphtha and light naphtha (the first stage's outputs), hydrogen (the second stage's outputs), and imported high-octane gasoline, while the stage's final output is gasoline.

It should be emphasized that although the third and fourth stages are contemporaneous rather than sequential, they are nevertheless handled as two phases for application purposes.

Second Step

The second step is identifying the cost pools and drivers. Indirect labor, machines, and indirect materials cost pools have been recognized as the three indirect cost pools. The working hours for the indirect wages cost pool, the operating hours of the machines for the machines cost pool, and the cubic meter of product for the indirect materials cost pool served as the cost drivers.

RESULTS AND DISCUSSION

Table (1) Identifying cost pools and cost drivers

Allocating base	Variable cost	Fixed cost	Total cost	Cost pool
Working Hours	40,569,198	23,665,366	64,234,564	Indirect wages
Machines Work hours	10,267,155	8,865,466	19,132,621	Machines
M ³	1,412,161	0	1,412,161	Indirect materials

Source: Prepared by researchers (2022) based on company data.

Third Step

Calculating the theoretical capacity (TC) and the practical capacity (PC) of the cost complexes: Here, the practical energy of each cost pool is chosen to be used in dividing the green costs for each activity, which aids in finding out the fixed to variable cost ratio.

Theoretical and practical capacity of the wage pool (WTCP) & (WPCP)

the refinery works 24 hours a day for three shifts, the total number of employees is 950 workers divided into the three shifts, and for the purposes of calculation, all workers were considered one shift for eight hours:

$$WTCP = \text{number of employees} \times \text{working hours} \times 365 \text{ days}$$

$$\text{Working Hours Wage } 2,744,000 \text{ } 365 = 950 \times 8 \times$$

$$WPCP = (\text{number of employees} \times \text{daily working hours}) \times (\text{365 days} - \text{days off})$$

$$(950 \times 8) \times (365 - 60)$$

$$W/\text{working Hours } 2,318,000$$

Theoretical and practical capacity of the pool of machines (MTCP) (MPCP)

It was assumed that the machines operate 24 hours without stopping, knowing that the downtime during the period amounted to 60 days (according to the records of the liquidator).

$$MTCP = \text{the number of working hours of the machines} \times \text{working days of the period}$$

$$24 \text{ h} \times 365 \text{ days} = 8760 \text{ Machine/ hour}$$

$$MPCP = \text{the amount of daily production} \times \text{the standard time of production of the barrel} \times \text{the number of working days}$$

$$40843 \times (0.617 / 3600 \text{ second})$$

$$2135 \text{ machine / hour } 2135 =$$

Theoretical and practical capacity of the indirect materials pool (IMTCP) (IMPCCP)

The practical Capacity is represented by the required amount of inputs needed to produce a cubic meter of auxiliary raw materials, amounting to 3,199,069 . Calculating the percentage of fixed costs for theoretical Capacity, and the percentage of variable costs for practical Capacity, as follows:

$$\text{Fixed cost ratio for wages} = \text{fixed cost of wages} / \text{theoretical wages Capacity}$$

$$23,665,366 / 2,744,000 = \$9$$

$$\text{Wages variable Capacity ratio} = \text{variable wage cost} / \text{practical Capacity of machines}$$

$$40,569,198 / 2,318,000 = \$18$$

The same applies to indirect machines and materials, as shown in Table (2) below:

Table (2) : theoretical and practical capacity and ratios of costs pools

Cost pools	Theoretical Capacity	Practical Capacity	Fixed cost ratio	Variables cost ratio
Indirect wages	2,744,000	2,318,000	\$9	\$18
Machines	8,760	2,135	\$1,012	\$4,809
Indirect aterials	0	3,199,069	0	\$0,5

Source: Prepared by researchers (2022) based on company data.

Fourth Step

Determining the consumption for each activity of the cost pools capacity: Here, the standard need for each activity of the indirect costs pool will be determined and considered as green costs (adding value) and compared with the actual costs charged to extract non-adding value costs and considering them as non-green costs (waste in the use of resources).

Separation activity consumption from Cost pools

A. Separation activity consumption from the wage cost pool = (Wages practical capacity / gross number of workers) × activity workers number

$$(2,318,000 / 950) \times 492 = 1,200,480 \text{ wage/hour}$$

B. Separation activity consumption from Machines cost pool = (Machines practical capacity / Machines gross working hours) × Activity working hours

$$(2,135 / 24) \times 8 = 712 \text{ Machine/hour}$$

C. Separation activity consumption from indirect Materials = Indirect materials used in Activity

$$= 1,400,000 \text{ m}^2$$

At the same manner above, considering the practical capacity of each activity, the consumption for each activity from the cost pools, shown in table (3) below.

Table (3): the amount of consumption for each activity of the cost pools capacity

Cost pools	Separation	Cracking	Treatment	Blinding	Quality control	Total
Wages	1,200,480	341,600	112,240	51,240	612,440	2,318,000
Machines	712	623	445	356	0	2135
Indirect materials	1,400,000	1,230,000	293,000	270,000	0	3,193,000

Source: Prepared by researchers (2022) based on company data.

Fifth step

Distributing the costs of the cost pools over the activities: Here, the costs of the cost pools are distributed over the activities based on Table (1) and (2) above, as follows:

Separation Activity

Distributing pools costs to activities (separation / wages) = (Activity working hours × Activity fixed cost ratio) + (Activity wages/hour × variable cost ratio)

$$(1,200,480 \times 8.5) + (1,200,480 \times 17.5)$$

$$= \$31,249,695$$

Distributing pools costs to activities (separation /machines) = (machine working hours × Activity fixed costs ratio) + (Activity working hours × Activity Variables cost ratio.

$$(712 \times 1,012) + (712 \times 4,809)$$

$$= \$4,144,552$$

Distributing pools costs to activities (separation /indirect materials) = (indirect materials × Indirect materials fixed cost ratio) + (indirect materials × Indirect materials variable cost ratio)

$$(1,400,000 \times 0) + (1,400,000 \times 0.5)$$

$$= \$700,000$$

And so on for the other activities (cracking, treatment, mixing). Table (4) below shows the distribution of the pools cost over the activities

Table (4): Distribution the costs of cost pools to activities

Cost pools	Separation	Cracking	Treatment	Blinding	Quality control	Total
Wages (W/H)	31,252,782	8,893,068	2,922,008	1,333,960	15,944,000	60,345,819
Machines (H/m)	4,144,560	3,626,490	2,590,350	2,072,280	0	12,433,680
Indirect materials (KG)	617,000	542,079	129,129	118,993	0	1,407,201
Total	36,014,342	13,061,637	5,641,487	3,525,233	15,944,000	74,186,700

Source: Prepared by researchers (2022) based on company data.

Sixth step: Distributions the costs of activities to the products

At this stage, the activity costs are distributed to the products (outputs) through several steps as follows:

1. Determining the cost drivers for the activities and use them as a basis for allocation:

For the activities of separation, cracking, treatment, mixing, the cost driver is the quantity of outputs. Whereas the time is the cost driver of quality control activity.

2. Allocation costs of activities to products

Here, the costs of the activities extracted in Table (4) are charged based on the activity cost drivers.

Table (5) determine the allocation ratio

Activity	Activity cost (Company records)	Sum of activity cost drivers (unit)	Allocation ratio
Separating	36,469,129	10,168,655	4
Cracking	14,223,261	24,415	583
treatment	6,612,834	169,998	39
Blinding	4,343,867	1,884,297	2
Quality C	15,284,158	35,700	428

Source: Prepared by researchers (2022) based on company data.

$$\text{Quality control/ Kerosene} = 599,379 \times 3,800 = 2,277,639,176$$

And the same calculating for other outputs of quality control activity.

Table (6) Allocation costs of activities to products:

Activity	Separation	Cracking	Treatment	Blinding	Quality control
Allocation ratio×	5,021				599,379
Process 1 output Quantity	kerosene	815,660	54460	4913	1,626,885
	Gas oil				1,698,269
	Fuel				1,840,949
	jet fuel				1,712,511
	Liquid gas				0
	Heavy naphtha				0
	light naphtha				0
	Naphtha mixture				0
Process 2 output quantity		14,224,528			5,137,532
Process 3 output quantity			6,612,922		3,296,583
Process 3 output quantity				6,612,537	--

Source: Prepared by researchers (2022) based on company data.

Seventh Step. Determining the green Activity cost

The green activities costs are the actual consumed costs needed by the activity. As for the costs of non-green activities, they are the costs that were carried on the activity without the need for them, and they can be considered waste costs. The table (7) below includes the costs of green and non-green activities

Table (7) Green activity costs

Cost pool	Cost of Cost pool	Green Cost	non-green Cost
Indirect wages	\$64,234,564	\$60,345,819	\$3,888,746
Machines	\$19,132,621	\$12,433,680	\$6,698,941
Indirect materials	\$1,412,161	\$1,407,201	\$4,960
Total	\$84,779,346	\$74,186,700	\$10,592,646

Source: Prepared by researchers (2022) based on company data.

CONCLUSION

The foregoing makes clear that using green activity-based costs assists in allocating indirect costs by identifying the costs of green and non-green activities, which is done by calculating and separating waste costs in materials, wages, and indirect industrial costs, which constitutes a waste of resources in light of the scarcity of resources, and which has a negative impact on the environment. According to Table (8)'s findings, the percentage of non-green costs was \$4,960 of the total indirect materials costs, or 0.35% of the total indirect materials. It was \$6,698,941 of the total machinery costs, or 35% of the total machinery costs, and \$3,888,746 of the total indirect wage costs, or 6.5% of the total wages. The total of non-green costs amounted to \$10,592,646, which represents 12.49% of the total indirect costs. If the management can prevent these disparities, costs will be reduced on the one hand and earnings will rise on the other.

The limitations of the study are the nature of the inflexible traditional accounting system in force in Iraq. This study is complementary to our previous study entitled " THE IMPACT OF GREEN ACTIVITY-BASED COSTING AND GREEN SUPPLY CHAIN PRACTICES ON ENVIRONMENTAL PERFORMANCE OIL REFINERIES IN IRAQ ". published in the journal " Journal of Economics and Finance Studies ". The suggestions for future work include the use of value chain methods, as well as modern methods of cost distribution and their impact on sustainable development.

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