



# Activity Based Costing (ABC) to Calculate the Cost of Training Students in School of Management and Medical Information Sciences

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## Abstract

**Introduction:** Public higher education is competing for limited public funds. Activity-based costing (ABC) provides detailed evidence that higher education administrators and policy-makers can be employed to allocate scarce resources more effectively and better understand what education centers do. Conducting context-specific studies on ABC and budgeting for educational systems is the crux of the matter for cost containment and making decisions. The present study was undertaken with the aim of determining the costs of training undergraduate and postgraduate students.

**Methods:** This is a descriptive-analytic and applied study. The costs incurred by 7 different disciplines and degrees including bachelor (n=2), master (n=4), and PhD (n=1) in the School of Management and Medical Information Sciences of the Shiraz University of Medical Science in the academic year 2015-16 were examined and costs of training undergraduate and postgraduate students were totaled by ABC method. The total number of students in included disciplines was 269; of them, 71% were studying in the bachelor, 26% in the master, and 3% in PhD programs. Since the primary purpose of our study was to calculate the total sum of cost per student, no sampling was done. After identifying the activity centers and incurred costs per activity center, the proportion of the schools' costs to the university headquarter was traced. In the school level, the costs of non-faculty staff by the deputies of education, research, support, and cultural-student affairs were estimated. Moreover, other costs, namely energy costs, rentals, consumables, depreciation, and missions were determined and assigned based on the number of students. Data management and analysis were performed using Excel 2007.

**Results:** The cost of training undergraduate students in the disciplines of health services management and health information technology was \$24413±2891 and \$24286±2926, respectively. The maximum cost of schooling a student in the master degree belonged to the discipline of medical informatics. The total cost of training a PhD student in the academic year 2014-2015 was \$95303±16106.

**Conclusion:** In an era of resource scarcity, the ability to recognize the gaps between resources and academic goals and redirect the resources into programs which maximize the value added is crucial for all higher education institutes.

**Keywords:** Costing, Activity based costing, Undergraduate, Postgraduate

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## Introduction

Universities and higher education institutions are at the heart of each country, and their impacts have become the cornerstone of

other sectors (1). Education is such a determining factor that some theorists such as Amartya Sen, Theodore Schultz, and Becker postulated it as the foundation stone of human wealth and the

base of economic development (2). Scanning the situation in different countries reveals that those countries having attained the higher rank of Human Development Index have made more investments in their human resources education. However, as long as the relationship among education, productivity and economic growth is not clearly defined, funding for higher education institutions would be reduced and costs have an upward trend. With this in mind, financial performance is a critical component of the management of each transitional educational system and regarded as an instrument for reaching the goals of efficiency, effectiveness, and saving (3).

Resource scarcity against unlimited needs for providing the education service has become evident for each educational system. This problem has posed a challenge to managers and planners to seek solutions to cost containment and make use of the existing resources cost-effectively. Therefore, cost analysis is an economic technique in decision making, which helps administrators design programs and policies (4). In this vein, costing can assist managers in acquiring the data needed to make informed decisions about investing in actions and infrastructures (5). In recent years, public sector organizations have been under growing pressure to improve their efficiency and effectiveness. A tendency among policymakers to fulfill public, in particular tax-payer expectations, combined with the pressure that is exerted by the private sector to capture markets, etc. have obliged public sector managers to focus on issues such as determining the cost of goods and services, improving the processes, assessing the alternatives pertaining to outsourcing, privatizing and benchmarking activities (6). Costing as a method of attributing direct and indirect costs can assist university and higher education institution directors to find whether the total cost is higher than the total revenues and subsidies and help the managers obtain detailed information about operating performance about the cost center. By comparing this information with the expected budgeting functions, it is possible to identify bottlenecks that need to be addressed and intervened and, as a result, make plans to reform those (7, 8). Having an in-depth understanding of the costs of training higher education students that are incurred by governments and societies has gained more attention, recently. From a financial point of view, private universities do not place heavy burdens on government spending, such as resource cuts, and the costs of training a student at private universities are in many cases less than half of those in public universities (9). For instance, a study conducted by Gammon et al. to assess the cost of educating undergraduate

medical students at UT-Houston found that the cost per student per year in 2006-2007 when 868 students were enrolled was \$61,862. The corresponding cost in 1994-1995 when 800 were enrolled was \$73,787, which is \$11,925 higher than that in 2006-2007 (10). In this line, findings of a recent study show that tuition costs to attend a 4-year public college has rose more than twofold, from an adjusted cost of \$3,190 in 1987 to \$9,970 in 2018, while private colleges have seen an increase of 129% at the same time period (11).

Noticeably, the persistence of the optimal activity in this sector entails the provision of appropriate educational services at a lower cost. In terms of assigning costs in the ABC, activities are identified and categorized as new cost objects, and overhead costs are allocated to them using allocation bases that are called "cost drivers". In the second stage, activities are regarded as charge areas and costs allocated to them are assigned to a final cost object (e.g. educational course or one-year term). In many development programs of the country, it has been emphasized that most sectors, including universities, should calculate the cost of their services (1). There have been many ABC studies on budgeting of universities, but the generalizability of much-published research on this subject to the Iranian universities and disciplines of studies is problematic. Conducting context-specific studies on activity-based costing and budgeting for educational systems is the crux of the matter for cost containment and making decisions. Therefore, the present study was undertaken with the aim of determining the costs of training undergraduate and postgraduate students by the ABC method at the School of Management and Medical Information, Shiraz University of Medical Sciences in the academic year 2015-16. This study can determine the necessity and efficiency of government investment in implementing effective cost containment policies and clarify the context in which measures are taken to monitor and control the costs in the policy-making process, as well as during policy implementation.

## Methods

This is a descriptive-analytical and applied study. The study population consisted of students that were graduated from School of Management and Medical Information Sciences in various disciplines and degrees over the academic year 2015-16. For data collection, a researcher-built checklist was used for identifying and recording cost items which incurred in the school. The costs of training undergraduate and post-graduate students were determined by the ABC method. To estimate the costs, we need to trace

the possessions and activities up to the cot centers. Following this, pooled expenses in the cost centers were assigned by allocation bases to each service related to students' training. Data management and analysis were performed using Excel 2007. The total number of students in the included disciplines was 269; of them, 71% (n=190) had been studying in the bachelor, 26% (n=71) in the master, and 3% (n=8) in PhD programs (Table 1). Since the primary purpose of our study was to calculate the total sum of cost per student in the school of interest, no sampling was done.

To do this research by using accounting documents, we divided the School of Management and Medical Information Sciences into four cost centers to cover the activities of the deputy of educational affairs, deputy of research affairs, deputy of student affairs, and deputy of financial affairs. In the current study, the number of students by each discipline and degree, as well as the number of faculty members in each field, was obtained; then, the cost proportion was identified according to the courses offered per student. By doing so, the overhead costs of the headquarter and school were assigned using the allocation base. Due to the higher costs of salaries and benefits, there was a need to consider course numbers as an allocation base to calculate the proportion of costs per discipline and degree based on it.

### Identifying Activity Centers (ACs)

Routinely, departments might be classified into three different ACs: overhead, intermediate and final activity centers. Overhead cost centers are those preparing facilities and offering services to intermediate and final service departments and are not directly related to customers. Intermediate ACs provide services that are supportive to final ACs.

Final AC is referred to the units being the point of direct contact with customers and clients. These centers which provide services to target customers are incurring costs from the overhead and intermediated ACs as overhead costs.

### First Phase

Initially, the cost of the deputies affiliated to the university headquarter was assigned. Since the university headquarter offers services to all subsector collections, including hospitals, health networks, and schools, the allocation bases for each deputy respective to the scope of the school activities were identified using the expert opinions, so that the cost contribution of the school from the headquarter is determined (Table 1). By doing so, the cost of training per student was calculated by dividing the total cost by the number of students.

### Second Phase

The costs of the school were classified into four cost pools, including the cost of Education, Research, Student and financial affairs. Education-related costs included such items as salary costs of education-related staff, departments, and education development office staff. Likewise, research costs included salaries of research affairs and library staff. The cost of student affairs consisted of the salary of cultural affairs deputy personnel. Moreover, the financial affairs deputy costs including the charges paid for the wages of the employees having the task of financial affairs, staffing, and the supply department, as well as other costs, namely energy costs, rentals, consumables, depreciation, and contracts were taken into account.

### Third Phase

This phase appears to be the most significant step

**Table 1:** Allocation bases of cost-sharing

Center type	Cost centers (Deputy)	Allocation base (NO.)	Cost- type	Analysis level
Overhead (Shiraz University of Medical sciences)	Student Affairs	Student	Personnel costs and other	University
	Research Affairs	Faculty member and Student		
	Education Affairs	Student		
	Development & Resource Management Affairs	Credit, Staff, and Entities		
Intermediate (School of Management and Medical Information Sciences)	Student Affair	Student	Salary and Benefit of Non-faculty members	School
	Research Affair	Student		
	Education Affair	Student		
	Support Affair	Student		
Final (School of Management and Medical Information Sciences)	Educational departments	Courses	Salary, Benefit, and Tuition benefit	School

in assigning the costs by each discipline and degree. The school curricula were identified by each discipline and degree. After dividing the professors' salaries and benefits by the total courses offered, we obtained the costs per course, and the cost of training a student was determined by summing the costs of the courses per discipline and degree. In the end, to calculate the cost of educating the students in a given field and degree, we totaled per capita student training costs in the first, second, and third phases.

## Results

To measure the cost of training students in the school of interest, as a whole 4 departments as a headquarter-related activity center and 4 departments as overhead activity centers were identified. The average exchange rate in 2015-16, according to the central bank of Iran database, was used to convert IR Rial to US dollar (1USD=30,320 Rial). The cost of training an undergraduate student in the disciplines of health service management and health information technology was \$24,413 and \$24,286, respectively. For master's degree, the cost was \$17,972 for health services management, \$21,438 for health information technology, \$22,746 for health economics, and \$24,015 for medical informatics. Also, the cost of training a Doctor of Philosophy (Ph.D.) student in the discipline of health service management was \$95,303. The maximum cost of training a student in master's degree belonged to the discipline of medical informatics.

As shown in Table 2, the deputies of student affairs and educational affairs accounted for the highest and the lowest costs, respectively.

As Table 3 shows, the highest and the lowest cost of training a student in the school of management and medical information Sciences over one academic year belonged to the Ph.D. and bachelor degree, respectively.

## Discussion

The current study found the average cost of training undergraduate and postgraduate students in the different disciplines in the School of Management and Medical Information Sciences during the academic year 2015-16.

It is encouraging to compare these figures with those found by Ghasempour et al. (2016) who suggested that the average cost of training an undergraduate student in Tehran University of Medical Science over the academic year of 2012-13 was \$10,074.41, while it was \$18,265.43 for a master's degree student and \$28,418.86 for the Ph.D. students. student (12). These variations in the findings of these two studies can be explained in part by different periods and settings of the studies. The present findings seem to be consistent with another research which found the cost of training an undergraduate student in the disciplines of health service management and medical records was 7.76 and 18.58 million Rials, respectively (13). Their finding also revealed that the cost of training a Ph.D. student is about 4 times that

**Table 2:** Share of school costs from university headquarter costs by the deputies (In US Dollar)

Deputies of the university	Share of school costs in academy year 2015-2016 (SD)	Percentage (%)
Education Affair	92,097 (8,652)	13.48
Student Affair	338,008 (14,553)	49.47
Development Affair	110,297 (3,188)	16.14
Research Affair	142,857 (6,343)	20.91
Total	683,259 (32,737)	100

Standard deviation (SD) is represented in parentheses

**Table 3:** The cost of training a student by discipline-degree in the School of Management and Medical Information Sciences, the academic year 2015-16 (In US Dollar)

Discipline	Degree	No. of Students	Total cost per student over school years (SD) (Dollar)
Health service management	Bachelor	91	24,413 (2,891)
Health information technology	Bachelor	99	24,286 (2,926)
Health service management	Master	27	17,972 (1,703)
Health information technology	Master	14	21,438 (2,782)
Health economics	Master	13	22,746 (3,347)
Medical informatics	Master	17	24,015 (3,904)
Health service management	Ph.D.	8	95,303 (16,106)

Standard deviation (SD) is represented in parentheses

of an undergraduate student, which corroborates the results of our study. In an investigation on the cost, Haghdoost et al. (2006) noticed the cost of training a postgraduate student is two and half times that of an undergraduate student (14).

Per capita student expenditure had been estimated between 6 and 12 million Tomans in the annual budget of the year 2016; huge part of it was spent on the payment of staff salaries. Per capita expenditure of a master and a Ph.D. student was predicted 1.65 and 3 times as much as that of an undergraduate, respectively (15). The magnitude of the costs in our study is higher than that in the annual budget of year 2016; this discrepancy may be due to the salaries of faculty members, cost of maintaining educational buildings, purchasing educational supplies and subscription to a scientific magazine as well as food and dormitory fees for non-native students. This implies that the amount of per capita student expenditure in the annual budget is lower than the cost of training a student at the School of Management and Medical Information, which can have an adverse impact on the quality of teaching. Therefore, there is a need to assign the costs according to the type of university and academic rank; in other words, universities and higher education institutions should not have the same per capita budget credit. Therefore, reconsidering the allocation of resources to universities is essential. It can be argued that the cost of training a student in each discipline and degree is a variable depending on the educational conditions such as starting salaries of faculty members, educational facilities and technologies, and research capabilities of each university, while the estimation of a single cost for all universities ignores their discrepancies. An overview of the documents and published articles highlights the fact that the cost of training a student in medicine or other disciplines varies even in a given country from university to university. Although the magnitude of these costs is lower in Iran, it is still substantial based on per capita national income. In 2010, Kjoury et al. reported the components of per capita cost of training medical students as follows: 3.268 for educational costs, 13.25 for research, 7.4 for cultural and financial services, and 14.45 million Rials for administration cost; the cost of training a student in medicine was 303.4 million Rials with the accumulation of four components (16). In a study by Rein and colleagues (1997), it was found that the total number of faculty contact hours was just under 100000. The number of full-time-equivalent faculties required was 223. In the University of Virginia, School of medicine, the faculty salary and benefits totaled \$

29400000. The costs of support and administrative services totaled \$4100000, the costs of house staff and contract faculty totaled \$2300000. The overall educational costs totaled \$49600000 (17).

Another finding of the current study is that the higher the educational degree, the more the cost of training a student per year. There are several possible explanations for this discrepancy. Firstly, the number of students per degree is different and, secondly, the number of dissertation courses varies in each discipline. Given that most of the educational costs including the salaries of the faculty are fixed at each university, the contribution of fixed costs per student in the cost decreases when the number of students increases (18).

Additionally, employing the faculty members with higher academic ranks as well as visiting college professors coupled with the need for more sophisticated educational equipment impose substantial costs on the education system. Ultimately, the Ministry of Health and Medical Education (MOHME) pays monthly scholarship for Ph.D. students, which have caused an increase in the cost of educating postgraduates (19). It should be noted that the merit of this study is that it considered the overhead costs such as the costs of the university headquarters, and traced them into the entire subsets. Therefore, the calculated cost of educating a student in this study includes all the school-level costs as well as the university-headquarter level costs

## Conclusion

During the recent years, the management system and organizational structure of the medical universities of the country have undergone massive changes. At the prevailing climate, universities have the ability to reorganize their structures, in a way that they move over to modern models of entrepreneurship using the development of the strategic goals and specialization. For this purpose, it is vital for universities of medical sciences to have a deep understanding of the cost of consumables, which in turn requires the revision of costing models, so that administrators can make informed decisions based on the determined goals and accurate and reliable data. In an era of resource scarcity, the ability to recognize the gaps between resources and academic goals, and redirect the resources into programs which maximize the value added is crucial for all of higher education institutes.

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