

Determination of Educational Cost in Public University – A Modified Activity Based Approach

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In modern public university, accountability and autonomy are issues where university leaders are expected to control costs effectively while continuously producing high quality education. There is a need for public universities to develop a costing system that is based on cost efficiency and effectiveness to enable them to be more analytical and systematic in understanding their own costs and their relationship to quality. Considering the limited evidence on the public university's costing systems, the study looks into the costing of public university educational programs using a Modified Activity Based Costing approach. Using a case study of a public university, the evidence demonstrates traceability of university costs to all programs offered and subsequently be the basis in calculating each educational program cost. Despite the challenge in implementing the ABC, improved cost estimate may support more informed operational and strategic decisions.

Keywords: conventional costing system, modified activity based costing, higher learning institutions.

1. Introduction

In recent years, higher educational reforms in most countries have given various implications on educational system. The explanations provided include the need to ensure accountability, efficiency, managerial ability as well as to take note of monetarist economic policies which advocate commoditization of education. Thus, universities are expected to contribute to the economy by providing world class education, producing highly competent graduates and commercialize their services. In countries, such as Malaysia, Thailand and, Japan, the governmental policies that are pushing the public universities to become "autonomous universities" with more administrative and financial autonomy adds another form of challenges. For public universities, the development has led to intense pressure to be creative in generating funds to sustain operations while maintaining high quality education. High quality educational programs require significant commitments in terms of infrastructure, training and other support systems, which contribute to rising educational costs. In facing the challenges, there is a need for public universities to develop a costing system that is based on efficiency, cost effectiveness and cost savings to enable them to be more analytical and systematic in understanding their own costs and their relationship to quality.

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Having an effective costing system in university is pertinent in order to provide the management with the necessary information and feedback for the university's value creation (Ismail 2010). According to Malmi (1999) such information is critically important in producing right information for decision makers. Similarly, other researchers (Hannan & Freeman 1984; Jackson & Lapsley 2003; Banker et al. 2008) also emphasise the strong relationship between having accurate cost information and successful organizational change process. Nonetheless, not much has been done on the design of effective costing system in public universities. The limited discussion pertaining to the public university has motivated the present study to embark on an empirical investigation to look into the costing of public university core activities. Focusing on the cost of delivering educational services, the main objective of the study is to build a tool to estimate the cost of delivering the educational program using activity based framework.

Activity based approach has been identified as the strategic costing tool since it could improve the conventional costing by establishing direct linkages between the activities performed and the output produced. Given the strengths of ABC, it is can be the right approach to resolve the costing issue (Granof et al. 2000; Whelan 2008) in a public university. Without ABC, it is difficult to estimate accurately the educational costs with a variety of outputs and high overhead cost that deem to be a barrier towards effective cost management (Clarke & Bellis-Jones 1996; Gupta & Galloway 2003). Through a case study of a public university, this paper demonstrate the traceability of educational as well as other university costs to all programs offered and subsequently be the basis in calculating each educational program cost. Past studies have been narrowly focused on the costing of a specific service or faculty. Taking a holistic approach, this study observes the application of activity based system at the university level. The findings reveal the necessity of adopting an effective costing system like activity based system to facilitate management decision making process and also as a communication, motivational and evaluation tool. However, the major setback in this study was the data gathering process. Since the current information systems in universities are not designed to support the direct application of ABC, a modified version is suggested as the best solution to work under the limitation.

The remainder of this paper is organized as follows. The following section reviews the relevant literature on ABC system. Section 3 explicates the case study method of data collection. Section 4 discusses the educational cost computation process in a public university. Section 5 provides the challenges and the final section a discussion and conclusions on the adoption of activity based approach.

2. Literature Review

2.1 Adoption of ABC

ABC was introduced when conventional costing systems were criticized for lack of relevance, accuracy and timeliness. Under ABC, costs are no longer allocated arbitrarily instead costs are assigned to the products and services based on the demand each product/services places on various activities. The technique has been lauded as

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a tool to help to allocate overhead cost with greater accuracy. Additionally the technique is claimed to provide accurate information on costs and utilization of resources which can be used to make sound planning and controlling decisions (Sherrard & McEwen 2010). To the public sector, ABC is an option to improve the ineffectiveness of traditional system and also to build up their accountability level as the generated information can help the organization to explain, justify and take responsibility for every action taken (Messner 2009).

Concisely, the ABC framework is operationalised using five steps :

- Step 1. Identifying resources (i.e. what is used to do work);
- Step 2. Identifying resource drivers (i.e. assigning the cost of the resources to activities based on effort expended);
- Step 3. Identifying activities (i.e. work);
- Step 4. Identifying activity drivers (i.e. assigning the cost of the activities to products based on unique consumption patterns); and
- Step 5. Identifying the work objects (i.e., to what or for whom work is done)

In the past, much emphasis has been placed on the implementation of ABC in supporting advances in manufacturing industry (e.g. Malmi 1999; Maelah & Ibrahim 2006; Nimtrakoon & Tayles 2010). Although the system was developed in a manufacturing setting, service firms need cost systems comparable with those used in manufacturing firms. Service firms generally differ from manufacturing firms in the respect that fixed costs are more common than direct costs. Besides, the nature of service operations that are labour intensive rather than capital intensive somehow makes ABC implementation rather difficult in practice. Despite that, cost management systems are needed by service firms for two main reasons. First, increased competition demands improved planning and control. Second, service firms have grown in size and organizational complexity. Deregulation of many service industries has increased competition in the service sector. The increased competition has made managers in the service sector more conscious of the need to use accounting information for planning, control and decision making.

Encouragingly, over the past few years there has been some progress in discussing the adoption of ABC in service sector. Service industries being studied for ABC application include health (Barnett 2009; Azoulay et al 2007), restaurant (Raab et al. 2009), hotel (Pavlatos & Paggios, 2007), financial (Rafiq & Garg, 2002), telecommunication (Abdul Majid & Sulaiman 2008) and insurance (Qiao & Chen, 2007). Some of the studies, however, are limited to development of model without empirical evidence or calculation of costs (Qiao & Chen, 2007; Popesko, 2009). There are also studies on ABC application at higher learning institutions. ABC is deemed appropriate to be used in a university environment where there are a number of outputs, high overhead costs and where the use of overhead does not relate to outputs. However, having various forms of university products/ services which are interrelated and not clearly separable from each other complicate the costing approach. The emerging trend of the studies in the area tend to demonstrate a narrow focus on a specific faculty (Granaof et al. 2000; Whelan 2003; Ismail, 2010), support services (Krishnan 2006; Ching et al. 2008) or a central overhead (Goddard & Oik 1998). The determination for

library services cost is evident in Belgium (Ching et al. 2008) and Australia (Ellis-Newman & Robinson 1998). Although such focus may assist in tractable research findings, they has been incomprehensive. It is necessary, to observe the ABC implementation process for an entire university. Therefore, this study attempts to fill the gap by estimating the cost of delivering educational program through the identification of inputs, activities, and outputs in the core and supporting functions of a university.

2.2 The Theoretical Underpinnings

Abrahamson (1991) explained the reason why firms adopt new management accounting practices is because of technical efficiency. The efficient-choice perspective is based on two principles that are: (a) firms are freely and independently choose to adopt an administrative technology; and (b) they are relatively confident about their goals and their assessment on the efficiency of the chosen technology in attaining those goals. The theory is built on the notion of performance gap where there are discrepancies between goal and performance. Most adoptions are assumed to occur because of the benefits and efficiency gained through implementation.

Meanwhile, management accounting studies has consistently emphasize the importance of accurate costing system (e.g. Clarke & Bellis-Jones 1996; Ismail 2010) in promoting effective and efficient management. An effective cost management system is important not only to facilitate planning and control decision but also as a communication, motivational and evaluation tool. The view is supported when efficiency was described as the main factor for adopting ABC in 14 Finnish firms (Malimi1999). Similar reasons were also given by Malaysian firms for implementing ABC as the system claimed to be an efficient tool in providing more accurate and relevant information to the company (Abdul Majid & Sulaiman 2008). On the basis of the preceding discussion, this study undertake ABC as an approach towards cost effective and efficient management.

3. Methodology

According to Yin (1989), the choice of method depends on the objective of the study, the current state of knowledge regarding a particular phenomenon, the environment in which the study is to be conducted and the conditions under which the research project is to be carried out (Yin, 1989). Given the aim of this study is to build a cost estimation tool and considering limited evidence on such model, the case study method was adopted. Indeed, a succession of researchers has widely used the similar research method in conducting study on ABC in practical settings. For example, Artemis and Kaplan (1987), Cooper and Kaplan (1988a, 1988b), Bhimani and Pigott (1992), Greeson and Kocakulah (1997), and Wang et al. (2005, 2010) has taken this approach in examining the differences between ABC and conventional costing system. Hence, using a public university (APU) as a case, this study attempts to demonstrate a modified ABC system in measuring costs of delivering university services/products, focusing solely on the educational services.

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APU is a large university with 12 faculties, a Graduate School of Business and 14 research institutes offering 95 undergraduates programs and 191 programs at postgraduate level, with a student population more than 30,000. Currently, APU also has an enrolment of 3,200 international students. For the purpose of this study, actual 2009 data were used. Feedbacks from faculty representatives and bursary officials indicate that the 2009 funds received by the university most reflect expenses incurred under normal operating condition. Although year 2010 represents the more current information, budget cuts due to the overall downsizing of nation's economy would result in understated educational cost figures as most responsibility centres were forced to reduce or put on hold certain activities that would otherwise be carried out under normal circumstances.

The study was carried out in two phases. In the first phase, analysis on the present cost per student data is performed to understand how cost per student is determined and how it can be improved in the proposed calculation using ABC. In the second phase, SAS ABM Select Edition software is used to determine the cost per student for each educational program offered by the faculties. Assumptions are used sparingly in situations where actual data was not available. Representatives from the relevant parties provided data and feedback for this study during interview and feedback sessions.

4. Educational Costing in A Public University

4.1 Background

Traditionally, cost per student at APU is determined using the number of students as the sole cost driver. In a university's financial system, costs are accumulated at various responsibility centres. The following formula is used to determine the cost per student.

$$\text{Cost per student} = \frac{\text{Faculty cost}}{\text{Number of students per faculty}} + \text{Administrative cost per student}$$

Based on the above formula, cost per student is made up of cost per student for each faculty plus a component of administrative cost per student. First, the faculty cost is divided by the number of students in that particular faculty to derive at the cost per student for the faculty. The average administrative cost per student estimated at RM 6,496.00 is then added to arrive at the annual cost per student for each faculty. Three main weaknesses under the current method are (1) number of students is the sole basis used to determine the cost per student; (2) cost per student is an average cost per faculty and not traced to specific programs; and (3) cost per student for graduate programs are estimated based on full time equivalent of undergraduate data. Overall, average cost per student is shown in Table 1.

Table 1: Cost Per Student Under Conventional Costing System

No	Faculty	Educational cost per student
1	Economics and Business	RM 15,174
2	Education	11,281
3	Islamic Studies	14,131
4	Law	14,024
5	Social Science Humanity	15,668
6	Engineering	18,343
7	Info. Science Technology	14,807
8	Science and Technology	16,866
9	Allied Health Science	18,876
10	Dentistry	47,091
11	Medical	34,296
12	Pharmacy	17,975

The ABC approach is expected to provide a more accurate cost per student figures because the method utilizes many cost drivers and is able to determine cost per student for each program both at the undergraduate and graduate levels. In order to apply the ABC approach, the following four critical steps were performed (1) improvement of data quality, (2) development of the Modified ABC model for cost per student determination, (3) setting of assumptions and (4) application of ‘SAS Activity-Based Management – select Edition’ software.

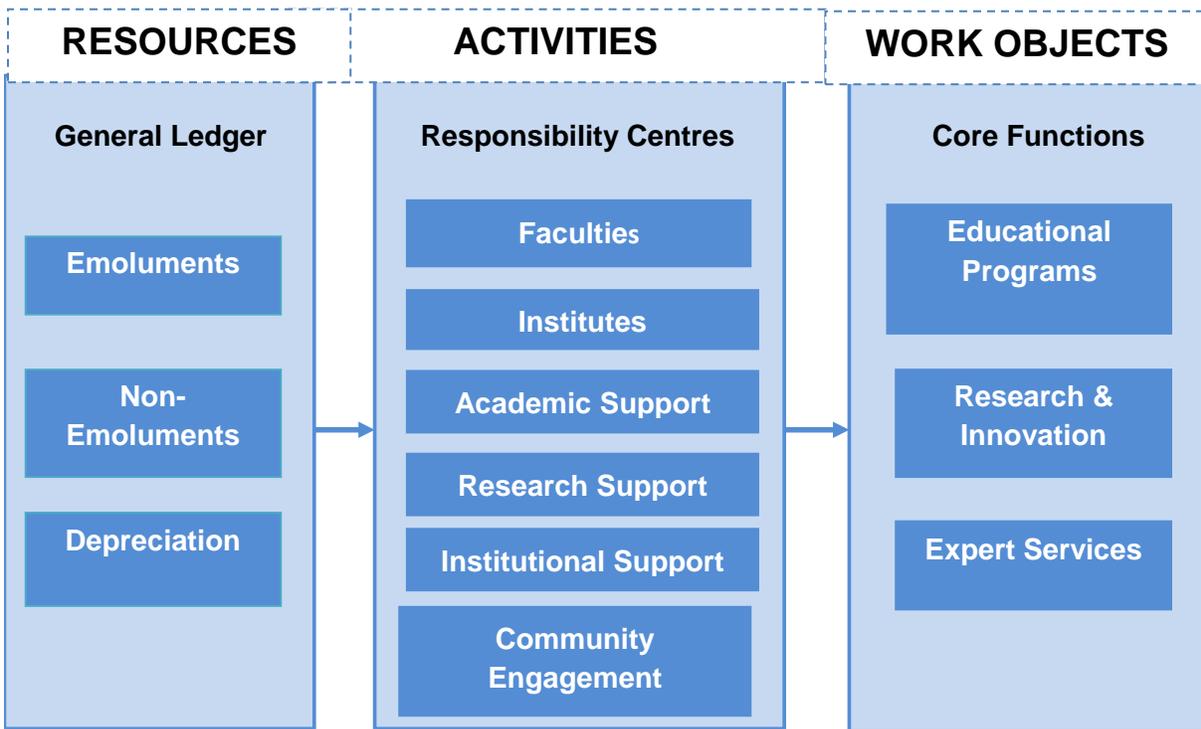
4.2 Improvement of Data Quality

Data improvement process includes tracing of general cost to related responsibility centres, excluding cost of asset purchases, including depreciation expenses, categorising responsibility centres according to functions, using various cost drivers, and detailing the costs according to program and student categories.

4.3 Development of the Modified ABC

Under the ABC model, cost are allocated and recorded according to activity centres where each activity centre represents actions taken or work performed in delivering services/products. Such approach, however, may not be applicable to most universities since under the existing accounting and information systems of universities costs are accumulated and recorded according to responsibility centres. Therefore, to cost for educational programs, a modified ABC approach is used. Under the modified approach responsibility centres, instead of activities are used as the cost pools to accumulate and redistribute costs. Once costs are collected in each responsibility centre, the ABC process begins by allocating costs directly to various outputs by means of cost drivers. Diagram 1 provides an overview of the Modified ABC model.

Diagram 1: Modified ABC Model



The steps taken in determining the cost of educational program are as follows:

Step 1: Identifying Resources

The university financial resources are mainly government grants. Besides grants, there are other sources that include endowment, contributions and university own generated incomes. Under the current accounting system, these inputs are categorised as emolument and non-emolument costs. Emoluments are costs associated with university employees’ salary and fringe benefit, while non-emolument category include other operation costs such as travelling, maintenance, communication and material. Additionally, the third resource element is depreciation cost, which represents the costs of using the university assets (i.e. equipment and buildings).

Step 2: Identifying Resource Drivers

The next step involves the identification of resources drivers. Since the current accounting system accumulates and records resources consumption at responsibility centre level, the costs are directly traced to the respective responsibility centres. Thus, each responsibility centre will have its own costs traced based on the three categories of resources (emolument, non-emolument and depreciation).

Step 3: Identifying Responsibility Centres

In this model, six categories of responsibility centres have been identified according to functions, as detailed out below:

- (1) Faculties – offer and manage academic postgraduate and undergraduate programmes, and other academic activities that include doing research and providing expert services.
- (2) Institutes – dedicate to undertake research and innovation activities.
- (3) Academic support – provide support services for educational programs to faculties and institutes, which include library, postgraduate centre and student finance department.
- (4) Research support – provide support services for research and innovation activities to faculties and institutes such as research finance department and research management centre.
- (5) Institutional support – provide support services that are necessary for the smooth running of a university as a whole. For example bursary, registrar, and IT centres.
- (6) Community engagement – provide services to the university which also benefit the community at large, which include religious centre and university museums.

Step 4: Identifying Activity Drivers

Activity drivers are identified for each responsibility centre. An activity driver is a measure of the quantity of activities used to produce an output. Examples of the activity drivers include number of transactions, number of students, number of staffs, credit hours, weighted costs, percentage of activities, duration of academic programmes. Once the activity cost driver of each responsibility centre have been determined, information on the total quantity of each cost driver and the quantity of cost driver used by other responsibility centres need to be determined. Table 2 provides an example of the units within Bursary Department and their activity drivers. The cost drivers for Employee Finance Unit in Bursary Department is the number of staff in other responsibility centres that the unit serves. This means that a particular responsibility centre with a greater number of staff would consume a larger quantity of activity of Employee Finance Unit and therefore would be allocated a greater amount of the Employee Finance Unit's costs.

Table 2: Bursary Department Units and Activity Drivers

Bursary Department Units	Activity Drivers
Accounts and Financial Budget	Number of staff in other responsibility centres
Employees Finance	Number of staff in other responsibility centres
Administration and Enforcement	Number of cases
Department of Acquisitions, Imbursement and Main Store	Number of vouchers
Department of Admission and Generation	Number of staff in other responsibility centres

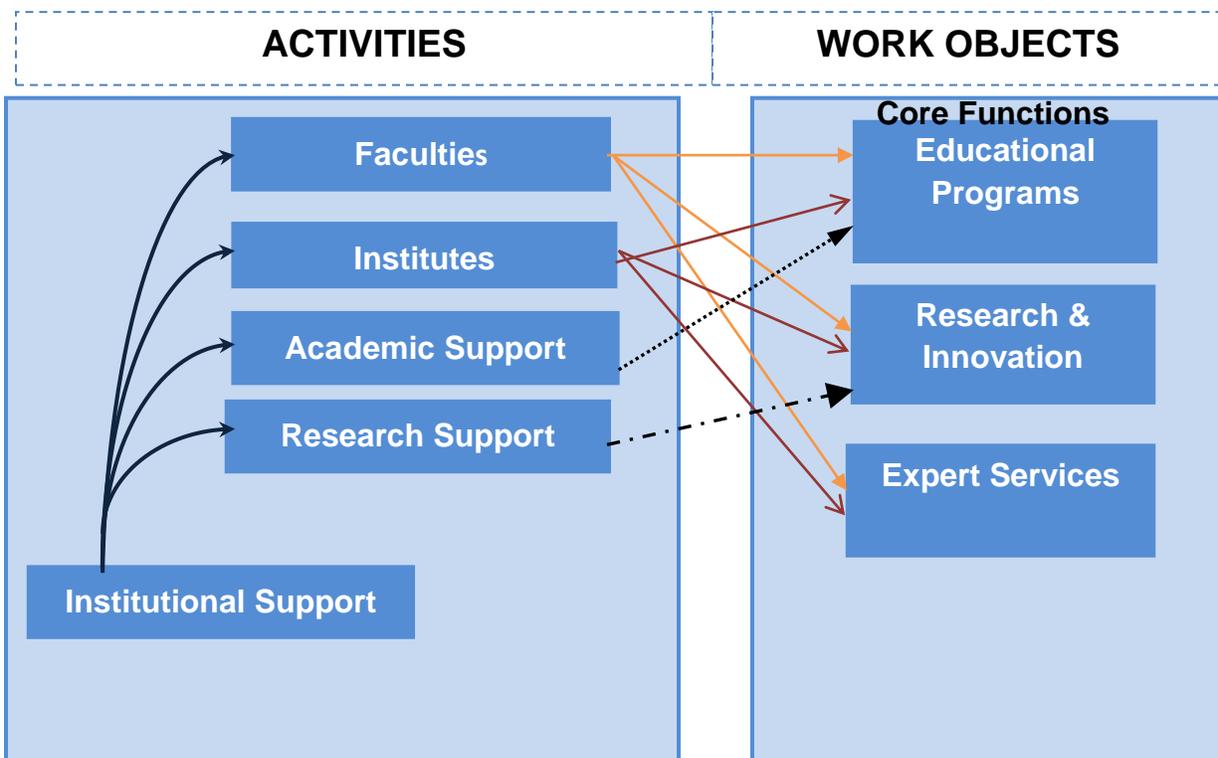
However, community engagement activities costs are not allocated to other responsibility centres as the community engagement centres provide services not only for the university but also to the community.

Step 5: Identifying the Work Objects

The following step is allocation of costs to outputs. The allocation process involves several stages as depicted in the following diagram (refer to Diagram 2). The allocation process begins by assigning all institutional support costs to other responsibility centres. The allocated cost are classified as indirect costs for the respective responsibility centres.

Next process involves allocating the costs of other responsibility centres to outputs. Firstly, faculties/institutes costs are allocated to outputs. As a public university, teaching and learning is only part of the academic outcomes. Besides teaching, academic advancement is developed through research and involvement in the communities. Considering the importance of all the three components, APU set a general guideline of 30% of academicians office hours for teaching, 50% for research and 20% for expert services. Based on this guideline, only 30% of faculties/institutes costs are allocated to educational programs. At the end of this process, Faculty/Institute costs have been allocated to outputs which are Educational Programs, Research & Innovation and Expert Services as shown in Diagram 2.

Diagram 2: Allocation of activity costs to outputs



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Academic Support cost consisting of direct costs for each Academic Support responsibility centre and indirect costs from Institutional Support are also allocated to outputs. Since Academic Support provide support services for educational programs of the Faculties and Institutes, all of the Academic Support costs (direct and indirect) are allocated to Educational Programs only. The Academic Support costs are allocated to the Educational Programs of Faculties/Institutes based on the number of students enrolled at the respective Faculties/Institutes. Whereas research support costs are allocated only to Research & Innovation based on the number of registered research for the respective Faculties/Institutes. Of particular objective of this study, the subsequent discussion is mainly on determining educational programs costs.

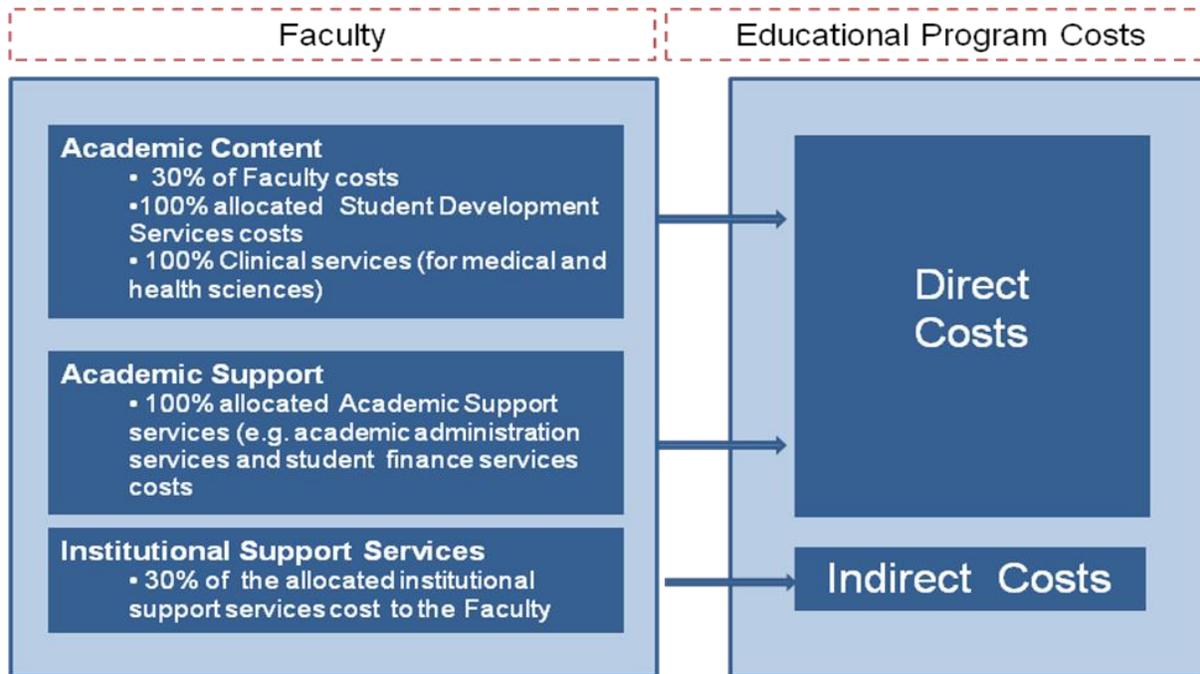
4.4 Setting Assumptions

Data gathering is a challenging process as it involves various parties within the university. Kaplan and Anderson (2004, 2007) noted that the procedure for estimating ABC model has proved to be difficult especially if the current accounting system does not support the collection of the information needed. According to Kaplan and Anderson (2007) updating ABC model through interviews and surveys further increase its time and resource consumption. Therefore, in situations where actual data is unavailable, assumptions are used in the model. Examples of assumptions for this study include 20 credit hours per year for postgraduate programs and 40 credit hours for undergraduate programs whenever actual credit hours information is unavailable and contribution of academic staff are equal regardless of their position.

4.5 Application of Software

SAS Activity-Based Management – Select Edition' software was used to operationalised the Modified ABC model to determine the annual cost per student per program. The university's resources are traced to respective responsibility centres and finally allocated to the university's outputs. The educational program costs now consist of Faculties/Institutes costs allocated to educational programs, Academic Support costs and indirect costs allocated from Institutional Support as depicted in Diagram 3. For medical and health based programs, the costs include a portion of clinical costs. The total educational program costs at each Faculty/Institute can now be allocated among the programs offered by the Faculty/Institute program based on the weighted average number of students enrolled in the programs offered by the Faculties/Institutes.

Diagram 3: Educational Program costs



The final step is to allocate further the program costs to determine the annual cost per student. Table 2 provides examples of per student cost of an undergraduate program in the Faculty of Engineering. Cost per students for the undergraduate program is obtained by dividing the total cost per undergraduate program by the number of students enrolled in the respective program. Based on Table 3, cost per program for Civil and Environmental Engineering is RM1,004,326.16. Cost per student per year of RM13,571.98 is derived by dividing the cost per program (RM1,004,326.16) by the number of students for the program (74). Using ABC, costs are traced up to the individual programme within each faculty. As a result, the student cost can now be determined for every programme offered in the university in a more accurate manner.

Table 3: Cost Per Student for Selected Engineering Programs

Programs	Number of students	Cost per Program (RM)	Cost per Student (RM)	Annual Cost per Student (RM)
Civil & Environmental Engineering	74	1,004,326.16	13,571.98	13,571.98
Civil & Structural Engineering	122	1,637,168.62	13,419.41	13,419.41
Biochemical Engineering	85	1,273,164.90	14,978.41	14,978.41
Electrical & Electronic Engineering	106	1,465,325.85	13,823.83	13,823.83

5. Issues and Challenges

During the process of applying the ABC model, several issues and problems were encountered. In general, the accounting and information system is insufficient to support

the ABC system as it focus on transaction processing system with budget and budgetary control as the basis for cost allocation. Kaplan (2007) indeed point out the the difficulty for many organisations to implement traditional ABC model because of the high costs incurred to draw together information for the initial ABC model. The current university information systems are not designed to support management-related information and would require major overhaul to enable ABC to be in place (Ismail, 2010). Considering the challenges and limitations, a modified ABC model was applied. Despite the attempt, there were still difficulties in operationalising the system. At the start of the ABC model development, data gathering presents a major setback to the progress. Data in a university come from various sources, i.e. financial data from the Bursary Office and the human resource data from the Registrar Office. Whenever there is a need to match the amount of the staff salaries with the staff listed in the directories, manual validation need to be undertaken. Cross validation of data consumes not only time but extra commitment from the staff. Additionally, there is a need for a significant amount of financial assistance for ABC software to be in place. Another concern in the lack of available skill within the university may create problem in implementing ABC. There is a need not only for specific costing expertise, but also training in designing, implementing and using the software. Thus, top management involvement and support is vital in ensuring the continuity of ABC as an approach in determining the educational cost for APU. After the model has been in place, the challenge is to ensure its continuity. University administrators may change but the spirit of the exercise should endure. While some problems might be unique to APU, it is believed that most might be common to other universities as well.

6. Discussion and Conclusion

It is acknowledged that many of the public universities are under great pressure to look for alternative ways of funding for the universities' activities. Putting in place an accurate cost information for Universities outputs, is no longer a choice but a necessity if the University is to have a world class management system. Nevertheless, the current systems are not designed to support management-related information with fund accounting and budgetary control systems dominating the mind-set of Universities administrators. Instead of proposing a major overhaul to the system, an ABC model that takes into consideration this limitation, was applied. ABC improves information visibility that enable the university management to understand the link between costs and activities and also indentify between value added and non value added activities. By providing more accurate costing information may allow the management to make more informed decisions. While far from being perfect, the modified ABC model is workable within the systems' limitation. Issues and problems as addressed above are for future improvement. This study contributes significantly to the theoretical knowledge by providing an empirical evidence of ABC application in a university. Practically, this study contributes significantly to various stakeholders including parents, students, private sector and most importantly the government. The information can be used to improve accountability, and determine fees, sponsorship amount, education investment, and government contribution. Future research should be aware that the finding is case specific, subject to changes in model and use of non-financial and qualitative information.

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