Adv. Math. Fin. App., 2025, **10**(1), P. 41-58

Advances in Mathematical Finance & Applications
www.amfa.iau-arak.ac.ir
Print ISSN: 2538-5569
Online ISSN: 2645-4610
Doi: 10.71716/amfa.2025.22021707

Case Study

Designing and Developing a Model for Calculating the Cost of Each Student in Islamic Azad University of Kermanshah Using Time-Driven-Activity-Based-Costing (TDABC)

Bahamin Khoshnava, Babak Jamshidinavid*

Department of Accounting, Kermanshah Branch, Islamic Azad University, Kermanshah, Iran

ARTICLE INFO

Article history:
Received 2022-02-21
Accepted 2022-07-26

Keywords:
Activity Based Cosing
Cost of Student
Time-Driven- Activity- Based Costing(TDABC)

ABSTRACT

The university is the mirror of the whole view of development and progress of society and provides the platform for human growth through the transfer of science to students. As a service organization providing its budget from students' fees, the Islamic Azad University is required to know the cost of the services it provides to its customers. Therefore, the present study designed and developed a model for calculating the cost of each student in Islamic Azad University of Kermanshah using time-driven-activity-based-costing (TDABC) .The obtained results show that the capacity cost is the same in each field. This result indicates that in case of using a time-driven activity based costing in the field of Education Deputy, the practical capacity is the same as the nominal capacity. The results indicate that time-oriented costing indicates loss of energy and time in the university. Based on time-driven costing, costs are lower than actual costs. This shows that the university should be able to reduce student costs and increase quality in exchange for planning and decision making correctly and in a timely manner in order to be more successful in attracting students.

1 Introduction

Today, accounting information system has become an integral part of management information system. While the cost-effective data generated by the accounting information system is used by the administrators for planning, control and evaluation of the operation [12]. This is important not only for the officials of an organization but also for the government as well. Cost management for organizations is beyond measurement and reporting cost-added products and services, and in fact a philosophy, a method of conduct and a set of techniques to create more value at a lower cost [13] and today, to sustain the organization in the competitive world, cost management is a necessity. It is believed that the other purpose of data collection and allocation of costs is not simply about control but also issues such as

* Corresponding author. Tel.: +98 9181320812
E-mail address: *jamshidinavid@iauksh.ac.ir*

prediction, planning, and evaluation. Simultaneously with the importance of strategic issues, the focus of cost management has been on the company strategy. It is noTable that the cost accounting system must support the mission and outlook of the university by identifying any empty capacity and providing relevant information for rational decision-making as well as improving the quality of services provided to the students and ultimately efficient management of the resources of the university [10].New management accounting techniques such as ABC and TDABC were applied in organizations as organizational strategy and strategic management accounting was introduced and their application was developed. Applying these techniques can create competitive advantage for organizations and increase the speed of achieving to organizational strategies and goals. Although activity-based costing model provides more accurate information than traditional optimization model, due to size, complexity and cost, it is not widely accepted by organizations and companies. For this reason, in recent years, efforts have been done to simplify the activity-based costing model [6].The TDABC model is the simplified form of the ABC model. Unfortunately, many companies have either abandoned or refused to update the ABC system because of their studies and time-consuming trainings and high cost of processing data in operational-based costing systems. Lack of updating the system led to incorrect estimates of process costs, product and customer costs. The disadvantages of the ABC system tend to use TDABC. In fact, TDABC has been considered as the main drive for allocating resource costs to the cost of final goals in academic programs [14].Therefore, Islamic Azad University has a large share of the country's higher education and provides all its expenses through students' tuition. Increasing costs in all organizations, on one hand, poses many challenges to them and Islamic Azad University is no exception. On the other hand, the reduction in the number of additional students has caused to the study of cost accounting problems in this university organization. This is because the higher education system includes a number of activities such as educational, research and student services. However, the accounting system has identified and classified the costs associated with these activities; however, less attention has been given to determining the cost of program activities to a smaller element. This has important implications for foreign administrators and users in higher education system. Therefore, the present study, through the use of the experiences, cooperation and counseling of experts and specialists, will be tried to provide appropriate information to the senior managers in the university so that they can make appropriate decisions regarding the proper use of existing facilities and equipment in order to increase the productivity and quality of the education expected by the students. According to the above cases, the main question of this study is “TDABC model for calculating the cost of the students of Islamic Azad University in Kermanshah province and based on the structure of higher education institutes in Iran.” In recent decades, factors such as a significant increase in university applicants, low student admission capacity in public universities and the appropriate services provided to students have led to the growth of the Azad University in the last two decades, because the excess demand over supply has led to many applicants admitted to Islamic Azad universities, but now the situation is reversed, with the number of undergraduate applicants declining and student admission capacity at public universities increasing. In such circumstances, the solution of implementing new costing systems to reduce costs and, by nature, to adapt the tuition of different disciplines to the cost of each discipline is suggested. Because managers need accurate and transparent information about the cost of each activity to reduce costs, as well as to make the right decisions and to correct and eliminate activities that do not have income, so considering the importance of correct economic decisions and correct use of limited resources in universities, the costing system The basis of time-oriented activity as one of the new methods of costing can significantly help universities to solve the problems arising from the use of traditional methods; Also, by obtaining

accurate and transparent information about the cost of each field, the tuition of each field can be determined in proportion to the cost of the same field. This research seeks to take an effective step towards this important step. However, no study has been done in this field for the mentioned university; Therefore, this study is innovative in this regard.

2 Literature Review

Managers need accurate and transparent information about the cost of each activity in order to reduce costs, as well as taking correct decisions and correction and eliminating activities that do not have income. Therefore, considering the importance of correct economic decision-making and proper use of limited resources in universities, activity-based method can be a significant contribution to universities to solve problems arising from the use of traditional method. It can also be determined by obtaining accurate and transparent information from the cost of each discipline at the end of each discipline [13]. This research seeks to take an effective step towards this important goal by taking a short step. Strategic cost systems must have key features that show their usefulness as a tool for managerial and financial decision making. The characteristics of a strategic costing system are:

1. The cost systems must be simple.
2. Costing systems must be user-friendly.
3. Costing systems must be logically accurate.
4. Costing systems must be accessible.
5. Costing systems must be flexible and multipurpose.
6. Costing systems must be appropriate for decision-making.
7. The cost systems must be dynamic [15].

In this regard, activity-based costing system (ABC) is one of the most important new phenomena that have caused the emergence of revolution in the field of calculating the cost of products and services. The system quickly gained a high status among management accountants. The increasing speed of adoption in the business world is evidence of the value of its concepts. The technique's theory was understood in a short time, and many academic centers have included its training in their classrooms and books [10]. This system is considered as one of the greatest advances in management accounting in the twentieth century. However, gradually, some weaknesses in the ABC system also appeared, causing concerns.Kaplan and Anderson [5], for example, report that an Activity Based Costing (ABC) system used in a large financial enterprise was intended to measure product cost and customer profitability on a monthly basis. Measuring product cost and customer profitability were conducted with the aim of doing activities to improve process, product pricing, and customer related actions. However, the system required 1700 employees, who were working in more than a hundred centers, to provide monthly percentages of time allocated for their work activities. As a result, the company only needed 14 full-time forces to collect and process data and produce management reports and it took more than thirty days [9] to perform these activities.Unfortunately, many companies have either abandoned or refused to update the ABC system because of their studies and time-consuming trainings and high cost of processing data in operational-based costing systems. Lack of updating the system led to incorrect estimates of process costs, product and customer costs.Therefore, in order to solve some of the problems of Kaplan and Anderson's conventional systems, a time-driven activity-based costing system was introduced which, unlike the previous one, did not identify activities in the first phase and did not allocate costs related to the activities, but first the Kaplan management team directly envisioned the resources required for each subject (products, services, customers, etc.), and instead of specifying the time required for activity through interviews and asking questions, the costs are determined through the

Anderson Solution and through the Solution [4].Time-driven activity –based costing model is a simple but attractive approach to costing a business unit process that provides comprehensive profit and loss reporting for the most complex organizations. The simplicity of this model stems from the fact that only two parameters have to be estimated for each circle: the cost per unit of resources provided and the amount of capacity that each transaction, product, or customer consumes. The cost of each unit of supplied capacity is obtained by dividing the total cost of each unit by the practical capacity, and to calculate it, two estimates need to be made:

The cost and practical capacity to reflect the changes of operating conditions can be easily updated to the time-driven model. When more activities are added to a circle, there is no need to re-interview staff. The complex effects of orders can be reflected by adding additional time units to simple orders in time equations. In general, TDABC is theoretically overcoming the criticism of the traditional cost-finding system, which uses direct labor or machine hours as a cost stimulus [10].

Accordingly, the TDABC system has the following advantages:

1. It is immediately set up.
2. To reflect changes in operations, the variation of orders and resource prices is easily updated.
3. It uses information from Enterprise Resource Planning (ERP) systems.
4. This model is validated by direct observation of time estimates.
5. It easily evaluates the execution of millions of deals, while it still offers quickly, operation times, an d processing and actual process time.
6. Clearly specifies unused resource capacities for management action.
7. Variation in orders and customers does not increase the complexity of the model [9].

In this regard, Kaplan & Anderson [4,5] claim the system helps companies quickly determine costs and process capacity operation and profitability of orders, products and customers. Also, time-driven activity-cost costing system enables companies to improve their costs rather than abandoning their ABC systems. Because the time-driven activity-cost costing does not identify activities based on activity in the first phase, and does not allocate the costs to the activities. In this method, the management will first directly predict the required resources for each issue of the cost (goods, services, customers...) and instead of specifying the time of the activities based on interviews of employees or providing a questionnaire to them, the cost resources are determined based on the time equation and directly and automatically assign to the activities and operations.Under these conditions, time-driven activity-based costing method can be more efficient than the activity-based method [8]. Using this approach, managers also obtain accurate and appropriate information about profitability and cost, so that they can determine the priority of process improvements, determine the diversity and composition of their products logically specified, manage customer orders and customer relations in a beneficial way.

3 Research Background

Jiang et al.[3] in a study investigating the management system based on time-based activity of public hospitals showed that the TDABC system developed can improve the accuracy of hospital cost accounting, improve the work efficiency of medical staff, total Realize the cost management process and increase the hospitality of the hospital.Dubron et al. [2] in a study providing a time-based activity-based costing approach to identify cost diversity showed that TDABC is a valuable approach to measuring and understanding cost diversity. Accordingly, these findings can inform providers, managers, and regulators about improving cost control processes and initiatives. Cidav et al. [1] in a study providing a practical method for costing implementation strategies using time-based activity-

based costing have shown that this step-by-step method identifies the letters, actions, actors, and scheduling of each implementation strategy and Produces a clear map of the implementation process. Determine the frequency and duration of each action related to individual strategies; And allocating dollar value to the resources that each action consumes. This method provides a transparent and granular cost estimate and allows the cost comparison of different implementation strategies. The data obtained allows researchers and stakeholders to understand how specific components of an implementation strategy affect its overall cost.Wouters & Stecher. [16] measuring real-time product cost in a medium-sized manufacturing company, data availability, and twouterhe need for updates are important considerations when designing product cost systems. This article describes the development of a costing system in a medium-sized company to better understand these issues. The company wanted to be able to assess product profitability more comprehensively than product profit margins, which were merely direct material costs. The system uses practical capacity to calculate rates and is based on a combination of machining and labor time. The innovative aspect is that the use of real-time machine data in production varies across a large number of products and often. This study also helps identify time-based activity-based cost constraints (TDABCs) and defines this role of "information discovery" in the design of cost systems. The results of some research on cost stickiness show that selling and general administration (SGA) costs, as well as costs of goods sold, have highly sticky behaviors[19]. Portney et al. [17] Cost-Based Activity-Based Costs to Identify Cost Reduction Opportunities in Pediatric Appendectomy, as Reimbursement Programs Have Become Value-Based Models with an Emphasis on Quality and Effective Health Care, need to understand the process There is management to eliminate the real costs of patient care. We sought to find cost-reducing ways to manage simple appendicitis using the Time-Based Activity Cost (TDABC) method for this high-volume surgical procedure. Process maps were created using medical record time stamps.

Labor costs with work capacity were calculated using the salaries of local physicians, the ratio of weighted nurses and patient costs. Consumption costs for supplies, pharmacy, laboratory and food were taken from the main list of the hospital. The results of time-based activity costs lead to an accurate calculation of each minute in personnel costs. The highest costs were in the operating room ($ 747.07), the hospital floor ($ 388.20) and the emergency department ($ 296.21). The most important contributors during the stay were emergency assessment (270 minutes), access to the operating room (395 minutes) and postoperative monitoring (1128 minutes). The TDABC model resulted in $ 1712.16 in personnel costs and $ 1041.23 in consumption costs for the entire appendix paying $ 2753.39. Inadequacies in healthcare delivery can be identified through the TDABC. Simple appendicitis is recommended for optimizing value-based care based on cost-cutting recommendations.

Lorena et al. [18] Using Time-Based Activity Costs to Identify Best Practices in Academic Libraries In today's competitive and dynamic environment, libraries need to stay fast and flexible, as well as new ideas and working methods. Open. Based on a case study of two university libraries in Belgium, this study examines the possibilities of using time-based activity-based costs (TDABC) to determine library processes. For this purpose, two main research questions have been considered: 1) Can TDABC be used to increase process metrics in libraries? 2) Do the results at the activity level provide more insight than the macro results in a process criterion? We begin by describing the implementation of the TDABC. Next, we discuss and compare the workflow of 10 library processes that cover the four main functions of the library: purchasing, cataloging, circulation, and document delivery. Later, based on benchmarks, we report and discuss, and potential processes and performance improvements can be analyzed through the use of library scheduling and cost information, especially for two libraries. We discuss this benefit by discussing the benefits of using TDABC as a tool to improve process metrics in libraries.

4 Methodology

According to the aim of this study, "design and development of a model for calculating the cost of each student at Islamic Azad University in Kermanshah using time-driven activity based method (TDABC)", therefore, the research method is of applied type. Also, according to the fact that in the present study, case study of "Islamic Azad University of Kermanshah" has been selected to study and the activities and services of this university branch have been considered; therefore, the present study regarding this classification is a descriptive study. From the perspective of data type, the study group is classified quantitatively and is sectional study in term of time period.

The statistical population in this study is Azad University Branch in Kermanshah province and according to the activities of Expenditure Element in this University, five areas were specified which are:

1. Costs of Personnel and Faculty
2. Administrative, service and educational costs
3. Research and technology costs
4. Cultural costs
5. Sports costs

Therefore, in this study, costing for each student considering five above-mentioned cost groups is investigated. In addition, excel software was used to classify and analyze the collected data. In the following, the TDABC model and its components are widely explained and how to use this model for the improvement of the cost per student. Finally, the implementation stages are briefly explained.

4.1 TDABC Model Description

The time-driven activity based method is a simple form of costing model based on traditional activity and thus allocating overhead costs is done more efficiently than traditional costing method. This model provides appropriate information about the extent of employing capacity in each sector of an organization. It also helps managers to evaluate the capacity of each sector in human resource planning, provide better services and necessary investment. Using the time-driven activity-based model in comparison with the costing model based on traditional activity is easier and faster.

Researches on using the time-driven activity based model, while emphasizing the simplicity and rapidity of its application in organizations, admit that the time-driven activity based model offers more relevant results than traditional absorptive model for decision making. The results of the present study include the tools of analyzing the model's capacity and the possibility of calculating unused capacity [6].The time-driven activity based model (TDABC) can easily be applied to measuring system in different types of activities. This is one of the most important advantages of the ABC system in comparison with the activity-based costing (ABC), which shows little flexibility about changes and changes in activities require a lot of time and costs. The TDABC provides a costing model which can be adjusted rapidly and with minimal cost with changes in the processes and external environment. Time equations can easily apply effects related to new activities, products and processes and update the cost-benefit system. These equations cause to change part of the costing model instead of whole cost model as a result of such changes. Time equations can easily simplify the complexity of the production process and make the cost operation more objective and simple. Time-driven activity -based costing models can be developed linearly by adding expressions in a time equation [9].

Time-driven activity-based costing model is a simple and attractive but powerful approach in costing processes of a business unit which provides comprehensive reports on profits and losses for the most

complex organizations. The simplicity of this model is due to that only two parameters for each circle should be estimated:
The cost of each unit of capacity supplied
Amount of capacity that each transaction consumes product or customer.
Let us consider these two parameters:
The cost of each unit of the supplied capacity is derived from dividing the total costs of each circle on the practical capacity, and to calculate it, two estimations are needed: The cost of the supplied capacity and the practical capacity. By doing these two estimates, the cost of each unit of the produced capacity (which is the unit of the riyal per minute) is derived from the following equation [16]:

$$\frac{cost\ of\ supplied\ capacity}{scientific\ capacity\ of\ supplied\ resource} = cost\ of\ per\ supplied\ unit \quad (1)$$

Using time equations, the time spent by each event related to the activity of tj,k can be represented in a function of different features. The following time equation shows the time required by the k-event related to j activity with the number p given X-time stimulus. In this equivalent, Tj,k time consumed by the k-event corresponds to the j activity, 0 β is the constant time factor for j activity, independent of the events k, 1 β the time taken by a unit of time stimulus number one, X1 time stimulus number one, X2 time stimulus number two, Xp time stimulus p and p the number of time drives determining the time needed to perform j operation. [16]:

$$Tj,k = \beta 0+\beta 1.X1+\beta 2.x2+\beta 3.x3+\ldots+\beta p.Xp \quad (2)$$

Thus, the total cost of events related to all activities can be calculated from the sum total cost of activities and the total cost of a subject of the cost can be calculated from the relation 3, in which the cost per unit of time corresponding to the resource pool i, tj, k time consumed by the event k of activity j, n number of resource tanks, m the number of active times and I the number of times that the activity j is performed or the number of events related to the j activity [16]:

$$The\ total\ cost\ of\ the\ costing\ subject = \sum_{i=1}^{n}\sum_{j=1}^{m}\sum_{k=1}^{l} tj.k \cdot ci \quad (3)$$

Time stimulus is of great importance in the time-driven activity-based model. Time stimulus is the variables that determine the time required for an activity. They can be continuous, discontinuous and index variables. The differences between these variables can be explained by a few examples:
Continuous variables: Like the weight of a pallet, distance to kilometers.
Discontinuous variables: The number of orders, the number of production lines, the number of long-term checks.
Index variables: Such as customers type (old or new), orders type (normal or urgent), how to receive order (via electronic or fax).
An important advantage of the time-driven activity-based model is that several stimuli can be considered to define the cost of an activity.
In the cost-based model based on traditional activity, only one activity stimulus can be considered for each activity. For example, the activity of registration of order lines by stimulus of the number of orders lines or the activity of new customer registration by stimulus of the number of new customers. In traditional models, if a lot of activity stimuli are used for accurate costing, we should define different activities. In the time-driven activity-based model, time equations consider the mutual effects of the

stimulus on one another. The general time equation, which includes the main effects and the two-way effects of time stimuli, can be written as a equation:

$$Tj,k = \beta 0 + \beta 1.X1 + \beta 2 + \beta 3.X3 + \beta 3.X1.X2 \quad (4)$$

In the time-driven model, instead of using interviews with personnel, the existing process documentation is examined to determine the amount of effort required to complete each stage of the commercial unit process. If the process is complicated, for example if additional steps are required for a certain process, the researcher must identify that transaction property that led to additional efforts. Additional observations can be used to validate time standards.

The key point of the time-driven model is the use of time estimates. The use of resource capacity for allocating resource cost to activities in the traditional activity-based costing model was previously proposed by Kaplan and Cooper, but what's new in the time-driven model is that the time required to perform an activity can be estimated for each event based on different features using time stimuli. Therefore, the time-driven model uses temporal stimuli rather than trading stimulus. The reason for using time stimuli is that in complex environments, in any given situation, a given activity does not always consume the same amount of resources. The time-driven model uses time-consuming equations to estimate resource demand by an activity rather than defining a separate activity for any possible combination of a process. Essentially, the time-driven model works by understanding the amount of effort required processing any given transaction and by properly connecting the cost of each given transaction, it measures the costs by activities, products, customers and channels. In the traditional activity-based costing model, the project team interviews groups of employees to determine the types of activities and the time they spend on each activity. The amount of time that these activities take place is registered and used as a basis to allocate the operating costs to products, customers and channels. This usually requires obtaining a large number of volume stimuli to complete the cost allocations of each period [17].

The assumption of full use of resources for physical resources such as direct material can be true, but this assumption is highly unlikely for unintuitive sources such as IT services. The time-driven model reveals the fact that in the normal organizational process of a company, there may be unusable resources as committed resources that are not fully utilized; thus, resource costs are only allocated to a cost repository when they are actually consumed by that repository. Unused sources that are not used in operations are individually identified and are not allocated to any cost repository. Identification of unused sources in the time-driven model gives a different approach to the costing nature of the product. In the weighting model based on traditional activity and the volume-based traditional cost accounting model, it is assumed that all resources are used in the operation and therefore all the committed sources are identified as the product costs. Any differences between the total cost of the committed resource and the cost of the allocated resources are represented as the error of the allocation process. However, in the time-oriented model, calculating product cost instead of required resources values is based on the amount of consumed resources in the operation. In this model, resources that can be used are considered as the costs of the period [6].

4.2 How to apply TDABC model in Islamic Azad University of Kermanshah for each student

In this study, the cost per student in Islamic Azad University of Kermanshah province in 2020 is estimated by TDABC method. Therefore, by specifying costing topic and model, the data of model should be gathered. cost components in this university unit are the subject of costing, so after identifying these sections, direct costs (related to each of the sections, are identified and indirect costs are extracted

and used to allocate indirect prices in the TDABC model and the stimulus of time prices.. Finally, the total cost of each part is calculated by adding direct costs and indirect costs associated with that section. Finally, by accumulating the cost of all sectors, the total cost of the university per student can be calculated for 2020. The amount of the cost can be used as a basis for budgeting different sections of the university for the next year.In the TDABC model, two parameters should be estimated: The cost of each unit of capacity is supplied, and the amount of capacity that the cost issue takes.

First, resources used to provide university services to students should be identified as resource reservoirs and the cost of these reservoirs should be determined (in this study, for this part, estimation is not needed and the actual amount is available). Then, the capacity of the practice that is available to different departments of the university is estimated.Now the rate of each unit of supply capacity is calculated using a formula that divides the cost of supply capacity into practical capacity, which is the unit of the riyal per minute. The first parameter of the model has been calculated.

For estimating the second parameter an interview and observation method is used. First, the essential processes of each part are identified and the forming activities of this part, which are doing that leads to the delivery of services, are time-consuming and in time equations of the process related to it. The total amount of time spent on service delivery is eventually reached. Below are the steps in stages in 1 part:

A. First parameter estimation: Cost per unit capacity supplied

1.Identifying resource reservoirs. These financial reservoirs are used to cover the costs of each part to provide its services.

2.The cost estimate of resource reservoirs which, of course, in this study, are the actual amount of the costs that have been done; therefore, there is no need for estimation.

3.Assessment of practical capacity. Considering that in different sections of the university, the manpower is that it is doing things, so in order to take into account the practical capacity, we consider the time that employees can work to provide services during 2019. To calculate this time, we should consider the total amount of time that personnel can actually perform, so there should be some adjustments to estimate the time that sector personnel are present in the workplace so that the amount of time that is practically available to perform various university services, i.e. the total time that personnel can actually work only, should be estimated. Each employee's working hours are 8 hours each day, which must be deducted from time to time and adjusted according to factors to achieve the working capacity of an employee during the year. We multiply the total number by the number of personnel to ultimately achieve the total practical capacity of the university.

Operating capacity = average number of working days during the year (* 8h*, 0min*) Functional capacity ratio to theoretical capacity

This formula is described in detail in chapter.

Calculating the cost of each unit of the supply capacity: For this purpose, we divide the 2-part digit, which is the cost of the provided capacity (in IRR), by the figure obtained in Part 3, that is, the actual capacity (in minutes).

$$cost\ of\ per\ unist\ supplied\ capacity = \frac{cost\ of\ supplied\ capacity}{scientific\ capaicy\ of\ supplied\ capcity} = \frac{performance\ of\ university\ in\ 2019\ + cost\ of\ salary\ in\ 2019}{available\ time\ in\ university} \quad (5)$$

B: Estimating the time required to perform the necessary activities to provide services

1.Identifying factors that affect the duration of each activity (time stimulus). Time stimuli are the

variables that determine the time required for an activity. We show these stimuli with X.
2.The creation of equations when the dependency of the time of each activity to all factors is indicated.

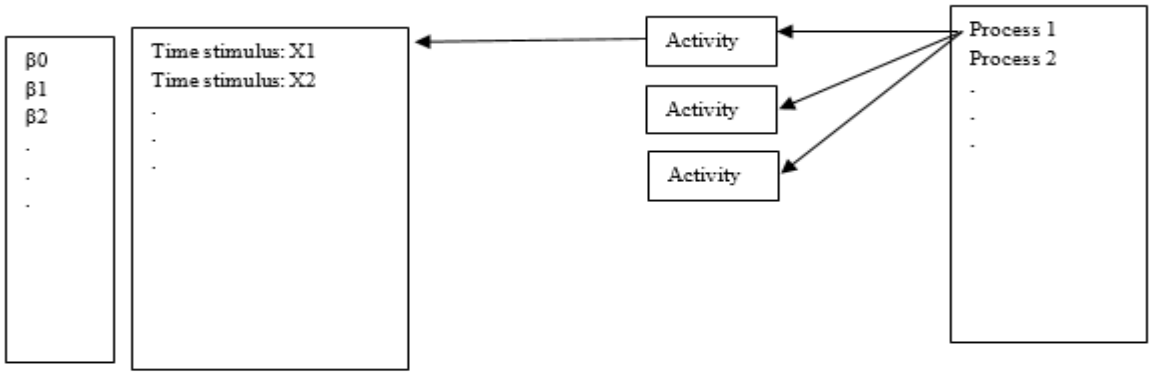

Fig.1: How to calculate the time of service

β0: Time constant for activity 1
β1: Time taken by a unit of time stimulus No. 1
β: Time is an estimate, either how long it takes to perform an event or activity precisely, or an average to be considered. In the case of activities that are repeated frequently during the year, it is virtually impossible to calculate the average time they perform accurately, so based on observations and a subjective assessment, we consider an estimated average time for them.

$$T(\text{Activity 1}) = Tj,k = \beta 0 + \beta 1.X1 + \beta 2 + \beta 3.X3 + \beta 3.X1.X2 \quad (6)$$

T (Activity 1) the duration of activity is 1. We calculate the time of doing all of Process 1 activities. The result is the total time required for performing the process 1. Since each process has a product as the process output, the process 1 product is the service 1. So the time to perform Process 1 will be the time needed to perform Service 1. Accordingly, the time required to provide all processes and services of cost components is calculated; in the end,

$$T\ (\text{Service 1}) = T\ (\text{Process 1}) = T\ (\text{Activity 1}) + T\ (\text{Activity 2}) + T\ (\text{Activity 3}) \quad (7)$$

c. The cost multiplication of each unit of the capacity supplied by the reservoirs at the time of performing any service resulting from this multiplication represents part of the desired service cost, which includes the indirect charges allocated to it.
The cost of each unit of the supplied capacity (Service1) T = the share of service 1 of the indirect costs Direct Service Charges 1+ Share of Service 1 of Indirect Costs = Cost of Service 1
After calculating the cost of all services, we collect the fees related to all services (which we have added in our calculations direct costs to the total university fees in 2019). This sum represents the capacity used in the university for each student from the total capacity of the funded facility, which is the cost of the university's services in 2019.
If we deduct from total resource capacity the used capacity, the amount that is received is the unused capacity of the university which should be developed and taken appropriate management measures for the proper use of this unused capacity. The time computation can also be measured in 2019 and the proportion of it to the total available time. These ratios greatly contribute to the management of the time, in other words the optimal use of time and subsequently cost management, which leads to an increase in the efficiency and effectiveness of the provided capacity. The time and the amount of unused

university capacity are according to the Table below.

5 Findings

In this study, the charts associated with each faculty are defined as Table (1).

Table 1: Faculty Related Chart

School of Nursing	Faculty of Basic Sciences	Faculty of Literature and Humanities	Faculty of Law and Political Science	Faculty of Agriculture and Engineering
Deputy Dean	Dean of the College	Dean of the College	Dean of the College	Dean of the College
manager	Deputy Dean	Deputy Dean	Deputy Dean	Deputy Dean
Expert in charge of training	Head of the Department of Educational, Student and Research Affairs	Head of the Department of Educational, Student and Research Affairs	Head of the Department of Educational, Student and Research Affairs	Head of the Department of Educational, Student and Research Affairs
Research expert	Research expert	Research expert	Research expert	Laboratory Expert (Plant Medicine)
Head of Service Development Department	Laboratory Expert (Physics and Chemistry)	Laboratory Expert (Psychology)	Student Affairs Expert	Research expert
Service Development Expert	Student Affairs Expert	Student Affairs Expert	Educational affairs expert	Educational affairs expert
	Educational affairs expert	Educational affairs expert	Educational affairs expert	Educational affairs expert
	Educational affairs expert	Educational affairs expert	Educational affairs expert	Educational affairs expert
	Educational affairs expert	Educational affairs expert	Educational affairs expert	Educational affairs expert
	Educational affairs expert	Educational affairs expert		Educational affairs expert
		Educational affairs expert		Student Affairs Expert
		Educational affairs expert		

It includes the dean of the faculty, the dean of the faculty, the head of the department of education, students and research in five faculties of agriculture and technology, faculty of law and political science, faculty of literature and humanities, and basic sciences. The Nursing School does not have similar departments with other faculties.

In this section, time-driven activity has been estimated in two centers and time stimuli have been identified and equations have been derived for each activity:

Table 2: Activities of Each Center and Average Time Observed for Each Activity

Time	Activity		Center
10 minutes	Headquarters		Headquarters
15 minutes	Tuition	Deputy for Management and Resources Development Student and cultural deputy	Deputy Department
10 minutes	prosperity Fund		
10 minutes	Cultural	Deputy of Education Deputy for Management and Resources Development	
20 minutes	Sports		
3 minutes	Student		
45 minutes	Education	Student and cultural deputy Deputy of Education	
25 minutes	graduates		
10 minutes	Library	Research Assistant	
65 minutes	Graduate students research		

In this section, an equation is determined for each center based on time stimuli. Time stimuli are determined by the number of students.

Table 3: Number of employees per Center

Administrative 78 people	Deputy of Development and Management Department of Education and Postgraduate Studies	Number of staff in each department
Finance 17 people		
58 people	Research Deputy	
25 people	Student and cultural field	
19 people	Headquarters	
71 people	Deputy of Development and Management	

The daily working hours of any of the staff are 8.40 and 44 hours per week. During the peak of registration and exams and the necessary items with the approval of the manager and the relevant assistant can be up to 11.30 hours which the duty hour's surplus can be 2.50 in overtime.

The cost of each center's capacity is calculated based on the cost of the capacity provided by the division of the provided functional capacity.

The Cost of Capacity Supplied by Department: 71 staff is working in the headquarter center.. The forces operate 26 days per month and 8.4 hours per day. So for a year, everyone works 2,621 hours. The required practical capacity is 85% of the theoretical capacity. Therefore, each person has 228 hours of useful activity per year. The equivalent is 133680 minutes. According to the number of people in this section, the 9491280 minutes of practical capacity can be used for this center.

$$\frac{50268 * 10^6}{9491280} = 5296.2 \quad (8)$$

Capacity Cost Provided by Management and Resources Development Deputy:

There are 78 people in the center. According to the number of people in this section, the practical capacity of this center is 10427040minutes.

$$\frac{55224 * 10^6}{10427040} = 5296.2 \quad (9)$$

Capacity Cost Provided by Management and Resources Development Deputy:

There are 17 people in the center. According to the number of people in this section, the 2272560 minutes of practical capacity can be used for this center.

$$\frac{120360 * 10^6}{2272560} = 5296.2 \quad (10)$$

Funded Capacity Cost of Education and Higher Education

There are 58 people in the center. Based on the number of people in this section, the 7753440 minutes of action capacity can be used for this center.

$$\frac{41064 * 10^6}{7753440} = 5296.2 \quad (11)$$

Funded Capacity Cost of Research Deputy

There are 25 people in the center. Based on the number of people in this section, the 3342000 minutes of action capacity can be used for this center.

$$\frac{17700 * 10^6}{3342000} = 5296.2 \quad (12)$$

Funding of student and cultural capacity

There are 19 people in the center. Based on the number of people in this section, the 2539920 minutes of action capacity can be used for this center.

$$\frac{13452 * 10^6}{2539920} = 5296.2 \quad (13)$$

The capacity cost rate is multiplied at the estimated time and multiplied at the corresponding time stimuli. The same capacity cost has been calculated in the Deputy Offices. It is concluded that time-driven cost system is implemented in the domain of deputy system and the practical capacity is equal to nominal capacity. In the following, the other units of cost have been studied.Universities are known as service units that should respond to social needs on one hand, and on the other, there should be an administrative system based on scientific management, dynamic, low cost, and efficient. By definition, the university's faculty members as production sector employees and the rest of the university staff, including administrators, department directors and administrative departments, all serve as support forces. Accordingly, the first and most important component of the costing model based on time-driven activity-based model is focused on the time spent for learning by the faculty members.

Table 4: Number of Professors and Faculty Members

	Number
Number of faculty members in the academic year 2020-2021	231
Number of invited professors in the academic year 2020-2021	347
The total number of staff in the academic year 2020-2021	253
Number of personnel working in the field of education in the academic year 2020-2021	63
Number of professors holding executive positions in the academic year 2020-2021	57

Due to the fact that the President, Vice Presidents and Head of Educational Departments are among the University Administrators, their teaching hours are calculated as solely as the Duty Study Hour and the number are 295 hours per week. Also, the teaching rate of other faculty members is calculated based on the teaching ceiling for each faculty member of a non-administrative board. Accordingly, the teaching of university professors who lack administrative responsibilities will be 2,742 hours a week. The faculty members of Islamic Azad University, Kermanshah Branch, including the university president, his deputies, the group's managers and other faculty members teach 3037 hours a week.Since each semester lasts for 17 weeks, by multiplying 3037 to 17 is determined that in each term, there are 51629 hours of instruction.

This amounts to 103,258 hours during the academic year, which consists of two terms and doubles the 51629 figure. Non-teaching hours of faculty members were calculated according to their numbers in a specific scientific level. Accordingly, the total non-teaching hours for faculty members per week are 1718 hours. Therefore, the total time of attendance and activity of faculty members in University is 161670 hours per academic year. According to the Pareto principle, 80% of the practical capacity will be equal to 129336 hours. The denominator of the cost of the capacity is calculated. For this purpose and with the aim of increasing the accuracy of calculations, we first calculate the total cost of fiscal year 2019 and 2020, separately from educational and non-educational costs. The academic staff of the University of Technology has been working with the Education Department only during the first academic from October until the end of June. All other educational activities are done in this period. Therefore, all expenses of the educational sectors in terms of the information of the Financial and Administrative Department of the University have been calculated for 6 months from 2019 and 3 months from 2020 more than 123301842603 Rials. The total costs of non-educational sectors are estimated for 6 months from 2019 in addition to 9 months of2020 at 55947968874 Rials. The deduction form was calculated as 179249811477 Rials.Now, based on the relation (supply capacity cost/resource supply practical capacity), the capacity rate of 138592 is extracted.In general, there are five academic disciplines at the Islamic Azad University (Kermanshah). They are agriculture and technical, law and political science, literature and the humanities, basic sciences and nursing. The academic chart of these disciplines is similar. Based on this, time equations, the research requirements, due to the similar nature and very close needs of the study sections, can be provided as follows:

Attendance time in class * number of classes

Time to attend workshop * number of workshop

Table 5: Time Used Per Student

field	Student	Classroom	workshop	Laboratory	Internet	Library	Transportation	Dormitory	Thesis	Publication	Self-services	Total
the literature	5026	16	0	0	8.7	3	2	14	0	1.5	0.7	34.9
Nursing	755	19	2	3	8.7	1	2	14	0	1.5	0.7	37.9
Law and Political Science	1679	14	0	0	8.7	3	2	14	0	1.5	0.7	34.9
Science	701	15	3	1	8.7	2	2	14	0	1.5	0.7	37.9
Technical and agricultural	4126	17	4	1	8.7	1	2	14	0	1.5	0.7	37.9

Table 6: Total Time Used for Student

field	Classroom	workshop	Laboratory	Internet	Library	transportation	Dormitory	Thesis	Publication	Self-services
the literature	80416	0	0	43726,2	15078	10052	70364	25130	7539	3518,2
Nursing	14345	1510	2265	6568,5	755	1510	10570	3775	1132,5	528
Law and Political Science	23506	0	0	14607,3	5037	3358	23506	8395	2518,5	1175,3
Science	10515	2103	701	6098,7	1402	1402	9814	3505	1051,5	490,7
Technical and agricultural	70142	16504	4126	35896,2	4126	8252	57764	20630	6189	2888,2

Table 7: Total Student Costs of Specified Disciplines

field	Classroom	workshop	Laboratory	Internet	Library	Transportation	Dormitory	Thesis	Publication	Self-services	Total
the literature	11,145,000,000	0	0	6,060,000,000	2,090,000,000	1,390,000,000	9,750,000,000	3,480,000,000	1,040,000,000	488,000,000	35,455,076,653
Nursing	1,988,102,240	209,000,000	314,000,000	910,000,000	105,000,000	209,000,000	1,460,000,000	523,000,000	157,000,000	73,245,872	5,953,843,024
Law and Political Science	3,257,743,552	0	0	2,020,000,000	698,000,000	465,000,000	3,260,000,000	1,160,000,000	349,000,000	163,000,000	11,378,832,835
Science	1,457,294,880	291,000,000	97,152,992	845,000,000	194,000,000	194,000,000	1,360,000,000	486,000,000	146,000,000	68,007,094	5,139,393,277
technical and agricultural	9,721,120,064	2,290,000,000	572,000,000	4,970,000,000	572,000,000	1,140,000,000	8,010,000,000	2,860,000,000	858,000,000	400,000,000	31,393,499,501
Total											89,320,645,290

6 Discussion and Conclusions

The lack of appropriate scientific information about the cost of all and the services offered to the Islamic Azad University's educational departments and the time of the student's reduction and increase of costs, the continuation of the activities and management of these units also threaten the students to pay for studying in these courses. However, students should study in a collection that has a high service quality, so designing and implementing a costing system to understand the cost of the work performed and the services provided and efforts to reduce the unnecessary costs and increase the necessary service and to implement this set of educational services are important. The present study provides appropriate information to the managers of these courses with the aim of introducing an appropriate costing system for allocating resources of student tuition and understanding the actual costs. Therefore, in this study, the design and development of a model for calculating the cost of each student in Islamic Azad University, Kermanshah, using a time-driven costing approach is discussed. In this regard, 13

components have been identified in direct and indirect costs. Assistants, teachers, academic groups, library, internet, laboratory, workshop, class, thesis and research, dormitory, self-service, transportation and publications were identified.Also, according to the results of this study, the vice presidents and directors of educational departments are considered administrative staff of the university. Their teaching hours are calculated as equivalent to the teaching hours and they are 295 hours per week. Also, the teaching rate of other faculty members is calculated based on the teaching ceiling for each faculty member of a non-administrative board. Accordingly, the teaching of university professors who lack administrative responsibilities will be 2,742 hours a week. The faculty members of Islamic Azad University, Kermanshah Branch, including the university president, his deputies, the group's managers and other faculty members teach 3037 hours a week.Since each semester lasts for 17 weeks, by multiplying 3037 to 17 times is determined that in each term, there are 51629 hours of teaching. This amounts to 103,258 hours during the academic year, which consists of two terms and doubles the 51629 figure. Non-teaching hours of faculty members were calculated according to their numbers in a specific scientific level. Accordingly, the total non-teaching hours for faculty members per week are 1718 hours. Therefore, the total time of attendance and activity of university faculty members is 161670 hours per academic year. According to the Pareto principle, 80% of the practical capacity will be equal to 129336 hours. The denominator of the cost of the capacity is calculated.For this purpose and with the aim of increasing the accuracy of calculations, we first calculate the total cost of fiscal year 2018 and 2019, separately from educational and non-educational costs. Because the faculty members are engaged solely in educational work during the academic year which is the first of October up to the end of June, and all other educational measures are taken during this period. So, all expenses of educational departments according to the information provided by the university's Finance and Administration Department, on average for 6 months from 2018 and 3 months from 2019 is total 123301842603 riyals and all costs of non-educational sectors in terms of the information given by the Financial and Administrative Affairs Department of the university, for 6 months from 2018 and 6 months from 2018 is 55947968874 Rials. The deduction form was calculated as 179249811477 Rials. This problem reduces the quantity and quality of services offered to students in different aspects. This issue further highlights the need to revise the validity of the credit allocated to the student Deputy.Now, based on the relation (supplied capacity cost/resource supply practical capacity), the capacity rate of 138592 is extracted. In general, there are five academic disciplines at the Islamic Azad University (Kermanshah). They are agriculture and technical, law and political science, literature and the humanities, basic sciences and nursing.The results show that time-driven costing shows the waste of time and energy in the university. Based on time-driven costing, costs have been lower than the actual cost. The results show that in recent years, competition has increased in the number of students applying for the university course and the number of students applying for the university course both in the governmental and non-governmental level. The number of branches of the Azad University has increased significantly. Therefore, it is necessary that the Azad University, with proper planning and appropriate decision-making, be able to reduce the expenses of students in a timely manner and increase the quality of students in order to achieve more success in attracting the students and enabling them to continue their activities.Therefore, based on the findings of this study, it is recommended that more supervision be carried out in order to reduce costs in the Assistants' wards, as well as the teachers, academic groups, library, internet, lab, workshop, classroom, thesis and research, dormitory, service predecessor, transportation and publications and take necessary measures to save costs. It is also recommended that the present study manage the cost of education in each field and apply it to reduce costs without lowering the quality in service delivery and

optimal determination of educational price. It is also suggested that managers use this technique to determine the exact cost of holding one hour of a training class.

References

[1] Cidav, Z., Mandell, D., Pyne, J., Beidas, R., Curran, G., Marcus, S., A pragmatic method for costing implementation strategies using time-driven activity-based costing, *Implementation Science*, 2020; 15: 28.

[2] Dubron, K., Verschaeve, M., Roodhooft , F., A time-driven activity-based costing approach for identifying variability in costs of childbirth between and within types of delivery, *BMC Pregnancy and Childbirth*, 2021; 21: 705

[3] Jiang, Q., Zhu, X., Chen, L., Zhao, Z., Chen, Y., Research on Time-Driven Activity-Based Management System of Public Hospitals, *Front. Public Health*, 2022; Doi:10.3389/fpubh.2021.763829.

[4] Kaplan, Robert S., Anderson, Steven. R., Time-Driven Activity Based Costing, *Harvard Business Review*, 2004; 22: 131- 138.

[5] Kaplan, R.S., Anderson, S.R., Time-Driven Activity-Based Costing: A Simpler and More Powerful Path to Higher Profits, *Harvard Business School Press*, 2007.

[6] Khalifeh Soltani, A., Mirzaei Kalani, M., Employing time-driven activity-based model in manufacturing firms, *Journal of Management Accounting*, 2012; 5(15): 100-101.

[7] Laverne, M., An Examination and Analysis of the Application of Performance Based Budgeting Systems in California Urban Transit Agencies, *OCED*, 2005; 21-26.

[8] Lesetedi, E., Mohee, R., Application of Time Driven Activity Based Costing in Botswana Open University, *Pan Commonwealth Forum*, 2019.

[9] Namazi, M., Ghaffari, M. J., Karaisky, M. A., A Comparative Study of Cost Estimation Model based on Fuzzy Activity and Cost-Taking Model Based on Traditional Activity in Hospital Services, *Management accounting and audit knowledge*, 2013; 1(4).

[10] Oraby, S., A Guide to Implementation of Time- Driven Activity -Based Costing in Saudi Electronic University, *International Journal of Business and Management*, 2020; 16(1): 68.

[11] Paulo, A., Alex, S., Application of the TDABC Model in the Logistics Process Using Different Capacity Cost Rates, *Journal of Industrial Engineering and Management, JIEM*, 2016; 9(5): 1003-1019.

[12] Ringelstein, D., Time Driven Activity Based Costing: A Critical Review, *Journal of New Business Ideas and Trends*, 2018; 16(3): 20-27.

[13] Yulianita, D. S., Wahuni. D., Use of Time Driven Activity Based Costing to Calculate the unit cost per students at faculty of economics of Universities Pendidkan Ganesha, *Advance of Economics Business and Management Research*, 2018; 79(3). Doi:10.2991/teams-18.2019.42

[14] Yulianita, D.N.W, Rencana Sari Dewi, G.A.K., Wahyuni, M.A., Use of Time-Driven Activity-Based Costing to Calculate the Unit Cost per Students at Faculty of Economics of Universitas Pendidikan Ganesha, *Advances in Economics, Business and Management Research*, 2019; 69.

[15] Lianabel, Oliver. "Designing Strategic Cost systems." *John Wiley&Sons*, 2004; 167.

[16] Wouters, M., & Stecher, J., Development of real-time product cost measurement: A case study in a medium-sized manufacturing company. *International Journal of Production Economics*,2017; 183: 235-244.

[17] Portney, David S., et al. "Comparison of incremental costs and Medicare reimbursement for simple vs complex cataract surgery using time-driven activity-based costing." *JAMA ophthalmology*, 2023; 141(4): 358-364.

[18] Lorena, Siguenza-Guzman., et al. "Using time-driven activity-based costing to identify best practices in academic libraries. " *The Journal of Academic Librarianship*, 2016; 42(3): 232-246.

[19] Zanjirdar,M., Madahi, M., Khaleghi Kasbi, K. , Comparative analysis of sticky SGA costs and cost of goods sold: Evidence from Tehran Stock Exchange, *Management Science Letters*,2014;4(3): 521-526