

IMPLEMENTATION PROCESS AND LESSONS LEARNED IN THE DETERMINATION OF EDUCATIONAL COST USING MODIFIED ACTIVITY-BASED COSTING (ABC)

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ABSTRACT

Putting in place accurate cost information for the outputs of universities is no longer a choice but a necessity if a university is to have a world-class management system. Nevertheless, the current costing systems are not designed to support management-related information with fund accounting and budgetary control systems dominating the mind-sets of the administrators of universities. In support of an autonomous pathway for public universities in Malaysia, Universiti Kebangsaan Malaysia has piloted an educational cost determination exercise using the activity-based costing (ABC) system. Instead of proposing a major overhaul to the system, an ABC model that takes into consideration existing limitations was developed. While far from being perfect, the model is workable within certain limitations. This study examines the process involved in the exercise of determining educational cost based on the modified ABC approach. Nine critical steps are explained and the lessons learned from the exercise are highlighted. This study contributes to the theoretical knowledge by providing empirical evidence of the application of ABC in a service setting, or, more specifically, in a university. In terms of practice, this study provides guidelines concerning the determination of educational cost to interested parties including the university's management, Ministry of Education and other universities.

Keywords: *activity based costing, educational cost, university, process*

INTRODUCTION

Activity-based costing (ABC) is recognised as a strategic management accounting tool that is able to improve the traditional costing of indirect costs. It has been widely recognised as a superior method for allocating overhead costs. In the 1980s and early 1990s, attention was directed to the design of ABC, which regards activity as the cause of resource assumption and develops multiple cost drivers through the measurement of the activity. Later, studies were focused on identifying the difference between ABC and the traditional costing system.

Much emphasis has been placed on the implementation of ABC in the manufacturing industry. However, the service industry also benefits from this system of cost allocation since service organisations usually incur overhead costs and are labour intensive. In addition, service organisations have multiple outputs and the rate of overhead usage is not output-driven. These characteristics make ABC a logical choice for cost allocation to help service organisations identify and allocate overhead costs, and quantify labour costs associated with each activity. The institute of higher learning (IHL) is classified as a service organisation that offers education services to its students. In recognition of the fact that studies on ABC implementation in a service organisation is scarce, this study adopts a case study approach to document the process involved, information required and lessons learned in the determination of cost per student for each educational programme offered by Universiti Kebangsaan Malaysia (UKM). Since the current costing systems are not designed to support the direct application of ABC, a modified version is suggested as the best solution to work within the limitations. The modified ABC model in this study uses responsibility centres, instead of activities as the cost pools to accumulate and redistribute costs.

The arrangement of the paper is as follows. The next section presents the motivation of the study. This is followed by literature review, methodology, findings and discussion. At the end of this paper, the conclusion is presented together with the limitations of the study and direction for future research.

MOTIVATION FOR THE STUDY

Many public higher education institutions have come under immense pressure to identify alternative ways of obtaining funding for the activities of the universities. Governments are under considerable pressure to allocate more funds for the increasingly demanding activities of the university. This, in turn, has created incentives for governments and universities to look for alternative modes and means of financing higher education activities. Amongst the many approaches are the corporatization of universities and granting autonomy to universities to be more creative in generating funds to sustain their operations.

In line with the granting of greater autonomy to public universities and the government's effort to incorporate value management in the allocation of resources, a concept of the government purchasing services from universities based on value for money is being introduced. This move will spur healthy competition among the universities, which will result in enhanced quality, higher efficiency, cost effectiveness and cost savings.

In order for the government to purchase services from the universities, the actual cost of each educational programme must be determined in an objective manner taking into consideration varying factors, such as age, focus (i.e. research intensive, comprehensive, technical), student size and location. This would enable the government to use the cost information to purchase educational services for specific programmes and for an agreed number of students per programme. Additionally, under the 10th Malaysia Plan, universities are expected to contribute significantly to a high-income economy by producing highly competent graduates and commercialising their research output. Thus, there is a need to develop a funding framework that is based on efficiency, cost effectiveness and cost savings to enable universities to be more analytical and systematic in understanding their own costs and relationship to quality.

Accordingly, as part of the critical agenda programme (CAP) for good governance towards autonomy, a study using the ABC method was proposed and approved by the cabinet, and UKM was selected as the institution to pilot the educational cost determination exercise. A study group assisted by a focus group was established to develop a tool for determining the cost

of an educational programme using a modified ABC. It is expected that, in the foreseeable future, the ABC method will be used for educational cost determination by other IHLs, hence, the documentation of the process involved and lessons learned by UKM can provide a guideline to assist the ministry in developing policies and providing guidance to other IHLs in the implementation of ABC.

In designing the costing system, consideration must be given to the diverse university settings and varying factors, such as age, focus (i.e. research intensive, comprehensive, technical), student size and location. ABC is deemed to be appropriate for use in a university environment where there are a number of outputs and high overhead costs, and where the use of overhead costs does not relate to outputs. Since the current costing 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 limitations. The modified ABC model in this study uses responsibility centres, instead of activities as the cost pools to accumulate and redistribute costs.

Therefore, the objectives of this study are to:

1. Examine the process involved in the educational cost determination exercise in UKM based on the modified ABC approach.
2. Highlight issues encountered in the determination of educational cost using the modified ABC approach.

LITERATURE REVIEW

The literature review section covers four areas: characteristics of ABC, ABC in service organisations, implementation of ABC in IHLs, and ABC implementation process.

Characteristics of ABC

The ABC method was developed in the United-States during the 80's (Cooper & Kaplan, 1988). It is a system that reduces the level of arbitrary

cost allocations associated with traditional costing systems, and results in a more accurate product cost. ABC focuses on the costs of various activities required to produce a product or service. Besides providing more accurate product costing, ABC also improves the basis upon which strategic decisions involving resource allocation, product mix, pricing and marketing are made (Hu, 2010).

In the 1980s, traditional costing methods were criticised for their lack of relevance, accuracy and timeliness. ABC was introduced during this period to ensure the overhead cost is determined not only based on the volume of output, but also the variety and complexity of outputs (Mitchell, 1996). The popularity of ABC can be traced to several organisations in the US through a series of case publications by the Harvard Business School (Cooper, 1988a, b; Cooper, 1989; Cooper & Kaplan, 1988). Since then, ABC has received tremendous attention among researchers and businesses. The differences between ABC and traditional costing, as identified by Granof *et al.* (2000), are shown in Table 1.

Table 1: Characteristics of ABC and Traditional Costing

Characteristic	ABC	Traditional costing
Cost pools	ABC systems accumulate costs into activity cost pools. These are designed to correspond to the major activities or business processes. By design, the costs in each cost pool are largely caused by a single factor – the cost driver.	Traditional costing systems accumulate costs into facility-wide or departmental cost pools. The costs in each cost pool are heterogeneous – they are the costs of many major processes, and, generally, are not caused by a single factor.
Allocation bases	ABC systems allocate costs to products, services and other cost objects from the activity cost pools using allocation bases corresponding to cost drivers of activity costs.	Traditional systems allocate costs to products using volume-based allocation bases: units, direct labour input, machine hours and revenue dollars.

Hierarchy of costs	Allows for non-linearity of costs within the organisation by explicitly recognising that some costs are not caused by the number of units produced.	Generally estimates all of the costs of an organisation as being driven by the volume of product or service delivered.
Cost objects	Focuses on estimating the costs of many cost objects of interest: units, batches, product lines, business processes, customers, and suppliers.	Focuses on estimating the cost of a single cost object – unit of a product or service.
Decision support	The ability to align allocation bases with cost drivers provides more accurate information to support managerial decisions.	The inability to align allocation bases with cost drivers leads to over-costing and under-costing problems.
Cost control	By providing summary costs of organisational activities, ABC allows for prioritization of cost-management efforts.	Cost control is viewed as a departmental exercise rather than a cross-functional effort.
Cost	Relatively expensive to implement and maintain.	Inexpensive to implement and maintain.

Source: Granof *et al.*, (2000, page 9)

Comprehensive research on ABC among developing countries, especially in the Asian region, is still limited. Most research use survey method to determine the management accounting tools including ABC among manufacturing organisations (Nimtrakoon & Tayles, 2010; Maelah & Ibrahim, 2007; Maelah & Ibrahim, 2006; Ghosh & Chan, 1997).

ABC in Service Organisations

The importance of the service industries to the world economies has been widely acknowledged. With the liberalisation and globalisation of services, service industries in Malaysia are now facing more intensive competition than before. Practice has shown that a number of service organisations have begun to evaluate their costing systems to achieve a competitive advantage. However, a systematic study showing the implementation of ABC in service organisations is still limited. The fact that service firms are labour intensive rather than capital intensive somehow

makes implementing ABC rather difficult in practice. Internal operating expenses are employee related and since employees often work on multiple activities, it is hard to isolate the time devoted by employees to specific activities. Thus, it is not surprising that in the past, much emphasis has been placed on the implementation of ABC in the manufacturing industry. 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 that fixed costs are more common than direct costs. Accordingly, cost management systems are needed for service firms for two reasons. First, increased competition demands improved planning and control. Second, service firms have grown in size and organisational complexity. Additionally, the deregulation of many service industries has increased competition in the service sector.

Basically, the design of ABC systems for service organisations involves the following steps. Firstly, the work carried out by staff and the equipment has to be arranged into activities, which are based on the grouping of types of work, which are as homogeneous as possible in respect of their output. The output, when measured will provide the cost driver to associate cost with the cost object. Consequently, the end services (ultimate source of demand for activities) will have the cost of the activities traced to them.

The service industries being studied for ABC application include health (Barnett, 2009; Lievens *et al.*, 2003), restaurant (Raab, 2009), hotel (Pavlatos & Paggios, 2007), financial (Rafiq & Garg, 2002) and insurance (Qiao & Chen, 2007). In general, past studies indicate that ABC is widely recognised as a superior method for allocating overhead costs. However, some studies are limited to the development of a model without empirical evidence or calculation of costs (Qiao & Chen, 2007; Popesko, 2009).

In addition, there are studies on the application of ABC in higher learning institutions. ABC is considered to be a useful tool in managing universities as their costs are increasing more rapidly than any other product/service (Granof *et al.*, 2000). In addition, having various forms of university products and services further complicate the costing approach. The emerging trend of the studies in the area tend to demonstrate a narrow focus on a specific faculty (Granof *et al.*, 2000; Whelan, 2003; Ismail, 2010), support services (Krishnan, 2006; Ching *et al.*, 2008) or a central

overhead (Goddard & Ooi, 1998). Although, such a focus may assist in tractable research findings, it limits the generalisability of the findings to the entire university.

ABC at Institutes of Higher Learning (IHLs)

The unique characteristics of universities have been argued to present a massive challenge to management in measuring their cost measurement and control. Granof *et al.* (2000) listed several unique characteristics of universities that can be classified as staff and employees attribute, accounting system and university output. To enable sound management and cost control, this uniqueness should be addressed with careful consideration:

- (i) It has been acknowledged in a university setting that many members are “free spirits” who view their scholarly efforts as intrinsic, rather than monetary. Thus, they are often suspicious of practices that hold them accountable for measurable outcomes. It is acknowledged that a faculty does not work on a standard number of hours, and, hence, can undertake additional tasks without any apparent reduction in the time devoted to other tasks.
- (ii) The university administrators who make decisions on key outputs, such as course offered, number of courses to be offered, faculty research projects and teaching loads, hardly consider the dollar cost involved.
- (iii) Universities lack well-defined objectives or measurable outcomes. Satisfaction regarding the output quality is very much in the eye of the beholder.
- (iv) The use of fund accounting systems that are designed primarily for compliance rather than effective management. Funding for universities come from various sources and may be restricted to a specific use. Even budgets are likely to mirror this funding system and not tied to strategic plans or measurable outcome. In fact, budgets and related financial documents are likely to be understood by relatively few administrators, most likely budgeting and accounting officers but not senior academic officials.

- (v) The costs and revenues of a university may be integrally related and certain costs may not be incurred unless they are to be funded from outside sources. For instance, a university only conducts certain research if it is independently funded.
- (vi) Outputs of faculty – where most services of a university are generated, interrelated and not clearly separable from each other. When conducting research, academia trains the graduate students. When writing or reviewing journal articles, academia gains insights that will influence both teaching and research.

The recent cuts in government funding and other challenges have placed Malaysian Public Universities in a critical situation with respect to obtaining accurate and precise knowledge of all their costs. The ABC methodology can assist universities by providing the link between the costs of the services they provide, such as programmes, research and consultation to the resources they receive. According to Ismail (2010), a university could use the ABC approach as a tool to match the utilisation of resources with the faculty's mission, obtain a better sense of effectiveness of time of the academic staff and effort differentiation within faculties, and discuss with the deans and department heads concerning the efficient and most effective allocation of resources to meet the needs of the faculty, the department and the university.

There are several studies on the application of ABC at IHLs which include Ismail (2010), Granof *et al.* (2000), Krishnan (2006) and Whelan (2003). However, these studies are not comprehensive in that they consider the use of ABC for specific segment within the organisation, such as faculty (Ismail, 2010; Granof *et al.*, 2000; Whelan, 2003), support services (Krishnan, 2006), or central overhead (Goddard & Ooi, 1998). The determination of the cost for library services is evident in Belgium (Ching *et al.*, 2008) and Australia (Ellis-Newman & Robinson, 1998). In the past, much emphasis has been placed on the implementation of ABC in the manufacturing industry. Examples that demonstrate the use of ABC in service organisations, especially the IHLs, have been incomprehensive and scarce.

ABC Process

Baxendale and Dombusch (2000) discussed the steps used to develop an ABC system that includes (1) form a cross-functional team, (2) identify cost objects or items for which there is a need for cost information, (3) identify activities or homogenous groups of work, such as accounting, (4) identify cost drivers or agents that cause costs to be incurred in the activities, (5) Attribute activity costs to cost objects, and (6) use the information. Chea (2011) profiles several service-oriented firms that have successfully adopted and implemented ABC using literature reviews on ABC in service sector. His description includes financial institutions, transportation companies, electricity utility provider, and automotive retailer. His findings indicate that successful implementation of ABC in service-oriented firm is a function of four characteristics as follows: (1) the impetus of the change must come from within the organisation, (2) the adoption of ABC must first be bought by operating manager before it is sold to top management, (3) all employees must be made to embrace ABC and be held accountable, and (4) effective sponsorship and how the rationale for ABC adoption is communicated to employees must be given a high priority.

Nassar, Al-Khadash and Sangster (2011) undertook a study on the diffusion of ABC in Jordanian industrial companies. Within the diffusion process, there are various stages that occur (Cooper & Crowther, 2008) including (1) “innovation” where the new process is adopted by a relatively few “leaders”, the “primary” stage; (2) “diffusion” stage, during which the number of adopters increases most dramatically; (3) “condensing” stage where the rate of adoption slows; and (4) “saturation” stage as the diffusion process comes to an end. Malmi (1999) refers to three stages of development through the diffusion process: (1) initial phase, (2) take-off phase, and (3) subsequent phases. Nassar, Al-Khadash and Sangster’s (2011) study found that the role played by consultants had an influence on many companies they surveyed.

METHODOLOGY

Over the past two decades, a succession of authors has called on researchers to study accounting in its practical setting. This study uses the case study

method. Case studies have gained wide acceptance, and are becoming an increasingly popular approach in accounting research. Although initially most of the attention was directed to the design of ABC, after it had been practiced for many years, case studies were widely used to identify the difference between ABC and the traditional costing system (Artemis & Kaplan, 1987; Cooper & Kaplan, 1988a, 1988b; Bhimani & Pigott, 1992; Greeson & Kocakulah, 1997; Wang *et al.*, 2005, 2010).

In recognition that studies on ABC implementation in service organisations are scarce, this study adopts a single case study approach to document the process to determine the cost per student for all educational programmes offered at UKM. The case study approach adopted in this study is in line with Artemis and Kaplan (1987), Cooper and Kaplan (1988a, 1988b), Bhimani and Pigott (1992), Greeson and Kocakulah (1997), and Wang *et al.* (2005, 2010).

UKM is an established public university founded 40 years ago. The university has a main campus and a medical campus. It now has 12 faculties, a Graduate School of Business and 14 research institutes. UKM is home to more than 2,500 academics, 700 support staff and a student population of approximately 28,000. At present, UKM uses the traditional costing method with a number of students as the sole cost driver to determine the cost per student. However, there is a growing concern that the data is inaccurate and lacking in detail, thus, implying the need for a more sophisticated costing method, such as the ABC system, which identifies costs, services and products at a much finer level (Barnett, 2009; Ross, 2004; Udpa, 1996).

FINDINGS AND DISCUSSION

This section discusses the process involved and lessons learned in the determination of educational costs using modified ABC in UKM. The process consists of nine critical steps, as outlined in Figure 1, and discussed below:

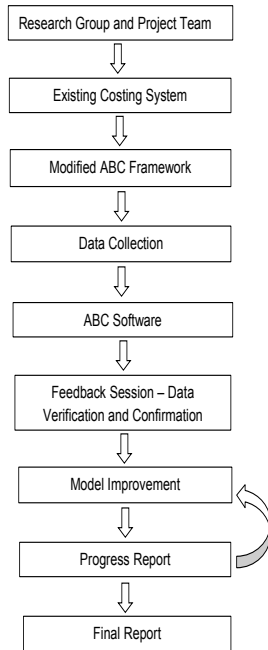


Figure 1: Nine critical steps using modified ABC

Step 1: Research Group and Project Team

In order to ensure the success of the project, a research group and a project team was established. The research group was responsible for the overall research process until the production of the final output. The research group was part of the project team. The research group comprised the following: university treasurer, accounting academics with knowledge and expertise in the costing system, and finance representatives who were responsible for managing the operational costs of the university and familiar with the costing system of the university.

The project team was responsible for the contribution of expertise, service and administrative support during the research process. The structure of the project team and the role of the members are shown in Figure 2 and Table 2, respectively. The project team comprised the following: steering committee (senior management and stakeholders); project sponsor

(treasurer); overall project coordinator (project managers); service and administrative support (IT and Administration Departments); research group and consultant.

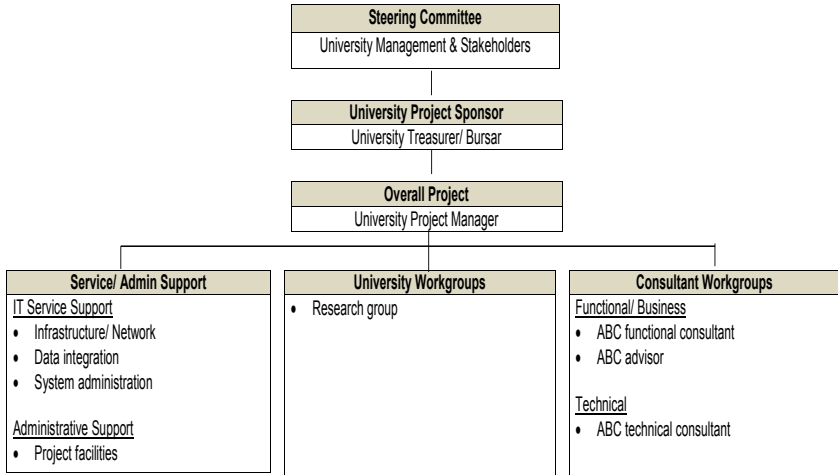


Figure 2: Project team structure

Table 2: Roles and responsibilities

Party	Role	Responsibilities
University ICT	IT Support	<ul style="list-style-type: none"> • Availability and oversight of hardware and network resources to support installation and configuration. • Availability and oversight of IT personnel to support installation, configuration, and process development. • Provide basic technical support for ABC.

Research Group	Project Manager	<ul style="list-style-type: none"> • Primary point of contact with consultant. • Sign-off each project stage. • Conducting and coordination of User Acceptance Testing (UAT). • Creation of user roles, groups, and development of an initial list of process user Ids.
	ABC Modeller	<ul style="list-style-type: none"> • Learning to use ABC software from consultant. • Gaining ability to maintain the ABC model and support process reporting. • Understanding methodologies and data flow. • Understanding ABC model requirements. • Understanding process output requirements.
	Subject Matter Expert	<ul style="list-style-type: none"> • Provide subject matter expertise as needed for: <ul style="list-style-type: none"> a) ABC model b) Data sources c) Data content
Consultant	Lead Consultant	<ul style="list-style-type: none"> • Primary point of contact with the university. • Coordination of consultant's resources. • Day-to-day project management. • Managing project scope, design and changes. • Working with project manager to determine project requirements and design. • Implementation of agreed upon design. • Construction of the ABC Model, supporting ABC processes and output. • Knowledge transfer to university personnel.

	<p>Technical Consultant</p>	<ul style="list-style-type: none"> • Implementation and configuration of software. • Coordination with university IT regarding hardware and hardware sizing.
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Step 2: Existing Costing System

Before implementing the ABC, the existing costing system was analysed. The university funds were identified and the funds related to education were determined. This process also enabled checking of information availability and understanding current practices in determining educational programme costs. The university funds for UKM were as follows: operations, student housing, research, development (purchase of assets, asset improvement), special accounts and trust (*waqf*, endowment) and hospital operation. The relevant funds related to education were operations, development (depreciation of asset) and hospital operation (related to students).

Operation funds were used to finance operational expenses incurred by the university. In most universities, operational expenses are accumulated by centres responsible. Operational expenses were classified as emolument and non-emolument. Development funds were used for the purchases and improvement of fixed assets. Since fixed assets are long-term in nature, depreciation expenses must be considered in the determination of educational costs. As UKM has its own teaching hospital, a percentage of the hospital operational funds should be taken into account in determining the educational programme costs for programmes with clinical components. Thus, a percentage of the hospital operation funds related to the educational programme were determined and educational programmes that use the hospital for their teaching and learning were identified.

Step 3: Modified ABC Framework

Based on an initial assessment of the existing accounting and information systems of universities, costs were accumulated and recorded according to the responsible centres. The ABC model allocates and records costs according to the activity centres where each activity centre represents actions taken or work performed in delivering services/products. Since such an approach is not applicable to most universities, a modified ABC approach was used.

The modified ABC model was developed by assigning the university funds related to education to the outputs of the university through various activities undertaken by the university. Under the modified approach, centres responsible instead of activities were used as the cost pools to accumulate and redistribute costs. Once the costs were collected in each centre concerned, the ABC process began by allocating the costs directly to various outputs by means of cost drivers. The modified ABC framework consists of inputs, activities and outputs. Inputs are the sources of funds that include student fees, government grants, private entity funds, external agencies grants, industry grants, and matching grants. Responsibility centres were used as a proxy for activities and categorised as follows: faculties, institutes, academic support, institutional support, research support, and community engagement.

Table 3: Modified ABC framework for university

INPUTS (Sources of fund)	ACTIVITIES (Responsible centres)	Cost	Cost drivers	University's main function	OUTPUTS
<ul style="list-style-type: none"> • Students fees • Government grants • Private entity funds • External agencies grants • Industry grants • Matching grants 	<ul style="list-style-type: none"> • Faculties • Institutes • Academic support • Institutional Support • Research support • Community engagement 	<ul style="list-style-type: none"> • Emolument • Non-emolument • Depreciation 	<ul style="list-style-type: none"> • Number of staff • Number of students • Credit hours • Duration of study 	Educational programmes	Graduates for undergraduate and postgraduate programmes and lifelong learners.
				Research and innovation	New knowledge, publications, technology, patents, commercial entities, and etc.
				Expert services	Consultancy, policy formulation, volunteered works, community development.
				Governance and management	Good governance, accountability, transparency and integrity.
				Talent management	Qualified and competent human resource.
				Infrastructure and facilities	Well maintained infrastructure and facilities.

The cost of activities consists of emolument, non-emolument and depreciation. Cost drivers were used to allocate the cost of activities to outputs. Examples of cost drivers are number of staff, number of students, credit hours and duration of study. The outputs were derived from the university's functions including educational programmes, research and innovation, expert service, governance and management (administration), talent management and infrastructure and facilities. The outputs of the university according to its main functions were graduates for undergraduate and postgraduate programmes, and lifelong learners; new knowledge, publications, technology, patents, commercial entities, consultancy, policy formulation, volunteered works, community development, good governance, accountability, transparency and integrity; qualified and competent human resource and well maintained infrastructures and facilities. A summary of the modified ABC framework is shown in Table 3.

Step 4: Data Collection

Data from both the primary and secondary sources were used to determine the educational programme costs. Primary data was gathered through interviews, documentation and reports from the responsible centres, while secondary data were obtained from the university financial and information systems. Table 4 provides examples of the types of data and their respective source:

Table 4: Data type and source

Type of Data	Source
Cost of each responsible centre	Finance Department
List of responsible centre	Website, annual report, telephone directory
Number of staff	Human Resource Department, IT system
Educational programmes	Registrar, IT system
Number of students	Faculty, IT system
Credit hours	Faculty, IT system
Duration of study	Faculty, IT system
Targets of outputs by faculty	Faculty, IT system
Mode of study for postgraduate	Faculty, Graduate Management Centre
Clinical cost	Faculty, University Teaching Hospital

The data collection process started with the identification of the responsible centres and cost drivers. At this stage, the organisational chart provided a good point of reference for the complete structure of the university and its line of reporting. The university's official website and published documents, such as annual reports and telephone directory, also provided useful background information about the university. The Finance Department provided the data on the costs accumulated at each responsible centre. Since a cash basis was used, adjustment was made for non-cash transactions, such as depreciation. Data on certain cost drivers, such as number of students, number of staff, credit hours, duration of study, mode of study, target outputs and usage of teaching hospital facilities, were obtained from the respective responsible centre or the university's information system. Additionally, visits to responsible centres provided opportunities to observe their operations and gather additional information. Finally, data were entered into the ABC software.

Step 5: ABC Software

In order to determine the cost of the educational programme per student using the ABC system, UKM invested in the system's requirements, such as data storage and server. For the system to operate successfully there was also a high dependency on the IT system already in place. In addition, UKM provided enough human resources, especially from the Finance and IT Departments, to assist in data input, data integration and technical assistance. Due to the sensitivity of the data involved and to ensure that security issues were properly handled, authorisation to access the system and data was only given to specific identified staff members for a specific time limit. Utilisation of the ABC software was imperative to the success of the ABC exercise. The university had two alternatives in utilising the ABC software. The decision depended on the cost and benefits analysis, and the discretion of the university's management:

- 1) Purchase of off the shelf ABC software and use the services of a consultant.
- 2) Develop a customised ABC system with a UKM IT expert.

Based on the cost and benefit analysis undertaken, the alternative of purchasing on the shelf ABC software and using the services of a consultant

were found to be advantageous:

- 1) Expert service
If a new task needed to be undertaken that required skills that UKM staff might not possess. The consultants had the expertise and experience in utilising the ABC software. UKM could benefit from their expert services to improve the costing for educational programmes.
- 2) Focus on core activities
Outsourcing enabled the UKM Finance Department to focus on its core activities, such as operational costing and budgeting. The determination of educational programmes was a supplementary task that could be outsourced to a consultant.
- 3) Cost and efficiency savings
Outsourcing reduced the costs of providing human resources, training, time, space, and etc. required to carry out the task of determining the cost of educational programmes.
- 4) Staffing flexibility
Outsourcing allowed operations that had seasonal or cyclical demands to bring in additional resources when needed by UKM and release the resources once the task was completed.
- 5) Staff development
On-site outsourcing of the task to determine the cost of educational programmes would bring people with the skills into UKM. UKM staff could work alongside the consultant to acquire new knowledge and skill sets.

In choosing to purchase off the shelf ABC software and use the services of a consultant, a procurement procedure was adhered to. The criteria for a good consultancy service include reputation, expertise, timeliness and reliability. Potential consultants were called to provide initial quotations and present their proposal to the management of UKM. A proper contract was signed between UKM and the consultant to specify the cost, scope of work, timeline, knowledge transfer and liabilities of each party. Initial investment was then made by UKM for the purchase of software and consultancy fee. Details of the contract were discussed by UKM and the

consultant, and amended according to the discussions. Examples of the details of the contract include the master service agreement (MSA) and statement of work (SOW) issued by the consultant, and an agreement between UKM and the consultant issued by UKM. Throughout the contract period, all documentation, such as invoice and proof of payment, needed to be in place. Examples of other important documents used at different stages during the contract period included solution design specification (SDS) acceptance signatories, UAT acceptance signatories and final delivery acceptance signatories. These documents provided proof that the consultant had delivered a certain percentage of the total service specified in the contract. For the purpose of control and monitoring, the consultant also provided periodical written report to the research group. Meetings and discussions between the consultant and research group were scheduled on a regular basis. Table 5 defines the key activities performed by the consultant during the utilisation of the ABC software.

Table 5: Key Activities

Key Activities	Explanation
Requirements	Gather detailed requirements from process owners and define the system's acceptance criteria.
Design	Analyse requirements, and perform design and modelling.
Build	Build the system and perform quality assurance measure.
Test	Perform user acceptance test and maintain quality assurance.
Install/Deliver	Roll out to the production environment. Ensure that knowledge transfer/training, user access and documentation meet criteria.
Close/Review	Review the project development process, review deployment and impacts on the business.

As part of the process, UKM developed its own expertise in this area. Specific staff were identified and assigned to facilitate the knowledge transfer from the consultant. Based on the level of involvement in this project, staff members of the Finance Department were identified as the most appropriate because they undergo on job training on the use of the ABC system to determine the educational cost per student. The identified staff members also undergo further training to ensure better understanding of the ABC system. Examples of relevant training modules include foundation,

analytics, enterprise business intelligence, data management, administration and solutions.

Step 6: Feedback Session-Data Verification and Confirmation

Data verification and confirmation constitute the process of obtaining feedback on the educational programme cost. The feedback sessions involve representatives from the faculties and relevant departments at the university, such as human resources, bursary and research management.

The feedback session was conducted to verify the accuracy and reasonableness of the cost for all the programmes offered by the respective faculties. The cost per programme per year along with the details of the cost components were presented to the representatives of the faculties (i.e. dean, deputy deans, head of programmes) to confirm the accuracy of the information. The feedback sessions also allowed the validation of assumptions used in the modified ABC model. Feedback received during the sessions was used to improve the determination of the educational programme cost. Obtaining feedback required a number of discussions, and visits to the faculties and relevant departments.

Step 7: Model Improvement

The modified ABC model was improved based on the feedback received during the data verification and confirmation exercise. The model improvement took into consideration various factors affecting the educational programme cost determination, such as:

- a) Optimum number of students for each programme as suggested by the Malaysian Qualifying Agency (MQA)
- b) Identification of support and academic staff in tracing the emolument cost
- c) Positions of academic staff, such as professor, associate professor, senior lecturer, lecturer and tutor
- d) The distribution of resources to various undergraduate and postgraduate programmes offered by the faculties
- e) Student-staff ratio
- f) Maturity of the educational programme

Step 8: Progress Report

Progress reports were prepared by the research group and presented to the UKM Management for feedback. The university's management comprised the key personnel holding the following positions: vice chancellor, deputy vice chancellors, registrar, treasurer, and others as determined by the university's management. The content of the progress report covered the following: existing costing system, cost per student per programme using the current system, modified ABC framework, data collection method, utilise ABC software, feedback session – data verification and confirmation, model improvement and cost per student per programme using ABC.

During the presentation sessions, the research group explained the overall process and the cost per student for each programme offered by UKM. The management team discussed related issues, and gave its views and suggestions to improve the overall process and the determination of educational programme costs. Feedback from the management is crucial because they have the strategic and operational knowledge, and expertise to evaluate both the process and its output. The information on cost per student per programme was used by the management for planning, decision-making, controlling and continuous improvement. Based on the feedback, the research team improved the progress report until the management accepted and considered it to be the final version.

Step 9: Final Report

The final report, which was approved by the university's management, was the improved version of the progress reports. As discussed earlier, the content of the report consisted of the following:

- a) Existing costing system
- b) Cost per student per programme using the current system
- c) Modified ABC framework
- d) Data collection method
- e) Utilise ABC software
- f) Feedback session – data verification and confirmation
- g) Model improvement
- h) Cost per student per programme using ABC

The final output of the process shows the cost per student per programme. At this stage, the mapping of the university's total costs to outputs was undertaken to prove that all the costs identified had been accounted for at each stage of the ABC process. The mapping involves the tracing of costs from resources to activities, and, finally, to outputs. The mapping shows that the total amount of resources was equal to the total cost of activities and to the total cost of outputs.

Steps in ABC process have limited discussion in the literature. Baxendale and Dombusch (2000) discuss the steps used to develop an ABC system, while Chea (2011) profiles service-oriented firms that have successfully adopted and implemented ABC. Nassar, Al-Khadash and Sangster (2011) undertook a study on the diffusion of ABC in Jordanian industrial companies. Their study found that the role played by consultants was an influence on many companies they surveyed.

Lessons Learned

During the process of applying the ABC model, several issues and problems were encountered. In general, the accounting and information system was insufficient to support the ABC system as it focussed on the transaction processing system with budget and budgetary control as the basis for cost allocation. The current systems were not designed to support management-related information and would require a major overhaul to enable ABC to be in place (Ismail, 2010). Considering the limitations, a modified ABC model was applied. Despite this attempt, there were difficulties to operate the system. While some problems might be unique to UKM, it is believed that most might also be common to other universities.

Information Management

Data gathering is a challenging process as it involves various parties within the organisation. Kaplan and Anderson (2004, 2007) noted that the procedure for estimating the ABC model has proved to be difficult especially if the current accounting system does not support the collection of the needed information. According to Kaplan and Anderson (2007), updating

the ABC model through interviews and surveys further increases its time and resource consumption. At the start of the development of the ABC model, it was found that data gathering presented 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's Office. Whenever there is a need to correlate the staff salaries with the staff listed in the directories, manual validation needs to be undertaken. The cross-validation of data consumes not only time but extra commitment from the staff.

Human Resources and Skills

The implementation of ABC in any organisation requires continuous human support from various departments within an organisation. The greater implication would be on the financial staff who have ownership of the financial data to be used in the exercise. There is a need not only for specific costing expertise, but also for software skills and commitment. The IT staff would also need to be aware of the specific requirements of the ABC system. In addition, the registrar's office would need to cooperate whenever there are requirements that involve data pertaining to the staff. Top management, in general, play a vital role in ensuring the cooperation among these various departments function.

Information Technology (IT)

As the implementation of ABC involves an extensive amount of data, an ABC software was acquired to expedite the process. During the data input process, technical assistance was provided. Nevertheless, issues regarding supplier reliability and timely response need to be addressed further. Internal staff training and involvement is vital to develop internal expertise and technology transfer, and to protect information secrecy. For the system to operate successfully, there is a high dependency on the IT system already in place. Currently, there is an integrated IT system in place, thus, the issue would be to allow access to the large database. Authorisation needs to be given to the appropriate staff for a limited time.

Cost Accuracy

At present, UKM uses the traditional costing method using a number of students as the sole cost driver to determine the cost per student. However, there is growing concern that the data is inaccurate and lack details, thus, implying the need for a more sophisticated costing method. The ABC system identifies the costs, services and products at a much finer level (Barnett, 2009; Ross, 2004; Udpa, 1996). There is a possibility that the annual cost per student was understated under the traditional costing method, as the ABC approach is expected to produce a more accurate cost because multiple cost drivers are used (Everaert *et al.*, 2008). The increase could also be due to the higher base cost as ABC uses an automated data collection, handles overhead expenses and includes all costs of the enterprise (Barnett, 2009; Azoulay *et al.* 2007).

Accurate cost determination is problematic for postgraduate programmes due to a high variation in the structure and conduct of the programmes. Flexibility is allowed for such programmes to accommodate the nature of postgraduate studies (i.e. differences in students' backgrounds, research progress, resource consumption, mode of study, etc.). For example, in science based programmes, the consumption of materials present a significant resource that needs to be considered. However, the current system does not allow the tracing of these material costs to specific programmes. This results in the same cost per student figure for different Masters programmes and different PhD programmes offered by the faculty.

As an alternative, the FTE can be used as proposed in the working paper prepared by Majlis Dekan-Dekan Pengajian Siswazah Malaysia (Malaysian Deans of Postgraduate Studies Council). The paper entitled *Kajian Kadar Yuran Program Pascasiswazah Institut Pengajian Tinggi Awam* used FTE rates, as follows:

Undergraduate	: 1.0
Postgraduate (Research)	: 1.5
Postgraduate (Coursework)	: 2.0
PhD (Research)	: 2.5
PhD (Coursework)	: 2.5
Doctoral Degree, e.g. Ed.D, DBA (Coursework)	: 3.0

Additionally, representatives from the sciences faculties have suggested adding a specific amount to certain programmes to cater for the additional costs of postgraduate students. The material costs suggested to be added to the programmes are RM10000 for PhD, RM5000 for Master by Research and RM3000 for course-based Master programmes. Nevertheless, in the long run, it is suggested that the actual usage of materials by different programmes be traced through the system.

Top Management Support

The process of applying the ABC model to a university has raised several implications to university's management practices. According to Granof *et al.* (2000), "Universities seem to present the Mount Everest of challenges" with respect to cost measurement and control. Technically, the current systems in most public universities are not designed to support management related information. From the social perspective, the various interests presented by the university's stakeholders induce conflicting objectives. The ABC model proposed in this study is a result of working within the current structure with future improvements in mind.

The use of the ABC software and outsourcing the data input activities can expedite the process. There is a need for a significant amount of financial assistance for the ABC software to be in place. This also includes training cost and annual licence. Top management, in general, play a vital role in ensuring cooperation from various departments to provide timely and accurate data. 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.

CONCLUSION

The exercise has proven that the Modified ABC model could determine the costs of university's educational programmes. Additionally, the costing approach could also be used to determine the costs of other outputs of a university. The mapping of the input-output costs could also be used to enhance the governance of a university towards achieving autonomy. In

ensuring that the modified framework developed in this study is applicable to other IHL, there is a need to test the tool across universities.

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 focuses on the transaction processing system with budget and budgetary control as the basis for cost allocation. The current systems are not designed to support management-related information and would require a major overhaul to enable the implementation of ABC (Ismail, 2010). Considering the limitations, a modified ABC model was applied. Despite this attempt, difficulties were encountered to operate the system. While some problems might be unique to UKM, it is believed that most might be common to other universities as well.

This study contributes to the theoretical knowledge by providing empirical evidence of the application of ABC in a service setting, or, more specifically, in a university. Previous studies on ABC in the service industry typically focus on the model without providing empirical evidence (Qiao & Chen, 2007; Popesko, 2009). On the other hand, previous studies on ABC at IHLs focus on a specific segment within the organisation (Ismail, 2010; Granof, Platt & Vaysman, 2000; Krishnan, 2006; Whelan, 2003). Practically, this study contributes to interested parties including the management of UKM, MOHE, other IHLs, sponsors, students, parents and the general public. This study provides empirical evidence that the ABC approach can be used by an organisation as a whole and for specific purpose. Costs per student information can be used to improve accountability of faculty management in managing its resources. In addition, it can be used as a basis to determine the fees for educational programmes. This information is useful for sponsors to determine the number of students to be sponsored and the amount involved, for parents to determine the size of the investment for education and for the general public to acknowledge the contribution of the government towards the building of the nation's education.

Future and on-going research in this area should address the limitations identified in this study. The findings from this study are case specific and should not be generalised. Non-financial, qualitative information and external factors should also be considered to explain the findings. Since

ABC is newly introduced at UKM, it is expected that it will undergo a learning process to accommodate improvement efforts. Therefore, it is also worth revisiting this organisation and other universities that replicate the ABC model proposed in this study to further understand its development in the application of ABC.

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