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ACTIVITY-BASED COSTING IN UNIVERSITIES – FIRST STEP OF CALCULATION OF TEACHING COSTS*

Summary: It is necessary to seek solutions supporting costs management where activity-based costing (ABC) is important especially in higher education institutions. The purpose of the article is to present the model of teaching cost calculation based on ABC, which was created by one of the departments of the Wrocław University of Technology. Because of the complexity of the model the article is divided into two related parts. This article contains the first step of calculation according to ABC.

Key words: activity-based costing, cost calculation, teaching costs.

1. Introduction

From the point of view regarding the demand for managerial information, the needs of higher education institutions do not differ significantly from the requirements of enterprises. The growth of interest in tools supporting taking managerial decisions at universities results not only from the necessity to change their functioning (caused by continuously growing competition in recruiting students and getting funds to finance research projects). They have been also influenced by legal regulations, which demand from universities to document their activity and set costs based on clear cost indicators.

The Polish statute "Prawo o szkolnictwie wyższym", which regulates the functioning of public universities, obliges them to self-finance the part-time studies. However, student fees cannot be higher than "essential costs incurred to the extent necessary to start up and conduct studies and Ph.D. studies" [Polish Statute 2005, Art. 99]¹. On the other hand, universities cannot collect too low fees, it is connected with breaking other law regulations [Polish Statute 2004, Art. 5].

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¹ Translation made on requirements of the publication. Original text: „...kosztów ponoszonych w zakresie niezbędnym do uruchomienia i prowadzenia w danej uczelni, odpowiednio studiów lub studiów doktoranckich...”

A very important aspect is the calculation of costs related to research. The Seventh Research Framework Programme (FP7) allows two methods of exerting indirect costs in budgets of the research projects: accounting indirect costs according to the rate established by the European Commission or presenting real costs which have been incurred during the realization of the project. The interviews with the financial representatives of the universities reveal that the realization of research projects takes much higher indirect costs than it results from the Commission's rate. Unfortunately, the lack of proper record and accounting methods makes it impossible to prove this thesis.

It is obvious that the internal needs and the external regulations demand from universities to search for better, improved systems of managerial information. The question is very complicated because academic centres are one of the biggest institutions which realize public mission (taking into consideration employment and financial amounts). The compound of university activity causes difficulties in the organization of cost records and unlimited needs for cost information.

In accordance with the above-mentioned requirements it is important to use tools such as Activity Based Costing (ABC) which help the management at universities.

2. State of knowledge

The legitimacy of using ABC in higher education was approved long time ago. Peter F. Drucker [Drucker 1995] ascertained that in the area of intellectual human activity, approach for costs was based more on estimation than test. However, in the present state of knowledge there is no better tool to make estimation than ABC. A wide range of literature and research confirms this thesis [Kaplan, Anderson 2007; Kaplan, Anderson 2005; Kaplan, Cooper 1998; Kaplan, Norton 1996].

In 1998 the Australian government (Australian Department of Education, Training and Youth Affairs), when searching for ways to increase the effectiveness of the functioning of public universities and ways to improve the speed of their reaction for environmental changes, started up a project related to finding the proper method of costs calculation. The executor of the project (Ernst & Young firm), after doing research, proposed to use ABC [Ernst&Young 2000; Ernst&Young 1998].

Thanks to the governmental initiative, two reports were produced: "A Study to Develop a Costing Methodology for the Australian Higher Education Sector" in 2000 [Ernst&Young 2000] and "A Study to Develop a Costing Methodology for Library and Information Technology Activities for the Australian Higher Education Sector" in 2001 [Information and Education Services Division 2001], which gives suggestions and leads to the implementation of ABC in educational environments (on the university level or only in a selected area, e.g. in a library).

Experiences with using ABC in higher education can also be found in Great Britain (e.g. at the University of Manchester, University of Cardiff, Southampton University) and in The United States (e.g. in The School of Dentistry at Indiana

University, University of Texas at Austin). Among other important elaborations connected to using ABC in academic environments there should be reports got from the Australian initiative [Ernst&Young 2000; Ernst&Young 1998; Information and Education Services Division 2001] and a few Australian articles [Brown, Booth 2007; Doyle 1994; Ellis-Newman, Robinson 1998; Gerdson 2001] and English [Cropper, Cook 2000; Goddard, Ooi 1998; Heaney 2003; Mitchell 1996] and American [Cox et al. 1999; Granof et al. 2000; Tatikonda, Tatikonda 2001].

The above-mentioned publications confirm that using ABC at universities as a basis of managerial information systems has many advantages. They present outcomes and virtues resulted from the application of the method, but insufficiently support the process of its implementation. In 2006 we took the challenge of creating and working ABC model for Wrocław University of Technology. The elaborations gave us a lot of inspiration, although the test also pointed out that many of the practical problems had been unsolved.

The main aim of the article is to show a model of teaching costs calculation which was created for The Department of Architecture at Wrocław University of Technology. It describes steps of work, indicates problems encountered and presents their discussed and recommended solutions.

3. Teaching costs calculation at Wrocław University of Technology

3.1. Background of the project

The idea for the organization of the managerial information system based on ABC was created at Wrocław University of Technology in 2005. The result of discussions between a group of researchers and people responsible for managerial information was a publication of a few theoretical studies [Klaus 2007; Klaus et al. 2007; Kowalski, Klaus 2007; Kowalski 2006] and conference presentations. In 2006 a trial was carried out using ABC to calculate administration costs to support teaching (dean's office costs) for one department [Klaus et al. 2007]. The presentation of the project outcomes led us to gain the backing of Wrocław University of Technology supervisors to develop the idea of using ABC in the academic environment.

In the same year there appeared a practical problem at one department of Wrocław University of Technology. Namely, the department was going to activate a new major of part-time studies. It was necessary to set a fee for the major, which would have granted law regulations and made it possible to cover already being incurred costs. Existing cost systems, based on arbitrary cost drivers do not ensure proper information, because they do not reflect the complexity of the teaching process. A project was started which goal was to account for teaching costs at the department using ABC.

The task concerned the calculation of historical costs for the academic year 2005/2006. There were two main project goals:

1. The indication of unit costs of each major, specialty, mode and type of study, per semester.

2. The indication of course costs depending on their forms.

At the department (in the analyzed period) there were studies in 2 majors, 3 specialties and 3 modes. There were about 3500 students in 127 groups.

3.2. Stages of the project

The project took place in the following steps:

1. Analyzing all costs of the department, creating resource pools.

2. Modeling costs of support area².

3. Modeling costs of faculty:

3.1. Making a dictionary of activities connected with faculty.

3.2. Estimating costs of activities and processes assigned to faculty.

3.3. Identifying cost objects for activities being realized by faculty.

3.4. Linking activity costs to cost objects.

4. Analyzing and allocating the rest of resources.

5. Identifying recipients of activities – cost objects.

6. Modelling cost flows among cost objects.

7. Reporting and interpreting the results.

ABC costing process of the department is shown in Figure 1.

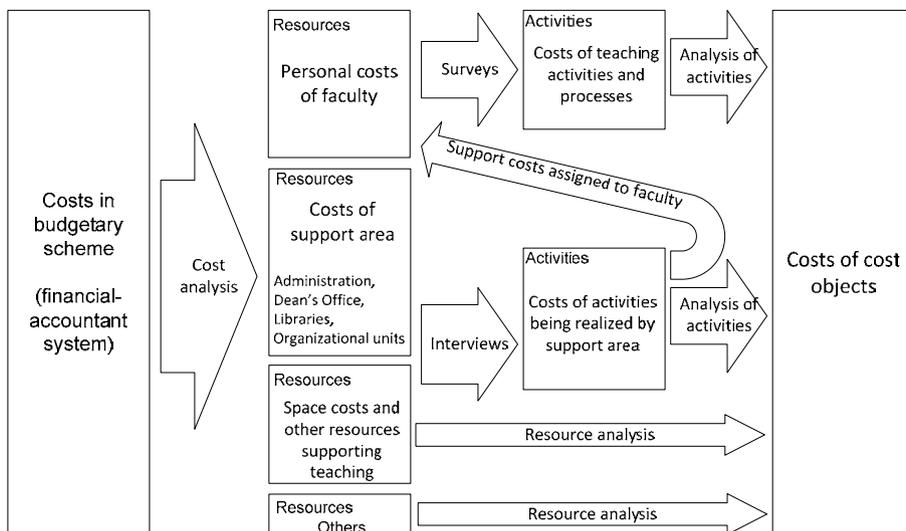


Figure 1. Model of ABC calculation

Source: individual work.

² "Support area" is covering: administration of the department and units support didactic process, such as: dean's office, libraries.

3.3. Step 1. Analyzing all costs of the department, creating resource pools

The first step in the project was a collection of information about costs which had been incurred by the department. The source documentation used on this level of work was a financial register (presented in the budgetary scheme) and data from the payroll system.

It was decided that in the calculation, costs related to the teaching area (including material costs of teaching, 100% costs of people/salaries), departmental costs and part of the cost of general administration assigned to the department, were all used.

The first problem needed to be solved was a definition of resources of the department and a qualification of their costs. It was identified that the previous way of grouping costs (according to categories) had been useless from the point of view of the calculation based on activities and it did not allow to create the cost pools representing resources of the department.

It was necessary to reorganize, aggregate, elaborate and calculate some cost positions. In many cases taking further information from source documentation was required. Finally, the following resources were recommended:

1. Personal costs of faculty.
2. Costs of support area.
3. Costs of space for teaching purposes and costs of other resources to support teaching³.
4. Rest of teaching costs.
5. Costs of management and development of the department.

The way of grouping was a consequence of logic adopted in further work with costs calculation.

First resource – “Personal costs of faculty” is the most essential group of costs of the department. It contains (after costs aggregation) 87% of the total costs of the department. Five subgroups were separated in the area:

- 1.1. Costs of faculty salaries.
- 1.2. Costs of indirect benefits.
- 1.3. Costs of impersonal salaries.
- 1.4. Costs of management allowances.
- 1.5. Rest of personal costs.

Subgroup 1.1 includes costs which directly and indirectly could have been linked to faculty staff. All costs were assigned personally to each faculty member of the department. Costs which were directly assigned to faculty members:

- elements of fundamental salaries,
- consequences of salaries (national retirement insurances),
- deductions for the Company Fund of Social Benefits.

³ The pool is covering costs related to maintenance: widely available spaces, class rooms and special rooms (like: Computer laboratory, Photographic studio).

In addition to this, to the pools representing each faculty member other costs of the department were assigned, which had been incurred in their favour (subgroup 1.2). The model tried to imitate, in the best possible way, the logic of cost consumption. An analysis of costs showed that a lot of costs are being incurred to assure the support to the faculty. To the pools representing each faculty member the types of costs were assigned as follows:

- costs of administration units,
- costs of library,
- space costs,
- phone and computer costs.

During accounting proper casually-consecutive relations were considered. In a few cases it was good enough to use simple cost drivers (e.g. space costs were assigned to each faculty member by virtue of practically used yardage). However, in the case of administration costs and costs of libraries, calculation based on ABC was applied.

The adopted method made it possible to make further calculations easy and clear and to define the total cost connected with each member of the faculty, which was important information in the point of view of costs management.

Subgroup 1.3 – “Costs of impersonal salaries” includes added wages paid to faculty members for the completion of course sections above obligatory teaching hours and the completion of special activities (e.g. making reviews, taking part in enrolment commissions).

Subgroup 1.4 – “Costs of management allowances” was separated (for faculty members) because of direct assignment and the costs of activities related to administrative functions.

The subgroup 1.5 – „Rest of personal costs” includes components of faculty salaries, which had to be treated in a different way, because of their one-time and/or occasional character. In particular, the costs of rewards, paid out equivalents in sabbaticals, retirement gratuity, etc. were included here.

Although the group was a little higher than 4% of the total costs assigned to the faculty, when we take into consideration one member of the faculty the group could have raised costs in one period several times regarding the average level. The group was excluded from the allocation of activities, if it was taken into consideration that the outcomes of calculation could have been deformed. The group of costs were treated like the costs of management of the department and were eliminated from further calculation.

The second resource “Costs of support area” consists of the subgroups as follows:

- 2.1 Administration of the department.
- 2.2 Dean’s office.
- 2.3 Library 1.
- 4.4 Library 2.

Costs qualification to each above-mentioned group was not difficult. The following components were assigned to them:

- staff salaries with their consequences,
- space costs,
- other costs (e.g. phone and computer costs, materials, depreciation of equipment).

Within the confines of the third resource – “Costs of space for teaching purposes and costs of other resources supporting teaching” there were separated 4 cost pools:

3.1 Computer laboratory.

3.2 Photographic studio.

3.3 Other classrooms.

3.4 Circulation area and other spaces of general use.

The costs of computer laboratory and photographic studio include costs assigned to people who work inside them (staff salaries with consequences), costs of using space, and the costs connected with equipment (e.g. depreciation of devices, photographic/computer services).

Subgroups 3.3 and 3.4 enclose only costs related to space. It is worth highlighting that inside there are all of the costs related to the maintenance of departmental buildings, such as: upkeep purity, repair fund, services of supervision, etc.

Thanks to costs analysis it was possible to obtain a lot of helpful information, for example, in the area of infrastructure management. It is possible to define a general cost connected with the maintenance of departmental buildings, and later to calculate the cost of 1 square metre of their space. This information is not available until now and can be seen as very substantial knowledge.

3.4. Step 2. Modelling costs of support area

Resources represented by cost pools 2.1, 2.2, 2.3 and 2.4 were calculated according to ABC procedure. To collect essential information used in the identification of activities and to make an allocation a technique of direct interviews with employees of was adopted.

The primary resource driver was a declared time of work needed to do the activities. Aiming to keep optimum between the accuracy of results of the calculation and the complexity and clarity of the model, only the main processes (from 3 to 9) for discussed areas have been identified.

It is assumed that in the point of view of goals marked at the beginning, more detailed proceedings are not necessary: they will not have significant influence on the final results but could diminish clarity of the model. As an example for pool 2.1 – “Administration of the department” there are identified activities, such as:

- making financial accountings,
- managing a documentation of the departmental council,
- acting in favour of faculty personnel causes,
- managing devices and equipment,
- conducting cases connected with PhD students,
- supporting secretary’s office of educational unit.

Costs of the activities were allocated on cost objects: course sections, free sessions, faculty members, PhD students, management of the department, and management of the university⁴. It is worth highlighting that part of the activity costs was assigned to cost object representing faculty members. The costs increased cost pools 1.2 (connected to faculty members) and later were allocated through activities to other cost objects.

3.5. Step 3. Modelling costs of faculty

The modeling of costs presented by resources 1.1, 1.2, 1.3 was very difficult, because it required an identification of faculty activities. The work was started with building a dictionary of faculty activities. Its purpose was to take into consideration available publications [Cox et al., 1999], [Ernst & Young, 2000], [Ernst & Young, 1998], [Granof et al., 2000] and discussions with teachers. Finally, a dictionary was proposed which contains 6 main processes and 45 elementary activities. Each activity was described and defined.

To nominate drivers essential to value the activities a research questionnaire was made. In the surveys for each activity there were used adequate units of time of work. Examples are shown in Table 1.

Table 1. Conversion units of time of work – examples

Activity	Conversion units of time of work
Designing a new course	hours on a didactic hour of new course ^{a)}
Regular preparing to course sections	minutes on a course section ^{b)}
Consulting students	hours in a week (during an academic year)
Conducting/taking part in scientific associations and student organizations	hours in a semester
Supervising graduate students	hours on a graduate student

^{a)} A definition of a “course” is presented in the subsection “Activity based costing in universities – second step of calculation of teaching costs”.

^{b)} A definition of a „course section” is presented in the paper titled “Activity based costing in universities – second step of calculation of teaching costs”.

Source: individual work.

The units of time of work were identified on the basis of: the carriers of variability of each activity, the cost objects of each activity and discussions with academic teachers.

The surveys were distributed among the faculty of the department. The research was conducted anonymously with the exception of questions about administrative activities. The research concerned 172 faculty members.

⁴ The structure of cost objects is presented in the paper titled “Activity based costing in universities – second step of calculation of teaching costs”.

The obtained research material was processed and statistically verified. The results made it possible to mark average time of each activity from the dictionary of faculty activities. Total balance sheet of the activities with taking into consideration the typical carriers of variability (e.g. number of realized courses, number of students needed to be examined, number of course sections) for the group of faculty allowed to establish the total time of work related to didactics (in a semester and in an academic year).

Next, for each faculty member of the department a card of work was created. The cards of work enclosed: identification data of the faculty member, amount of the faculty member cost which assigned cost positions to him, estimated time of work (in a semester) for each activity being completed by him, costs of the activities, an allocation of the activities costs on cost objects.

Costs accounting of each faculty member was conducted according to the procedure which is shown in Figure 2.

Based on average time of an activity unit and quantitative data, time was set (for a semester) which each faculty member spent to complete the activity (1). Knowing the total cost of each faculty member and time of work spent by him for didactics, it

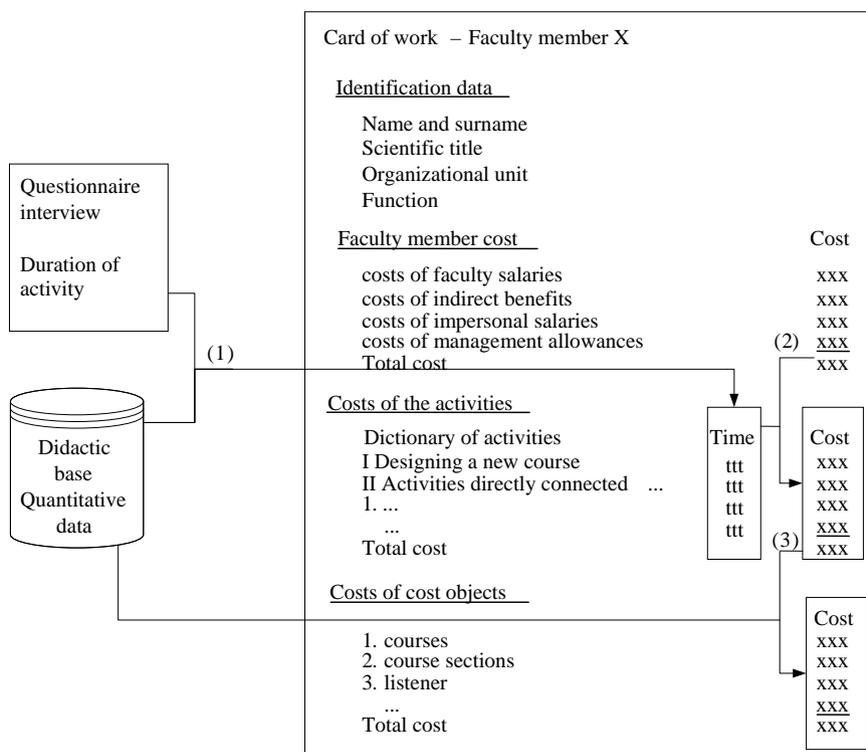


Figure 2. Scheme of faculty costs calculation

Source: individual work.

was possible to count a cost of each activity (2). An allocation of activity costs on cost objects were conducted based on drivers mostly related to the amount of products of the activities (3).

Table 2. Dictionary of activities with the structure of costs of the department

Total		100,00%
I. Conducting course sections		23,50%
II. Activities directly connected with courses		37,20%
1.	Designing a new course	9,20%
2.	Regular preparing to course sections	7,60%
3.	Regular monitoring of students progress	9,70%
4.	Preparing examinations	2,00%
5.	Marking examinations	8,60%
III. Attendance in PhD studies		3,80%
IV. Activities of teaching process not directly connected with courses		24,00%
1.	Consulting students	12,90%
2.	Supervising graduate students	4,00%
3.	Supervising PhD students	1,80%
4.	Other forms of students support	3,40%
5.	Taking part in serving didactic system	1,80%
6.	Conducting/taking part in scientific associations and students organizations	0,00%
V. Other activities of teaching process		2,00%
1.	Preparing instructional materials	0,00%
2.	Professional development	0,00%
3.	Liasing with other universities	1,80%
4.	Taking part in the commissions appointed for students:	0,20%
a)	recruiting commissions of undergraduate/postgraduate students	0,0%
b)	recruiting commissions of PhD students	0,00%
c)	graduating commissions	0,00%
d)	examination commissions of PhD students	0,20%
e)	commissions appointment connected with start/ending of PhD student research	0,00%
f)	other commissions	0,00%
5.	Attendance in organization of practices for students and student exchange	0,00%
VI. Departmental activities		9,50%
1.	Managing area of the department	1,70%
a)	dean of the department	0,20%
b)	substitute for the dean of the department	0,30%
c)	agent of the dean	0,00%
d)	institute head	0,10%
e)	substitute for the institute head	0,10%
f)	manager of the departmental workshop	0,30%
g)	manager of the institute workshop	0,20%
h)	manager of other departmental unit	0,20%
i)	manager of the doctoral study	0,10%
j)	manager of the postgraduate school	0,20%
k)	other function	0,0%
2.	Taking part in bodies of the department	2,80%
a)	departmental council	0,20%
b)	council of the institute	0,00%
c)	institute meetings/meetings of other bodies	2,60%
e)	other bodies	0,0%
3.	Managing area of the university	0,00%
4.	Taking part in bodies of the university	0,00%
a)	senate	0,00%
b)	commissions of the senate	0,00%
c)	other bodies	0,00%
5.	Taking part in evaluations	0,10%
6.	Representing the department and the university	5,00%

Source: individual work.

Cost drivers (of resources and activities) were based on the following quantitative data:

- numbers and didactic form of courses,
- numbers of course sections of the course,
- numbers of students taking part in the course sections,
- numbers of graduate students and PhD students,
- functions resulted from scientific title and held position at work.

In the calculation of faculty costs there was used information from the database of system supporting didactics.

Basic salaries and impersonal salaries (paid to faculty members for the completion of course sections above obligatory teaching hours) were treated jointly in the calculation of work unit cost of the faculty member. An example: in the period a faculty member completed course sections consisting of 100 didactic hours (50 hours of obligatory teaching and 50 hours non obligatory teaching). The cost of basic salary for 50 obligatory hours was 80 units, additionally he was rewarded with 20 units for 50 overtime hours. In the calculation it was assumed that the cost of one didactic hour (in case of this faculty member) is 1 unit: 100 hours/ (80 + 20) financial units. The lack of that assumption would cause differences between the cost of teaching a student who attended a course in range of the obligatory teaching hours and non obligatory teaching hours.

The costs of scholarships of PhD students were assigned in 100% to the activity – “Attendance in PhD studies” and later to the cost object – “PhD students”. An assumption was made that course sections being conducted by PhD students were part of their studies (practice), so the costs of the scholarships were not allocated on the course sections and later on the students. However, an allocation of cost was made of impersonal salaries paid to PhD students for the completion of courses which consisted of non obligatory teaching hours.

An example of the results: a list of processes and activities and a percentage structure of costs of the whole department is presented in Table 2.

3.6. Step 4. Analyzing and allocating rest of the resources

Resource pools 3.1 and 3.2 were calculated as similarly as in the case of the second resource “Support area”, discussed in subsection 3.5. Interviews were carried out with representatives of the computer laboratory and photographic studio, who identified activities and made an allocation of costs.

The costs of resource pool 3.3 – “Other class rooms” were assigned directly to cost objects – “Course sections” which have taken place in each didactic room. According to a suggestion of the project principals, it was decided not to include the model costs of unused time of didactic rooms (although it was possible to do it).

The cost pool which contains the costs of common areas (3.4) was assigned to cost objects – “Free sessions”. The consequences are explained in the article titled “Activity based costing in universities – second step of calculation of teaching costs”.

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RACHUNEK KOSZTÓW DZIAŁAŃ W SZKOŁACH WYŻSZYCH — PIERWSZY ETAP KALKULACJI KOSZTÓW KSZTAŁCENIA

Streszczenie: Z punktu widzenia zapotrzebowania na informację zarządczą potrzeby wyższych uczelni nie różnią się istotnie od wymagań przedsiębiorstw. Wzrost zainteresowania narzędziami wspomagającymi podejmowanie decyzji zarządczych jest nieunikniony w związku z nasileniem konkurencji w pozyskiwaniu studentów i funduszy na badania naukowe. Także regulacje prawne wymagają od uniwersytetów dokumentowania działań i wyznaczania ich kosztów na podstawie czytelnych nośników kosztów. W związku z powyższym niezbędne jest poszukiwanie rozwiązań wspierających zarządzanie kosztami, gdzie rachunek kosztów działań odgrywa szczególną rolę. Celem artykułu jest zaprezentowanie modelu kalkulacji kosztów kształcenia z wykorzystaniem rachunku kosztów działań, jaki został opracowany na jednym z wydziałów Politechniki Wrocławskiej. Z powodu złożoności modelu rozwiązania zaprezentowano w dwóch powiązanych ze sobą częściach. Artykuł prezentuje pierwszy krok kalkulacji.