

The Steps of Designing an IT-embedded Costing System for Higher Education Institutions

A. Januszewski¹, J. Kujawski²

¹Department of Management Engineering, University of Technology and Life Sciences, Bydgoszcz, Poland

²Department of Accounting, University of Gdańsk, Gdańsk, Poland

Abstract - The article presents steps of constructing a computer-based costing system for a higher education institution. Activity-based costing was chosen as the underlying cost accounting methodology. The structure of the costing model for a hypothetical university was described in the paper. The model was created in an attempt to find out how costly is a process of education performed for a study programme, with particular attention given to how high are costs of delivering particular courses, and how costly it is to educate a group of students in each semester. Significant emphasis was put on the model implementation in the information technology environment. The Oros Modeler – a component of SAS Activity-Based Management package – was used as the modeling and calculating software. Finally, results of the costing procedure performed with the use of assumed data were presented.

Keywords: Activity Based Costing, ABC model, higher education, teaching costs

1 Introduction

Analysis of costs of teaching and learning has been crucial for higher education institutions. This results from a high share of these cost in the total expenses of universities, an increasing competition between educational institutions on the Polish education services market and the demographic changes. Moreover, latest legal alterations force Polish universities to count actual costs of educating [2]. Thus, reliable costing of education services has recently become a priority for Polish higher education institutions.

Generation of reliable information on costs of education services is highly possible thanks to activity-based costing [1, 3, 4, 8, 9]. Efficiency of ABC in this area has also been noticed in Poland [5], [6]. The aim of the article is to present the subsequent steps of constructing a computer-aided system of activity-based costing for education of students. The described model of ABC has been embedded in a hypothetical university that offers only one study curriculum for regular and weekend full-time undergraduate students.

2 Idea of Applying ABC for Costing Education Services

Every model of a costing system built upon the activity-based costing notion should consist of three modules:

- resources unit,
- activities unit,
- cost objects unit.

In relation to each of the mentioned modules the model of education services costing offers specific elements and solutions in the area of cost accounting. A general model of ABC developed for the purpose of costing the education services which is limited to solely one undergraduate study curriculum is depicted on Figure 1.

The resources unit of the model consists of:

- university teachers,
- education infrastructure (classrooms, laboratories, etc.),
- materials required for the study processes,
- department administration (salaries, office stationary, phones, etc.),
- other common resources (e.g. library).

In the activity unit there are processes of teaching both regular and weekend students, and processes that are not directly linked to education itself, such as managing the university or servicing students. Every teaching/learning process consists of separate activities of delivering each course of the study curriculum in a prescribed form (e.g. lecture, class, laboratory class, project class, etc.). Ultimate cost objects are individual students who attend any major path on each semester.

Activities of servicing students in the timespan of their study are differentiated with respect to three periods into [7]:

- the first semester, when recruitment costs are incurred;
- the particular year, when students are obliged to choose their major resulting in changes in types and sizes of student groups,

- the diploma year, when the number of courses students attend is lower but the time burden for teachers brought

about by the diploma assessment is higher.

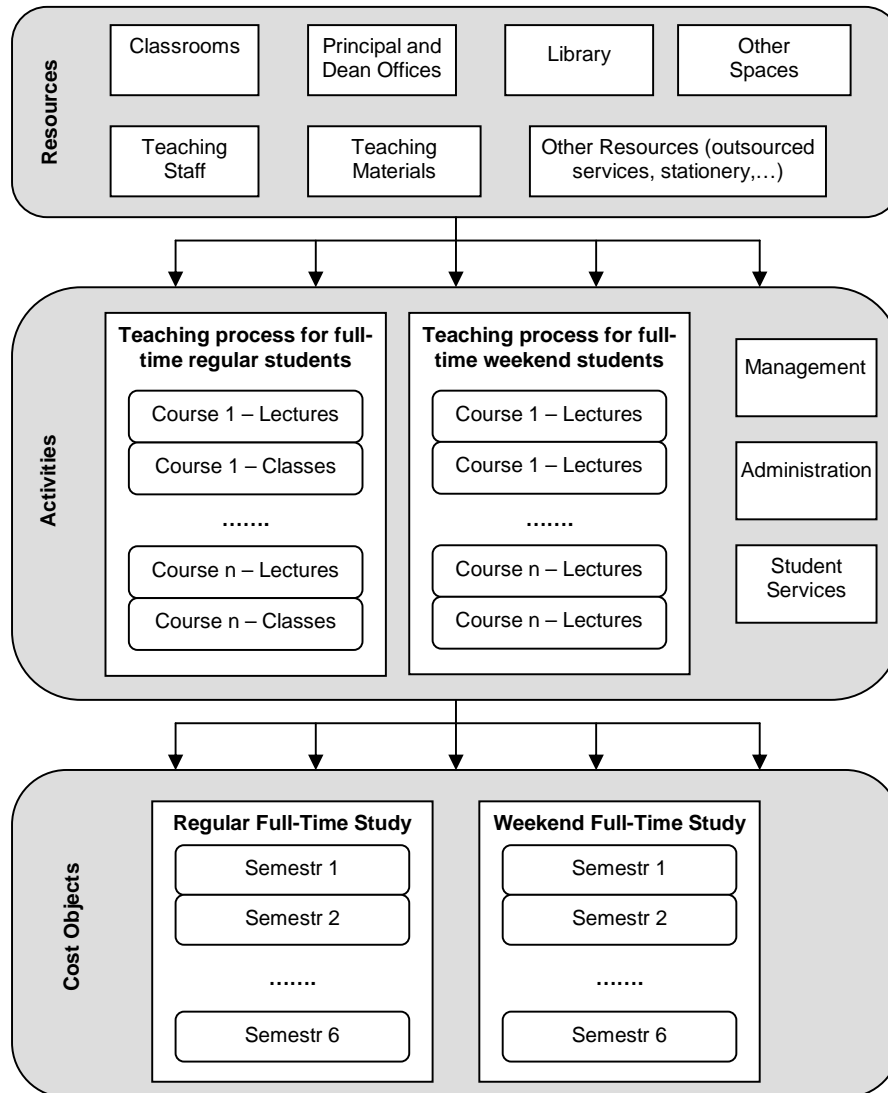


Figure 1. The ABC-rooted Structure of Higher Education Services Costing
Source: own preparation

Costs of resources that are consumed for delivering scheduled courses should be assigned with the use of resource drivers, such as teaching hours of teachers or hours of occupation of classrooms. Costs of particular courses are then assigned to related semesters of studies.

3 Aims, Assumption and Steps of Constructing the Costing System

The aim of the costing model was to obtain answers to the following questions concerning the full-time regular and full-time weekend curricula:

- how costly is a process of education performed for a study programme;
- what are costs of delivering particular courses;
- how costly it is to educate a group of students in each semester;

- how high is unit cost per student for every semester.

Constructing the system required the following steps:

- 1) elaboration of assumptions to the costing model,
- 2) defining the model of the costing system with the adoption of ABC,
- 3) implementing the model in the IT environment,
- 4) preparation of input data required for the costing procedures,
- 5) inputting data, calculating unit costs and interpreting the results.

For the sake of the model the following assumptions for a hypothetical university have been made:

- university leads just one curriculum called “Business Administration”,
- studies last 3 years (6 semesters) and are possible in the regular or weekend way,
- management bodies of the university are the Principal, the Dean and the Chancellor,
- administration units are: Dean’s Office, Finance and HR Department, Maintenance Department, Social Department, and the Library,
- university hires all offices (for the management and administration),
- the university rents all teaching rooms (three lecture theaters, one large and two smaller, three class rooms, one language laboratory, two computer laboratories, three laboratories and one gymnastic facility),
- teaching staff is: 8 professors, 30 PhDs, 24 MSc fellows,
- administration staff is 18 people in total,
- remuneration of tutors depends on teaching hours delivered and their position in the hierarchy.

The presented ABC model for costing education services consists of:

- 23 GL accounts for posting costs by nature;
- 16 types of resources in 6 groups (teaching staff, the Principal and Dean office, Finance and HR, Alumni Career and Marketing Center, Library and teaching rooms);
- 5 processes (including: 2 educational processes for both regular and weekend studies, „Strategy” process, Student Services” process and „Administration Activities” process);
- 12 cost objects (a particular cost object is each of 6 semesters during both regular and weekend curricula);
- 697 costs flow paths with over dozen of resources cost drivers and activity cost drivers.

Subsequent steps of the ABC model implementation to the IT system will be presented in point 4 of this text.

The preparation of input data necessitated making detailed assumptions concerning the costs by nature. In particular, salaries for teaching, administrating and managing staff, rentals for infrastructure and amounts of other costs (e.g. office stationary, telecommunication, marketing and promotion) have been estimated. In order to apportion costs by nature to the university resources defined in the ABC model it was crucial to estimate square meters of teaching and office areas, the number of computers and phones installed in every classroom or office room and to establish certain bases for natural costs apportionment, such as for example marketing, stationary, utilities or outsourced services, to the university resources.

As far as the assignment of resource costs to activities is concerned, it was necessary to assume the number of teaching hours for every single course, and the lecturers designated to deliver courses, the teaching rooms to be occupied for each course. Another crucial information that influences the number of hours realized in the form of tutorial classes or laboratory classes was the number of groups the students were divided into.

In the case of assigning activity costs of courses to cost objects the number of teaching hours of each course realized in each semester was needed. In order to allocate costs of other activities to cost objects the number of students during each semester was required.

The final step of the entire project was to put the assumed data into the model, launch the costing procedure and interpret the outcomes.

4 Implementation of the Model in the IT Environment

OROS Modeler was the IT environment upon which the model has been based. This tool is now part of *SAS Activity Based Management* software package developed by SAS Institute and is said to be one of most popular tools of the stand-alone type for ABC modeling.

The implementation of the model in the *OROS Modeler* was carried out in the following steps:

- defining GL cost accounts for costs by nature;
- defining a cost center for each group of resources and a cost account for each item of resources;
- defining a cost center for each process and a cost account for each activity,
- defining a cost center for each group of cost objects and a cost account for each cost object,
- defining resource cost drivers and activity cost drivers,
- assigning costs by nature to resource cost accounts;
- defining cost flow paths from resource cost accounts to activity cost accounts;

- defining cost flow paths from activity cost accounts to cost object accounts.

The Figure 2 depicts the structure of adopted cost accounts in the “Resources” unit and the Figure 3 – in the “Activity” unit. The “Cost Objects” unit looks similar.

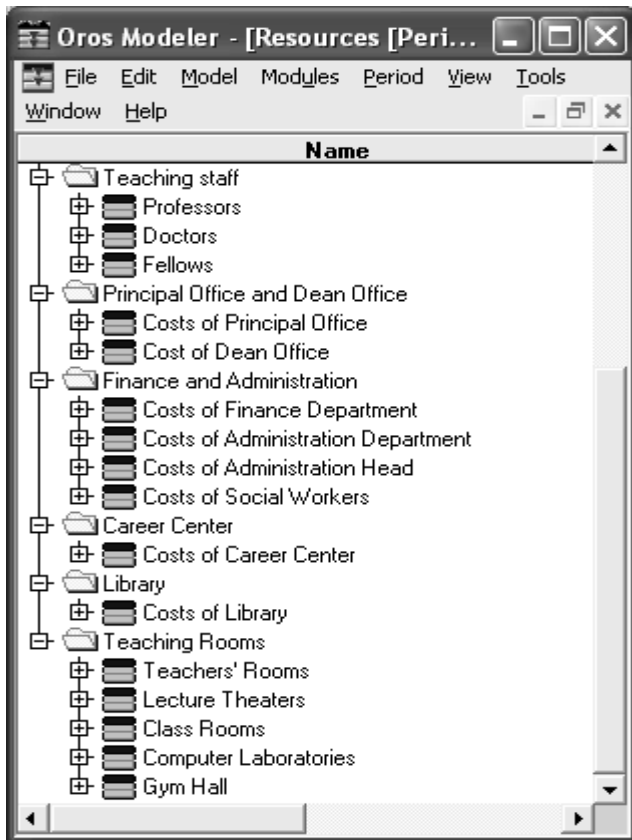


Figure 2. The “Resources” unit

In the next step, cost allocation paths with suitable resource cost drivers and activity cost drivers have been defined. A cost allocation path shows how costs flow from resource cost accounts through activity cost accounts to the accounts of cost objects. Examples of cost assignment paths with linked drivers are given in Figures 4 and 5.

In the last step of the model implementation in the *OROS Modeler* environment the unit presenting “Education Unit Costs” was prepared. It was designed by adding two additional columns, i.e. „number of students” and „unit costs” to the „Cost Object” unit.

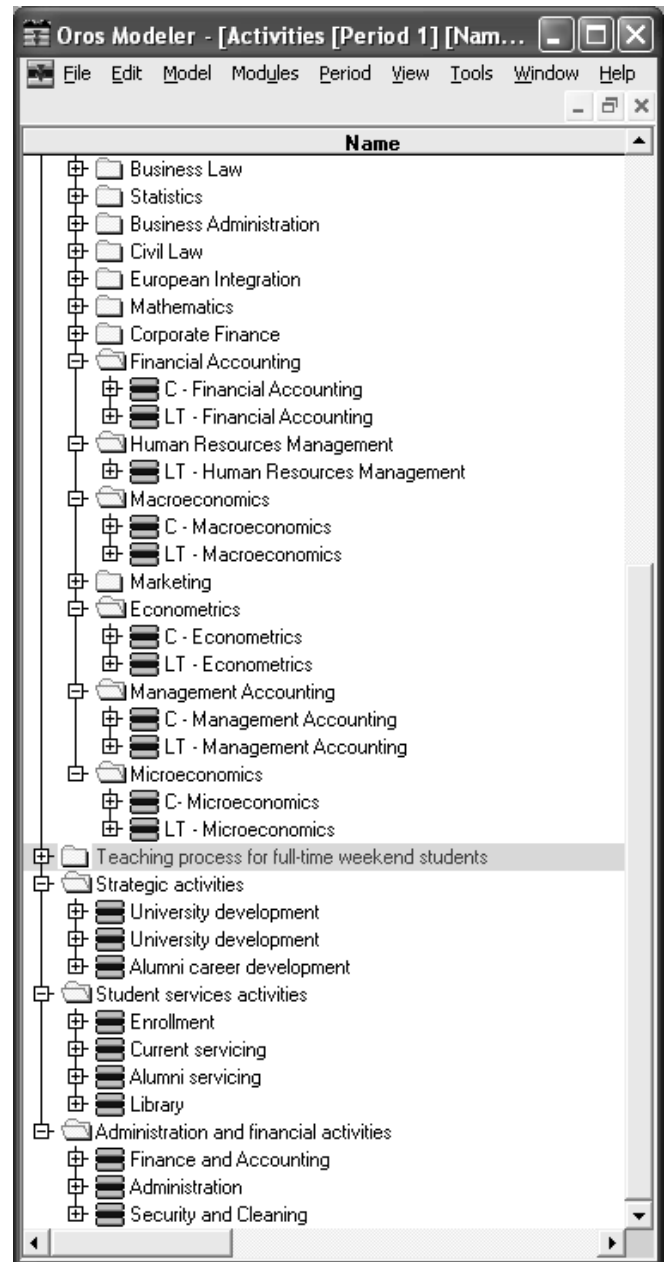


Figure 3. The “Activity” unit

After the structure of the model had been designed, which means that cost centers and cost accounts for resources, activities and cost objects had been defined and cost flow path had been depicted, the following data have been prepared and input to the computer:

- the amounts of natural costs which were estimated upon underlying assumptions;
- the values of resource cost drivers , i.e. cubic meters of teaching and office areas, percentages of apportionment of several natural costs to resources, number of telephones, computers and employees in particular organizational units, hours of usage of

teaching rooms by particular courses, teaching hours for particular courses;

- the values of resource cost drivers, such as the number of teaching hours for particular courses during each semester which was required to allocate the costs of delivering courses to semesters, and the number of students in particular semesters which was necessary to allocate costs of other activities;

- the numbers necessary to calculate the unit student costs, i.e. the number of students in particular semesters of regular and weekend studies.

After having input the above mentioned data, the calculation functions have been launched. This resulted in obtaining the unit cost per student of both regular and weekend curricula. The outcomes of the costing procedure have been showed in the Figure 6.

The screenshot shows the 'Oros Modeller - [Resources [Period 1] [Named View -]]' window. It features a tree view on the left and a table on the right. The tree view lists various resources like 'Fellows', 'Principal Office and Dean Office', 'Finance and Administration', etc. The table on the right lists activities and their corresponding driver quantities.

Name	DriverName	Name	DriverQuantity
Fellows	# hours F	LT - Microeconomics	108
Principal Office and Dean Office		LT - Mathematics	108
Costs of Principal Office	PERCENTAGES	LT - Business Administration	36
Cost of Dean Office	PERCENTAGES	LT - Statistics	54
Finance and Administration		LT - Basics of Law	36
Costs of Finance Department	EVENLY ASSIGNED	LT - Civil Law	36
Costs of Administration Department	PERCENTAGES	LT - Sociology	54
Costs of Administration Head	PERCENTAGES	LT - European Integration	36
Costs of Social Workers	EVENLY ASSIGNED	LT - Macroeconomics	108
Career Center		LT - Business Law	36
Costs of Career Center	PERCENTAGES	LT - Financial Accounting	54
Library		LT - Econometrics	45
Costs of Library	EVENLY ASSIGNED	LT - Management Accounting	54
Teaching Rooms		LT - Corporate Finance	45
Teachers' Rooms	PERCENTAGES	LT - Marketing	45
Lecture Theaters	# hours LT	LT - Human Resources Management	45
Class Rooms	# hours CR	LT - UE Finance	45
Computer Laboratories	# hours CL	LT - Commercial Banking	54
Gym Hall	# hours GH	LT - Insurance	36

Figure 4. The Example of Allocation from Resources to Activities

The screenshot shows the 'Oros Modeller - [Activities [Period 1] [Named View -]]' window. It features a tree view on the left and a table on the right. The tree view lists various activities like 'Teaching process for full-time regular students', 'Strategic activities', 'Student services activities', etc. The table on the right lists cost objects and their corresponding driver quantities.

Name	DriverName	Name	DriverQuantity
Teaching process for full-time regular students		Students (F-T R) - Semester I	120,00
Teaching process for full-time weekend students		Students (F-T W) - Semester I	100,00
Strategic activities		Students (F-T R) - Semester II	108,00
University development	# students	Students (F-T R) - Semester III	98,00
University development	# students	Students (F-T R) - Semester IV	97,00
Alumni career development	# students	Students (F-T R) - Semester V	92,00
Student services activities		Students (F-T R) - Semester VI	92,00
Enrollment	# students	Students (F-T W) - Semester II	90,00
Current servicing	# students	Students (F-T W) - Semester III	76,00
Alumni servicing	# students	Students (F-T W) - Semester IV	75,00
Library	# students	Students (F-T W) - Semester V	73,00
Administration and financial activities		Students (F-T W) - Semester VI	73,00
Finance and Accounting	# students		
Administration	# students		
Security and Cleaning	# students		

Figure 5. The Example of Allocation from Activities to Cost Objects

Name	Cost	# students	Unit Cost
Cost Objects	856 510,00		
Full-time Regular Students	529 319,46	607	872,03
Students (F-T R) - Semester I	87 757,97	120	731,32
Students (F-T R) - Semester II	97 919,81	108	906,66
Students (F-T R) - Semester III	77 595,16	98	791,79
Students (F-T R) - Semester IV	101 265,71	97	1 043,98
Students (F-T R) - Semester V	104 235,43	92	1 132,99
Students (F-T R) - Semester VI	60 545,38	92	658,10
Full-time Weekend Students	327 190,54	487	671,85
Students (F-T W) - Semester I	50 686,58	100	506,87
Students (F-T W) - Semester II	62 485,16	90	694,28
Students (F-T W) - Semester III	44 059,11	76	579,73
Students (F-T W) - Semester IV	58 617,87	75	781,57
Students (F-T W) - Semester V	69 211,51	73	948,10
Students (F-T W) - Semester VI	42 130,31	73	577,13

Figure 6. The Teaching Unit Costs per Student

5 Conclusions

The results show a significant difference between education cost of students of the regular and weekend types. The teaching process of regular students turned to be 62% higher than that of weekend ones (529 319 PLN for regular study compared to 327 191 PLN for the weekend one), the main reason being the limited number of teaching hours delivered to students of the weekend education. The difference is much lower if we take into account an average teaching cost per student per semester which is 30% higher in the case of regular education (872 PLN to 672 PLN). This is mainly due to a higher number of weekend students than those of regular type.

Significant differences between the total and unit cost of education in relation to particular semesters can be observed as well (Figure 6). In the case of regular study the highest unit cost is for semester 5 which is by 72% higher than that for semester 6. Even bigger differences occur for weekend study, where the most "expensive" semester 5 is by 87% more expensive than the "cheapest" semester 6. The spread in total cost of education between different semesters mainly results from two reasons: first, various numbers of teaching hours for each course and second, delivering courses in the form of tutorial classes and laboratory classes. The latter brings about a rise in the number of student groups and in consequence augments the numbers of hours and thus the amount of education costs.

In the authors' opinion the costing methodology described above can be a basis for shaping the pricing policy for a higher education institution.

At the end one specific feature of activity-based costing for higher education institution is worth emphasizing. The model structure is decisively more complex in the part that relates to allocating resource costs to activities and allocating GL accounts of natural costs to GL accounts of resources in comparison to the part which refers to allocating activity costs to cost objects. The latter step of the costing procedure requires only two activity cost drivers, i.e. the number of students for each semester and the number of hours for each course delivered in each semester when a particular course lasts more than a single semester. Costing models for merchandise and production enterprises are usually significantly more complex in both steps of the costing procedure.

6 References

- [1] D. D. Acton and W. D. J. Cotton, "Activity-based costing in a university setting," *Journal of Cost Management*, pp. 32-38, March/April, 1997
- [2] A. Klaus and M. Kowalski, "Kalkulacja kosztów kształcenia w uczelni wyższej na podstawie rachunku kosztów działań" in *Rachunkowość a controlling*, E. Nowak, Ed. Wrocław, Poland: Wydawnictwo Akademii Ekonomicznej im. Oskara Langego we Wrocławiu, 2007, pp.257-267.
- [3] A. Krishnan, "An Application of Activity Based Costing in Higher Learning Institution: A Local Case Study," *Contemporary Management Research*, Vol. 2, No.2, pp. 75-90, September, 2006.

- [4] K. Lukka and M. Granlund, "The fragmented communication structure within the accounting academia: The case of activity-based costing research genres," *Accounting, Organizations and Society* vol. 27, no. 1-2, pp. 165-190, January-March, 2002.
- [5] H. Miłosz, *Analiza kosztów kształcenia w szkołach wyższych*, Legnica, Poland: Stowarzyszenie Wspólnota akademicka, 2003.
- [6] M. Ossowski, "Rachunek kosztów działań w publicznych szkołach wyższych," *Controlling i rachunkowość zarządca*, vol. 2, no. 2. pp. 20-28, February, 2009.
- [7] A. Szuwarzyński, "Rachunek kosztów kształcenia w publicznej szkole wyższej" in *Budżetowanie działalności jednostek gospodarczych – teoria i praktyka. Część II*, Kraków, Poland: Wydział Zarządzania AGH, 2001, pp.259-266.
- [8] L. U. Tatikonda and R. J. Tatikonda, "Activity-based costing for higher education institutions," *Management Accounting Quarterly*, pp. 18-27. Winter, 2001.
- A. Vazakidis and I. Karagiannis, "Activity-based costing in higher education: A study of implementing activity-based costing in University of Macedonia," presented at the 5th Conference of the Hellenic Finance and Accounting Association, Thessaloniki, Greece, 2006.