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IMPROVING THE PRODUCTIVE EFFICIENCY OF THE ECONOMIC UNIT BY USING THE COSTING TECHNIQUE BASED ON TIME-ORIENTED ACTIVITIES (TDABC)

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ABSTRACT
The study seeks to achieve its goal in shedding light on costing technology based on time-oriented activities (TDABC) and its role in improving productivity efficiency in the economic unit. To a main hypothesis that "the use of TDABC technology helps the economic unit in improving production efficiency through optimal utilization of resources and rationalization of costs." The sample of the study was the Diwaniyah Tires Factory, one of the factories of the General Company for Rubber and Tire Industries. The researcher applied the TDABC technology to the factory data for the year 2017 as well. About conducting personal interviews with the workers in the factory from all specializations, as the researcher adopted the applied study method to test the main study hypothesis and reach a set of results, the most important of which is that the application of TDABC technology on the cost of the product is more consistent with the actual use of resources in the company compared to traditional costing methods, The TDABC technology provides more important information on cost and pricing, which in turn It can improve manufacturing efficiency and thus improve product to rationalize costs.
KEYWORDS: *TDABC technology, production efficiency, optimal utilization of resources.*

I. INTRODUCTION

The competitive market in the industrial environment is characterized by permanent changes and continuous innovation, so in order for the economic unit to keep pace with these changes, it must interact quickly and work to provide high-quality and low-cost products, as traditional methods have become unable to do so, so it was necessary to resort to modern technologies that manage the process of optimal utilization of resources in production processes in order to rationalize and improve product costs. Many techniques have emerged that address the problem of allocating indirect industrial costs, and the cost technique based on ABC activities is one of the most important of those techniques that were used in the allocation and distribution of costs appropriately, but its application was accompanied by a set of difficulties and problems, including the difficulty of determining cost drivers and the lack of resources for the application process and others, so many alternative techniques have emerged, perhaps the most prominent of which is what Kaplan and Anderson presented. It is a costing technique based on time-oriented activities TDABC, which works to convert the drivers (cost routers) to the time equation, through which the time required to perform the activity is reached, as this technology is characterized compared to traditional methods by its ability to allocate costs and link them to the activity or product in a better and easier way by detecting unused energy and improving production efficiency by getting rid of non-value-adding operations and following up costs and changes in production and storage and distribution. Hence, the importance of this study to emphasize the importance of the great role played by cost technology based on time-oriented activities TDABC by focusing on different concepts in a comprehensive framework that explains the mechanism of improving the productive efficiency of the economic unit as one of the important indicators through which it is possible to know the extent to which the available resources are used efficiently and effectively in terms of cost, quality and performance.

II. STUDY METHODOLOGY

1- Study problem

The study problem crystallizes in the extent to which the economic unit can apply costing technology on the basis of time-oriented activities TDABC in order to keep pace with developments in the industrial environment, and

therefore the following problem can be raised: "Can the production efficiency in the economic unit be improved using costing technology based on time-oriented activities."

2- The importance of study

The importance of study lies in knowing and demonstrating the mechanism of applying costing technology on the basis of time-oriented activities TDABC in a comprehensive framework for the purpose of identifying the great and important role that it can play in improving the productive efficiency of the economic unit.

3- Study Objective

The main objective of the study is to highlight the theoretical and practical foundations and advantages of applying TDABC costing technology, as well as to test the role of its application in optimizing the use of available resources and improving productivity.

4- Study hypothesis

Based on the study problem and to achieve its objectives, it is based on the main premise that " the use of costing technology based on time-oriented activities TDABC helps the economic unit to improve production efficiency through optimal utilization of resources and rationalization of costs."

III. LITERATURE REVIEW

The first topic: Introduction to costing technology based on time-oriented activities TDABC

First: The origin and concept of TDABC technology

The main reason for the emergence of TDABC technology is due to the reversal of many economic units from the cost method based on the activity ABC due to the problems caused when applied and this is due to the changes in the processes that require re-estimating the use of resources according to activities and energies as the ABC method deals with each change in the activity separately, which increases the difficulty of allocating resources and as a result of this presented Kaplan and Anderson incorporate ABC's strengths as well as addressing its weaknesses. Published accounting literature indicates that TDABC is the most suitable technology for economic units that somehow take on tasks based on a series of In this context, many researchers believe that TDABC technology can be useful in multi-activity and product industrial companies in order to accomplish operations. In this context (Hall & McPeak, 2011:14) believes that TDABC technology information Much more important about cost and pricing, which in turn can lead to improved manufacturing efficiency and thus improve the product or service to rationalize costs, which ultimately leads to improved profitability and agree with them in that (Afonso&Santana,2016:1007) as they considered TDABC technology more transparent, scalable, easy to implement and update, allowing managers to obtain important information about costs and profitability quickly and cheaply.

On the other hand, this technology focuses heavily on resources, as (Blocher, 2010:153) indicates that the common element of this technology in the use of activities is time. When the economic unit has a large number of activities as well as repetitive operations, cost allocation can be based on To the average time required for each activity, this means that this technology uses time to pay costs directly from resources and then allocate them to the cost target, and there is no allocation of resource costs to activities and then from activities to the cost target as in the case of ABC technology. While (Abdullah and Faleh, 2018: 84) confirms that the main element in this technology is practical capacity, as it works to avoid untapped energy when calculating the cost. Through the foregoing, it is clear to us that the TDABC technology is a complementary technology to the ABC method, as it was found in order to avoid problems and obstacles that accompanied its application. Know the time needed to complete each activity. Accordingly, it can be defined as an accounting tool for cost management that provides appropriate information on how to make optimal use of available resources and employ idle energies in a way that contributes to improving productivity, rationalizing product costs, increasing the profits of the economic unit and supporting its competitive position.

Second: Advantages of TDABC technology

There are many case studies on the implementation of TDABC where their advantages can be noted which can be summarized as follows:

(Afonso & Santana,2016:1007) & (Namazi, 2016: 458).

1. It is an easy model to design and integrate with other programs.
2. Through which the effectiveness of processes can be studied in terms of available energy versus energy used.
3. This technique allows to evaluate the added value that determines the existence of each activity and simulate the use of resources.
4. It can be applied in any industry or company with complex cost goals.
5. Avoid the costly and time-consuming task of identifying the activity.

6. Do not require interviews with employees that are expensive and time-consuming.
7. It discloses the exact amounts and values related to the efficiencies of the company's operations and unused capacities.
8. Availability of relevant information for administrative decision-making.
9. Provide more accurate information about the complex activities of the company by deriving appropriate time equation models.

Third: TDABC Components

1- Cost driver: Cost driver is a variable such as the level of activity or volume that causally affects costs during a certain period of time, for example, product design, machine preparation or product testing, which means that the level of activity or volume is the cost driver if there is a cause-and-effect relationship between the change in the level of activity or volume and the change in the level of total costs (Horngren et al, 2015:34) and according to a review of the accounting literature by (Neumann et al,2004:37) that cost drivers are usually time estimates and quite reliable and using time as a cost driver breaks costs down into sufficient detail without providing much unimportant information.

2- Time drives: Time drives are the events through which the time required to implement the activities is determined, and the costs are then determined by time equations, and in the event that there is more than one event in one activity, there may be several time directives (Dalci et al, 2009: 610).

3- Time equations: In order to get rid of the technical difficulties of cost equation in ABC technology, TDABC technology provides time equations: that reflect the costs of different cost objectives, taking into account the specifics of the consumption of each activity by each specific product, assuming a standard time to implement the activity in addition to additional time to perform activities (Afonso & Santana,2016:1007) This makes it possible to know how many minutes employees spend on activities in a given period of time, so time equations can provide greater transparency than a traditional ABC system as well as identify customers who consume the most time and resources (Dalci et al, 2009:611).

Fourth: Steps to implement TDABC technology

TDABC technology is applied according to the following steps: (Ganorkar et al. 2018:3) & (Ramida& Rungchat, 2015:10)

1- Determine the total cost of resource pools that perform the activity or activities (wages, materials, maintenance ..... etc).

2- Determine the practical capacity of the time required for each resource pool (available working hours).

3- Calculating the average cost per unit time for resource pools by dividing the actual total cost of the resource pool by the energy units available to them in hours.

4- Determining the time required for each activity based on the different causes of time by applying the appropriate time equation for this activity.

5- Calculate the total cost of each activity by multiplying the cost per unit from step (3) by the time required for each activity from step (4).

The second topic: the cognitive foundations of production efficiency

First: The concept of production efficiency

The concept of production efficiency has been imposing itself strongly in the accounting literature, as it represents an important measure of the performance of economic units, as it is closely related to the extent of the ability of those units to exploit the available resources and achieve the maximum possible benefit from them, as well as being an important indicator that expresses the efficiency of the economic unit compared to its counterparts and the extent to which production factors are used to achieve the largest amount of products.

It is worth noting that there is a debate about the concept of production efficiency, according to the different objectives of the economic unit and its responsibility towards society. to productivity on the basis of achieving a certain level of production through the use of specific production factors, regardless of material return (Al-Qaliti and Hassanein, 2007: 8) and in this context (Latifa, 2017: 11) considers that productive efficiency represents the ideal use of the production factors available from In order to obtain the best possible production, that is, to complete the production process at the lowest possible costs, while (Sabah, 2010: 81) sees it as measuring the output achieved as a result of using specific inputs or factors, meaning achieving a balance between all factors of production, through which the greatest output is reached with the least. Finally, (Phusavat, 2013: 34) believes that production efficiency shows the ability of the economic unit to compete on the basis of cost, in the sense that any increase in productivity means a decrease in the unit cost, and therefore this decrease should help in enhancing

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the market share, which will have positive effects On investing in the future (through training and skill development), capital (through upgrade and scheduled maintenance), and materials (through quality improvement and long-term partnership with suppliers). Through the foregoing, it is clear to us that the concept of productive efficiency is closely related to the ability of the economic unit to exploit the available resources optimally and produce at the lowest costs, and of course, this depends on a set of factors, most notably the existence of a modern cost system capable of allocating costs fairly, which leads to rationalization of costs and appropriate decision-making As shown in Figure 1

Figure (1) shows the concept of production efficiency

Source (Sabah,2010: 81)

Second: The Importance of Production Efficiency

Production efficiency derives its importance as a main indicator through which it is possible to know the ability of the economic unit to exploit the available resources efficiently, as well as it reflects the efficiency of management in making appropriate decisions, and from this point of view, the importance of productive efficiency can be summarized as follows: (Sabah, 2010: 93) and (Kazem, 2019: 82)

1- The importance of production efficiency is highlighted by the administration's attempt to satisfy all parties, customers demand to reduce prices and at the same time ask workers to increase wages and reduce the hours of the holidays, as well as asking the owners of capital to increase profits, and therefore the only way to satisfy all these parties is by improving production efficiency.

2- Assisting the administration in controlling and controlling the performance of the economic unit by monitoring its parts, whether by product or job.

3- Productive efficiency is directly related to the standard of living of the individual and society, as its rise is beneficial to workers, economic unity and society alike.

4- Production efficiency enables comparison of the overall performance of the economic unit with other competitors.

5- Production efficiency contributes to saving funds by not wasting and properly exploiting complementary raw materials, from which the State incurs huge funds, especially if they are imported.

Third: Factors Affecting Production Efficiency

There are several factors that affect production efficiency that can be summarized as follows: (Qesmi and Al-Zari, 2018: 445), (Kazim, 2019: 83), (Wafa, 2017: 63).

1- Administrative factors: They are also called governing factors, which have a significant impact on production efficiency and include scientific methods and tools followed by management in decision-making , as well as management skills in planning, organization and control.

2- Technical factors (technology): It represents technological development, means of study and development, and variables of creativity and technical innovation, which have a significant impact on improving production efficiency, as these developments have contributed to the provision of goods and services of good quality that suit the real needs of the consumer.

3- Economic factors: They represent changes in the market, income, competition, etc., as well as supply and demand factors, market mechanisms and economic plans that have an important impact on productive efficiency.

4- Social factors: represented by the social environment and the demographic structure of the administration such as gender, age, educational level and skills, as well as the values, norms and customs prevailing in society, which have a significant impact on productive efficiency.

5- Humanitarian factors: These factors are represented in the following:

Ability to work, including education and acquired skills.

B - the desire to do work and which is affected by production.

c. The individual's need and material working conditions as well as collective working conditions.

Fourth: Strategy to improve production efficiency

Improving productivity is more than just lowering employment levels, productivity can be improved by: (Al Darrab, 2000:8), (Atkinson et al., 2012:27)

1- Carry out more operations with the same resources.
2- Less work than operations with relatively greater reduction in resources.
3- Carry out more operations with relatively less increase in the resources consumed.
4- Rationalizing costs by reducing indirect expenses, which enables the economic unit to produce the same amount of outputs while spending less on materials, energy and wages.
5. Reduce the working capital needed to support a certain level of business, for example, the inventory levels required to support a certain level of sales can be reduced by carrying out production processes on time.
6- Developing technical inputs such as the development of machinery, equipment and technical systems used in production processes.
7- Introducing assembly technology by grouping and dividing similar and recurring problems, which helps to avoid duplication of efforts to solve problems and save time.
8- Implementing the prepared plans and strategies, measuring and comparing the actual implementation in light of the criteria that have been identified, and then preparing the report on the efficiency of the actual implementation.

Fifth: The mechanism of improving production efficiency using TDABC technology

Due to the increasingly competitive market conditions at the present time, this allows consumers more options when deciding to buy products and therefore economic units need to adapt accordingly, as these units face the challenge of increasing manufacturing costs due to the increase in raw material costs as well as the increase in employee wages. However, raising the prices of their products increases the risk of losing customers in favor of other economic units that offer lower prices and thus lose their position in the market. It is important that these units provide accurate cost estimates as well as an understanding of where the manufacturing process needs to be improved so that it can sell at the optimal price.

In this regard, (Guzman et al, 2014:161) asserts that the current economic situation, which is characterized by periodic shortages and limited resources, forces economic units to search for ways to improve their production efficiency and provide high-quality products at lower costs in order to improve performance. Seek to identify opportunities for improvement and eliminate costs related to non-value-adding activities. In order to do this, managers must keep their activities, resources, and costs under control, relying on correct information about activity costs, resource capacity, and performance. Based on the foregoing, it can be said that TDABC technology is one of the most techniques that can provide this information, as it is seen (Hall & McPeak, 2011:14), that it encourages the economic unit to improve product design because the competitive market does not bear the increase in prices and therefore is Work on improving product design to reduce its cost, and therefore the use of this technology enables it to achieve rationalization of material costs and improve manufacturing efficiencies. On the other hand, TDABC technology relies on the production capacity methodology to reduce costs by measuring and identifying idle energies, then excluding them from allocation and submitting reports to management to deal with them, where these (idle) energies are removed or converted into productive energies, and then non-productive energies are analyzed. Which is always associated with non-value-added activities, and on this basis, non-essential activities are removed, then the necessary energies are reduced, and accordingly this methodology tries to improve the efficiency of productive capacities by reducing the energies required for value-added activities (Al-Hibari & Al-Matari, 2019: 775).

A study of an American dairy factory has found that the time equation used by TDABC technology can help predict the time taken by activities even in light of the different specifications required by each activity and thus improve reliability as the time equation is able to integrate all relevant constraints into one equation and thus this makes the economic unit able to understand the actual cost of producing its products, which would support the growth strategy where It enhances its profit-making capacity by accurately measuring costs and profits (Ramida & Rungchat, 2015:9).

Through the foregoing, it is clear to us that the mechanism for improving production efficiency according to the TDABC technology is centered in two parts. The first is dealing with idle energies, as the problem that the administration faces with regard to production capacity does not lie in the availability of such resources as much as it relates to how to manage them and the continuous work to get rid of them. idle energies. Given that what cannot be measured cannot be managed, the management of the economic unit requires an input to cost estimation

that is able to accurately measure the resources used, allocate these resources to cost objectives, and exclude the costs of idle energies. Thus, measuring idle energy and excluding it from allocation is the first step to reducing cost on the basis of the energy methodology. Productivity which subsequently affects the next steps. As for the second part, it is represented by the use of the time equation, as this equation provides a detailed distribution of time in the various sub-activities, and this provides clear information to the management about the activities that consume more time and cost, in addition to that, it also provides detailed information about the sub-activity that takes longer, and therefore the TDABC technology Provides a clear operational vision regarding activities and their added value. In this way, management can take appropriate measures to reduce the time needed for some actions, which provides open communication between management and the employee responsible for operational improvements to be able to measure internal performance.

IV. PRACTICAL FRAMEWORK

TDABC technology was applied in the State Company for Rubber Industries and Tires, Diwaniyah Tire Factory, as the factory produces various sizes of tires, and the laboratory data for the year 2017 was relied on

The first topic: the productive reality of the Diwaniyah tire factory
The plant consists of the following departments that contribute to the tire industry:
First: The main sections related to the tire industry, which include the following: -

1. Preparation Department: It mixes the materials involved in the manufacture of the frame according to the specified proportions.
2. Forming Section: It handles the process of forming the doughs received from the preparation department by mixing and kneading them and adding fabric to make soft tapes.
3. Construction Department: Assembles the semi-finished parts of the frame.
4. Installation section: The final stage of the tire manufacture is carried out through the pressing operations for each item.

Second: The service departments supporting the tire industry, including the following:

1. Industrial Services Section: It prepares various production requirements through different divisions such as boiler division, cold and hot water, compressors and boiler maintenance.
2. R&D and Quality Department: Undertakes study and development operations as well as laboratory testing of materials in production.
3. Packaging Section: It stores raw materials and spare tools, as well as carrying out packaging for finished products.
4. Department of Administration: includes various administrative departments such as legal, financial and administrative affairs, as each section undertakes its own tasks.

Table (1) shows the **total production cost of Diwaniyah tire factory**

Account Number	Account Name	Total Amount
31	Salaries and wages	10,623,228,000
32	Commodity Supplies	1,571,779,000
33	Service Supplies	41,793,000
37	Extinctions	255,186,000
Total manufacturing cost		12,491,986,000
38	Marketing expenses	5,506,000
39	Administrative expenses	22,024,000
Total production cost		12,497,492,000

Source (company records from the Finance Department / Cost and Pricing Division)

Table (2) shows the cost of one unit of products in the Diwaniyah tire factory

Products	Direct wages	Direct materials	T.S.G.M.	Total manufacturing costs	Production volume	Manufacturing cost per unit
Size 1200/24	929532450	495812800	3438658800	4864004050	90000	54044
Size 1200/20	1062322800	433836200	3008826450	4504985450	78750	57206
Size 1400/20	663951750	309883000	2149161750	3122996500	56250	55520
Total	2655807000	1239532000	8596647000	12491986000	225000	

Source (company records from the Finance Department / Cost and Pricing Division)

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The second topic: the application of TDABC technology in the Diwaniyah tire laboratory

First: Extracting the cost of products according to TDABC technology

The production costs of the plant will be calculated according to TDABC technology in order to know the extent of its applicability and its role in achieving production efficiency, and field visits and laboratory data have been relied upon in order to reach the actual time that the production process takes in the various activities that production goes through as follows:

Step One: Determine the costs of the main activities of resource pools

After each of the main and supporting activities of the laboratory has been identified, we will in this step distribute the planned costs to the activities by reviewing the records and information provided by the Financial Affairs Department / Cost Division as shown in the table below.

Table (3) shows the allocation of costs on activities in the Diwaniyah tire factory

Account Name	Costs	Distribution basis	Preparation	Composition	Construction	riveting	Industrial Services	R&D & Quality	Packaging	Management
Salaries	7967421000	Custom	1593484200	1274787360	1195113150	1115438940	637393680	398371050	796742100	956090520
Fuels & Oils	120000000	Custom	30000000	20400000	22800000	21600000	18000000	0	2400000	4800000
Backup Tools	96121000	Custom	0	0	0	0	96121000	0	0	0
Packaging	9000000	Custom	0	0	0	0	0	0	9000000	0
Miscellaneous	26000000	Custom	0	0	0	0	0	0	0	26000000
Personnel Equipment	273000	Custom	0	0	0	0	0	0	0	273000
Water & Electricity	80853000	Area	16170600	13745010	12936480	10510890	24255900	0	0	3234120
Maintenance Services	3000000	Custom	0	0	0	0	3000000	0	0	0
Study & Consulting	12250000	Custom	0	0	0	0	0	12250000	0	0
Rental of fixed assets	1611000	Custom	0	0	0	0	0	0	0	1611000
Service expenses	15000000	Custom	0	0	0	0	0	0	0	15000000
Extinction	255186000	Area	53589060	48485340	43381620	51037200	30622320	5103720	7655580	15311160
Total	8596647000		1693243860	1357417710	1274231250	1198587030	809392900	415724770	815797680	1032251800

Source (prepared by the researcher based on the company's records from the Financial Affairs Department / Cost and Pricing Division)

Step Two: Extract the Practical Energy for Each Activity

The practical energy is the number of working hours required to perform each activity, and after conducting the interview with the employees and reviewing the reality of work, it was found that the percentage of practical energy is 80% of the theoretical energy, as the following equation was applied to extract the percentage of practical energy for each activity.

Practical capacity = number of workers × number of minutes per day [(1)]× number of days of the year [(2)]

(1) The plant works at a rate of (8) hours a day, i.e. (480) minutes per day, and after subtracting the planned stopping times, which amount to (1) 1 hour, the actual number of minutes per day is (420) minutes.

(2) The actual number of days of the year is (240) after excluding official weekends, holidays and religious occasions.

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Third Step: Calculating the unit cost loading rate from the activity guides to the laboratory

Table (4) shows the practical capacity of each activity

Activity	Number of workers	Number of minutes per day	Total Time	Number of days in the actual year	Annual Operation Power
Preparation Activity	200	420	84000	240	20160000
Formation Activity	190	420	79800	240	19152000
Construction Activity	210	420	88200	240	21168000
Installation Activity	165	420	69300	240	16632000
Industrial Services Activity	110	420	46200	240	11088000
R&D Activity	67	420	28140	240	6753600
Packaging Activity	95	420	39900	240	9576000
Management Activity	230	420	96600	240	23184000

Source (prepared by the researcher based on company information)

In this step, the rate of loading the unit cost of the time required to perform each activity will be calculated by dividing the costs of the activities from Table (3) by the practical capacity from Table (4) as shown in Table (5).

Table (5) shows the rate of loading one unit of the cost wave for each of the laboratory activities

Activity	Cost of activity	The practical energy of each activity	Load Rate Per Unit
Preparation Activity	1,693,243,860	20160000	84
Formation Activity	1,357,417,710	19152000	71
Construction Activity	1,274,231,250	21168000	60
Installation Activity	1,198,587,030	16632000	72
Industrial Services Activity	809,392,900	11088000	73
R&D Activity	415,724,770	6753600	62
Packaging Activity	815,797,680	9576000	85
Management Activity	1,032,251,800	23184000	45
	8,596,647,000	127713600	

Source (prepared by researcher based on Table 3 and 4)

Step Four: Determine the time required for each activity

In this step, the time required for each activity will be reached based on the different causes of time by applying the appropriate time equation for this activity as shown in Table (6).

Table (6) Shows the Time Required for activities

Activity	Activity Events	Time Required for the Event
Preparation	Preparation of cladding paste	15
	Preparation of the dough of the trade	10
	Preparation of sidewall paste (side)	10
	Preparation of filler dough	10
	Preparation of the cutchen dough	10
	Preparation of the dough for iron rings (bid)	5
	Total	60
Composition	Calender Fabric Manufacturing	12
	Trade Manufacturing Line	10
	Frame sidewall manufacturing line	10
	Filler Manufacturing Line	8
	Cutchain Manufacturing Line	10
	Total	50
Construction	Add the first bucket (four fabric layers)	15

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	Add the second bucket (four fabric layers)	15
	Add the third pocket	10
	Add Bead Wire	5
	Total	45
riveting	Green tire press with special presses	25
	Shed heat and hot water	20
	High pressure shed	20
	Total	65
Industrial Services	Preventive Maintenance	15
	Therapeutic Maintenance	10
	Boiler Maintenance	5
	Compressor Maintenance	5
	Total	35
Study & Development	Carrying out study and development	10
	Conducting laboratory tests	15
	Total	25
Packaging	Receipt of the manufactured product from the installation activity	3
	Product Packaging	4
	Delivery of the product to the full production warehouse	3
	Total	10

Source (prepared by researcher based on production department)

A. What is the administrative activity? The direct working hours of the administrative staff are the appropriate cost guide for calculating the time equation, as shown in the following equation:

Step Five: Calculate the total cost of each activity

In this step, the total cost of each activity will be reached by multiplying the cost per unit of step (5) by the time required for each activity from step (6) and as shown in Table (7).

Table (7) shows the total cost of activities

Activity	Activity Time	Download Rate	Unit Cost	Production Volume	Total costs
Preparation Activity	60	84	5039	225000	1,133,868,656
Formation Activity	50	71	3544	225000	797,355,328
Construction Activity	45	60	2709	225000	609,485,611
Installation Activity	65	72	4684	225000	1,053,952,340
Industrial Services Activity	35	73	2555	225000	574,852,912
R&D Activity	25	62	1539	225000	346,252,640
Packaging Activity	10	85	852	225000	191,681,786
Management Activity	103	45	4588	225000	1,032,251,800

Source (prepared by the researcher based on Table 5 and 6)

Identify the exploited and untapped resources of the main activities of the laboratory

After the costs of the main activities of the tire industry have been reached by multiplying the loading rate of one unit by the time taken for each activity as shown in Table (7), which represents the exploited resources, it will be possible to determine the unutilized resources by subtracting the exploited resources from the total resources of the plant as shown in Table (8).

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Table (8) shows the identification of untapped resources

Activity	Total resources of the activity	Resources exploited	Untapped resources
Preparation Activity	1,693,243,860	1,133,868,656	559,375,204
Formation Activity	1,357,417,710	797,355,328	560,062,382
Construction Activity	1,274,231,250	609,485,611	664,745,639
Installation Activity	1,198,587,030	1,053,952,340	144,634,690
Industrial Services Activity	809,392,900	574,852,912	234,539,988
R&D Activity	415,724,770	346,252,640	69,472,130
Packaging Activity	815,797,680	191,681,786	624,115,894
Management Activity	1,032,251,800	1,032,251,800	-
Total	8596647000	5739701072	2856945928
Ratio	100%	67%	33%

Source (prepared by the researcher based on Table 3 and 7)

Determining the cost of each product according to TDABC technology

The cost of each product is calculated by dividing the total manufacturing costs by the volume of production of each product, after excluding unutilized costs from the company's total resources.

Table (9) shows the cost of one unit of products in the Diwaniyah tire factory according to TDABC technology

Products	Direct Wages	Direct Materials	T.S.G.M	Total Costs	Production Volume	Cost Of Manufacture
Frame size 1200/24	929532450	495812800	2295880429	3721225679	90000	41347
Frame size 1200/20	1062322800	433836200	2008895375	3505054375	78750	44509
Frame size 1400/20	663951750	309883000	1434925268	2408760018	56250	42822
Total	2655807000	1239532000	5739701072	9635040072	225000	

Source (prepared by the researcher)

Second: Comparison of the cost of manufacturing products between the traditional approach and TDABC technology

The costs of manufacturing products according to the traditional approach of the company can be compared with the **TDABC** technology that has been reached, as shown in Table (10).

Table (10) shows the comparison of the cost of manufacture between the traditional entrance and TDABC technology

Products	Cost according to the traditional system	TDABC Cost	Troupes	Observations
Frame size 1200/24	54044	41347	12697	decrease
Frame size 1200/20	57206	44509	12697	decrease
Frame size 1400/20	55520	42822	12698	decrease

Source (prepared by the researcher based on Table 2 and 9).

Through the above table, it becomes clear to us that the cost of making all products has decreased according to TDABC technology than in the traditional way of the company, and therefore this reduction is in itself an improvement in the company's production efficiency, which came by getting rid of non-value-adding resources, which will not be charged to the products, but rather are closed in the income statement (period costs) and accordingly the true picture of the costs will appear to us, which allows management to make appropriate decisions that It will increase the efficiency of the optimal use of resources.

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Third: Extracting the productivity index under TDABC technology

The productivity index is measured by the relationship between inputs and outputs, and therefore a comparison will be made between the productivity index before and after the application of TDAB technology to see the impact of its application on improving the company's production efficiency, as shown in Table (11).

Table (11) shows the productivity indicators of the Diwani tire factory

Product	Pre-Technology Productivity Indicator	Productivity Index After Technology Implementation
Frame Size 1200/24	1.67 = 54044/90000	2.18 = 41347/90000
Frame Size 1200/20	1.38 = 57206/78750	1.77 = 44509/78750
Frame Size 1400/20	1.01 = 55520/56250	1.3 = 42822/56250

Source (prepared by the researcher based on Table 10).

It is clear from the above table that the productivity index of products before the application of the technology is (1.67, 1.38, 1.01) respectively, and this indicator increased after the application of the technology to (2.18, 1.77, 1.3) respectively, and therefore the application of TDABC technology contributed to reducing the cost of manufacture and improving the production efficiency of the company, and this is what the study hypothesis was based on.

V. CONCLUSIONS

1. The application of TDABC technology to the cost of the product is more consistent with the actual use of resources in the company compared to traditional costing methods
2. The application of TDABC technology ensures that product costs are more accurate and compatible with the company's resource usage patterns, since it depends mainly on actual activities and recognizes that activities consume production resources
3. TDABC technology provides more important information about cost and pricing, which in turn can lead to improved manufacturing efficiency and thus product optimization to rationalize costs.
4. The application of TDABC technology showed that there is untapped energy in the main activities of the company reached its maximum in the construction activity at a cost of (664,745,639) and by 33% of the total available resources.
5. The application of TDABC technology contributes to improving the production efficiency of the company, as the results showed that the productivity index of the company's products (size frame 1200/24, size frame 1200/20, size frame 1400/20) is (1.67, 1.38, 1.01) respectively before application, while it increased to (2.18, 1.77, 1.3) respectively after application.

VI. RECOMMENDATIONS

1. The need to provide material, intellectual and moral support in order to urge economic units to apply modern technologies in determining the cost of products, which would provide the necessary information in making appropriate decisions.
2. There must be a continuous update of the time equations and activities required in the operations, whether when adding or modifying activities, in order to ensure that costs are consistent with resource use patterns.
3. The economic unit should carry out processes to improve weaknesses in some activities and provide appropriate and radical solutions in order to improve manufacturing efficiency.
4. The need for the economic unit to exploit untapped resources by increasing the units produced and sold and using one of the pricing strategies that suit them and that increase the demand for products.

VII. REFERENCES

1. *Abdullah, Hanan Sobhat and Faleh, Haider Musa, (2018.) "The use of cost technology based on time-oriented activities (TDABC and its role in reducing costs" An applied study in the General Company for Electrical and Electronic Industries / Waziriya "Al-Rafidain University Journal of Science, No. 43*
2. *Afonso, P., & Santana, A. (2016). Application of the TDABC model in the logistics process using different capacity cost rates. Journal of Industrial Engineering and Management (JIEM), 9(5), 1003-1019.*
3. *Al-Qulaiti, Saeed Ali Hassan and Hassanein, Wael Salah Al-Saeed, " (2007) "Definition of the productive efficiency of public sector employees and methods of measuring and mechanisms for improving them using industrial engineer ing techniques Administrative Development Conference: Reality and Ambition at Al-Jouf University in the Kingdom of Saudi Arabia*

4. *Ashwin B. Ganorkara, Ramesh R. Lakheb, and Kamalkishor N. Agrawal (2018) TDABC for a manufacturing environment, Review of Applied Management Studies.*
5. *Bin Qismi, Tariq and Bin Al-Zari, Abdul Razzaq, (2018) "A proposed model that illustrates the factors affecting the production efficiency in industrial institutions - a field study" Journal of Law and Human Sciences Issue 34*
6. *Blocher, E. J., Stout, D. E., Juras, P. E., & Smith, S. (2019). Cost Management (A Strategic Emphasis) 8e. McGraw-Hill Education.*
7. *Dalci, I., Tanis, V., & Kosan, L. (2010). Customer profitability analysis with time-driven activity based costing: a case study in a hotel. International Journal of contemporary hospitality Management.*
8. *Hall, O. P., & McPeak, C. (2011). Are SMEs ready for ABC. Journal of Accounting and Finance, 11(4), 11-22.*
9. *Horngren, Ch. T, Datar, S.M & Rajan, M.V (2015)"Cost Accounting a Managerial Emphasis", Library of Congress Cataloging-in-Publication Data, Fifteenth Edition*
10. *Kazim, Hatem Karim, (2019) "Integration of Target Cost and Resource Consumption Accounting to Increase the Productivity of the Economic Unit in Iraq" PhD thesis, University of Baghdad – College of Administration and Economics*
11. *Latifa Bakouch, (2017) "The Contribution of Activity-Based Management to Improving the Performance of Algerian Economic Enterprises – Case Study: Saidal Complex", PhD thesis, Mohamed Khider University, Biskra, Algeria*
12. *Namazi, M. (2016). Time Driven Activity Based Costing: Theory, Applications and Limitations. Iranian Journal of Management Studies, 9(3), 457-482.*
13. *Neumann, B. R., Gerlach, J. H., Moldauer, E., Finch, M., & Olson, C. (2004). Cost management using ABC for IT activities and services. Management Accounting Quarterly, (1), 29.*
14. *Ramida, P. O. N. G. W. A. S. I. T., & Rungchat, C. I. (2015). Analysis of wooden toy manufacturing costs through the application of a time-driven activity-based costing system. In Vol. 65, presented at the Symposium on Mechanical Engineering, Industrial Engineering, and Robotics (pp. 14-7).*
15. *Sabah, Haymer, (2010) "Morale and its relationship to the productive efficiency of the worker, a field study at the Soft Drinks Establishment-Tulqa " Master's thesis, University of Mohamed Khider – Biskra – Algeria*
16. *Wafa, Boughlouf, (2017) "The Role of Training in Raising the Productive Efficiency of the Institution" Master's Thesis, Larbi Ben M'hidi University – Oum El Bouaghi.*