

# Activity-Based Management Systems in Higher Education

Stuart McChlery, Jim McKendrick and Tom Rolfe

*Financial pressures facing UK universities have increased the demand for good financial management information. The government wants higher education institutions to adopt standardized full economic costing. This article describes an activity-based management (ABM) model which has been successfully used to cost institutions' activities down to appropriate levels of focus, linking the activities to income streams and arriving at a form of value added. The model is extremely flexible allowing information to be collected for different levels of focus: faculty, department, programme, module/project or support unit.*

The past 25 years has seen the introduction of public sector policy initiatives based on an essentially neo-liberal, positivist ideology, abandoning traditional approaches to public administration replacing them with New Public Management (NPM) (Hood, 1991). A key feature is the emphasis on managerial accountability, including performance measurement and the achievement of targets (Pollitt, 1990; Pollitt and Bouckaert, 2000). Although enjoying fairly widespread acceptance, NPM has been criticised as 'creeping managerialism' (Strong and Robinson, 1990) and creating a 'managerial state' (Clarke and Newman, 1997). Within higher education (HE), there are concerns over institutional autonomy—the decline of donnish dominion' (Halsey, 1995), a move to more utilitarian universities (Maskell and Robinson, 2002), and the rise of the 'McUniversity' (Parker and Jary, 1995).

Increasing pressures on UK universities' performance has led to financial management taking on greater prominence, underpinning decision-making and informing the viability and coherence of activities (HEFCE, 1997, 2002). However, financial management in HE appears somewhat limited including a lack of awareness of indirect costs and inadequate devolution of responsibility to cost centres (CVCP, 1985, 1988; Ahumada, 1992), and a need for the recognition of net operating surplus/deficits on all activities (NAO, 1998). Cropper and Cook (2000) noted that 83% of survey respondents were dissatisfied with their university costing system.

This article considers a management accounting methodology based on a value-based management (VBM) information system.

We discuss the academic literature relating to financial information needs in HE, and recent developments by the government regarding costing practices. Two recognized accounting methodologies, activity-based management (ABM) and VBM are reviewed in relation to HE.

## Information Requirements for the Higher Education Sector

The prevailing management cynicism regarding information systems within a bureaucratic structure could be creating a barrier to their development. Cropper and Cook (2000) note the concerns of the staff not only regarding the documentary burden on them, but also psychologically perceiving a loss in academics' role as 'self-validating professionals'. Additionally, Lewis and Pendlebury (2002) recognize the negative psychological implications where financial considerations dominate traditional academic values.

Managers are often unaware of the way that financial information can help strategic and operational thinking alongside other non-financial factors. Informed understanding of cost and income behaviour assists in decision-making at a strategic level—for example introducing new study programmes, and at an operational level—for example applying different methods of learning delivery. A costing system also assists in pricing courses and supports bids for funding, while informing risk management for example predicting the effects of downturns (HEFCE, 2002). In addition, systems can be used creatively to change management behaviour (Hiromoto, 1988), for example reducing expensive resources by

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internal charging for that element (space for instance) (Tomkins and Mawditt, 1994).

Systems could assist in validating levels of subsidy given to modules, programmes and departments (Anthony and Young, 1999). In HE, services are mixed such that the identification of separate costs is difficult and cross-subsidization inevitable (Breneman, 2001). There is a danger that cross-subsidization goes unchallenged focusing only on societal benefits (Lewis and Pendlebury, 2002). Such analysis has often been at a macro level (academic schools and departments), but key levels of cross-subsidization remain hidden within departments, for example between research and teaching activities, and central services funded through 'top-slicing' (Pendlebury and Algaber, 1997).

Devolution of control to academic departments may be aided through a robust system, although the level of devolution is debated. Bourn and Ezzamel (1987) advocate school or faculty as an appropriate level, while Howson and Mitchell (1995) suggest a two-level approach with the institution's management considering central costs and academic departments their own direct costs. Lewis and Pendlebury (2002) suggest a cumulative approach, with information available at course, departmental (or subject grouping) and faculty level. The key focus should be to link decision-makers with the effects of their decisions with commensurate accuracy.

#### **Transparency Approach to Costing (TRAC)**

A set of mandatory costing standards was developed in 1999–2000 for all HE institutions to meet the government's requirements for improved accountability regarding 'the full costs of research and other publicly-funded activities' (JCPSG, 2001). TRAC is a form of activity-based costing (ABC) aimed at accommodating formal cost reporting requirements and facilitating the development of improved management information. Costs are allocated to five categories: publicly-funded teaching and research, non publicly-funded teaching and research, and 'other'. These may be insufficient to capture the complex nature of activities (Lewis and Stiles, 2004), for example teaching includes such activities as pastoral care and career placement. Academic staff costs are allocated through the collection of time allocations, other direct costs charged directly to activities, while overhead costs are allocated using between four to six robust cost drivers. Two adjustments are made to institutions'

reported costs: an infrastructure adjustment to recover the full current economic costs of the institutions' assets and a cost of capital adjustment utilizing a market cost of capital.

From 2005, all UK HE institutions have had to calculate the full economic cost (fEC) of each research project which can then be used to set the price for government grants and inform the price of other projects. There is a perceived need to meet the challenge of a pervading 'low-price culture' in HE, arising from a tradition of badly informed and inexperienced decision-making allied to marginal cost pricing being seen as the norm, overhead costs having been dealt with in relation to other core activities. This tradition of 'under-charging' from full cost has become accepted by suppliers and the client base, endangering the ability to invest adequately to maintain sustainable positions.

There is potential for fEC to be extended to teaching and other activities. HEFCE (2002) considered using costing systems to 'understand the financial contribution' from different types of teaching' with more detailed analyses such as course costing, including 'the surplus or deficit on each activity for the institution and by department' and recognition of modules 'under a minimum economic size'. TRAC principles may 'also provide the fEC of teaching courses and modules' (JCPSG, 2005) for example research councils being informed of the costs of postgraduate research student activity. TRAC has already been used as the basis for a number of studies on the costs of teaching (for example of modes of study related to widening participation) and is being considered for providing cost-based information to inform HEFCE's teaching funding method. An independent review of TRAC carried out by the Financial Reporting and Activity Costing Group (FRACG, 2003) suggested expanding the annual transparency review reporting return to include both income and full costs across the five activity categories. From January 2006, institutions have had to report their annual surpluses and deficits on each of their five main activities.

#### **Activity-Based Management in Higher Education**

ABC emerged in the late 1980s and involves costing organization's activities (cost pools), identifying the causal factor leading to the costs occurring (cost drivers) and thus calculating a cost rate for each activity. This allegedly allows a more appropriate pooling related to the causation of overhead costs, with charges more

likely to reflect usage of resources than traditional systems. Applying ABC in HE institutions is not a new phenomenon (see Mitchell, 1996), with proponents arguing that ABC raises awareness on costs and values. Cropper and Cook (2000) note that in 1998 only 9% of survey respondents had introduced ABC (16% intending to introduce it), with problems with implementation tending to be cultural rather than technical—for example getting academic staff to accurately complete an activity-based time sheet (KPMG and HEFCE, 1997).

ABM refers to the fundamental management philosophy that focuses on the planning, execution and measurement of activities as the key to efficiency and effectiveness and competitive advantage (Roberts and Silvester, 1996). Antos (1992) regards ABM as highly applicable to the not-for-profit and governmental sectors. Brimson (1991) suggested that most organizations incur up to 40% of their expenditure on non-value added activities, leaving scope for an ABM approach. In commercial organizations, 'lean enterprise' strategies are often driven by an ABM analysis, emphasizing the designing-out of costs. This is clearly transferable to HE regarding new programmes, modules, and learning pedagogies. In addition, overhead allocation to activities and business units provides the potential for more meaningful allocation of costs down to sub-business unit level (Bourn, 1994).

Value analysis (VA) is a 'systematic and creative method for improving the value of a product, service or process' (Bone, 1993). VA breaks operations down to key functions, at least at business unit level, and against each defines its outputs (quantitatively where possible) and its inputs (as depicted by costs) allowing the questioning of those functions, as well as suggesting developments (Mills, 1998). In HE, the major difficulty will be in the valuation of outputs, with wide variations in defining education let alone valuing it, including its worth to the social welfare and well being of communities. Value systems originating in the business or private sectors tend to over-concentrate on exchange values at the expense of use and labour value (Moore, 1995; Jackson, 2001; Bozeman, 2002). The concept of social value, as recognized in social capital, social cohesion and social relationships and identity, also has importance. There are fundamental differences between value in the public and private sectors in areas like distributional equity, co-production and preference signalling. There

is the suggestion that the concept of public value is primarily a means of judging the performance of government policies and public institutions and making decisions about allocation of resources and suitable delivery systems (Kelly and Muers, 2002). There is a need, however, to recognize that market-driven practices and business culture continue to play a significant role in government policy. We now review a methodology linking ABM with VA to HE institutions.

### Case Study

Senior management in a university requested an in-depth review of the financial circumstances pertaining to a specific academic unit which had been giving cause for concern. We constructed a value-based model for an actual academic department based on real data. Appropriate key activities, warranting separate attention, were identified for which costs and incomes were collected. The activities selected were undergraduate teaching (at individual module level), the department's research activity and other income-generating activities. This article uses the methodology and processes developed during the original exercise but applies it numerically to a fictional department. A financial summary is provided in appendix A on p. 322. The appendix is an exemplar of the model, although only year 4 modules are provided in detail.

### Income

The case study utilized income streams as a surrogate figure for value, with the levels of resource given by government regarded as the value placed on the education provided. Undergraduate tuition income was allocated to modules based on the full-time equivalents (FTEs) for each module, while postgraduate tuition and research income was allocated to the research activities of the department. Other income was charged to a separate activity heading (see column 1, appendix A).

### Direct Costs

Academic payroll costs for the department were applied to activities based on discussions with staff. However, while some academics worked within the contracted hours (32.5 hours per week), a significant number of them worked well in excess of this time. It was agreed that the model should initially be run using two different bases:

- A model based on 1,300 hours worked per annum (32.5 hours per week x 40 weeks).

- A model based on the total hours worked by each member of staff.

Academic staff time spent on tuition was collected by reviewing each module which the department offered, detailing the hours worked including lectures, seminars, tutorials, examination setting and marking, module leadership, graduate supervision, post doctoral supervision etc. Once this was collected, agreed weightings were attached to the different modes of involvement, for example weighting actual lecture hours to cover preparation time. A separate pro forma was then completed by each academic staff member showing their work activities other than tuition. A spreadsheet model was used to build up each individual academic's total time and thus allocate their actual payroll spend to the department's activities (appendix A, column 2). Where total staff time was less than the contracted time, the shortfall was treated as 'unallocated academic payroll' representing a surplus capacity of staff time (shown as a separate line on appendix A, column 2).

The allocation of staff time to activities is an important element of the overall model due to the proportion of total costs taken up by academic staff costs. A light touch percentage apportionment without due review could easily lead to inaccurate data. This may well be one of the major problems with TRAC as those most critical of it are those who filled in somewhat simplistic time allocation schedules. The system adopted in the case study was more robust. The teaching time was as detailed by the individual module leaders who identified each individual staff member's input. Non-teaching time was detailed by academic staff members in terms of research, consultancy etc. These two sources of information were then amalgamated for each individual staff member. This information had to be signed off by the head of department as being a fair statement. In addition, there was a cross check with the TRAC data for the department within the university as a further reasonableness check. Both the head of the department and programme organizers were satisfied with the data.

Administrative staff costs were apportioned in relation to their individual responsibilities. The same non-teaching schedule as used for the academic staff which included a detailed activity mapping was used for the administration staff. The recorded data was reviewed by the department's head before being submitted to the model. The teaching related administrative support was apportioned across

modules using the FTE numbers of students on each module, while general departmental duties were given a separate activity line (appendix A, column 3). Direct costs (for example consumables) were analysed from data provided by the accounting ledgers and then allocated to appropriate activities, with teaching related costs then apportioned to individual modules on the basis of the FTEs of each module (appendix A, column 4). The administration and direct costs could have been treated as an indirect cost and allocated with these costs as described below. However, with rigorous cost data collection, many of these costs could be allocated directly to specific activities, for example specific research contract costs.

#### *Indirect Costs*

The university's resource allocation model (RAM) was adopted in order to charge central overheads. The university overhead figure was split into nine different cost pools and then recharged to departments via appropriate cost drivers and then allocated to activities using appropriate sub-drivers (appendix A, column 6). For example costs allocated to the department via the RAM driver 'student numbers' were reallocated to activities based on FTEs; while the costs relating to the cost driver 'academic staff' were reapportioned using the academic staff cost apportionments in column 2 of appendix A.

General departmental administration costs were dealt with outwith the RAM and recharged to all of the other activities on the basis of total other expenditure to date (appendix A, column 7). The reapportionment of unallocated academic payroll of £110,759 was accomplished by allocating the calculated staff costs on the basis of the FTE number of students taking the specific modules, as the staff members with unallocated time were not involved in the research portfolio (appendix A, column 8).

Throughout the model's construction, reasonableness tests were carried out with the department managers. The outcomes were also checked against the university's RAM model prediction for the department and the university's transparency review findings. For example the transparency review calculations showed that when considering all staff the percentage of staff costs relating to research was 31%, the value-based model being seen to be close to this with a return of 33.8%.

#### *Sensitivity Analysis*

The arbitrariness of the methods of cost

allocation are often viewed as a stumbling block, with the level of accuracy decreasing the lower the unit of cost object. For example to arrive at overheads at programme level would require university overheads to be apportioned to schools, then to departments and then to programmes with three sets of assumptions.

Sensitivity analysis tests were applied to the model to check the impact of changes to the key assumptions implicit in its construction. These all demonstrated that the model was both versatile and flexible. For example, the initial model considered only the contracted hours of the academic staff. A second iteration using actual hours worked by staff was also considered with an expected cost swing towards research but showed only a shift in costs of just 3.4% of the teaching related costs and 6.4% of the research costs. Sensitivity analysis was also applied to the weightings applied to teaching hours. The original model applied a weighting of 2.5 to each lecture hour, but was recalibrated using a weighting of 3.5 applied to all lecture hours with total costs allocated to modules changing only by between 1% and 3%. Other assumptions were also tested in relation to the overhead apportionments (for example space utilization) as the head of the department was not a supporter of the RAM system. The overhead assumptions were altered and their effect noted as being insignificant regarding the levels of subsidy given across the department.

The sensitivity analysis suggested that there would need to be a very large movement in the underlying assumptions before any significant impact would be seen in the results. At the head of department's request, various reiterations of the model were run based on differing assumptions, with the end result for the department as a whole and across modules remaining predominantly the same. The magnitude of some of the findings, for example deficit modules and research projects, would have required massive changes to the assumptions of the model in order to invalidate the model's findings. This led to the head of department accepting the model because changes to it were not altering the basic arguments regarding the financial positions of the modules and activities.

Senior management's response after sensitivity analysis was very positive and led to a number of strategic adjustments relating to the academic unit concerned. The model was able to provide information that was previously unavailable and so decisions had been taken on, at best, a macro perspective or merely an

intuitive response.

### Conclusions

The benefits of a robust financial information system must be balanced against the limitations. The benefits include operational and strategic decision-making, pricing, and transparency of cross-subsidization. Financial information should not be seen to drive decision-making alone, but nor should it be ignored either due to lack of available information or due to prejudice against financial data. A key factor in reporting should be to link decision-makers to the effects of their decisions. However, while some of the limitations are also obvious, such as the development costs (it should be noted that the cost of implementing TRAC for a typical large multi-faculty research university is thought to be around £400,000–£500,000 per annum over a few years), others are less obvious.

The accuracy of any system is fundamental to its applicability. For the value-based model described to be acceptable, the income and cost assumptions inherent in the modelling must be defensible. This is exacerbated by the chosen level of activity values sought, with the lower levels of activity (for example costs and incomes by module) requiring continuous iterations of allocations and apportionments as opposed to information at a macro level.

It is a dangerous mistake to use the income received for a service as a statement for the true 'value' of education. This would involve a short-term and narrowly-focused perspective based solely on monetary worth. To do so ignores the benefits to the individual, society and state, which although they are intangible are also significant and have provided the rationale for public support of HE over centuries.

The model is in line with some of the recent rhetoric of the university funding bodies. It would be sensible to extend TRAC to teaching. If the government is willing to entrust research project funding to fEC based on TRAC, it seems logical to question the value provided by teaching on differing programmes. In addition to this, there has been the recent development of TRAC to include income and thus surplus/deficit at a macro level for an institution for the areas of teaching, research and other. A valuable future extension to this would be for this to be considered not only at a macro level, but also by research project and teaching programme. The value-based model would provide this information and would highlight significant imbalances in levels of subsidy. The model could be developed to integrate TRAC ideology, such as infrastructure adjustments, and could

be applied across an institution as with TRAC requirements.

The model is extremely flexible allowing information to be collected for different levels of focus: faculty, department, programme, module/project or support unit. Information can be collected at the level of where 'change agents' operates, influencing cost and income movement. Sensitivity analysis can be applied to show the effects of changes to various parameters, as well as providing assistance in the risk management of an organization—for example the effects of downturns. A further adaptation to the model relates to the level of cross-subsidization evident in most institutions where funding for teaching subsidises research activities. Levels of agreed underpinning could be adopted and fed into the model and the model rerun/. Thus an agreed percentage of research time could be regarded as underpinning teaching and re-allocated to the teaching activities resulting in the research subsidy falling.

The concept of value-based management could be considered across other sectors of the public sector. The need for surrogate prices could be a challenge but not an insurmountable one. Surrogate prices could be used by benchmarking costs across the sector—for example refuse collection in local government.

There are political ramifications in the adoption of a model like the one described here. It could be argued that previous systems, such as resource allocation models, are relics of past political backdrops and instruments for power boundaries being set within institutions. The value-based management system has the potential to become another such bureaucratic millstone with the possibility of political misuse. In addition, the cut-off point between financial information and strategic leadership is unclear, with the distinction between professional judgement and financial measurement in such areas as cross-subsidization being non-definable. However, it is clearly of great benefit to be making those decisions with financial information providing additional insight and being integrated with other such data streams.

There is also the need to consider the different cultures within and between universities. Institutions with a managerial emphasis may welcome accounting information, while more 'collegiate' universities might not. Within institutions, data may be welcomed by those from the business studies and science-based faculties and be ignored by those in the arts and humanities faculties. Future research is needed about the different cultures

in HE institutions and their interaction with accounting information. ■

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## Call for Papers: Sustainable Development

Guest editors: Professors Amanda Ball (University of Canterbury, New Zealand) and Jan Bebbington (University of St Andrews, UK)

*Public Money & Management* will be publishing a theme on sustainable development in December 2008 (Vol. 28, No. 6). Topics that could be investigated include:

- The role of the public sector in attaining sustainable development goals.
- The role of indicators sets for sustainable development evaluation.
- Innovative methods for measuring progress towards sustainable development.
- How sustainable development priorities are informing spending decisions.
- The role of sustainable development concerns in PPP schemes.
- Education needs for accountants in the public sector prompted by the sustainable development agenda.

**Extended abstracts of full papers need to be submitted to Jan Bebbington (jan.bebbington@st-andrews.ac.uk) by 10 December 2007. As part of the theme there will be a section recording initiatives that are underway in the public sector. Expressions of interest for this section are welcome at any time before 31 March 2008.**

## Appendix: A university department—summary of cost (£).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		
	<i>Income</i>	<i>Academic staff costs</i>	<i>Administration staff costs</i>	<i>Direct costs</i>	<i>Contribution</i>	<i>RAM overheads</i>	<i>Recharge of department administration</i>	<i>Subtotal</i>		
								<i>Recharge of unallocated academic payroll</i>		
								<i>Net surplus/ (loss)</i>		
<i>BSc</i>										
Year 1	143004	15350	3898	15187	108569	-61451	-14012	33107	-13403	19704
Year 2	264978	34293	7224	28140	195322	-113864	-25964	55493	-24835	30659
Year 3	269184	31939	7338	28586	201320	-115672	-26376	59272	-25229	34044
Year 4	40658	4553	1108	4318	30679	-17471	-3984	9224	-3811	5413
Module 1										
Module 2	40658	4287	1108	4318	30945	-17471	-3984	9490	-3811	5679
Project/ dissertation										
Module 4	40658	19193	1108	4318	16039	-17471	-3984	-5416	-3811	-9226
Module 5	40658	3515	1108	4318	31717	-17471	-3984	10262	-3811	6451
Module 6	40658	4103	1108	4318	31129	-17471	-3984	9674	-3811	5863
Module 7	20329	5396	554	2159	12220	-8736	-1992	1493	-1905	-413
Module 7	20329	6272	554	2159	11344	-8736	-1992	616	-1905	-1289
YEAR TOTAL	243948	47319	6650	25906	164072	-104827	-23904	35341	-22864	12478
DEGREE TOTAL	921114	128900	25111	97819	669284	-395814	-90256	183214	-86330	96884
<i>BSc Course 2</i>										
Year 1	64153	10913	1593	6204	45444	-25102	-7291	13050	-5475	7575
Year 2	88531	14974	2198	8561	62798	-34641	-10062	18095	-7556	10539
Year 3	67745	17227	1682	6551	42286	-26508	-7700	8078	-5782	2297
DEGREE TOTAL	220429	43114	5472	21316	150528	-86252	-25053	39223	-18812	20411
<i>Income-generating activities</i>										
Evening classes	26049	3368	1204	4690	16787	-18977	-3319	-5509	-4139	-9648
Other short courses & consultancy	123400	22000	430	8225	92745	-6778	-10987	74981	-1478	73502
<i>Overheads</i>										
Departmental administration		99566	73817	0	-173383	-79884	253267	0		0
Research & other research-related activities	250260	182066	10967	70438	-13211	-123902	-94428	-231542		-231542
Unallocated academic payroll		81537			-81537		-29223	-110760	110760	0
Totals	1541252	560550	117000	202488	661213	-711607	0	-50393	0	-50393