Application of time-driven activity-based costing (TDABC) in the laboratory of Imam Ali Health Clinic in Dezful

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Abstract: The aim of the present study was to review the results of TDABC in health centers in comparison with the traditional costing method. In this case study, TDABC was used to calculate costs in the laboratory of Imam Ali Health Clinic in Dezful in 2014. Accounting records were used to collect the required data. Interviews and observations were used to determine the cost allocation basis. The results indicated an unused capacity of 3.3% in the relevant sector. According to the results, the costs estimated by TDABC were less than those estimated by the traditional costing method.

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1. Introduction

Managers always encounter cases that need decision making to perform their tasks. They need information to make decisions on planning objectives, control, leadership, coordination of resources and facilities. Financial information is one of the most important information. The accounting systems have been one of the most important sources of financial information in organizations. Costing system can provide managers with an important part of financial information (Asad, 2006). Activity-based costing (ABC) system is a costing system for products which was first proposed by Kaplan and Johnson in 1987. ABS is not an alternative for job order costing or process costing, but it can be used along with them (Namazi, 1999).

Activity-based costing system provide more convenient information about products or services, support activities and the costs of products or services. Accordingly, management can focus on products and processes with the greatest leverage to increase its own profits (Cooper & Kaplan, 1991). Unfortunately, the difficulties of implementing and maintaining the conventional activity-based costing system prevent the efficiency, timeliness and updating this innovation as a management tool. Time-driven activity-based costing (TDABC) system meet these difficulties (Khani *et al.*, 2013). TDABC develops a detailed model easier and faster. Using the enterprise resource planning and customer relationship management, TDABC provides a dynamic system with less human resources. It increases the efficiency of processes by clarifying the utilization of capacities (Namazi & Mahdavi, 2008).

2. Theoretical Background

ABC system is one of the most important new phenomena leading to a revolution in calculating the cost price of products and services. It immediately received much attention by management accountants (Beshkoh and Kazemi, 2009). Despite the value of ABC model, this system was not accepted extensively, because implementation of the conventional ABC system was associated with the following problems (Kaplan & Anderson, 2007):

1. Many activities should be defined to increase the accuracy of the system.
2. Due to seasonality of some activities, some drivers should be replacing and redefined.
3. Interview and survey process was time-consuming and costly.
4. The activity-based costing data were based on self-assessment and it was difficult to update them.
5. Most activity-based costing models did not provide an integrated approach of profit opportunities within the company and were based on location.
6. Allocation of initial costs was not very accurate despite the time-consuming process.

After a while, a financial services company began to apply a new activity-based costing approach in which the data were automatically logged into the enterprise resource planning system to provide all managers with monthly reports on the performance, capacity and profitability of products and customers. This new approach is called time-driven activity-

based costing (TDABC). Using TDABC, the companies can improve their cost management systems rather than abandon them. TDABC is mainly based on the use of time driver. Unlike ABC, it does not identify activities in the first stage to allocate costs to them, but the resources are directly predicted for all cost items based on the estimated required time and the cost rate per unit time (Babaei and Masoudi, 2013).

This model aims to eliminate drawbacks of the activity-based costing model. The new model facilitates costing process by eliminating the need for interviews and surveys of employees for the allocation of resource costs to activities before moving them to profit objectives. TDABC directly allocates resource costs to cost objectives and follows a certain framework requiring only two sets of estimates including the capacity cost rate and capacity utilization in each processed transaction. These are not difficult to be calculated (Namazi & Mahdavi, 2008).

3. Literature Review

A questionnaire-based field study was conducted among 130 American manufacturing company to investigate the differences between their costing systems. The results showed negligible differences in internal and external environment of variable costing system, traditional costing and ABC. However, the variable costing system and ABC better respond to the needs of users (Hejazi and Shahroki, 2013).

Dejnega (2011) compared ABC with TDABC in manufacturing companies, agricultural centers and also in hospital services. TDABC was recognized as a more appropriate tools for cost allocation. According to the results, cost allocation by TDABC is more equitable. This model is not only useful in the design of accounting systems, but also in the daily activities of organizations.

Mahani (2011) studied the cost of services in radiology ward of Shafa Hospital in Kerman using ABC method. According to the results, the highest share of costs was allocated to the salary of employees equal to 55.7% of the total costs. Therefore, the cost price of services can be reduced by improving the performance, particularly through modifying human resources management practices and standardization of consumption to reduce consumer costs.

Khalife and Mirzaei (2012) studied the principles of TDABC model as an appropriate tool for cost allocation in comparison with the previous costing models. In addition to eliminating ABC drawbacks, TDABC is able to calculate the cost of unused capacity to help managers in evaluating the performance of different departments.

4. Methods

This case study was conducted in the laboratory of Imam Ali Health Clinic is Dezful in 2014. Accounting records were used to collect data. Interviews and direct observation were used to determine the cost allocation basis.

Based on interviews, observations and investigations, the TDABC stages were implemented in the laboratory: (1) determination of capacity cost rate of resources by (a) calculation of supplied capacity cost based on total costs, (b) calculation of practical supplied capacity cost based on the working hours of employees after deduction of hours of rest and holidays, (c) calculation of the cost rate, (2) estimating the capacity required to implement each activity, (3) preparation of the time equation for all activities carried out in the laboratory and (4) determination of the cost of each activity by TDABC.

4.1. Determination of the capacity cost rate of resources

4.1.1. Calculation of the supplied capacity cost

The cost of each activity center based on objective include:

- Labor costs
- The cost of consumables
- Depreciation costs
- Other overhead costs
- Costs allocated from other centers

After collecting all the costs associated with laboratory, the costs were summarized as follows:

Table 1: The costs of laboratory

	Costs	
1	Labor	2,652,037,129
2	Consumables	555,913,485
3	Depreciation	246,730,000
4	Overheads	122,608,500
5	Cost allocated from other centers	455,523,672
6	Total	4,032,812,786

4.1.2. Calculation of the practical capacity of resources

In this stage, the practical capacity was calculated.

The number of laboratory staff * Average workdays* useful time per day = practical capacity of the laboratory

The number of laboratory staff was 6 who work in three shifts. The average working days were 30 days and the average time deducted for the rest of employees per shift was 45 minutes.

Useful time per day = 5.32

Practical capacity=5.32*365*6=11484 hr

Practical capacity in minutes=11484*60= 689040 min

4.1.3. Calculation of the capacity cost rate

The capacity cost of each unit is calculated by dividing the total cost by the practical capacity:

Laboratory capacity cost rate = 4032812786/689 040= 5853 IRR/ min

4.2. Estimating the capacity required to implement each activity based on time

To estimate the time required to perform each activity, the factors affecting each activity should be first identified. For this purpose, all activities carried out in the laboratory were identified and classified as follows:

- Patient Admission
- Sampling
- Testing
- Result

Using the observations and interviews with staff, the approximate time for each activity was calculated. It is noteworthy that due to differences in duration of various tests, testing activity should be separately presented based on the type of test.

4.3. Preparation of the time equation for all activities carried out in the laboratory

After calculating the duration of each activity, the time equation was obtained based on data in the following table:

Table 2: Data required for preparation of time equation

	Activity	Driver	Duration (min)
1	Admission	Patient admission for testing	1
2	Sampling	Blood sampling (preparation of syringe)	1.5
3	Testing	Biochemistry Blood bank Hormone Serology Parasitology Hematology Microbiology	120 60 150 60 20 60 20
4	Result	Finding the test result to deliver it to the patient	1

4.4. Determination of the cost of each activity by TDABC

After calculating the duration of each activity, the cost of each activity was calculated by TDABC using the cost rate and the number of activities in each period.

Table 3: The required time and resource costs

	Activity	**Unit time (min)**	**Number**	**Total time (min)**	**Capacity cost rate**	**Total cost**
1	Admission	1	16126	16126	5853	94385478
2	Sampling	1.5	8305	12457.5	5853	72913747.5
3	Biochemistry Blood Bank Hormone Serology Parasitology Hematology Microbiology	120 60 150 60 20 60 20	2125 21 143 1453 5714 1672 2107	255000 1260 21450 87180 114280 100320 42140	5853 5853 5853 5853 5853 5853 5853	1492515000 7374780 125546850 510264540 668880840 587172960 246645420
4	Result	1	16126	16126	5853	94385478
5	Used capacity			666339.5		3900085093.5
6	Unused capacity			22700.5		132727692.5
7	Total			689040		4032812786

Table 4: The cost price of tests

	Activity	Unit time (min)	Number	Total time (min)	Cost rate	Total cost
1	Biochemistry Admission Sampling Testing Result	 1 1.5 120 1	 2093 2093 2125 2093	 2093 3139.5 255000 2093	5853	1535391151.5
2	Blood Bank Admission Sampling Testing Result	 1 1.5 60 1	 21 21 21 21	 21 31.5 1260 21	5853	7804975.5
3	Hormone Admission Sampling Testing Result	 1 1.5 150 1	 2122 2122 143 2122	 2122 3183 21450 2122	5853	169017081
4	Serology Admission Sampling Testing Result	 1 1.5 60 1	 2584 2584 1453 2584	 2584 3876 87180 2584	5853	563199072
5	Parasitology Admission Sampling Testing Result	 1 1.5 20 1	 5714 0 5714 5714	 5714 0 114280 5714	5853	735768924
6	Hematology Admission Sampling Testing Result	 1 1.5 60 1	 1485 1485 1672 1485	 1485 2227.5 100320 1485	5853	617593927.5
7	Microbiology Admission Sampling Testing Result	 1 1.5 20 1	 2107 0 2107 2107	 2107 0 42140 2107	5853	271309962
8	Used capacity			666339.5		3900085093.5
9	Unused capacity 3.3%			22700.5		132727692.5
10	Total			689040		4032812786

Unused capacity of the laboratory was found using the TDABC system. Using the unused capacity and value engineering, lab managers can determine how to reduce the cost of unused resources to increase efficiency and cost effectiveness. The unused capacity of the laboratory is 3.3%. Instead of reducing the unused capacity, lab managers can maintain it for future growth. According to Table 4 and the costs of various tests, the price cost can be calculated. Comparing costs of tests with those obtained from TDABC, it can be concluded that spending is proportional to the cost rates.

5. Conclusion

Lab staff salaries accounted for a large part of the costs. Therefore, to increase the performance and reduce the costs, it is proposed to make changes in staffing policy to increase efficiency. The aim of the present study was to allocate the costs using TDABC. TDABC was practically implemented using real data. According to the results, by analyzing the costs and activities by TDABC through eliminating the additional costs associated with unused capacity, the costs can be reduced to provide better services at

lower cost.

6. Suggestions

It is recommended to examine the following items in future studies:

1. The use of other techniques such as fuzzy and ABC costing and compare their results with TDABC.
2. Application of TDABC in other companies.

7. Limitations

This research was conducted with the following limitations:

1. Data collection from health centers was time consuming and costly due to referrals of patients and certain conditions.
2. Due to the lack of human resource planning systems in the laboratory, data collection was difficult with the risk of error.
3. It was difficult to separate various tests conducted at the laboratory and some tests were admitted together.

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