The Trial of Activity-Based Costing at Sheffield Hallam University

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Introduction

In the past, universities have concentrated on financial accounting to the neglect of cost and management accounting. Financial control and monitoring have centred upon working within funding received at both the institution and school level. In an article entitled 'Activity-Based Cost Management in the Management of Change', Paul Clarke and Robin Bellis-Jones argue that conventional management accounts have been linked cynically to a journey for which the traveller:

- estimates the distance to be travelled and the time of arrival at the destination as well as at 11 intermediate landmarks, without identifying the route;
- is told after each landmark how far they were from where they thought they would be, but not where they went wrong, or how to avoid making the same mistake again;
- is obliged to decide the direction to go by looking in the rear view mirror.[3]

An initial research project[4] carried out at Sheffield Hallam University in 1999 sought to identify the unknowns described above – in the university's case, those hidden within networked learning (now widely known as e-learning). The project concluded that the best way to determine the true costs of networked and other types of learning would be to apply a methodology known as Activity-Based Costing (ABC).

This report[5] explores Sheffield Hallam's success in applying Activity-Based Costing (a methodology developed for manufacturing industry) within a university setting. It first offers a brief overview of ABC, then details its trial within Sheffield Hallam's School of Computing and Management Sciences during 2000/2001.

Rather than offer a simple case study of the experiment, the chapter seeks to offer practical guidance to others utilising ABC in universities, in hopes of clarifying the aforementioned 'journey' for others.

What is Activity-Based Costing?

Activity-Based Costing was developed in 1988 by Robin Cooper and Robert Kaplan of the Harvard Business School, during their research into product costing in the manufacturing

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[3] Paul Clarke, Robin Bellis-Jones, (1996) "Activity-based cost management in the management of change", *The TQM Magazine*, Vol. 8 Issue 2, pp.43-48.

[4] Funded by JISC.

[5] The report was written originally in 2002 for a chapter in a multi-author book; however the book never materialised. It was re-edited in June 2005 but not then published due to pressure of other work.

industry.[6] They recognised that 'the traditional costing model distorted product costs by assuming overhead costs are driven by the volume of goods produced via surrogates such as direct labour hours, machine hours or direct material expenditure'.[7] If the manufacturing process of two different products required time on the same machine, it was likely that the products would receive the same average overhead cost allocation, even if the processing of one product took twice as long as that of the other. The cost was spread out evenly, in what consultants hired by Sheffield Hallam would later term the 'peanut butter spread approach'

Put simply, ABC acknowledges that the business of a manufacturer can be broken down into a number of discrete activities that often cross departmental boundaries. It costs a certain amount of money to perform each of these activities, and the majority of the organisation's costs can easily be assigned to one (or in proportion to a number) of these specific activities.

Contrary to traditional accounting, Activity-Based Costing breaks down overheads based on actual consumption of the resources by each activity or task, thereby making a rational allocation of indirect costs.[8]

Basic questions ABC attempts to answer are:

- What activities are undertaken to provide a product or service?
- How often, and by whom, are activities performed?
- What resources are consumed when undertaking activities?
- How much does it cost to perform a particular activity?
- How much does it cost to provide a product or service?
- What value-adding and non-value-adding activities are undertaken?

When the total cost for each activity has been established, this cost can then be distributed to the products or services (known as 'cost objects') in relation to their consumption of that activity. Thus, each product or service is assigned costs for only the activities that go into producing it.

Under ABC, costs that cannot be sensibly linked to the cost object can be treated as 'Business-Sustaining Costs'**.** The organisation doing the costing may choose to either keep these costs completely separate or to reallocate them across activities so that all costs can be taken to the cost object.

ABC in Universities

Within a university setting, ABC can be applied in a similar manner. As in manufacturing, university faculty and staff devote their time to a variety of common activities (for example,

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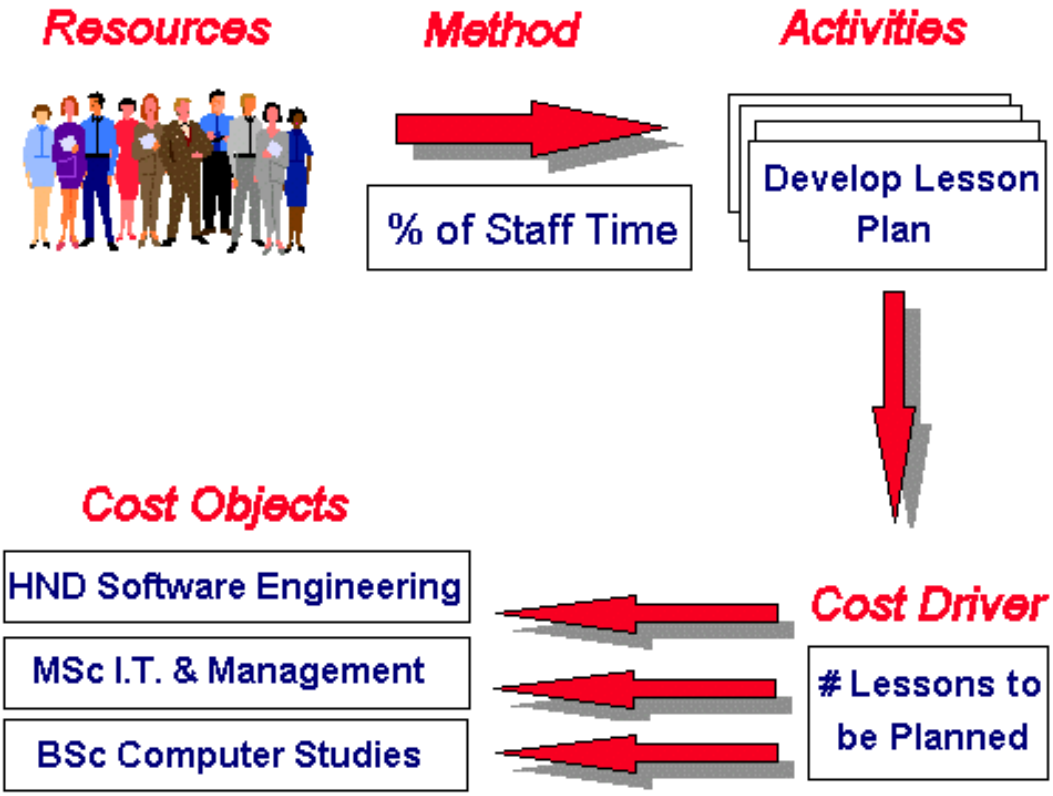
[6] Cooper/Kaplan 1998 note.

[7] (Cleary, 2000).

[8] (Howson and Mitchell, 1995).

lesson planning). If we calculate the percentage of time each individual spends on lesson planning, and apply that same percentage to each of their individual salaries, we get the 'Salary Cost' for the activity lesson planning. When other costs of lesson planning, such as a percentage of office space costs, have been allocated to activities, the total cost of the activity Lesson Planning is known and can then be distributed to the courses (cost objects) using an appropriate cost driver. When all the different activity costs have been distributed to courses then we end up with a total cost for each course.

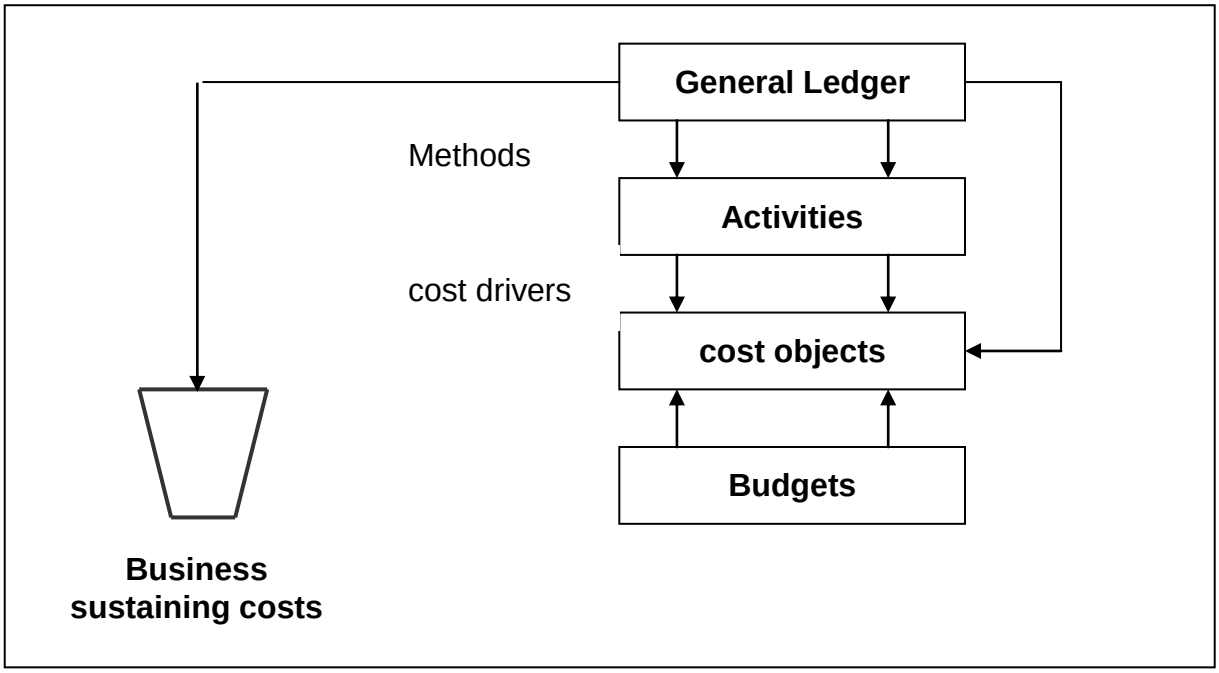
Figure 1: Example of how costs are distributed to cost objects



In the above example, academic staff are a resource of the university and their time is a cost to the university. Staff spend their time carrying out various activities, such as 'lesson planning'. If we take the percentage of each individual's time spent on 'lesson planning' and apply that same percentage to each of their salaries, we get the salary cost for the activity 'lesson planning'. The cost of the activity 'lesson planning' is then distributed to the courses (cost objects) using an appropriate cost driver – in this case number of lessons to be planned.

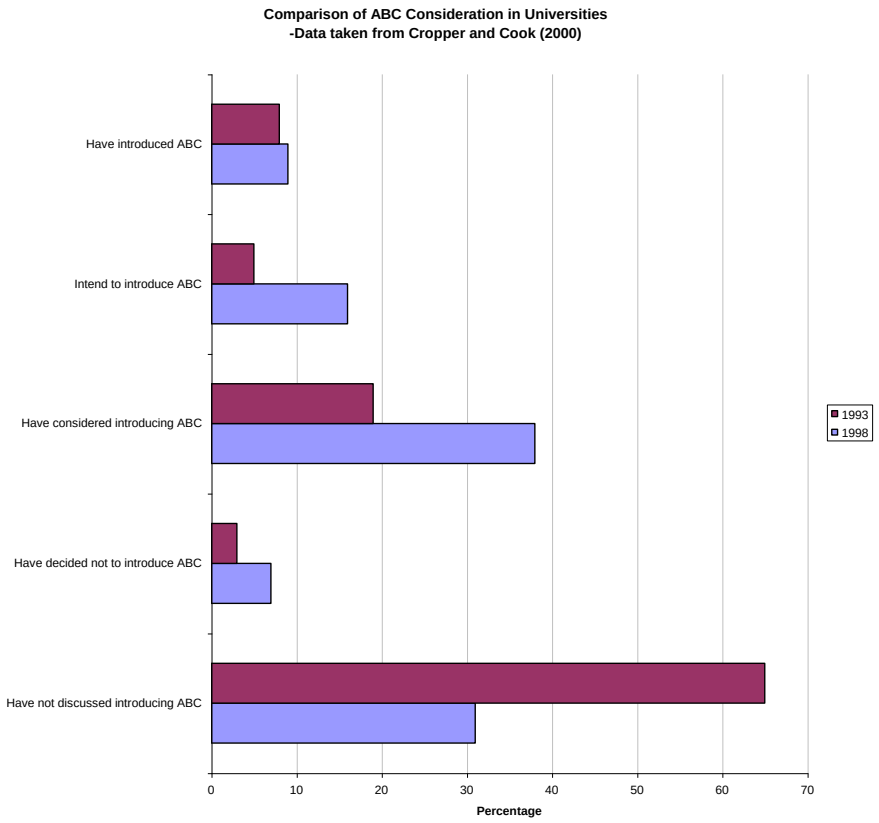
Figure 2 below illustrates the ABC Process. Costs, taken from the General Ledger, are attributed directly to Cost Objects or to Activities using Methods; some Costs are called Business Sustaining Costs when they cannot be realistically attributed to Activities or Cost Objects. Those which are attributed to Activities are then distributed to the Cost Objects using Cost Drivers. Budgets can then be fed into the model allowing comparisons between budgets and actual spending to take place.

Figure 2: ABC in diagrammatic form



Cropper and Cook surveyed University Finance Directors in 1993, and then again in 1998/9 to establish trends in the use of Activity-Based Costing within universities. They discovered a great deal more interest in ABC by 1998, but there had been little increase in actual usage over the period. Telephone research undertaken during this project indicated that a substantial number of universities have now bought ABC software and intend to adopt ABC in the future, but most have still to get started.

Figure 3: Interest in using Activity-Based Costing in Universities



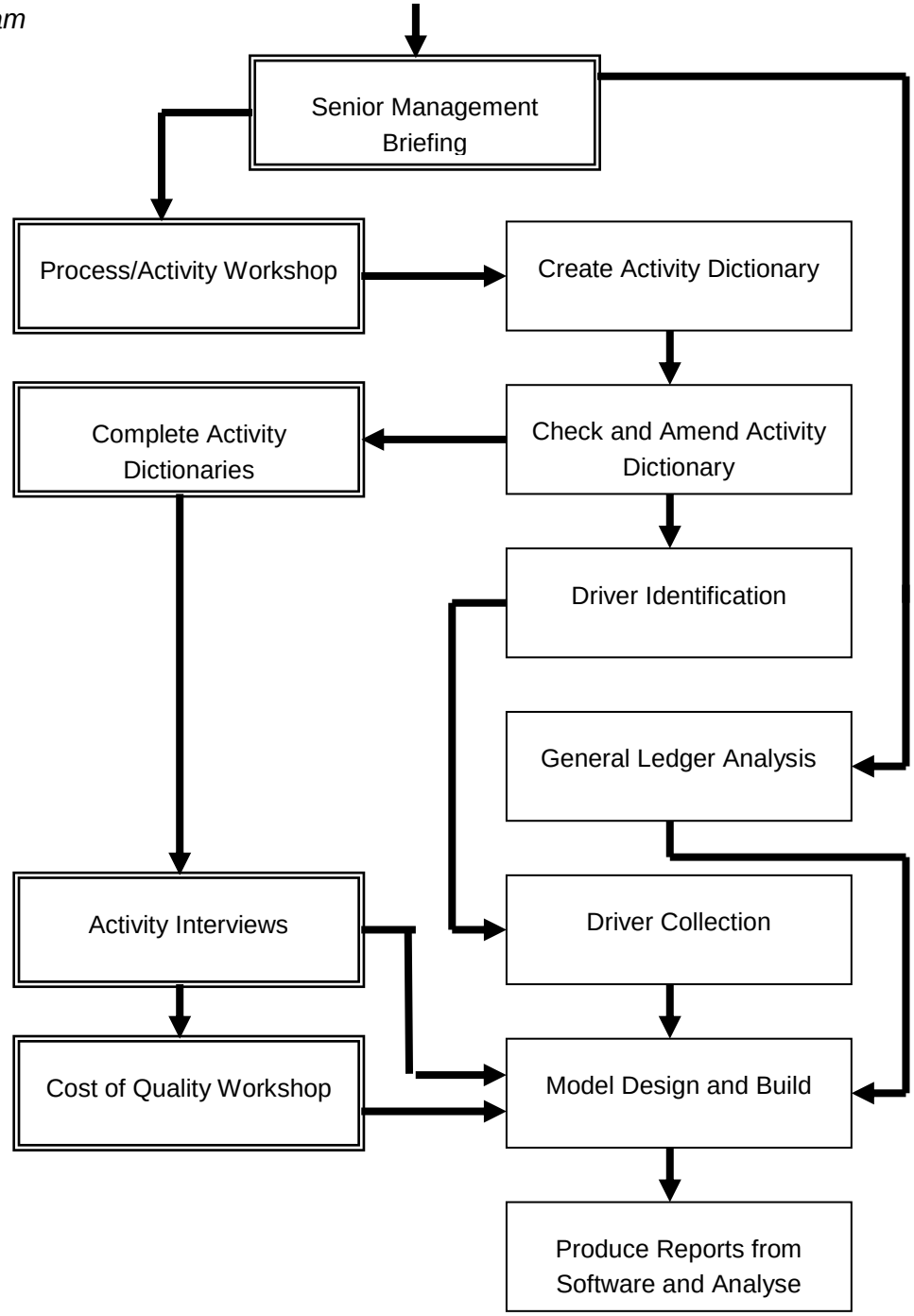
The ABC Trial at Sheffield Hallam University

The following material covers the experiences of the team (two full-time non-accountant research assistants over a period of six months) in piloting Activity-Based costing in the School of Computing and Management Sciences at Sheffield Hallam University. This was done in accordance with the methodology provided by an ABC consultant from the Armstrong Laing Group. Consultants were employed to advise and assist the team due to the short time frame and limited experience of the researchers in Activity-Based costing; and in particular to ensure that the full industry methodology was adhered to.

Within Sheffield Hallam University, the School of Computing and Management Sciences (CMS) is a lively community of some 100 academics, 50 support staff, 1800 undergraduate students and 600 postgraduate students. Undergraduate courses in IT, Statistics and Business Process Management are popular with students and employers. The School has an international portfolio, including 200 students studying through distance learning overseas. The University operates a devolved budgeting system, allocating government funding and other income to academic schools using a Unit Income Distribution Model (UIDM) after funding for central services has been top-sliced.

Figure 4 illustrates the processes undertaken by the team during the trial. Boxes with a double outline indicate exercises which required the involvement of people outside the study team.

Figure 4: Flow Chart Illustrating the Activity-Based Costing Methodology trialled by the SHU team



Introduction

The SHU trial consisted of the following stages: a Senior Management Briefing; a two-day Process/Activity Workshop; the creation and amendment of an Activity Dictionary; the

completion of the Dictionary by all members of university staff; a session held to determine all relevant cost drivers; an analysis of the university's General Ledger; Activity Interviews with all participating members of staff; collection of data for cost drivers; a 'Cost of Quality' workshop; the entering of data into special software for processing; analysis and reporting of results.

Each stage is detailed below.

Senior Management Briefing

The Senior Management Briefing signifies the start of the process, bringing together the key management stakeholders, the project team and the consultants. This is the first stage of the trial, and as such its primary purpose is to define Activity-Based Costing by:

- outlining its potential benefits,
- exploring the involvement expected from various members of staff; and
- forecasting probable outcomes.

The briefing also gives management an opportunity to outline the type of information they themselves hope to glean from the project data.

The Sheffield Hallam briefing was delivered by the consultant from the Armstrong Laing Group, an arrangement that was agreeable for a number of reasons:

- the consultant could reassure any doubtful senior managers that ABC had worked in a variety of organisations, and provide recognised examples such as DHL, and Glasgow City Council;
- the consultant could reassure senior managers that everyone's first reaction is to say that their job is too complicated to be analysed in such a way and explain how the analysis will be done;
- the consultant had a wealth of examples demonstrating the ways in which ABC had helped organisations to understand how their income was spent, to determine which aspects of their businesses were adding the most value, and to allow senior managers to make more informed business decisions.

The SHU team anticipated resistance from its own senior management, but it became clear at the briefings that managers understood the general concept of ABC, and all agreed that if the necessary data could be obtained for analysis, the outcome would be extremely useful to their planning processes.

The Process/Activity Workshop

The Process/Activity Workshop (which should take no longer than two days) brings together representatives of all staff within the entity being costed: academics, managers, administrators and technical staff. The goal of the exercise is to gain an understanding of the processes and activities undertaken by different staff members within the School, and then follow up by drafting a comprehensive list of these activities.

At SHU, this exercise took two extended afternoons with roughly ten participants (and the project team). The team had selected key representatives from all areas of school operation, and found it difficult to keep participants present for the full duration of the exercise (due to teaching commitments, meetings and other responsibilities). Fortunately, it did not disrupt the exercise to have participants coming and going according to the requirements of their schedules, as long as all maintained a general understanding of what was taking place.

Participants were asked to identify all of their work-related activities, including those that are generally considered to be 'fire-fighting' (dealing with problems that ought not to happen such as chasing non-payment of fees or sorting out enrolment forms that have been incorrectly filled out). These are the activities that can be further investigated for improvement if it is shown that they carry significant costs.

The exercise turned out to be a great team-building experience, offering staff members an insight into what their colleagues do, and a rare opportunity to question why they do it.

Create the Activity Dictionary

The Activity Dictionary is the resulting list of all activities undertaken by staff in the school, categorised according to headings identified during the Process/Activity Workshop. (The Activity Dictionary will serve as the primary device for collating all data regarding how staff members spend their time; see *'Complete the Activity Dictionary',* below and Appendix A for a sample Activity Dictionary.)

Creating the dictionary simply involves typing the processes and activities cited by participants in the Process/Activity Workshop into a proforma (in SHU's case, one provided by the consultant). The SHU team found it necessary to explore some areas in more detail during this phase of the process due to gaps and issues of clarity and consistency.

Check and Amend the Activity Dictionary

A draft of the Activity Dictionary is sent out to all who attended the Process/Activity Workshop, to ascertain whether it can be considered an accurate interpretation of the activities identified and discussed at the workshop. At this stage additions and clarifications can be made if necessary.

Complete the Activity Dictionary

This is the most time-consuming part of the ABC process. Once checked and amended, the Activity Dictionary becomes the project's main information-gathering tool, recording the range of tasks undertaken by each staff member and the time spent on each one.

In industry, line managers or section heads can complete the Activity Dictionary on behalf of their entire team, so that all members of the organisation can be recorded without having to complete the Dictionary in person. In a university setting this may be more complicated. Sheffield Hallam's matrix management structure for academic members of staff made this type of Dictionary completion impossible. This was because the academic members of staff report to different people for different parts of their work (e.g. undergraduate teaching, staff development, research etc.) and so no one person knows

exactly how another spends their time. As a variant of the normal business procedure, academic members of staff were asked to complete individual Dictionaries which were then amalgamated by the project team. As in industry, the administrative and technical team leaders were able to complete a single Dictionary which incorporated the times for their entire teams.

A member of the SHU project team visited each participant in person when distributing the Dictionary, to make sure that all understood what was required. It was recommended that staff read through the Dictionary thoroughly the first time without marking anything, to get an overall picture of its contents and structure before marking which activities they undertake during the course of the year. (We found it expedient to talk people through the completion of their Activity Dictionaries in person at a later phase of the process; see *'Activity Interviews',* below.)

A small number of additional activities can be added at this stage if the participant feels strongly that something crucial has been omitted (it is the up to the study team to decide whether the new activity is significant enough to be included in the master Activity Dictionary). Only once staff members are confident that their selections represent the range of tasks that they personally undertake should they focus on the percentage of the time they spend doing them. Activities which account for less than one percent of a person's time are discounted.

Some participants complete this exercise on 'gut feeling', while others consult diaries or similar records. Some approach the dictionary in a more empirical way altogether, calculating roughly what percentage of their time is spent doing teaching-related tasks, and then looking at how that breaks down. Whatever the method employed, the SHU team have found the results to be surprisingly similar.

Driver Identification (Methods and Cost Drivers)

Driver Identification is handled by a brainstorming session to determine appropriate and available cost drivers. It is important to use appropriate cost drivers because the cost driver chosen can dramatically affect the costs allocated. For example, if the number of students is chosen as a cost driver it would give a totally different effect than if the number of staff were chosen as the cost driver.

This exercise took the SHU team one afternoon, with the assistance of the ABC consultant. Each activity was considered in turn, and an appropriate method and cost driver chosen to drive the costs firstly to the activities from the General Ledger and then from the activities to the cost object respectively.

General Ledger Analysis

In this phase the General Ledger is examined, and transactions, or groups of transactions, are allocated one of the 'methods' identified in the previous phase. The method describes how the transaction costs in the General Ledger are to be allocated to activities, or in some cases to the cost objects directly. For example, travel costs for placement visits would have the method 'direct to activity – Visit Students'**.** Staff undertake a number of duties which will cover a various activities or a number of courses; their salaries therefore need to be distributed across the amount of time spent on those individual activities. In this case the method would be 'percentage of staff time'.

The Armstrong Laing software that the SHU team opted to use was able to extract information directly from SHU's existing General Ledger system. For the chosen period of one year, the School of CMS had approximately 15,000 transactions to examine.

Activity Interviews

This exercise is intended to ensure that the information submitted in the Activity Dictionary is correct. It is also an opportunity to check that any new activities added by those completing the Dictionary are significantly different from pre-existing ones.

The team discovered that some staff needed more help than others at this phase; some had completed their Dictionaries already, while others had run into difficulties. Very few academics had completed their Activity Dictionaries in full before their Activity Interview.

The most common mistakes among all participants were:

- duplication of time: where they believed activities overlapped, some participants had recorded the time spent in both categories; and
- many participants had completed the Activity Dictionary but not added up their percentages to see how close it was to 100%; upon inspection, one Dictionary from a manager added up to 324%.

The team also found that:

- it can be extremely useful for the interviewer to look at documents relating to the interviewee's schedule, such as an academic's teaching timetable, before the informal Activity Interview;
- designated names for processes and activities will be questioned, even by those who attended the initial workshops;

Driver Collection

This exercise follows directly on from the Driver Identification and focuses upon collecting the data required for the cost drivers. Appendix B gives some examples of cost drivers used. The ease of this process will depend upon the specific drivers chosen and whether the information required is easily accessible.

Drivers are split into two different groups – methods, which drive the general ledger costs to activities, and cost drivers, which drive activity costs to the cost object.

In the trial, SHU attempted to cost courses specifically; therefore the cost drivers were items which directly affected the cost of the activities involved in putting on a course. For example, if one course receives 5000 applications and another only receives 5, it is obvious that the cost of dealing with the 5000 applications is far greater than for the 5. The cost driver for the central admissions service could, therefore, be the number of applications. The SHU team found that for some identified cost drivers the information was readily available and highly relevant, but for other situations (where the most obvious and relevant cost driver information was not available), surrogates were required.

Cost of Quality Workshop

This is a workshop usually attended by those who were involved in the initial Process/Activity Workshop to ascertain the perceived value of each activity undertaken in the School. Workshop participants were asked to assign a value and a quality attribute to each activity simply by ticking their choice in a matrix (see Figure 5).

The purpose of this exercise is to illustrate where things are going wrong, potentially leading to a reduction in costs without a loss of service or quality, as well as an ongoing measure of process improvement.

Figure 5: Value and quality management attributes assigned to activities in the SHU study

Value Attributes	***Quality Management***
• Customer Value Adding	• Basic Work
• Business Value Adding	• Prevention
• Non Value Adding	• Internal Failure
• Support	• External Failure
	• Check

Model Design and Build

At this point all of the information collected is entered into the software.

In SHU's case, all data collected thus far had been stored in Excel spreadsheets. Model building involves formatting the data correctly and importing it in to the software. Once the model is built, activity and cost object costing can take place; allocations and driver volumes can be altered; and 'what if' analysis can be undertaken.

As the process is likely to vary depending upon the software used, it is not appropriate to enter into too much detail regarding how our specific model was built. However, this was the 'fun part' of the project for the SHU project team and where the hard work of data collection began to show results.

Reporting

This stage is vital for presenting the results of the ABC implementation. It enables the team to isolate significant findings from the model and present them in a manner suited to various audiences. Once initial reports are produced, it is important to validate them by confirming with the people concerned that the figures look correct, and consist of the costs they would expect to see. From the validation stage certain changes may need to be made to the model. For example, it may be appropriate to alter cost driver shares / weightings for certain cost objects and then rerun the reports.

Throughout the ABC process, from the Management Briefing onwards, participants will inform project team of what type of information they are interested in receiving once the

data has been processed, and it is beneficial to note these requests and to report on them as information becomes available.

Results

For reasons of confidentiality, we cannot report on the results from the SHU trial in too much detail, but it will be necessary to refer in part to our own results in order to illustrate ABC's ability to inform decision making.

The cost data can be analysed in many ways. However, the main costs are those of:

- departments (budget codes within each School)
- accounts (types of cost e.g. academic pay, course advertising etc)
- activities
- cost objects (courses and other projects and student types).

Below are four examples of general interest to the HE and FE sectors which we feel most readers will be able to associate with. Where figures have been mentioned they have been rounded up or down to the nearest thousand, and details such as course names have been changed.

Chart 1: Activity Costs

Chart 1 gives a breakdown of teaching activity costs. This analysis can be undertaken for any activity or group of activities. Not surprisingly, this shows that 65% of time spent on teaching activity was spent in front of students (TEA07).

Chart 1: Teaching Activity Costs

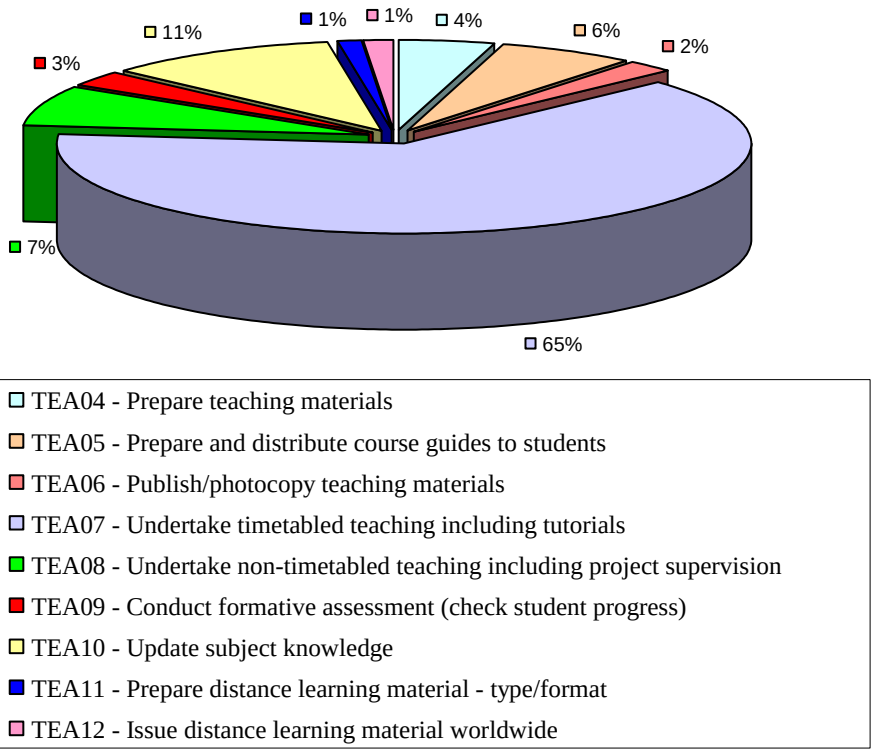
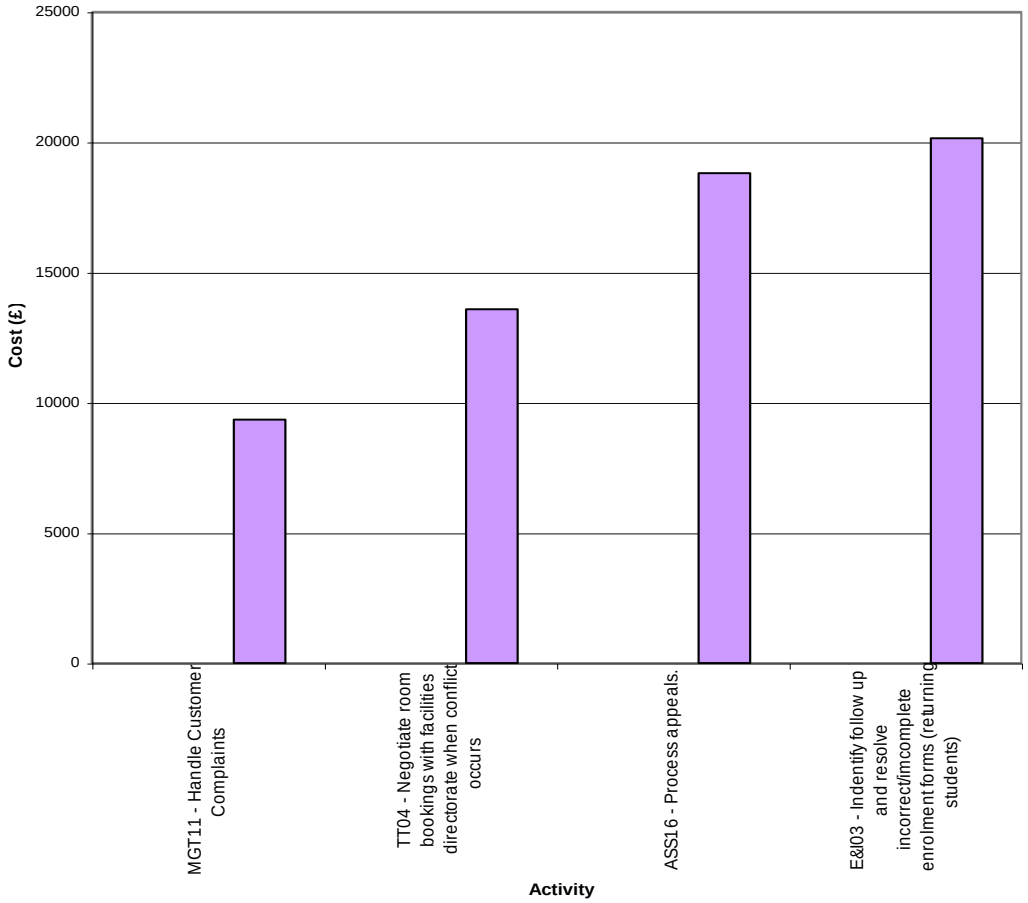


Chart 2: Cost of Quality and Value Analysis

At the Cost of Quality workshop (see *Cost of Quality Workshop,* above), each activity was allocated both a quality and value attribute. Once these were imported into the software, we were able to establish the total cost to the School for each attribute. Chart 2 shows the cost of a small number of activities that were considered to be non-value adding It is this type of information that we recommend be used by management to prioritise attention for reducing the non-value adding activity costs wherever possible.

Chart 2 Non value added activities identified



Charts 3 and 4: Costs by Student Type

Charts 3 and 4 illustrate the percentage breakdown of student numbers and costs by student type. It is interesting to note that although 75% of students are full-time undergraduates, they only account for 68% of the costs – making them less costly per student than other student types. Additionally, postgraduate full-time students appear to be proportionally more expensive than other students, as they only make up 5% of student numbers but 11% of the overall student costs. (However, it is possible that part-time students have not been counted in the most appropriate fashion.)

Chart 3 Percentage of Students by Type

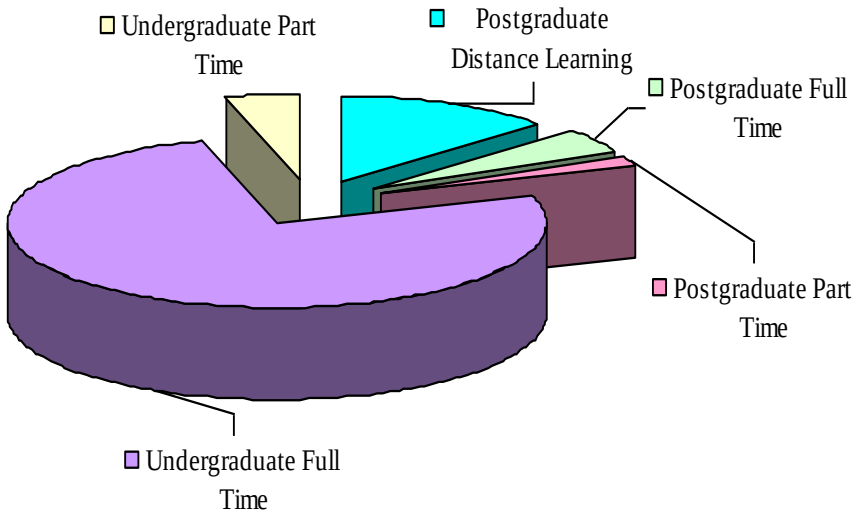


Chart 4 Percentage of Student Costs by Type

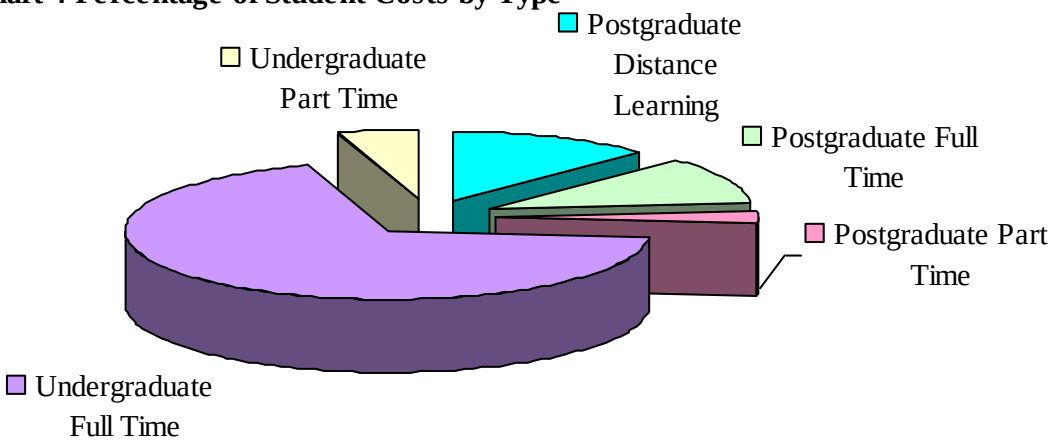


Chart 5 Cost per student type (£)

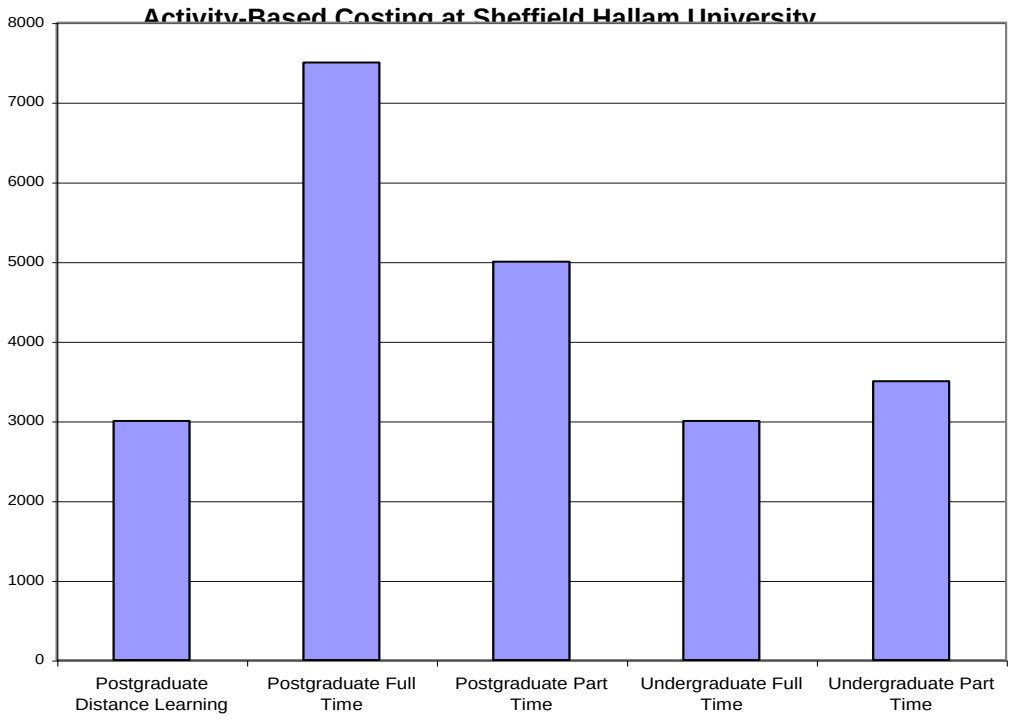


Chart 5 gives the average yearly cost per student by type in 1999/2000. The figures have been rounded to the nearest thousand but clearly demonstrate that postgraduate full-time students cost the School over twice as much per student as undergraduate full-time students. What the Chart fails to take into account is the amount of funding received per student type, and in future studies a profitability figure (the difference between the cost and funding received) would be a better measure of the worth of each student to the School. Again, note the point made above about fractional students.

Conclusions

Given the drive towards more transparent financial operation and quality control, ABC is indeed a viable and extremely effective way forward. This team set out in this project to investigate whether ABC as used in industry was suitable for use in universities without major adaptation; during this study we have confirmed that it is.

It is crucial to note that the usefulness of the data derived from the project depends largely upon the accuracy of the information collected in the early phases of ABC. In order to undertake ABC successfully, suitable software and initial professional support are also vital; spreadsheet products such as Excel are not complex enough to tackle ABC effectively.[9] Contrary to many ABC accounts, which report that academic staff are sceptical about the exercise and afraid of the results it may yield, we found that though most were initially sceptical, most of our staff put aside their initial scepticism to become increasingly enthusiastic once they understood what was to take place.

Activity-Based Costing uncovers costs that are 'generally absorbed' but not those which are 'fundamentally unrecorded', such as staff overtime**.** This remains an issue.

The methodology can be applied to an entire institution, an individual faculty or individual course level. In addition, ABC provides more than just financial information, allowing the understanding and monitoring of the key processes and activities taking place, and of the perceived quality of those activities.

The team developed a handbook that it hopes will enable others to undertake a similar exercise (with the aid of professional support and suitable software) at a higher level of detail in the first instance. Complete and accurate Activity-Based Costing takes time; most studies record that two or three iterations to the model are needed before a satisfactory ABC system is reached. Universities must accept a pay-off balance between amount and quality of data collected in terms of the results and cost of the exercise, as opting for simplicity is likely to produce inconclusive and unusable results. Those utilising ABC must decide what their organisation can gain from its application; overall, ABC complexity depends on what the institution is trying to achieve.

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[*] (Added 2022) Paul Bacsich is now a consultant in e-learning, Managing Director of Matic Media Ltd and CEO of Dualversity, also with senior positions in other e-learning organisations. To contact him the best email (of several) is paul@matic-media.co.uk
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[9] A point we also made in the CNL1 study.