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Specification of Training Costs in Higher Education

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Authors' contributions

This work was carried out in collaboration between the two authors. Author SV designed the information systems needed for the model and not available at the institution and also coordinated the adaptation of the model. The first version of the manuscript was written by author SV. Author ZB managed literature review, compliance with legal stipulations, monitoring of the results of the pilot project and finalized the manuscript. Both authors read and approved the final manuscript.

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ABSTRACT

Effective utilization of available resources has become increasingly crucial for institutions of higher education. Global trends put an ever-growing pressure on the financing of the sector: a decreasing amount of resources are available, while costs rise continuously. [1] This necessitates vigorous savings all over the world.

The scarcity of budget resources is clearly visible in Central-Eastern Europe, thus in Hungary also. In 2013 the support granted to Hungarian higher education was three-quarters of the state subsidy received in 2010 [2].

Although the government has considered it necessary for years, a general prime cost calculation model is still lacking in Hungarian higher education that would lead to the allocation of justified costs to programs or credit numbers iteratively with the help of its decision-supporting function in the planning and feedback stages; a model that would support the well-founded and rational use of resources and contribute to knowledge determining the financing of higher education.

Through more effective institutional operation (with the specification and acknowledgement of

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justified costs), the paper introduces the framework and application of a possible model that undertakes to precisely specify the costs of educational activities. However, it is not our primary objective in this paper to introduce the underlying methodology in detail.
Besides considering the special attributes of institutions, our primary goal was to make the model adaptable for institutions of higher education with a very heterogeneous background and thus to provide a framework both for those financing higher education and the institutions themselves to answer two crucial questions: "what the costs are" and "what the costs should be."
The post-calculation model is indispensable because it helps in the subsequent evaluation of activities, supports decision making and its database can improve the effective operation of institutions while also providing a crucial tool in planning a stable budget.

Keywords: Higher education; prime cost; more effective management; strategic objectives.

1. INTRODUCTION

The strategic importance of higher education is recognized by all governments but their actual economic policy often creates a difficult terrain for the sector that influences our future on the long term [3]. In the last decades continuous and potent changes have taken place in the financing of higher education even if the intensity and relative weight of such processes differed in particular countries. Such differences arise from social and economic disparities just as much as they are the result of diverse educational financing models [4].

Institutions of higher education depend on state financing to differing degrees: in Germany, for example, on average 80% of the revenue comes from regular state subsidies while there are countries where this proportion is below 50% (e.g.: New Zealand with 40%). Still, it may be ascertained that the state is the unique and most significant partner of institutions of higher education in all countries in terms of financing. Thus the financing system maintained by the state considerably affects performance in all countries, while it can serve as a tool that stimulates institutional-level planning and strategy especially if it is transparent and predictable [5].

Johnstone, in a study published in 2009, analyzes the global trends affecting the financing of higher education [6]. One of the identified tendencies involves the pressure affecting the unit or per-student cost of higher education. Several reasons were identified for such pressure: the general increase of wages and salaries in the economy is one of the major causes, which is visible in the personnel costs of higher education. It is also influenced by the developing (and increasingly expensive) technology, the rapidly increasing cost of research, and the addition of new programs at faster pace than the less demanded ones can shed.

However, government resources can barely, if at all, can keep up with the increase of costs. In the aging societies of developed countries the major burden on the budget is represented by the financing of pensions and health care, while there is also a growing social demand for a wide-range of welfare services and benefits. At the same time, globalization and the growing mobility of labor and capital leads to increasing tax competition and thus faltering redistribution by the government.

In order to ensure the financial stability of the institutions of higher education, actors have to be aware of exact costs of human resources, infrastructure, and other areas that are available or can be made available. This shall be a joint objective of the government, the institutions, and the students. The governmental decisions also predetermined by the tightening budgetary resources can result in well-founded changes that may be managed reassuringly if the educational strategy meets predictability (financially, by using pre-calculation) and reality, the accurate knowledge of the "cost of things." [6]

After the introductory remarks, the paper presents the methodology related to prime cost calculation. First, the features of prime cost calculation are introduced as applied in Hungarian higher education, followed by the outline of the established model and the related calculation scheme. The latter also includes the brief definition of the main cost types. In the final subsection, those information-based planning systems are introduced that are indispensable for the application of the methodology in practice. The Results and Discussion section introduces one of the most important ways of utilizing prime

cost calculation: the significance of its integration in the planning process both from the institutional and governmental perspective. The conclusion takes account of the benefits of knowing the precise prime costs of educational programs from the perspective of the three main actors in higher education.

2. METHODOLOGY

This section discusses the characteristics of prime cost calculation in higher education, followed by the introduction of the model created for the specification of education prime costs with post-calculation. The related calculation scheme is also presented in this part of the paper, along with those IT systems that may be used as tools for prime cost calculation.

2.1 Characteristics of Prime Cost Calculation in Higher Education

In 2008 a study conducted as part of a government project aimed at mapping how institutions of higher education determine the prime costs of their programs. The summary of research findings was included in the 2009 publication of Havady et al. [7]. The main conclusions of the study were the following:

- Institutions of higher education control the calculation of program prime costs at different levels and in different detail. There are institutions where regulation is completely lacking.
- Calculation procedures do not start out from stipulations of law in many cases.
- The majority of institutions do not differentiate between justified and incurred costs, there is an established cost standard (based on the usually incurred costs) and the calculation involves the "redistribution" of these.
- From the calculations it is not clear how and based on what methodology institutions specify the types of costs as the calculation typically includes large aggregates.
- The majority of institutions only perform pre-calculation for training programs.
- When determining direct costs, the institutions start out from the curriculum (the highest item being the personnel cost) and the indirect costs are treated in a varied way.
- It is necessary to collect the calculation data of institutions in full and in identical structure.
- The majority of the institutions, taking the incurred costs as given, use the calculation primarily for the specification of the amount of tuition fee.
- The majority of the institutions, although meeting the stipulations regarding prime-cost calculation, are rarely aware of the inherent opportunities and thus do not make use of them.
- The source of data is basically provided by the accounting systems. The qualitative and quantitative increase of information is indispensable for the improvement of decision-making processes of institutions of higher education and for the increase of efficiency with regard to the management of public property. A tool and software park has to be created that is suitable for wide-ranging database management and the analysis of data.

Based on the findings of the project, it can be stated that in Hungarian higher education there is a need (among other things) for such a post-calculation model that leads to the allocation of justified costs to majors (programs) in an iterative way with the help of its decision-supporting function (there has been no significant progress made in this area since the study either).

2.2 A Model for the Specification of Education Prime Costs with Post-Calculation

Prime cost calculation has to be made for the natural unit of the subject of calculation, which, in the case of higher education, is the student. In the process of the post-calculation of prime costs there are several factors that have to be taken into consideration deriving from the special features of the educational activity. These are the following:

- Prime cost calculation is carried out at an institutional level.
- The calculation model is built on basic costs (that cannot be further divided, e.g. the basic salary) and complex costs (that can be subdivided into further elements, e.g. general costs).
- Prime cost calculation is broken down into programs with divided costs (taking into consideration that programs do not have

exclusive instructors, only faculties do; moreover, usually neither the program, nor the faculty has its own infrastructure thus institutional infrastructure shall be considered).
- The utilization of resources is differentiated.
- The basis of calculation is the timetable prepared based on the curriculum specified by the qualification requirements of programs; the timetable is a document which includes the classes of students, the instructors, the venue, time, and duration of the program for each major.
- In higher education the training program takes place on a semester basis, thus the unit of prime cost calculation is HUF/person/semester.

The result of prime cost calculation can be modified by numerous factors, including the following:

- The geographical, regional location of the institution.
- The composition of instructors.
- The status and utilization of the institution's building and technical infrastructure
- In the training process students in different programs often use the same personnel and material capacities simultaneously and to a different degree.

2.3 Calculation Scheme

The calculation scheme for the subject of prime cost calculation includes those costs which

- are directly incurred in the production of the goods, the provision of services, and the performance of activities,
- are justifiably related to the production, service, activity
- can be accounted with the help of appropriate indices, attribute for the goods, services, activities.

As the first step of the post-calculation process, all those costs have to be taken into consideration, which are relevant in the educational activity of different programs (calculation scheme). Based on their accountability, these are divided into two groups: direct and indirect costs.

Direct costs are those costs connected to the organizational unit responsible for teaching, the teaching staff, and students, which can be accounted for one unit of the teaching activity (the student) directly at the time when they are incurred. Moreover, we also consider those costs as direct which can be connected to the organizations performing and supporting teaching and to the students and which can be distributed for each student with the help of indices and attributes.

Indirect costs are such costs of the institutional and faculty management (Dean's Office, Rector's Office) and of functional (Education Management, Quality Assurance Office, Office for International Relations, Financial Office, etc.) and service-providing units (Library, IT Center, Student Center, etc.) connected to teaching which can be reallocated to the subject of diploma prime cost, i.e. the student, with the help of different indices.

Fig. 1 shows a possible post-calculation model for the prime costs of education [8].

We have identified the following types of costs related to higher education [9]:

- Personnel costs with taxes – the personnel allowances of educational activity include the regular (base salary, remuneration and wage additions, bonuses), non-regular (cafeteria and other benefits), as well as the external personnel allowances. Contributions paid after personnel allowances and all amounts to be paid as taxes are accounted here which have to be established based on the number of employees or personnel allowances, irrespective of their name.
- In the process of specifying the prime cost of programs, the cost of training directly or indirectly related to education provided based on invoicing is accounted among material and other current expenses, together with material costs, the costs of professional materials needed for theoretical or practical training. the costs of low-value equipment and tools, cost of services (services accounted and used for the teaching activity as well as the other external services needed, e.g.: postage, rent of machines and equipment), costs of related assignments, together with the value added taxes, contributions accounted for the costs connected to the programs and which cannot be deducted.

- The following are considered as operating costs: maintenance and all other expenses (e.g. public utilities, cleaning, guarding and protection, waste disposal, site management and IT operation) of institutional infrastructure (buildings, structures, machines equipment, etc.), as well as the material and personnel costs of service-providing and maintenance units.
- Costs of general tasks: These types of costs are necessarily incurred while performing the activities of the institution but they cannot be connected to one particular activity and their distribution is also difficult as they are needed for the operation of the institution as a whole. Thus the real educational prime cost of programs cannot be established precisely as the general costs can be divided among the programs based only on supposed correlations of varying strength. The most significant degree of heterogeneity can be seen in terms of general costs. The general cost ites (may) include basic and complex costs as well. For the calculation of the prime cost of programs it should be specified for each general cost item how the costs are divided among the different activities; this takes place in accordance with the projection bases set in the budget. The costs related to general tasks can be accounted in the case of the educational units and the service and functional units playing a major role in education in proportion to the educational activity.

The created model takes depreciation into account both within direct and indirect costs. In the former case it is connected to education (e.g. lecture hall, seminar rooms), instructors (e.g. offices) and students, while in the latter to the institutional, faculty management, as well as the functional and service-providing units, in the proportion of their activities they devote to education. Depreciation can be considered as a *direct cost* if it can be demonstrated that it has a strong connection to the subject of prime cost calculation, i.e. education. In practice this means that, for example, the particular machine or equipment is used only for providing the product or service (i.e. education) that is the subject of prime cost calculation and it can be allocated to the educational product, service with the appropriate indices. When specifying the costs of education, it is recommended to consider only *ordinary depreciation* and this cost may not exceed 10% of the educational cost calculated without depreciation.

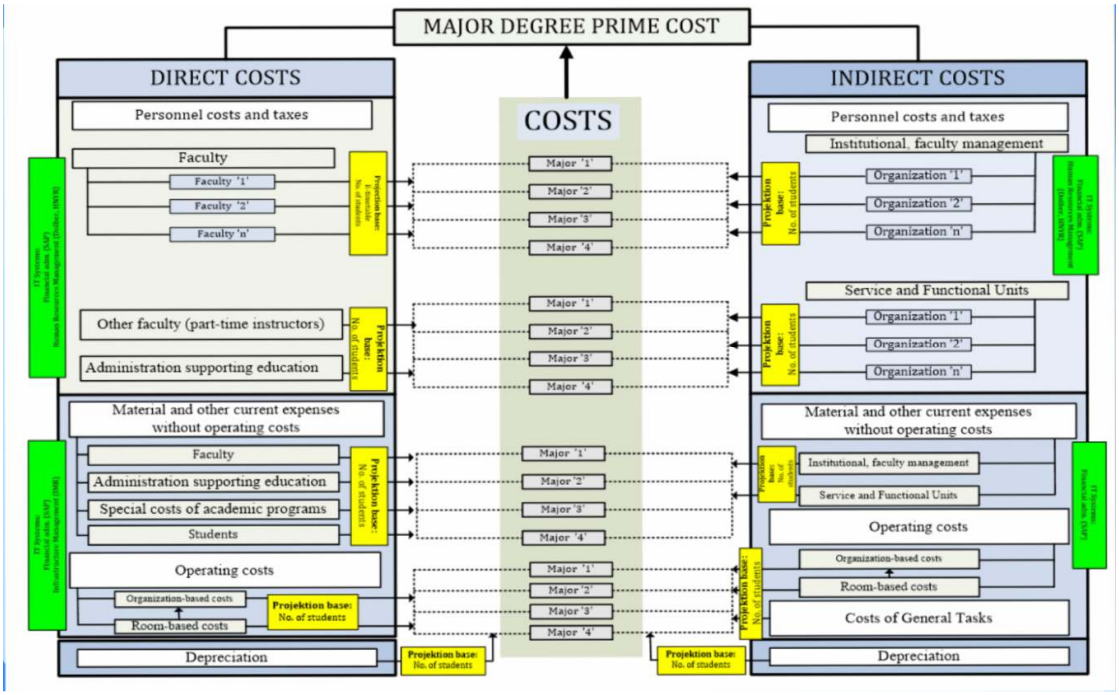

Fig. 1. A possible model for the specification of higher education prime cost

It is not our objective in this paper (primarily due to limitations in terms of its length) to introduce the methodology for the allocation of the types of costs to the different bearers of the costs but the significance of the creation of the model laid in the specification of this methodology. The detailed methodology is available in the 2012 book of Vincze, titled *A Possible Post-Calculation Model of Diploma Prime Costs* (available in Hungarian). The book was based on a project carried out over four years. One section of the work involved the drawing-up of the model in consideration of the accounting and other laws and regulations, while the other focused on the creation and adaptation of the IT systems supporting the execution of the methodology.

2.4 The Tool for Educational Prime Cost Calculation: Modern IT Systems

For a well-founded prime cost calculation that takes into consideration the institutional characteristics, it is of crucial importance to introduce an information-based planning system. Higher education management systems have to be developed and used in line with the new requirements together with the system-level databases of higher educational services, which provide authentic information both for the decision-makers in higher education and the "clients" of higher education.

The substantiated post-calculation model built on actual costs takes into consideration all costs incurred for educational purposes. An essential condition for this, however, is to have access to information in the appropriate structure and quality. The basis for this is provided by background information (IT) systems. The information input is determined based on actual processes and not simply by re-planning the fiscal framework which is irrelevant in itself.

The specification of educational costs takes places in the management information system to which the necessary data can be channeled in from various resource systems.

A suitable financial-accounting system is of primary significance in this regard. It has been shown in practice that in most cases the financial-IT systems used in higher education are inadequate in themselves for the specification of training prime costs, thus other information/information technology systems are also necessary:

- the resource system for personnel costs is provided by the payroll management systems.
- the precise specification of operation costs requires the use of an IT system that allows for the registration of all rooms of the institutions with their measurable basic features (e.g. floor space) and special equipment and which, among other things, includes a scheduling module (timetables), a room reservation module, asset management module, and a cost allocation module.
- the student registration systems used by institutions are also included as resource systems; these transfer the necessary data (name of programs, number of students, etc.) directly to the management information system, on the one hand, and to the information system performing the cost allocation on the other.

The above information systems provide data in an integrated manner with the financial information system for the calculation of specific educational costs.

The other IT systems make it possible for the different costs incurred in relation to the training program (e.g. personnel, operation) to be provided as precisely as possible for the programs, then for the unit of prime cost calculation, the student. It is a basic requirement for these systems that their information data content and the flow of information should be accurate and regulated, the processing and transfer of data should take place by means of such algorithms that make the process of prime cost calculation transparent and clear; moreover, it should also be in harmony with the Act on Accounting and other stipulations of law as well as the internal regulations of the institution.

3. RESULTS AND DISCUSSION

The discussion of the practical uses of the model contribute to the study not being an end in itself. In line with this, in this section we present how prime cost post-calculation can help task- and cost-based institutional planning as well as budgeting both from the institutional and governmental perspective. This chapter concludes with the section introducing the relationship between post-calculation and pre-calculation.

3.1 Transparent Higher Education: Post-Calculation – Pre-Calculation – Planning

Post-calculation, in itself, cannot be used as an active tool for planning and for its substantiation by means of changes in real processes: in this case it is "only" one of the profiles of institutional task performance, i.e. a completely closed system is not yet created this way. Moreover, post-calculation records the consequence of already completed processes and explores the resultants of the processes. The specification of "justified" costs is the task of the preceding decision-making stage: this involves the specification of tasks, requirements, conditions, and work processes.

The efficiency of operation, financial management and thus discipline may also improve if these costs are harmonized with the financing allocations and its tools. This way the financing of education is the result of well-founded prime cost calculation containing the necessary costs and educational management performed in line with this and not the consequence of operative decisions and different agreements prone to various eventualities.

With the help of post- and pre-calculation, the preparation of the budget could go beyond the mechanism which only means the mere breakdown and detailing of given amounts. The basis for the creation of an executable budget could be the planning of the costs of real processes calculated in advance, connecting to it the specification of sources and their extent. Thus it is essential to get access to pre-calculations (building on business organization and not fiction) for the different versions of the budget and its elements, which necessitates the precise knowledge of facts (post-calculation) [10].

3.2 Task- and Cost-based Budget Planning

The starting point for the financial management process is realistic planning and one of its essential prerequisites is that the institution should specify the costs of its basic tasks, thus that of its training programs as well, with post-calculation. After providing the answer to the question of "what is the cost of something" (which is necessarily a "single version" answer) it will be a new task to decide "what can/should be the cost of something for someone and how that cost could be achieved." If we can provide a relevant budget planning technique, it can become the basis for a budget that is "counted" and executable by the financing body and the institution performing public service and for rational and disciplined financial management during the year.

A modern planning system that reacts to the current situation, trends, and expectations should be implemented at an institutional level as the supporting central financial regulations and toolbox (not only providing fiscal discipline) is currently not available. Input-type regulation with a uniform approach towards the entire system of institutions and emphasizing the dominance of the directing body's budgetary support among resources (also) only forces higher education to framework management. Therefore, the institutions, similarly to the financing body, are not forced to

- plan the budget in a more exacting way with a service/quality/performance approach
- justify the included appropriations and their fulfillment by organizing the work processes in a more rational way during the planning of institutional operation and the performance of expert tasks, to measure and regulate the tasks and conditions for this purpose.
- manage the costs in a more efficient way and provide the means for all this on their own.

3.2.1 The Process of Budget Planning, Its Elements, Pre-Calculation

Budget planning that is suitable for meeting the requirements described above includes the justified and acknowledged cost needs and income in a way that it

- deduces them from the identified general budget requirements and those professional requirements prescribed for certain higher educational public services as well as various other (long-term and actual) boundary conditions,
- relies on process planning to be implemented in the particular institution, and
- builds on the internal regulation of professional, infrastructural, and income conditions of task performance.

The work processes (as it can be seen from the detailed description) appear as boundary and internal conditions in the post-calculation model but in planning they already represent variable elements. The pre-calculation of costs and income is connected to these.

The general framework mostly prevails at the organizational level in current budgeting but not comprehensively and not in task depth. These include, for example, the budget figures from the fiscal side, the normative grants, specific indices, the wage and employment stipulations, as well as the professional specifications (training requirements of programs, definitions of research, regulations for healing, for experimental, educational production activity, student welfare services, etc.), the specific qualitative and quantitative performance expectations, other indicators, and finally the individual management decisions. The actual consequences of these factors are thus to be displayed in the task-based pre-calculation as well.

The next planning phase involves the organization and specification of professional tasks, the method and procedure of their solution, the work processes in consideration of the foregoing, the internal professional requirements, the personnel, material, infrastructural, and organizational characteristics. These processes have to be recorded in protocols for the purposes of creating the executable budget. The professional content of these is complex, in accordance with the profile of the institution.

After this it is necessary to

- specify the quantitative and qualitative expectations and conditions with regard to the above (e.g., personnel and material capacities, room availability and utilization, their equipment, cost items: salaries, use of atypical forms of employment, hourly wages, direct professional material costs, usage costs, etc.) and then
- assign the closely connected financial, material, personnel conditions to the professional activities according to the protocols on a program-project-task-subtask level as well as the (direct and indirect) expenses and revenues with pre-calculation.

For the calculation of the costs of activities related to the performance of professional tasks, for pre-calculation, the above characteristics and indices have to be (re)established in consideration of the possibility for changing the situation.

The specification of material and personnel costs for organizational operation, administration, functional intellectual and physical tasks is the next step together with the consideration of non-distributable expenses.

Finally, in the case of a lack of harmony between the tasks and conditions defined up to that point in the planning process, the consequences have to be specified together with the necessary additional action to be taken. These are such planning and organizational decisions (with regard to cost factors and income items, in this case already in pre-calculation per variable) which are necessary for the observation of performance requirements and the execution of the budget.

All this requires decisions mostly within institutional competence but can also mean the initiation of higher level stipulations. The costs should be harmonized with the financing allocations by means of increasing the efficiency of operation and management.

If the planning of the budget could go beyond the mechanism which currently means the mere division of given amounts and their detailing, then the planning of the previously calculated costs of real processes could be the basis for the development of the executable budget, connecting from the other side the specification of sources. For this it is essential to get access to pre-calculations (building on business organization and not fiction) for the different versions of the budget and its elements.

3.3 The Connection between Pre- and Post-Calculation

In general, it can be stated that during pre-calculation (during its preparation) it is necessarily utilized already if the methodology of post-calculation is elaborated, its data types, data content, the results of its application are used and evaluated. It is a theoretical consideration that the budget methodology, which also includes the planning of the implementation of professional and operating tasks, should consider the planning elements not as the causes, explanations of emerged cost levels (and resource need) for pre-calculation but

as its active cost drivers and thus as the basis of decisions.

The elaborated post-calculation model based on actual costs considers all expenses incurred for the purposes of education. An essential condition for this, however, is to have access to information in the appropriate structure and quality. The basis for this is provided by background information (IT) systems. The information input is determined based on actual processes and not simply re-planning the fiscal framework which is irrelevant in itself.

According to those mentioned above, the planning and budgeting of task performance (within the framework of financing) involves the planning, organization, cost-allocation, and own income calculation of professional and infrastructural supply processes deriving it from the external and institutional requirements and conditions. This is why it is crucial to explore as deeply as possible in the post-calculation described above the relationship between tasks, the activities supporting them, and the costs realized in the actual processes so that the constant and (to a certain extent) variable elements are identifiable and quantifiable with regard to their effects. An additional, active step involves the change of real processes identified as cost drivers so that the financial consequences can also match the development of boundary conditions.

Therefore, in the process of drawing up the budget, the pieces of information (partly organizational, partly financial data) from the application of the already completed post-calculation are indispensable.

4. CONCLUSION

Actors in higher education, the government, the institutions, and the students form a special community of interest. Their common goal is to operate a system that is mutually beneficial. It is a fundamental descriptor of both the actors and their cooperation how students can make use of their acquired knowledge. To be successful, such a knowledge is required that is competitive, modern, and which can be used on the labor market. This can be provided only by an educational system that is also modern and operated efficiently both in a professional and (with unavoidably limited financial conditions) financial sense. As the basis of the above, all actors of higher education have to address the question of how much the human resources, infrastructural and other conditions cost that are or can be made available for it.

For actors in higher education the answers provided to the questions of "*what is the cost of certain things*" and "*what should be the cost of certain things*" and the information related to such issues may be of varied significance [11].

For the *state* as funder, it can provide guidelines for the establishment of a new resource planning, distribution, and financing system. Educational policy-makers have to know precisely how much the training of the graduated students "ordered" from the institutions actually costs, while its quality should not be left unconsidered either. This is the only meaningful way in which the institutional expenditures can be matched and evaluated with the financial resources (and within this the financial subsidy) both by the institution and the financing party. The tools for relieving the tension between the opportunities and the expectations can be divided between the institution providing the service and the state which is in a special position as customer, controller, and director. The opportunities of the institutions are unsatisfactory on their own in theory as well as in the current financial situation. Moreover, it can

- provide assistance in the planning of the budget resting on realistic foundations with the elimination of unjustified funding needs besides the consideration of justified costs;
- become a database for providing a sound institutional framework and for ensuring the necessary conditions for those participating in education;
- provide a basis for a competitive Hungarian higher education (e.g. with comparability between universities and programs);
- provide information for controlling quotas from the perspective of real costs.

From the perspective of the institution, the results of prime cost calculation may bring different extra benefits on various levels of management.

It becomes possible for the *institutional management* to make adequate decisions regarding pricing (tuition fees) and cross-financing, the reduction of general costs, concerning issues related to the number of employees, wages, educational programs and

methods, as well as in connection with the extension or narrowing of infrastructural capacities or their use for alternative purposes. Moreover, it can

- provide a sound foundation for financial stability (e.g. with margin calculation, the identification of reserves and critical points of intervention, the elimination of unjustified costs);
- provide information for pricing (prime cost) through specifying measurable capacity utilization and resource needs,
- become a tool for the support of strategic decision-making by the institutional management and
- through this help increase competitiveness.

On the level of *faculty administration,* with the help of post-calculation it can be specified on an actual cost basis how much the maintenance of a particular program costs, reserves can be identified, together with the causes of unnecessary additional costs and the actual resource requirements of educational activities; at the same time, the strategic decisions of the faculty administration become more substantiated. Moreover, it can

- help in increasing efficiency with feedback to the academic programs (e.g. the determination of the effectiveness of activities);
- provide information for decisions regarding the form and methods of academic programs;
- become an analytical tool for the sustainability of programs;
- offer assistance in accounting cross-faculty teaching;
- provide a basis for possible consolidation of programs.

Last but not least, through the calculation of the program prime cost per student, such a financial model can be developed that is characterized by prime-cost-based financing established on a realistic foundation.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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