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The Role of Time Driven Activity Based Costing in Reducing the Costs of the Logistic Services at the Entrepreneurial Companies: Case Study of ZR Express Office in Khenchela

دور أسلوب التكلفة على أساس النشاط الموجه بالوقت (TD-ABC) في تخفيض تكاليف الخدمات اللوجستية في المؤسسات الريادية: دراسة حالة مكتب ZR Express –خنشلة–

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Abstract:

This study sheds light on the role of time driven activity-based costing TD-ABC system in reducing service costs at the ZR Express office. It analyses operations, identifies cost factors, and eliminates non-value-added activities. Findings show that TD-ABC reduces 23.83 DZD of the costs of dealing with one mail, marking a decrease of 13.46%, Considering operational reality and improving office operational processes. Moreover, TD-ABC helps identify the unnecessary activities and the unused capacities and take informed decisions based on the estimated budgets. Thus, this method helps ZR Express improve its financial and logistic performance, reduce costs, and increase the competitive advantage.

Key words: Time driven activity-based costing; cost reduction; logistic services, entrepreneurial companies.

JEL classification codes: *M41, D24, R40, M21*

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1. Introduction:

Costs accounting is a cornerstone in modern companies, as it helps manage resources and achieve operational efficiency, and provides accurate financial and accounting information on the overall costs and on their items to take better decisions, mainly in logistic companies known for their multiple and overlapping activities, and where time is a decisive factor. However, the full reliance on the traditional methods for cost accounting proved inefficiency to cope with the rapid developments in business, particularly that the logistic operations are complicated, and showed inability to provide accurate information on real costs, in the light of theincrease and diversity of the indirect costs.

In this context, businesses felt the need for a more flexible and accurate method, namely, activity-based costing ABC, which provides reliable information on the indirect costs. Such method marked a giant leap in cost accounting and proved efficiency in providing valuable financial information by linking resource consumption to the generating activities. Nonetheless, the method was criticised, mainly in logistics, for its inability to deal with the complicated operations and interconnected activities. Thus, Kaplan & Anderson introduced the time driven activity-based costing TD-ABC to allow for a more accurate measurement of costs and a better time management. It is a suitable method for the logistic offices and helps reduce costs in the entrepreneurial companies, such as ZR Express.

The research' problem:

Based on what was said, we raise the following problematic, "**to what extent does TD-ABC reduce the costs of logistic services in ZR Express office?"**

To answer this question, we, first, have to deal with these sub-questions:

- To what extent is the information provided by TD-ABC on the costs of each logistic activity accurate?
- How is TD-ABC used in pricing mail treatment in ZR Express?
- DoesTD-ABC reduce costs without effect on quality?

Hypotheses:

The study is based on two main hypotheses:

- TD-ABC improves pricing mails and reflects the real cost of each service.

- TD-ABC has a positive relation with the reduction of costs of mail treatment without effect on the logistic service.

The objectives of research:

This study aims at:

- Introducing TD-ABC, as it is one of the modern efficient methods in cost accounting.
- Analysing the structure and identifying the main items of the logistic costs adopted by ZR Express.
- Showing the role of TD-ABC in reducing the costs of mail treatment in ZR Express.

Importance of the Study:

This study shows the role of modern methods of cost accounting, mainly TD-ABC, in reducing costs in companies. In this regard, TD-ABC improves measurement and the allocation of the logistic costs inside companies, fosters taking informed administrative decisions, helps detect and exclude activities with no value added, improves the efficiency of the logistic performance, rationalizes costs, and enhances pricing.

Methodology:

We adopted the analytical descriptive method to show the role ofTD-ABC in reducing the logistic costs, describe the study variable, and show the relations between the variables. As for the practical chapter, we used the case study and took ZR Express as a focal point to evaluate the role of TD-ABC in reducing the logistic costs.

The Study Variables:

The Independent Variable: TD-ABC.

The Dependent Variable: Cost Reduction.

The Study Structure:

We divided the study into two axes; the first is theoretical and the second is practical and tackles the adoption of TD-ABC in ZR Express office in Khenchela.

previous studies:

The study of Soudani Zakaria & Toumi Ibrahim (2023): It is titled "the contribution of TD-ABC to internal controls on costs". It is a practical study at "Amira Diary" that reported that TD-ABC

made key difference in the control on costs, in the accuracy of measurement and allocation of indirect burdens, and in the identification of unused capacities; these points help managers take better decisions.

The Study of Sihem Ledghal Chikhouk (2020): It is titled "the role of TD-ABC in improving the company competitiveness" and was conducted at al Basma Center for Dentistry. It found out that TD-ABC helps reduce costs by identifying the unused productive capacity and by excluding its costs. Besides, TD-ABC helps in the better management of time by obliging the productive machine to increase the actual production. Thus, the method helps restructure the activity to take advantage of the unused capacities in other activities and boost the company competitiveness.

The Study of Mohamed Abdellah Abou Rahma & Khaled Youcef Imad (2019): It is titled "the effect of TD-ABC on the quality of the administrative decisions". It was conducted at the Faculty of Sciences and Technology and found out that TD-ABC provides many opportunities to design a cost system in the complicated and multi-activities environments, such as the logistic facilities and the service providing companies.

The Study of Risl Istabraq Hadi & Sabiha Berzane Farhoud (2018): It is titled "the role of TD-ABC in reducing the cost of one unit". It was conducted at the General Company for Hydrolic Industries that produces plastic and reported that the traditional method used in the company does not provide immediate information for taking decisions that reduce the cost of one unit, unlike TD-ABC.

2. The Theoretical Framework:

2.1 The Concept of TD-ABC:

Definition 01: It is a method that relies on the number of time units needed for an activity and the cost of one-time unit in order to identify the final cost of products and services (Ibrahim, 2013, p. 904).

Definition 02: It is based on time for measuring the cost of the resources used in the production processes by formulating special linear equations to measure the time taken in activities and in the relevant events and tasks (Serhane, 2024, p. 229).

These definitions show that TD-ABC is a modern cost accounting method that relies on measuring time needed for an activity to accurately identify the cost of products and services, rationalize the use of costs, improve time management, and exclude of any activity with no value added. TD-ABC remedies the deficits of ABC.

2.2 The Importance ofTD-ABC:

TD-ABC has many advantages for companies (Zebine, 2023, p. 296):

- It provides suitable accurate and detailed information that helps managers take good decisions.
- It relies on time and the cost of one unit of the economic unit activities. Thus, it remedies the weaknesses and deficits of ABC.
- It accurately measures the cost of used and unused capacities in the economic units to allow for the optimal allocation and distribution of indirect costs on activities to take suitable decisions.

2.3 The Steps of Applying TD-ABC:

TD-ABC requires (al Moussaoui, 2023, pp. 538-539):

- Identifying the sets of resources and activities that consume costs.
- Identifying the overall cost of each set.
- Estimating the work capacity of each group: identifying the available work hours (work capacity) of each set of resources. The available work hours are between 80 and 85% of the theoretical capacity; the work capacity is 80% of the theoretical capacity while the rest marks the capacity unused for different reasons, such as the sudden electricity cut out, maintenance, repair etc.
- Calculating the cost in the time unit: calculating the cost of one unit of each set by dividing the overall cost of resources (estimated in step 02) by the available work hours (estimated in step 03).
- Identifying the time units needed for each activity: calculating time needed for each event of the activity based on time causes using time equations.

Tjk = bibi +..... + b3 X3 t b2 x2 + b1x1 + Bo

Where:

Tjk: the time needed for the event k of the activity j.

B0: the record time for making the activity j.

B1: the time estimated by the economic unit for the one unit of time cause x1.

- Calculating the cost of each transaction: calculating the overall cost by multiplying the cost of the unit (estimated in step 04) by the time needed (estimated in step 05).

2.4 The Advantages of TD-ABC for Businesses and its Response to the Change in the Contemporary Businesses for Harmony:

TD-ABC is marked with the following points (Saleh, 2021, p. 07):

- It is more efficient, as we find good integration with the data provided by other systems, such as customer management, resources management, etc.
- The transactions or orders cost causes are based on given orders with given specifications.
- It is updatable monthly to take advantage of the modern employment economies.
- It provides a clear vision of the efficiency of processes and use of capacity.
- It helps predict the needed resources and complexity of operations to allow for making the productive capacity budget.
- It is easy to unify the cost models in all the unit departments thanks to databases and other applications.
- The system repair is less costly than ABC repair.
- It provides information that helps users recognize the causes of problems and obstacles to be considered in calculating the productive capacity costs and assessing the required productive capacity.
- It can be used in any industry or economic unit, even if there is complexity in dealing with customers, products, production chains, distribution, etc.

2.5 TD-ABC Criticism:

The criticism of TD-ABC can be summed up as follows (Mohamed, 2023, pp. 414-415):

- The need for detailed information at the first application of TD-ABC is a special problem when ERP system is not available in the company. Therefore, it is necessary to record many detailed information when applying TD-ABC for the first time. The foundation is costly and consumes time, requiring classification of activities, estimation of needed time, and identification of time cost engines, including days and weeks; this depends on the complexity in the economic unit.
- TD-ABC collects resources that can be, and those that cannot be, directed by time in one set. The diversity of resources may cause inaccurate identification of costs, mainly if the non-time-driven resources are many.
- TD-ABC treats all the operational costs as variables and neglects the constant nature of the allocated expenditures and the need to distribute the costs on the available time.
- TD-ABC time estimation is based on personal judgments.

2.6 TD-ABC and its Importance in Pricing and Cost Reduction:

TD-ABC reduces costs because (Serhane, 2024, p. 231):

- It can detect and identify the unused capacity, exclude their costs, and redirect the costs for the good of the company.
- TD-ABC use of time equations helps predict the time needed for activities, identify the activities that consume time, handle ABC deficits, and take decisions that reduce time of the activities to reduce the products costs.
- TD-ABC provides companies with accurate information on costs to improve competitiveness.

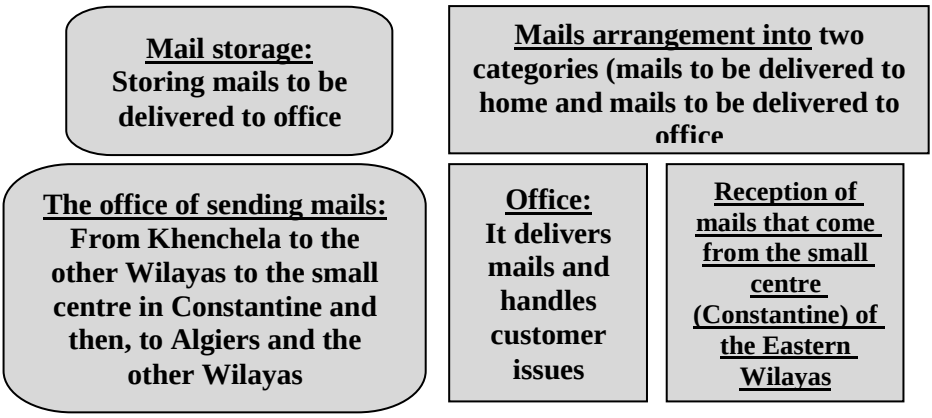
TD-ABC allows for the optimal use of the available resources by linking the costs with the consuming activities. This helps rationalize resources, improve performance of activities, reduce frequency of execution, and make more activities with the least possible resources.

3. The Practical Chapter:

3.1 Introduction to ZR Express Office in Khenchela:

It is located in Khenchela, Algeria, and is one of the entrepreneurial businesses. It is made up of 05 departments with different tasks, including mails reception, arrangement, identifying mails to be delivered to home and those to be delivered to the office, storing mails temporarily, receiving cancelled mails, coordinating transportation processes, and ensuring delivery in due time. The

office has adopted TD-ABC as a modern tool for cost accounting to organize and treat mails and manage the logistic costs; therefore, it is a good model for the practical study.



3.2Statement of the Direct Costs of Mails Delivery in November 2025:

Table 01. Statement of the Direct Costs of Mails Delivery in November 2025 (Unit: 1DZD)

Costs	Amount
Wages of delivery men	1840.000
Wages of office men	450.000
Monthly cost of petrol	75.000
Transportation means repair	12.000
Packaging materials	169.000
Communication costs	22.000
Reimbursement of lost mails	18,000
Total	2.568.000

Source: by the authors based on the information provided by the executive of ZR Express Office in Khenchela

The table shows that the wages of delivery men make 71.6% of the overall costs, as the office employs 23 workers (inside and outside the Wilaya). It is a high rate because it is directly linked to the delivery process. Besides, 17.5% of the total costs goes to the office workers (estimated at 10 workers) while 6.6% is devoted for packaging, which is a direct cost for all office mails to protect them during transportation. In addition, petrol and repair make 2.9% and 0.5% of the costs, marking necessary operational costs for the continuity of delivery. Finally, the communication costs make 0.9% to allow for the good coordination between the office and customers.

In short, the workers of ZR Express are the main engine of costs while the other operational costs make the needed support for mail delivery.

3.3 Statement of the Indirect Costs of Mails Delivery in November 2025

Table 02. Statement of the Indirect Costs of Mails Delivery in November 2025 (Unit: 1DZD)

Costs	Amount
Management and administration wages	200.000
Office rent	80.000
Digital systems	45,000
Insurance	55.000
Gas and electricity	35,000
General costs (stationary)	21,000
Depreciation	16,000
Discipline grants	90,000
Total	542,000

Source: by the authors based on the information provided by the executive of ZR Express Office in Khenchela

3.4 Identification of the Indirect Costs with ABC:

a. Identification of Activities and their Costs:

After identifying the indirect costs in table 02, we distribute the resources on the activities of the company as follows:

Table 03. The activities that cause the cost of delivery in November 2025 (Unit 01 DZD)

Costs	Main activities					
	Amount	Loading	Transportation	Arrangement (home and office)	Storage	Delivery
Management and administration wages	200.000	30,000	20,000	40,000	30,000	80,000
Office rent	80.000	_ _ _	_ _ _	20,000	40,000	20,000
Digital systems	45,000	5,000	5,000	10,000	5,000	20,000
Insurance	55.000	_ _ _	15,000	_ _ _	_ _ _	40,000
Gas and electricity	35,000	_ _ _	_ _ _	27,000	8,000	_ _ _
General costs (stationary)	21,000	3,000	_ _ _	5,000	3,000	10,000
Depreciatio	16,00	2,000	3,000	3,000	2,000	6,000

n	0					
Discipline grants	90,000	10,000	10,000	20,000	10,000	40,000
Total	542,000	50,000	53,000	125,000	98,000	216,000

Source: by the authors based on the information provided by the executive of ZR Express Office in Khenchela

The table shows that most of the indirect costs (40%) come from delivery service while 23% come from mails arrangement. In addition, 18% of the costs are caused by storage, 09% by loading, and 10% by transportation. This shows that the administrative resources are more consuming than the preparatory and support activities.

b. Calculating the loading rate of activities and the indirect costs of each activity:

Loading rate= the indirect costs of activities/ the number of causes

The number of actual days of November= the number of days- days off.

= 30 – 4 = 26

The number of mails in ZR Express is estimated at 650 to 700 mails per day.

Table 04. The loading rate of activities and the indirect costs of each activity (Unit 01 DZD):

Activity	Amount	Cost cause	Number of causes	Loading rate	Overall amount
Loading	50,000	Number of mails	17.550	2,85	50.018
Transportation	53,000	Number of Km and petrol	4.500	11,7	52.650
Arrangement	125,000	Number of arranged mails and time consumed	17.550	7,12	124.956
Storage	98,000	Number of mails X storage days	2.025	48,40	98.010
Delivery	216,000	Number of delivered mails	17.550	12,31	216.041
Total	542,000		_ _ _	_ _ _	541.675

Source: by the authors based on the information provided by the executive of ZR Express Office in Khenchela

The table shows that the highest loading rate was in storage with a value of 47.80 DZD per cause because of the small surface and big number of mails. On the other hand, the lowest loading rate was in delivery with a rate of 12.31 DZD per mail. Thus, the storage activity takes the biggest amount despite its small added value compared to the other activities. Therefore, it is necessary to review the work method to improve the management efficiency and reduce the unnecessary costs.

c. Calculating the Unit Cost Rate of Treating One Mail Using ABC:

The unit cost rate of treating one mail= direct costs+ indirect costs/ number of mails

The unit cost rate of delivering one mail= the direct costs+ the indirect costs+ the cost of unused capacities+ the risk costs (loss, return, delay, damage)+ the costs of management and control+ the margin of operational inefficiency.

Table 05. The unit cost rate of one mail using ABC (Unit: 01 DZD

Statement	Amount
Direct costs	2.568.000
Indirect costs	541.675
Unit cost rate	3109657
Number of mails	17550
Unit cost rate of treating one mail (inside)	177

Source: by the authors based on the information provided by the executive of ZR Express Office in Khenchela

The table shows that the unit cost rate of treating one mail using ABC is around 177 DZD, reflecting the actual cost of the logistic service provided by Zr Express.

N.B: In addition to the management costs, the operational risks, the unused capacities, and the inefficiency margins, the cost of delivering one mail logically increases to about 1200 DZD, what shows the limitation of ABC in providing a cost that actually serves the company.

3.5 Identifying the Indirect Cost with TD-ABC:

TD-ABC matches all activities with the time factor that is decisive for identifying the activities costs. Table 06 shows the time taken in the activities and the available capacity in Zr Express in November 2025.

Table 06. The available capacity and the overall time consumed.

Activities	Type of workers	Number of workers	Practical capacity by minute (per worker)	Overall capacity
Loading	Logistic	5	9360	46800
Transportation	Logistic	5	9360	46800
Arrangement	Office	6	11200	67200
Storage	Office	4	11200	44800
Delivery	Logistic	13	9360	121680
Total		33	50480	327280

Source: by the authors based on the information provided by the executive of ZR Express Office in Khenchela

N.B: The number of workers in Zr Express in Khenchela is 33, who are divided into 10 office workers specialized in delivering mails to the office customers, receiving mails from customers to send them, returning or changing mails upon customer request, and arranging them in the small storage zone. In addition, 23 other workers are specialized in loading, transporting, and delivering mails.

- **Remark about the calculation:**

Calculation of the practical capacity:

- **The office workers:**

8 hours daily= 480 min
Number of working days= 26

Theoretical frame= 480 X 26= 12480 min
We deduct (breaks, organization, waiting, and indirect works) = about 10%
Thus, the practical capacity of the office worker = 11.200 minute / month

- **The logistic workers (by time)**

The activity goes on for 24 hours, but:

- Workers work in shifts.
- Some are short-distance drivers and others are long-distance.

- Temporal non-commitment (difference of the time of the end of the shift for each worker)

Practically, we do not use 24 hours for each worker.
The average actual use = 8 hours/ day
26 days X 480 min= 12.480 min.
We deduct (traffic, customer waiting, arrests, temporal gaps) ≈25%.
Thus, the practical capacity of the road worker = 9.360 min/ month.
The following table shows the time taken for each activity per minute during November 2025.

Table 07. The time consumed during November 2025

Activities	Consumed time by h/ day	Overall time by min/ month
Loading	2 h	3.120
Transportation	2.5 h	3.900
Arrangement	1.5 h	2.340
Storage	Only unreceived mails (02 days/maximum)	31.680
Delivery	3 h (near regions) + 5 days for far regions such as the far desert	7.080
Total	---	17000

Source: by the authors based on the information provided by the executive of ZR Express Office in Khenchela

- **Explaining the calculation method:**
  - **Calculating the overall time by min per activity:**
    - **Loading:**

2 hours X 26 days X 60 min= 3120 min.

- **Transportation:**

2.5 h X 26 days X 60 min= 3900 min

- **Arrangement:**

1.5 h X 26 days X 60 min= 2340 min

- **Storage:**

The number of daily mails that remain in the storehouse: 5% of 650 mails ≈ 33 mails daily.
The period of storage per mail= 2 days X 8 h/ day= 16 h= 960 min
Month= almost 26 working days. We multiply the number of mails X 960 min
However, because the mails change daily, we take the monthly average storage practical capacity:
The overall storage minutes= 33 mails daily X 960 min X 26= 31680.

- **Delivery**:

Ordinary mails: 3 h X 26 days X 60 = 4.680 min.
The far mails: whole day per worker (8 hours X 60= 480 min X number of devoted days).
For example, we take 05 days as maximum for the South: 5 X 480= 2400 min.
The overall for delivery= 4680+ 2400= 7080

Table 08. the loading rate for the activities cost by TD-ABC during November 2025 (Unit: 01 DZD/ min)

Activities	The indirect costs per minute	The practical capacity	The cost rate/min= the costs÷ time
Loading	50,000	46800	1,06
Transportation	53,000	46800	1,13
Arrangement	125,000	67200	1,86
Storage	98,000	44800	2,18
Delivery	216,000	121680	1,77
Total	542000	327280	8

Source: by the authors based on the information provided by the executive of ZR Express Office in Khenchela, and tables 07, 06, and 03.

After calculating the rate of service cost per hour for each activity, we calculate the indirect costs of each activity using TD-ABC, as shown in table 09:

Table 09. The indirect costs for the activities with TD-ABC during November 2025 (Unit: 01 DZD)

Activities	The indirect costs per minute	The practical capacity	The cost rate
Loading	3.120	1,06	3307.2
Transportation	3.900	1,13	3901.13
Arrangement	2.340	1,86	43524.
Storage	31.680	2,18	69062.4
Delivery	7.080	1,77	12531.6
Total	17000	802	12073. 154

Source: by the authors based on tables 07and 08.

The table shows the actual indirect costs for treating mails in each activity separately according to the time needed to show the higher administration the used and unused capacities. Table 10 shows the unit cost rate of treating one mail using TD-ABC.

Table 10. The unit cost rate of treating one mail using TD-ABC during November 2025 (Unit: 01 DZD)

Statement	Amounts
Direct costs	2.568.000
Indirect costs	73. 154 120

Unit cost rate	2688154,73
Average number of mails	17550
Unit cost rate of treating one mail	153,17

Source: by the authors based on tables 01and 09.

The table shows that with TD-ABC, the cost of treating one mail is 153.17 DZD, marking a decrease of 23.83 DZD (13.46%) than ABC that gave a value of 177 DZD. In this regard, TD-ABC matches costs with the actual consumed time in activities and excludes the unconsumed time, making it more realistic and suitable for the activity of delivery compared to ABC that exaggerates loading the indirect costs.

Table 11. Comparing the results of ABC and TD-ABC:

Method	Nature of cost	Unit cost rate of treating one mail	Unit cost rate of delivering one mail
ABC	Comprehensive accounting	177	Almost 1200 DZD
TD-ABC	Operational based on the consumed time	153.17	Between 500 DZD and 900 DZD

Source: by the authors based on the previous tables.

The table shows that TD-ABC differs than ABC in the fact that TD-ABC reduces the treatment and delivery costs more than ABC does.

4. conclusion:

In conclusion, this study confirmed that adopting the Time-Directed Activity-Based Costing (TD-ABC) method significantly and effectively contributes to improving the pricing of parcel handling services. This is due to its high accuracy in determining the true cost of each service, thus establishing a positive relationship between implementing this method and achieving a reduction in parcel handling costs without compromising the quality of the logistics service.

Findings:

Upon our practical study, our findings show that:

- We confirm hypothesis one that states that TD-ABC improves the efficiency of pricing the mails treatment, reflecting the actual cost of each service.

- TD-ABC helps reduce the cost of treating one mail with a difference of 23.83 DZD than ABC; thus, it increases the office profits.
- TD-ABC helps identify the unnecessary elements and the unused capacities, unlike ABC.
- TD-ABC helps in decision making and in estimating and predicting budgets.
- TD-ABC is the most suitable for the entrepreneurial logistic companies because they rely on the time factor and the estimated distances for mails delivery.
- The accurate calculation of the cost of treating and delivering mails is based on pricing with TD-ABC that provides accurate information on the actual cost.
- The indirect costs are logically and suitably distributed on each activity based on the actual time taken for each.
- We confirm the second hypothesis about the positive relation between TD-ABC and the decrease of the costs of treating mails without effect on the quality of the logistic service.
- TD-ABC allows for identifying the actual operational reality in each activity, mainly with the difference of time with the difference of the delivery distance.

Recommendations:

Based on our findings, we recommend:

- Zr Express should go on using TD-ABC for its actual and accurate identification of the cost of treating mails.
- It is necessary to develop mails tracking system based on TD-ABC, and to equip the office with immediate temporal and spatial accurate data that help collect mails.

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