

Role of Time-Driven Activity-Based Costing (TD-ABC) in Reducing Costs An Applied Study in the General Company for Food Products - Abu Ghraib sector (Diwaniyah Dairy Factory)

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Abstract : In light of the current circumstances and the fact that Iraqi companies suffer from intense competition due to the invasion of the financial markets with a large number of competitive products with a low price and better quality compared to the local products, which put Iraqi companies under many pressures for various reasons, including the high cost of their products and the low level of quality due to their lack of application of technologies Modern calf. Therefore, the research focused on the application of the costing technique based on time-oriented activities (TD-ABC) and the disjointed analysis technique and its role in reducing costs and improving quality in the Diwaniyah dairy factory, which is one of the Abu Ghraib dairy factories affiliated with (the general companies for food products), to overcome the defects of traditional costing techniques and provide more accurate and objective information as well as identifying the utilised and untapped energy in the factory by applying (TD-ABC) technology.

INTRODUCTION: The contemporary business environment is witnessing tremendous developments, most notably the fierce competition between economic units, the information revolution, technological progress, the great openness in trade and investment, the fluctuation in the tastes of customers and their desire to search for products that enjoy low prices without compromising quality and the resulting short life cycle of products. In the face of all these developments, it was natural for the economic units to think about reconsidering the traditional accounting systems due to the increasing criticism levelled at them due to their neglect of market considerations and the developments that took place in them, and to search for technologies that respond to these developments by producing products at the lowest costs and of high quality. It achieves a competitive advantage in the market, and perhaps the most prominent of these techniques is the time-driven activity-based costing (TD-ABC) technique. The costing technique based on time-oriented activities is one of the techniques aimed at planning activities related to the product or service provided, and an attempt to link these activities to the optimal time spent in the implementation process, to reduce and control costs through good allocation.

To achieve success in applying the costing technique based on time-oriented activities, it requires appropriate information that helps in promoting the goal of reducing costs, by imposing control over time, especially what is related to activities and their costs that do not add value.

The first chapter: research methodology

1- Research problem

The Iraqi industrial economic units suffer at present from the inability to compete in the market due to the high costs of their products, as well as the developments that occurred in the business environment practised by the economic units, which led to the emergence of fierce competition and technological progress

The research problem can be posed through the following question.

1- Can (TD-ABC) technology be applied in Iraqi industrial economic units?

2- Research Importance

1-The application of costing techniques based on time-oriented activities (TD-ABC) will help reduce costs used in production processes in a way that achieves the appropriate level of cost, quality, time and flexibility.

2- The need for economic units, especially in the Iraqi industrial environment, for contemporary accounting techniques that can provide information with high accuracy on costs and quality.

3- Research aims

The research objectives can be formulated as follows :

1- Statement of the knowledge foundations of the two costing techniques based on time-oriented activities (TD-AB)

2- Applying costing technology based on time-oriented activities (TD-ABC) in the Iraqi industrial economic units to help these units reduce costs.

4- Research hypothesis

The research shows a main hypothesis based on the following:

The economic unit, the research sample, can apply the costing technique based on time-oriented activities (TD-ABC) for cost reduction.

The acceptance of this hypothesis will be tested by testing the following sub-hypotheses.

1- The application of (TD-ABC) technology by excluding unnecessary activities and knowing the time of each activity and non-value-adding employees leads to cost reduction.

5- Research sample

The Diwaniyah dairy factory affiliated with the Abu Ghraib dairy sector in the (General Company for Food Products) was selected as a spatial boundary for the study, and the researcher was able to apply the practical side and embody the subject of the study and strengthen it, and relied on data and information for the year (2022) as a base year.

second section: previous studies

1- Local studies

1-	Name of the researcher	(Al-Abadi 2021)
	Title of the study	Harmonizing the target cost and the cost system based on time-directed activities (TD-ABC) and its impact on developing production processes.
	Type of Study	applied study on a sample of Iraqi companies - Samawa Cement Factory) - Al-Qadisiyah University - College of Administration and Economics.
	problem of the study	Some industrial companies suffer from relying on ineffective systems in distributing indirect industrial costs according to the activities in which they operate. Does the (TD-ABC) system work to reduce costs in Iraqi industrial companies.
	Aim of the study	work on organizing production processes and developing them through the integration achieved between the costing system based on time-oriented activities and the target costing system, and to demonstrate the impact of this on developing production processes.
	most important conclusions	: Applying the TD-ABC system helps identify untapped capacity in production departments, and the TD-ABC system also allows for raising competitiveness by reducing costs, product prices, and developing production processes.
	most important	most important recommendations are the need for Iraqi industrial economic units to pay attention to applying fair techniques in distributing costs and organising them over activities in a way that reduces costs, achieving accuracy in determining the cost of one unit and providing requirements by the administrative authorities supervising industrial operations to create the appropriate atmosphere for controlling and organising elements of industrial costs, as well as Developing production processes in a way that can help improve the performance of the economic unit.

2 - Arabic Studies

1-	Name of the researcher	(Al-Hadi et al. 2019.)
	Title of the study	cost system based on time-oriented activities and its role in increasing competitive advantage in Saudi organizations
	Type of Study	Applied research in a sample of Saudi industrial business organizations - Al-Nilein University - Sudan.
	problem of the study	Many industrial organizations have no interest in the costing system based on time-oriented activities (TD-ABC) and its role in increasing competitive advantage.
	Aim of the study	Identify the impact of applying the costing system based on time-directed activities (TD-ABC) in supporting competitive advantage by increasing product quality, as well as revealing the application of these modern cost systems and knowing their impact on increasing competitive advantage in industrial economic units.
	most important conclusions	research found a relationship between costs based on time-directed activities (TD-ABC) and increasing competitive advantage in Saudi industrial organizations through statistical evidence. This system provides information that helps support and maintain competitive advantage.
	most important	recommendations are to pay attention to applying costs based on time-oriented

		activities because of their role in increasing competitive advantage. Industrial organizations should follow the example of the world's leading institutions in the field of applying costs based on time-oriented activities and follow in their footsteps, as well as issuing several laws and instructions related to the application aspect of (TD-ABC).
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3- Foreign studies

1-	Name of the researcher	Pakyoupaе – Jung Sungwoo – Jahmanl Yousof - 2019
	Title of the study	Time-Driven Activity-Based costing
	Type of study	Costing is based on time-oriented activities
	problem of the study	The ABC system is insufficient to provide appropriate information and does not satisfy traditional management accounting or achieve increasing international competition. Although there are some advantages in the (ABC) system in making administrative decisions, which led to the emergence of the (TD-ABC) system and achieving competitive advantage.
	The Aim of the study	However, the TD-ABC system achieves two things: the amount of cost per unit, and the time taken by each activity.
	most important conclusions	The TD-ABC system is one of the best tools that can be understood for improving the cost of marketing activities and also allows for further improvement of the process by shortening the time required to perform certain activities.
	most important	It is necessary to provide the requirements by the authorities supervising industrial operations to create the appropriate atmosphere for controlling the elements of industrial costs and organising activities in a way that reduces costs and reduces the waste of money, as well as accuracy when determining the cost of one unit.

The second chapter: The theoretical approach to the costing technique based on time-oriented activities (TD-ABC) in reducing costs.

First - the concept of costs based on time-oriented activities (TD-ABC)

There is a set of concepts presented by some researchers for costs based on time-oriented activities (TD-ABC). These concepts can be clarified through the following table

Schedule (1) Technical concepts (TD-ABC) according to the opinions of some researchers

T	Sources	Concept
1-	Yves Levant, 2014 : (33)	The (TD-ABC) technology is a new method that was recently reached during the past decade by (Kaplan and Anderson) and their goal was to address the criticisms directed at the (ABC) technology in terms of cost and the complexity of its maintenance as well as the time.
2-	(Faleh, 2018: 39)	This technology works to address the problems in (ABC) technology and encourage economic units to adopt it for ease of application
3-	Mohanad & Miaad & Rnaa, 2019: 8)	It is the technology that provides more accurate information that contributes to rational decision-making that reflects reality after the technology of costs based on activities became inappropriate and unreliable, which led to the search for techniques that work to reduce costs and improve product quality
4-	(Abdul Hassan, 2021 :26)	for the time-oriented activity-based costing approach as a modern approach to cost management that is applied to reach the cost of the product or service in a more accurate and clear manner and by adopting two parameters, which are the time required to perform each activity and the cost of the activity related to the cost objective
5-	(Lrene Pawlysz , 2022 : 43)	Costing technology based on activities and linking them to time. This technology removes many difficulties and is the task of implementation and updating. It works to improve cost information, provide useful information to managers, and avoid idle energy

Source: prepared by the researcher based on sources and indicators for each concept

The researcher believes in this technique that it works to develop the costing technique based on activities added to the time.

Second - the importance of costs based on time-oriented activities (TD-ABC)

As a result of changes that occur in the environment and technological developments that change the structure of economic unit costs that lead to an increase in total costs as a result of intense competition in the market . (461: Berikol and Guner, 2016)

Therefore, the importance of costs can be limited based on time-oriented activities according to the following.

1- This technology focuses on time and cost per unit, as well as addresses the shortcomings of the activity-based costing technique.

2- It provides strong support for the facility and works to improve the level of management and enhance the competitive advantage, as well as being used as an analytical technique by managers.

Third - Steps to apply the costing technique based on time-oriented activities (TD-ABC)

The steps for applying time-driven activity-based costing (TD-ABC) are six steps as follows: (Gao & Li, 2013: 90) (Kaplan & Anderson, 2007, PP: (14-16) (Mir, 60-57: 2016). Surur 95:2021.

1- Defining activities: where the resources that are used by the work unit that has been studied or applied to are identified, such as area, number or workers.

2- Calculating the total cost for each department: the resources used, such as salaries, rents, and any other expenses, are determined. Sometimes determining expenses is not easy, and some expenses can be easily linked to the unit being studied, while other expenses require distribution to production units to make estimates so that they are distributed accurately.

3- Determining the total practical energy for each department: Determining the total energy capacity is very important, not only for determining the cost of any specific cost target, but also for various other considerations that serve management in decision-making, such as reviewing the amount of available and unused energy, so that it is either activated from During additional production processes, or abandoning it if it cannot be used or benefited from in the foreseeable future, and sometimes the amount of energy that is not used enables the administration to decide to receive additional orders if it knows that the energy not used by the economic unit is sufficient to carry out additional work.

4- Determining the time required for each activity based on time vectors derived from time equations: where the cost per unit of time is measured as the cost of energy divided by the practical energy of the resources provided, and the unit of time may be a minute or an hour depending on the complexity of the production processes, the time required for completion, and the degree of accuracy required.

5- Calculating the unit cost for each group by evaluating the total costs of resources on scientific energy: This is done by monitoring the production or service process or by conducting interviews, while the costing technique based on traditional activities sees that each time the activity is performed it is similar For other times, and therefore it bears the same cost, the costing technique based on time-oriented activities sees that each time the same activity is performed may differ from other times, and this technology reflects the complexity of production or service operations, which has become a necessity in the world of contemporary business imposed by the intensity of competition And attention to customer satisfaction.

Fourth - Comparison between (ABC) technology and (TD-ABC) technology

The time-driven activity-based costing (TD-ABC) technology complements or updates the activity-based costing (ABC) technique, which allocates resources to activities, and is based on the use of time equations. The basis for that is to convert cost vectors into time equations that It expresses the time required to complete the activities as a function of some of the vectors, these properties are called time vectors, and it works to avoid weaknesses in (ABC) technology through the ability to determine the unexploited cost. It has been shown that there are many differences between the time-oriented activity-based costing (TD-ABC) technique and the activity-based costing (ABC) technique. (Chikosh 41: 2020,).

Table No. (2) Comparison between (ABC) and (TD-AB)

Comparisons	Technology (ABC)	Technology (TD-ABC)
Cost causes	(ABC) technology depends on the cost vectors working with the number of achieved vectors such as the number of machines.	(TD-ABC) technology is based on time vectors that work with the time of the operating period, which results from factors that have an impact such as the time required to prepare the machines.
The ability to know the utilized energy	There is no ability to know untapped or idle energy	She has an untapped ability to know energy by relying on practical energy only

concept of energy	Depends on the total energy, i.e. carries the products with the costs of the used and idle energy	It depends on the practical energy, that is, it carries the products with the exploited energy only and carries the unused energy at the expense of profits and losses
Update implementation	The difficulty of updating is experiencing the difficulty of implementation	Ease of updating and ease of implementation
Number of factors to allocate costs	For each activity, only one operator can be used	Each activity has an unlimited number of factors, with a relationship between the factors that must be taken into account

Source: Zhuang, Zheng-Yun. Chang, Shu-Chin., (2017) “Deciding product mix based on time-driven activity-based costing by mixed integer programming” Springer Science Business Media New York. The researcher behaves

It is clear that the costing technique based on time-oriented activities (TD-ABC) is one of the modern techniques of cost and administrative accounting that imposes on economic units the application of the benefits that it achieves, but the application of this technique requires appropriate information that helps in promoting the goal of cost reduction through the imposition of control over Time, especially what is related to activities and their costs that do not add value.

Fifth: the concept of cost reduction

Thus, we can review some concepts of cost reduction through the following table.

Table No. (3)Concepts of cost reduction, according to the opinions of some researchers

T	Sources	Concept
1-	(Akeem,2017 :19)	A scheme that helps economic units eliminate wasted time and control operating costs through the use of modern methods or technologies.
2-	(Al-Zamili, 2017 : 86)	The economic units take a set of methods and procedures, in order to make the costs of their products and services to the lowest level while maintaining the required quality and achieving customer satisfaction.
3-	(Faleh,2018:54)	The ability of the economic unit that contributes to reducing costs to compete, especially with the existence of financial crises and great pressures on the economic unit at the present time, provided that this reduction does not conflict with the quality of products or services that will reflect customer satisfaction.
4-	(Surour , 2021:366)	It is characterized by dynamism and its application varies from one economic unit to another economic unit, according to the desire and enthusiasm of the senior management based on the economic unit, the working personnel and the size of the economic unit.

Source: prepared by the researcher based on the indicated sources, and the opinions of each concept.

Sixth: Conditions for reducing costs

A set of conditions should be met in the cost reduction process, which are as follows. (Al-Zamili 56-57: 2022,)

- 1- Continuity: cost reduction occurs as long as the economic unit continues to carry out its business, i.e. it has the characteristic of continuity.
- 2 - Achieving abundance: Reducing costs leads to achieving abundance in the costs of various activities, whether at the administrative, production or marketing levels.
- 3- Improvement and development: The process of reducing costs leads to improving productivity and efficiency in performance by identifying unnecessary activities that do not add value to the product.
- 4- Maintaining quality: the process of reducing costs should not affect the components and characteristics of the product necessary for its usefulness.
- 5- The requirement to challenge standards: The process of reducing costs requires challenging objective standards at all levels and achieving them in different ways.

Seventh: Reducing costs by using (TD-ABC) technology

The time-driven activity-based costing technique (TD-ABC) can reduce costs through the following:

- 1- The (TD-ABC) technology contributes to reducing production costs through its ability to identify and detect unused energy and exclude its costs.

2 - The use of (TD-ABC) technology for time equations helps management to predict the time required for activities and to identify time-consuming activities, as well as to address deficiencies in (ABC) technology and to contribute to decision-making, which is reflected in reducing costs in products.

3 - Providing (TD-ABC) technology for competition in economic units by providing more accurate information on costs.

The third chapter: the application of costing technology based on time-oriented activities (TD-ABC) in the Diwaniyah dairy factory.

First: About the Diwaniyah Dairy Factory

The Diwaniyah Dairy Factory is an integrated project for the dairy industry according to the standards approved in Iraq. The project was designed, established and implemented by the Swedish company ALFA LAVAL in 1980. The project includes integrated production lines, industrial services management, testing and standardization, and marketing. The Diwaniyah Dairy Factory is one of the factories of the General Company for Dairy Products, which is one of the formations of the Ministry of Industry and Minerals. Work began in the factory in 1981 AD with three production lines, which are the sterilized milk line with carton boxes, the cream line, and the yogurt line, with a design capacity of 120 tons of raw milk for each. On the year 1996 AD, a cooked cheese line was added, and the production of sterilized milk stopped in 1996 due to the depletion of raw materials due to the economic conditions imposed on Iraq (the blockade). It was the only factory in the central and southern region that was classified as a government factory (public sector) and provided products to all central and southern governorates. In 2007, the UNIDO of the United Nations Industrial Development Organization equipped the factory with a sterilized milk production line (Tetra Pak) with a capacity of 200 ml, especially for school feeding. Experimental operation of the line in 2011.

Product types

The factory includes several production steps: a cheese production line, a cream production line, a milk production line, a sterilized milk production line, and a free fat production line, which is an occasional product according to the demand for it. As for the rest of the products, they are produced continuously, except for the sterilized milk product.

Second: Applying (TD-ABC) technology in the factory

The costing technique will be applied based on time-oriented activities (TD-ABC) to measure the cost of the products of the Diwaniyah Dairy Factory, through the steps of its application, which are as follows.

1- Determine the activities related to the products

The application of costing technology based on time-oriented activities (TD-ABC) requires identifying each activity and calculating the time that this activity takes. The production process includes a set of production activities and stages, and its implementation requires a specific time and number of workers for each activity and stage. The following tables show the activities and materials used and the time that each activity takes per day for a product (milk) in the factory. As shown in the following tables:

coffee manufacturing process through the following table:

Table No. (4) Activities used in a coffee product

Activities	Description of the activity	Number of employees	Time	Materials used in the activity
Prepare the mix	In addition to raw milk, solids at a rate of (8%-5.5%), and powdered milk is added at a rate of (4%-5%) to increase the proportion of solids.	one worker	120 minutes	Raw materials, machines, workers
pasteurization activity	Pasteurization of powdered milk at a temperature used in the factory (88-90) degrees Celsius.	one worker	15 minutes	Raw materials, machines, workers
Naturalization activity	Make the mixture homogeneous by mixing the ingredients well to ensure that the milk remains more stable. By adding starter culture to it at a rate of (2-3)% and at a temperature of (43-45) degrees Celsius.	one worker	45 minutes	Raw materials, machines, workers
packing activity	The milk is transferred to the filling machine according to the available packages.	Two worker	180 minutes	Raw materials, machines, workers
Nursery activity	After the mobilization activity, the mixture is placed in a special incubator, at a temperature of (45) degrees Celsius, so the temperature is the most suitable for the	One worker	120 minutes	Direct materials, machines, workers

	work of bacteria, as it may die at a temperature higher than (54) degrees Celsius, and it cannot grow at a temperature less than (36) degrees Celsius and any increase In the incubation period leads to an increase in acidity.			
Examination activity	Part of the samples of milk are examined to ensure that they comply with the specifications, as well as to check the acidity, not to exceed 80%.	One worker	30 minutes	Direct materials, machines, workers
cooling activity	When the product reaches the required pH, it is cooled to a temperature of (10) degrees Celsius to finish the fermentation process	One worker	90 minutes	Direct materials, machines, workers
Administrative services activity	This activity focuses on lab management and accounts	12 workers	90 minutes	employees
Marketing services activity	This activity involves marketing products to the market	4 workers	60 minutes	employees

Source: prepared by the researcher based on field experience and opinions of engineers in the factory.

It is clear from the above table that a milk producer contains a group of activities that are involved in the process of producing the product, and each activity contains two workers, as well as the time that each activity takes.

2 - Determine the total cost for each product

In this step, the total cost of the factory is determined by relying on the trial balance. The following table shows the trial balance of the products of the Diwaniyah Dairy Factory for the year (2022). The total cost of each product is determined from the materials used, as well as salaries, rents and other expenses related to the products. As shown in the following figure:

Table No. (5) Total costs of products (milk)

Details	Partial amount	Total amount
Direct material	374921540	
Direct salaries and wages	191860600	
total direct costs		568454540
extinction	39945723	
indirect manufacturing costs	44605971	
total indirect costs		84551700
The total cost of the plant		551333840

Source: prepared by the researcher based on field experience and opinions of engineers in the factory.

The table above shows the total costs of the factory for all products (coffee) from direct materials that go into manufacturing the products, as well as the salaries and wages of the workers in the factory, as well as depreciation on buildings and machinery, and indirect expenses.

3 - Determine the working capacity

1- Indirect costs:

The exact cost can be calculated from the indirect costs of the coffee product through the following table:

Table No. (6) The exact cost of indirect costs

Details	Costs
indirect costs	44695971
annual extinction	39945723
total annual	84551700
total monthly	7045975
Number of Employees	24
working power 80%	167328
The cost of one minute in dinars	42 dinars

Source: prepared by the researcher based on field experience and opinions of engineers in the factory.

It is clear from the table above that the cost of one minute of indirect industrial costs during one month is equal to (42) dinars.

2- The direct costs of the coffee product are represented in the salaries and wages of the employees:

Calculating the cost per minute of the direct industrial costs of the milk product for each of the activities involved in the milk industry process, as shown in the following tables:

Table No. (7) Direct costs of the blend preparation activity

Details	Total costs	Direct costs	Number of Employees
Staff salaries	6813996	6813996	----
total annual	6813996	----	----
total monthly	----	597833	----
Number of Employees	---	---	one employee
Annual minutes	----	104580	----
Monthly minutes	----	8715	----
working power 80%	----	6972	----
The cost per minute is in dinars	---	86 Dinar	---

Source: prepared by the researcher based on field experience and opinions of engineers in the factory.

It is clear from the above table that the cost of one minute of direct industrial costs during one month for the activity of preparing the mixture is equal to (86) dinars per minute.

Table No. (8) Direct costs of pasteurization activity

Details	Total costs	Direct costs	Number of Employees
Staff salaries	6780000	6780000	----
total annual	6780000	----	----
total monthly	----	565000	----
Number of Employees	---	---	one employee
Annual minutes	----	104580	----
Monthly minutes	----	8715	----
working power 80%	----	6972	----
The cost per minute is in dinars	---	81 Dinar	---

Source: prepared by the researcher based on field experience and opinions of engineers in the factory.

It is clear from the table above that the cost of employees during the month is equal to (565000) dinars, and the minutes during the month are equal to (8715) multiplied by the practical energy by (80%) and equal to (6972) during the month. Through this, the cost of employees during the month can be divided into the monthly minutes after the energy The process, and the cost of one minute of the direct industrial costs during one month of the pasteurization activity is equal to (86) dinars per minute.

Table No. (9) Direct costs of naturalization activity

Details	Total costs	Direct costs	Number of Employees
Staff salaries	8124000	8124000	----

total annual	8124000	----	----
total monthly	----	677000	----
Number of Employees	----	----	one employee
Annual minutes	----	104580	----
Monthly minutes	----	8715	----
working power 80%	----	6972	----
The cost per minute is in dinars	----	97 Dinar	---

Source: prepared by the researcher based on field experience and opinions of engineers in the factory.

It is clear from the table above that the cost of one minute of direct industrial costs during one month for the briquette activity is equal to (97) dinars per minute by dividing the cost of employees during the month by the amount of (677000) dinars by the number of minutes after the practical energy during the month.

Table No. (10) Direct costs for packing activity

Details	Total costs	Direct costs	Number of Employees
Staff salaries	16332000	8166000	----
total annual	16332000	----	----
total monthly	----	680500	----
Number of Employees	----	----	2 employee
Annual minutes	----	104580	----
Monthly minutes	----	8715	----
working power 80%	----	6972	----
The cost per minute is in dinars	----	98 Dinar	---

Source: prepared by the researcher based on field experience and opinions of engineers in the factory.

It is clear from the table above that the cost of one minute of direct industrial costs during one month for packing activity is equal to (98) dinars per minute by dividing the cost of employees during the month by (680500) dinars on the number of minutes after the practical energy during the month.

Table No. (11) Direct costs of the nursery activity

Details	Total costs	Direct costs	Number of Employees
Staff salaries	9009600	9009600	----
total annual	9009600	----	----
total monthly	----	750800	----
Number of Employees	----	----	One employee
Annual minutes	----	104580	----

Monthly minutes	----	8715	----
working power 80%	----	6972	----
The cost per minute is in dinars	----	108 Dinar	---

Source: prepared by the researcher based on field experience and opinions of engineers in the factory.

It is clear from the table above that the cost of one minute of direct industrial costs during one month for the nursery activity is equal to (108) dinars per minute by dividing the cost of employees during the month by (750800) dinars by the number of minutes after the practical energy during the month.

Table No. (12) Direct costs of the screening activity

Details	Total costs	Direct costs	Number of Employees
Staff salaries	20064000	20064000	----
total annual	20064000	----	----
total monthly	----	1672000	----
Number of Employees	----	----	One employee
Annual minutes	----	104580	----
Monthly minutes	----	8715	----
working power 80%	----	6972	----
The cost per minute is in dinars	----	240 Dinar	---

Source: prepared by the researcher based on field experience and opinions of engineers in the factory.

It is clear from the table above that the cost of one minute of direct industrial costs during one month for the examination activity is equal to (240) dinars per minute by dividing the cost of employees during the month by the number of (1672000) dinars by the number of minutes after the practical energy during the month.

Table No. (13) Direct costs of cooling activity

Details	Total costs	Direct costs	Number of Employees
Staff salaries	8616000	8616000	----
total annual	8616000	----	----
total monthly	----	718000	----
Number of Employees	----	----	One employee
Annual minutes	----	104580	----
Monthly minutes	----	8715	----
working power 80%	----	6972	----
The cost per minute is in dinars	----	103 Dinar	---

Source: prepared by the researcher based on field experience and opinions of engineers in the factory.

It is clear from the table above that the cost of one minute of direct industrial costs during one month for the examination activity is equal to (103) dinars per minute by dividing the cost of employees during the month by the number of (718000) dinars by the number of minutes after the practical energy during the month.

Table No. (14) Direct costs of the administrative services activity

Details	Total costs	Direct costs	Number of Employees
Staff salaries	85767000	7147250	----
total annual	85767000	----	----
total monthly	----	595604	----
Number of Employees	----	----	12 employee
Annual minutes	----	104580	----
Monthly minutes	----	8715	----
working power 80%	----	6972	----
The cost per minute is in dinars	----	85 Dinar	---

Source: prepared by the researcher based on field experience and opinions of engineers in the factory.

It is clear from the table above that the cost of one minute of direct industrial costs during one month for the examination activity is equal to (85) dinars per minute by dividing the cost of employees during the month by the number of (595604) dinars by the number of minutes after the practical energy during the month.

Table No. (15) Direct costs of marketing services activity

Details	Total costs	Direct costs	Number of Employees
Staff salaries	30354000	758850	----
total annual	30354000	----	----
total monthly	----	632375	----
Number of Employees	----	----	4 employee
Annual minutes	----	104580	----
Monthly minutes	----	8715	----
working power 80%	----	6972	----
The cost per minute is in dinars	----	91 Dinar	---

Source: prepared by the researcher based on field experience and opinions of engineers in the factory.

It is clear from the table above that the cost of one minute of direct industrial costs during one month for the examination activity is equal to (91) dinars per minute by dividing the cost of employees during the month by the number of (632375) dinars by the number of minutes after the practical energy during the month

4- Formulate the time equation

In this step, formulating the time equation and adding the direct and indirect cost for each of the activities involved in the process of manufacturing the product (milk) in the Diwaniyah dairy factory.

A milk product contains several activities, so the time equation can be applied to each of the activities as follows.

Time equation = x (r1) + x (r2)

Q: Time in minutes.

P. 1: The direct costs of employees in each activity.

P. 2: Indirect costs of the product for coffee.

Factory manager = 30 (323) + 30 (42)
= 9690 + 1260

= 10950 dinars, the cost of the factory manager for the product of milk according to (TD-ABC) technology.

Production manager = 30 (258) + 30 (42)
= 7740 + 1260

= 9000 dinars, the cost of the production manager for the milk product according to (TD-ABC) technology.

1- Mix preparation activity

Time equation = x (r1) + x (r2)

= 120 (86) + 120 (42)

= 10320 + 5040

= 15,360 dinars, the cost of the activity of preparing the mixture according to (TD-ABC) technology.

2- Pasteurization activity

Time equation = x (r1) + x (r2)

= 15(81) + 15(42)

= 1215 + 630

= 1845 dinars, the cost of the pasteurization activity according to (TD-ABC) technology.

3- Naturalization activity

Time equation = x (r1) + x (r2)

= 45(97) + 45(42)

= 4365 + 1890

= 6255 dinars, the cost of pasteurization activity according to (TD-ABC) technology.

4- Packaging activity

Time equation = x (r1) + x (r2)

= 180(98) + 180(42)

= 17640 + 7560

= 25,200 dinars, the cost of packing activity according to (TD-ABC) technology.

5- Nursery activity

Time equation = x (r1) + x (r2)

= 120(108) + 120(42)

= 12960 + 5040

= 18,000 dinars, the cost of the nursery activity according to (TD-ABC) technology.

6 - Examination activity

Time equation = x (r1) + x (r2)

= 30(240) + 30(42)

= 7200 + 1260

= 8460 dinars, the cost of the examination activity according to (TD-ABC) technology.

7- Refrigeration activity

Time equation = x (r1) + x (r2)

= 90(103) + 90(42)

= 9270 + 3780

= 13050 dinars, the cost of cooling activity according to (TD-ABC) technology.

8- Administrative services activity

Time equation = x (r1) + x (r2)

= 90(85) + 90(42)

= 7650 + 3780

= 11430 dinars, the cost of the activity of the administrative service according to (TD-ABC) technology.

9- Marketing services activity

Time equation = x (r1) + x (r2)

= 60(91) + 60(42)

= 5460 + 2520

= 7980 dinars, the cost of the marketing services activity according to (TD-ABC) technology.

Milk production cost according to (TD-ABC) technology for all activities (127530).

Since the number of official working days during the year (2022) is (249) days, and the amount of actual milk production during the year is (359,181), and accordingly, the amount of production during the day can be determined through the following.

$$359181 \div 249 = 1442.5 \text{ kg per day}$$

$$127530 \div 1442.5 = 88 \text{ dinars per kilogram}$$

$$88 \times 1000 = 88,000 \text{ dinars per ton, according to (TD-ABC) technology}$$

$$359,181 \times 88000 = 31,607,928 \text{ dinars during the year, according to (TD-ABC) technology}$$

Raw materials (374921540)

$$\begin{aligned} \text{Total cost according to (TD-ABC)} &= 31607928 + 374921540 \\ &= 406529468 \end{aligned}$$

The cost according to the factory data for the milk product = 551,333,840 dinars during the year

$$551333840 - 406529468 = 145881915 \text{ dinars}$$

The difference between the company's data and (TD-ABC) technology

Chapter Four: Conclusions and Recommendations

First: conclusions

- 1- The economic unit needs cost and administrative techniques that contribute to reducing costs, especially with the complexities and rapid developments in the contemporary business environment.
- 2- There is a weakness in the use of contemporary cost techniques and technology by the economic unit, which led to the superiority of competing products in the market over the products of the economic unit, the research sample.
- 3- The use of costing technology based on time-oriented activities (TD-ABC), and the time equation will help the management in predicting the required time for activities, identifying the most time-consuming activities, and contributing to decision-making that leads to a reduction in the time for activities, which leads to a reduction in product costs as well. Provide information on all costs of production processes that are necessary to improve production processes.
- 4- Time-driven activity-based Costing (TD-ABC) technology helps provide more accurate information on costs as well as highlighting untapped energy that can be avoided. It is also an easy and less expensive technology that can be easily updated.

Second: Recommendations

In this topic, it deals with the recommendations reached by the researcher based on the conclusions that have been mentioned, which are the following:

- 1- On the economic unit, you should familiarize yourself with contemporary costing and administrative techniques to respond to changes in the contemporary business environment, such as the costing technique based on time-oriented activities (TD-ABC).
- 2- The factory advised the research sample to use (TD-ABC) technology, to help reduce product costs as well as through the use of the time equation and highlight the untapped energy that can be avoided, and contribute to providing more accurate information on the costs of production operations, which are necessary to improve production processes research sample.
- 3- The economic unit should take care of the research and development department to provide studies and research that would help develop the work of the economic unit and improve its performance.

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