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ABSTRACT

The introduction of computers in the Department of Accounting and Finance at Manchester University is described. General background outlining the increasing need for microcomputers in the accounting curriculum (including financial modelling tools and decision support systems such as linear programming, statistical packages, and simulation) is followed by a description of the process by which information was gathered on the use of microcomputer application packages by the accounting profession and industry in both the United Kingdom and the United States. The educational implications of microcomputer use are then addressed, including: (1) the need for training students in their use; (2) effects on the social process of learning and on the complexity of case study material that can be employed; (3) effects on the organization and scheduling of classes; and (4) effects of word processing on students' writing skills. The applications of microcomputers in the curriculum are outlined. It is noted that finance, management, and financial accounting were the most appropriate subject areas for microcomputer applications and that spreadsheets and database management systems were the most obvious software packages. Plans for future development of computer applications are described. Two appendixes provide data on the use of microcomputers in the accounting profession. (3 references) (GL)

The Impact of New Technology on Accounting Education

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The Impact of New Technology on Accounting Education

Introduction

When I was asked to prepare a paper for the European Conference of IBSCUG, the organiser suggested that it would be most useful if I could describe and analyse our experiences in introducing computers into the Accounting curriculum so as to bring out the implications for other Universities embarking on the same path, particularly the educational implications.

It is important to stress that that the advent of microcomputers mean that techniques, such as financial modelling, that have been available, in principle, for years, are now widely available. The old technology, mainframe computers, and the associated software, were relatively scarce, costly and cumbersome to use, thereby restricting access to these techniqes. Thus, it is not that anything new, ie conceptually impossible twenty years ago, is capable of being done, but rather it is capable of being done by the many rather than the few.

In the absence of widely available financial modelling packages and other software, one had to write programs to perform these calcualations. Now, with the availablity of application sofware, anyone can perform these calculations with minimal training and relatively cheap equipment. The newer techniques, such as spreadsheets, data base management systems, graphics, expert systems etc, rendered possible by the microcomputer, stress decision making for planning, and to a lesser extent, control. This is in contrast to the older technology which, in the Accounting context, is more appropriate for transaction processing and control.

It is an important distinction to make because the cheap technology is only an enabling factor, it is not important as a thing itself. The different type of software mean that completely different uses will be made of the microcomputer, as opposed to the mainframe. The user must learn a variety of new user roles, which will be discussed further. The pedagogic issues arise because these new roles can only be internalised through some learning exercises. The concepts cannot be grasped in isolation from the operational context.

General Background

The Department of Accounting and Finance at Manchester University is one of the largest departments of Accounting in the UK, although very small by US standards. Our degree provides students with exemption from the the foundation examinations of the major Accounting Institutions. But unlike the US, the Accounting firms hire only 50% "exempt" students - the remaining students hired having studied anything from archeology to zoology. There is no expectation that this percentage will change in favour of the "exempt" students. i.e. students who have studied Accounting or a related subject. Thus all trainee Accountants undergo extensive training while working as a junior Accountant.

University courses have grown very fast to meet the demand for trainee accountants from the profession and industry. Currently 10% of all UK graduates become trainee accountants and of these, 50% have studied accounting or a related subject as their main course of study. Only 25 years ago, less than half of the trainee accountants were graduates and very few of them were accounting graduates. It is now almost wholly a graduate profession.

This means that while Accounting as taught in UK Universities is undoubtedly a vocational course, the University curriculum is not (and does not have to be) as professionally orientated as are courses in the US. There is no requirement for the students to be rigorously instructed in all the mechanics of book-keeping, application of standards, consolidations, etc. The emphasis, in the UK, is on teaching general principles and issues.

Students, as at many other Universities, from the early 1970's, received a one term, compulsory course of computer programming in BASIC. It was reasoned that students needed to understand the general issues involved in programming, the design of information systems and to see the way that computers can be used in business. BASIC was taught as it is the easiest language to learn. Programming, in this context, is a tool to enable students to understand the issues in addition to, rather than a skill in its own right. Students were taught on a mainframe, which was administered centrally. But no use was made of computers in other courses, despite its "in principle" usefulness (cf Fowler 1973).

When microcomputers became available in the late 1970's, the Department, with the aid of finance from Deloitte, Haskins and Sells, purchased a few Apple Microcomputers. This enabled third year students to be offered an optional, one year course in Accounting Information Systems. It was a practical course which included a design study. The course stressed the importance of being able to participate as part of a system development team with an appreciation of information system development theories and methods, the behavioural consequences of system change and the principles of project management.

With the growth of the big multinationals and their requirements for huge transaction processing systems, the organisation of these aspects of the Accounting task were taken over by the Data Processing departments who were computer trained people. Accountants are now trying to get some part of this work back and consequently the emphasis is on training Accountants to become knowledgeable about data processing rather than on data processing specialists to become knowledgeable about Accounting.

Another optional third year course, Management Accounting, involved a significant use of computers, using regression, linear programming techniques and latterly, spreadsheets.

But by 1983, it was becoming clear that computing needs for the department as a whole, i.e. both staff and students, were changing qualitatively and quantitatively. All students needed to be taught to use financial modelling tools and decision support systems such as linear programming, statistical packages, simulation etc. for management decision

making and problem solving.

This was a reflection of the increased use of these techniques in industry, commerce and the profession. It is noteworthy that unlike many other subjects taught in Universities, Accounting follows the profession rather than vice versa. In many other departments, students are being taught concepts and techniques which are ahead of those currently used outside University. This is possible because the Universities are, to a large extent, carrying out the research and development in that area eg physics, chemistry, engineering etc. In Accounting, the developments have come from another source (commercial companies which have developed products - hardware and software). This is a necessary consequence of the fact that Accounting is a set of techniques (albeit problemmatical) for recording financial transactions and assigning a monetary value to a companies' assets and liabilities.

While there was a recognition of the necessity to train students in the use of these new techniques, many members of staff had had little or no exposure to computer applications in business, while others were unclear of the pedagogic benefits of introducing them into the curriculum. Few had the expertise to use the then current application packages (Visicalc, Visitrend, Database management systems, word processing etc). Computing management and development typically fell on the shoulders of one or two members of the department who, although willing to help their other, less knowledgeable colleagues, also had to carry out their own, "mainstream", research.

Thus, despite the objective of developing the students' computer based Accounting skills, there was little formal incentive (in terms of promotion and tenure) to administer the microcomputer computer facilities belonging to the department and even less to develop good computer based materials for other courses in the Accounting curriculum eg finance, financial and management accounting, auditing, tax etc.

It was therefore decided to appoint someone with an interest in and commitment to the computing area, whose resposibility it would be to to develop the computing in the department. There was no necessity for the person to be a computer specialist or even an Accountant. What was important was that the individual be prepared to be responsive to the needs of the other members of staff and provide them with the appropriate skills and resources. To compensate for the added responsibility of integrating computers into the Accounting curriculum, the amount of teaching time required was reduced and the development of educational material for the department was to be viewed as the "research" component, in the initial period, at least.

Information gathering in the UK

While having had considerable experience of handling large data bases on a mainframe computer, the person appointed had had no exposure to microcomputer application packages used in business. The first task was therefore to learn how to use them and to see how they were being used by the Accounting profession and in industry.

This implies a definite recognition that Accounting is a vocational

course and must be responsive to the requirements of future employers. It is also a reflection of the growing competitive pressures on Universities to be seen to be keeping up to date and to offer a first rate degree course for its students.

Initial discussions were held with most of the big 8 firms and some of the smaller firms in Manchester, who expressed their interest in the development of this work and offered to help in a very concrete way. Several firms offered their training programs in computer auditing and microcomputing applications to members of staff who were interested in attending. (Peat Marwick Mclintock, Binder Hamlyn, Arthur Anderson, Arthur Young, Deloitte Haskins and Sells.) Deloitte Haskins and Sellls, in addition to providing funding for microcomputers, also provided money to establish a departmental library for computing journals. Some of the firms, most notably Coopers and Lybrand, were willing to let the University have copies of their audit software, especially if good teaching case studies were designed to make use of them.

Touche Ross expressed an interest in the project and made a substantial contribution towards funding a member of staff to visit the US, to review the use made of computers by Accountants in the profession and in the business colleges, and to assess their implications for the development of Accounting education in the UK. The opportunity to attend conferences and courses, and to acquire books and software was invaluable.

Tinker (1985) stated in relation to the US experience and to a lesser extent, the British, that Accounting is a vocational course, and as such its' course content is geared to the needs of the employers. It has to be responsive to external pressures, eg changes in legislation and Accounting standards, for content validity. Educational techniques and methods, such as the use of applications software, are determined by those currently in use by the practitioners, teachers and the availability of finance.

Discussions were held with the big 8 and several small firms to ascertain the main ways that computers (of all types) are used by the Accounting profession in the UK and also the software that was used. This is listed in Appendix I.

A major use is for their own internal administration eg, time allocation, electronic mail, word processing etc. Other applications stress the number crunching eg consolidation of accounts, foreign currency translation, leasing, etc., which would not typically be taught in great detail at British Universities.

The vastly reduced costs of computers meant that they can be widely used in the auditing task and that auditing, a labour intensive task, can be automated to some extent.

Computer usage was increasing and was expected to continue to increase. All firms had a computer audit team who took responsibility for the computer audit. Previously, computer usage (mainframe and minicomputer) had been restricted to this group, but now with the new technology, all this had

changed and microcomputers were being purchased for use by all the staff. Further more it was being used by individuals as a tool, as part of their work, not as their sole task.

Interestingly enough, while all levels of staff were being trained to use computers, the nature of the applications meant they would be used predominantly by the less senior staff. This is in part due to greater acceptance by younger staff and in part due to the nature of their work.

It was widely acknowledged that computers save a great deal of time and therefore are important in cost cutting. Computers are therefore increasing the productivity of the more junior staff who work on the "production line" tasks of auditing. This in turn is a reflection of the increased competition for auditing work. Ultimately this must mean a reduced demand for trainee auditors, other things being equal.

The main value of this survey was to highlight the wide range of uses to which computers were being put since the advent of the microcomputer and user friendly software. In addition to auditing and administration, computers were being widely used for tax, consulting work and general advice to clients. This is a reflection of the changing nature of Accountants' work from auditing to consulting and other financial work.

At the same time as this survey of the use made by the Accounting profession in the UK of computers, we obtained information (via the published literature, conferences etc), about the computer applications introduced by other Accounting and business colleges. Most of these were American and given the differences already outlined between the US and UK courses and the financial prescriptions as to what should be done rather than an analysis of what they had done. In Britain, it was only the University of East Anglia which had the most experience in integrating computing into the curriculum. (Bhaskar 1983)

We also tried to ascertain what other members of the department would like to see taught. This was less easy as few understood the flexibility and power of the new software. As a result, classes were organised to show them how to use spreadsheets, databases, word processing, etc. Most agreed about the potential usefulness of spreadsheets, but none were prepared in practice to alter their course material or assignments.

Discussions were held (informally) with students who were taking the optional third year courses in management accounting and information systems where computer assignments were a signicant part of the course. The nature of the subject and the type of assignments set lead to a much closer relationship with students than is usually possible on other courses. Most of them were extremely responsive to questions raised about innovations in the accounting curriculum, volunteering their opinions and learning experiences. Many were of the opinion that a course in Accounting Information Systems, application software and information technology was absolutely essential. Some raised the point that it should be made compulsory. Most of them enjoyed working in groups and doing project work. Several felt that the programming course did not adequately prepare students.

Fact finding in the US

Similar discussions were held in the US about the use made of microcomputers by the accounting profession. While they had had a greater experience in using microcomputers, and were more advanced in the use of computers, particularly the development of expert systems, the general picture was not substantially different to that in the UK.

Microcomputers are a fact of professional life in the accounting/auditing profession. They play a major role in such auditing activities as adjusting journal entries and consolidations, and in such tax services as estate planning. Virtually all the major firms are committed to developing their own accounting and microcomputer support systems. Some write their own software, while others base their systems on commercial packages such as Lotus 1-2-3. (These are listed in Appendix II).

However their involvement in Accounting education in the business colleges was markedly different to this country. Several of the accounting firms are devoting significant resources to this involvement, most notably Coopers & Lybrand, with their Accounting Curriculum Development Program, Deloitte, Haskins and Sells, with their Audit and Plus Plan software, and Price Waterhouse with its educational Accounting Practice Support System. Peat Marwick Mclintock are funding the development of computer case studies. Many of the large firms also have significant research funding programs for University staff.

The business colleges were often using the mainframe computers for teaching programming. Usually, they were teaching a general foundation course in programming rather than a course specifically geared to the needs of accounting students. i.e. the issues involved in transaction processing and information systems were not necessarily covered. Many teachers raised the question of the wide range of needs which such general courses had to serve as being a problem. Many felt that the situation was improving as these courses were no longer being taught in a department of Computer Science. Furthermore, departments of Information Systems were being increasingly located in the business colleges rather than Computer Science, and Information Science teachers were to be found in Accounting departments. But the relationship between Information Science and Accounting is an ill-defined one. In some Universities, there are two departments, in others, they are combined.

Microcomputer labs were available for students' use. Many had hard disc systems but all had assistants on hand to help with administration and to give students help with the software. The labs were often open 6-7 days a week, for up to 12 hours a day.The most commonly used packages were Lotus, dBase, word processing, linear programming, SPSS, project management and expert systems. All of them came with self teach tutorials. In addition to microcomputers being available in the business colleges, there were usually other Pc clusters elsewhere. Most libraries had Pcs available for word processing.

The Accounting courses involved much more extensive use of computers than courses in this country, including computer based instruction and

practice sets. Their courses are much more technique orientated than in this country and consequently lend themselves to a greater use of computers. Auditing courses would include a significant use of dBase to check ,say, the payroll file.

Educational implications

As could be expected, many uses (administrative) were not directly relevant to University students, while others were not considered to be useful from an educational perspective. i.e. Some applications are useful in the field and may even be useful in reducing students'workload, but may actually eliminate a procedure that has learning value.

However, it was abundantly clear that to prepare students adequately for the world of work, they must be able to use the new equipment and a variety of microcomputer application software. Compared to mainframe computers where users may belong to any one of a number of user categories such as operators, data entry clerks, analysts/programmers, end users of reports, personal computer users often assume all theses roles. Students will therefore need instruction in the theory and practice of all these tasks.

It would be important to teach a few generic packages so that students could become proficient in each type and be able to build on this experience, to learn with comparative ease, newer packages as they become available. But the emphasis would be on using the software as problem solving tools.

It would therefore become possible to give students much larger, more realistic case studies, and to devote most of the class time to discussing the issues that arise, the assumptions, limitations of the method, etc. rather than going over the calculations.

One of the most noticeable features of the profesional Accountants' courses was that they were "hands on" courses combined with lectures. i.e. they learned by doing. Most people learn more quickly and thoroughly by doing than by listening and reading. Since it is more rewarding they enjoy it more. However, it should be pointed out that it is also a source of frustration, since it is a different type of learning experience and one which conflicts with previous ones.

This strikes at the heart of the University system which emphasises the teaching of theory rather than uniting theory and practice, by giving students thorough practice. This is a reflection of the division of labour within society as a whole (between the thinking class and the doing class). This is one of the reasons why the introduction of new technology presents such difficulties to the University system. It disrupts the existing methods, organisational structures and social relations.

Another implication of the technolgy is the effect it has on learning as a social process. Given that larger, more realistic case studies can be set and equipment may be in short supply, the opportunity exists to set group work. Students thereby learn to work in teams rather than individually and competitively. They learn a wider range of social skills than are currently

fostered in accounting courses. Project work requires them to cooperate with each other, divide the tasks, coordinate, lead and discuss with one another. This type of learning situation makes them less dependent on the teacher and more dependent on their colleagues. Most learning is a social process, but the change in technology makes this more obvious.

However, students do need help in this, to understand the generalisability of their experiences - that they are not unique experiences peculiar to them. It becomes possible, thereby to teach them some of the problems involved in project management. eg to see why some groups had crises and others did not and what could be done to minimise their effects or to avoid their occurrence altogether.

If work of this nature is set, it will have repurcussions on the organisation and scheduling of classes. (In Britain, courses typically consist of one or two lectures per week to the full class of, say, 50-200, in the second year, and a weekly tutorial class or seminar of up to 12 students, which is used to go over the class assignment.) Some classes may need to use the microcomputer lab or at least have access to one micro in the class. It may be that class time would be used to discuss the students' work on an individual or group basis.

There are a number of interesting ways that class assignments may be used. A series of exercises may be set that make use of the previous results as a building block. Projects may be set. One of the draw backs with work of this nature is that there not be the time to give the students adequate feedback about their work. In any event, the students tend to be interested their grade rather than the different ways of tackling the assignment.

One way round this, is for all the groups in the class to make copies of their work, which they distribute to their colleagues and the assignment is, for them as say the senior manager, to review the plans, budgets etc of all the groups, including their own. This requires them to study other people's work and analyse them critically and to see the implications for their own work. Emphasis should be given to criticising their own work. This type of method avoids the problem of how to assess an individual's contribution to the team. It is not always clear how much the less able students, have been able to contribute to the group task. But an individual assignment such as this gives each student the chance to participate as a team and to make his/her own assessment of the work. Most students said they learned a lot by studying the way that other people tackled the problem.

Another aspect of the computer technology that should be mentioned is word processing. In Britain, students typically turn in hand written work which is often poorly presented and difficult to read. Undoubtedly, word processing (and the use of graphics)improves the presentation of the work (and reduces staff marking time), but from an educational point of view there is another advantage that should be considered. Because it is so much easier for students to correct their work or even to add to it, the content, as well as the form may also improve! The technology alters the way that people work. It is no longer necessary to leave the writing up to the end. It can be done alongside the other tasks, in the knowledge that it can be easily altered as

they are going along.

There is another way that the technology (and its associated software) affects students' performance, that is, the method of writing. Because it is so much easier to change what has already been written up, there is no need for the student to write it out in linghand and then type it in. They can just make a series of notes and write it up in detail as they type it in. Typically this results in a style of language which is closer in form, style and grammar to spoken English than written English. i.e. shorter sentences and words with all that that implies for greater clarity. There are now programs which will analyse the readability of a report, the degree of complexity of the language by the number of long words, sentences etc.

Introduction of microcomputers into the curriculum

As a result of this fact finding and analysis, the kinds of applications, the subject areas, software and the educational methods could be identified. Finance, management and financial Accounting seemed the most appropriate areas, while spreadsheets and database management systems were the obvious software packages.

Some educational software was obtained which gave the students practice in book keeping. The students were also given some basic training in the use of spreadsheets (in both the first and second year). The expectation was that they would use the computing facilities as a tool to solve some of the tutorial exercises that had been set.

Thus the approach taken was to introduce computing into the other subjects (first year accounting and second year financial and management accounting.) A couple of extra workshop classes were introduced to give the students hands on experience of using micros and spreadsheets. Extra teaching hours were bought in. (ie the students had different teachers.) It was done as an experiment to see what the take up would be, the administrative problems, etc. It could not have been sustained in that way in the long term.

Several difficulties emerged. The equipment (11 Apple micros) and the software were inadequate in quality and quantity to cope with the potential demand. The shortage of eqipment is not in fact due simply to the lack of equipment, but to their limited availability, only 8-9 hours a day, 5 days a week due to cut backs in the security staffing of the building. A hard disc system was required to pull down the programs and data files, to obviate the need for floppy discs. An IBM compatible system, given its prevalence in the market place, was necessary to support the required software.

Students were still being taught the compulsory second year course on data processing systems using BASIC on the interactive mainframe, ie on a different computer system.

But more importantly, the students were not being taught to use spreadsheets as an integral part of their course in finance or management accounting. The course material was not changed to reflect the change in tools from a calculator to a micro. The staff themselves did not use a micro, either

in lectures or in tutorials, nor did they require their students to do so. Consequently, the students did not see the connection and didn't use the micros after the initial introduction. To a large extent, these problems arose because of the shortage of resources - there was a lack of hardware for staff , leading to lack of expertise.

The hardware problem was resolved by the Computer Board awarding a special grant to the Department of Accounting and Finance to set up a networked microcomputer lab (15 IBM Pcs with 2 file servers) for undergraduate teaching, identify suitable application areas and to develop course material for students.

The equipment was fully functional for the large compulsory second year courses by September 1987. It took longer to get the system operational than desirable, because no money had been allocated for technical help to set the system up or for the running costs. Extra hardware was needed to run the software in the network version. Some of the software was not available in the network version. Thus we have yet to see if the network offers more in practice than stand alone hard disc systems. Ultimately, the system can be hooked up to the IBM mainframe at the Manchester Business School and the mainframe at the University of Manchester Regional Computing Centre.

In addition, the University of Manchester Regional Computing Centre has replaced the interactive teaching machine with IBM Pc compatibles serving as terminals to a mainframe. Additional Pc clusters have also been provided and are administered by UMRCC throughout the University.

The compulsory programming course could therefore be redesigned to take into account the fact that it is through this course that the students are introduced

(1) to information technology
(2) to data processing in business
(3) to the use of computers as a decision making tool.

Programming for Accounting students has traditionally, in the UK and the US, been an unpopular course. Students rarely perceive the value of such a course and its relevance to Accounting. Reviewing the material that students are required to do, it seemed that students did not

(1) do exercises that covered the range of applications that computers are typically used for in management and business and
(2) did not become sufficiently proficient at the programming task that they could see the wood for the trees.

Programming is analogous to learning to drive. When one first learns to drive, one is so concerned with carrying out the correct sequence of procedures and manoeuvres that it is difficult to take into account the actions of the other road users.

The course was therefore redesigned to include exercises covering the range of computer applications in business and management, the updating of

files in sequential and random access mode, to consider the control issues in both and to introduce them to systems development and control. Systems analysis and design is a very difficult course to teach in a classroom context, relying so heavily as it does on practical experience, knowledge of user behaviour, etc; areas in which students have little prior experience. It was therefore decided to make use of films which could convey these issues much more realistically and succinctly than could be done in lectures.

Two of the professional firms of accountants which had produced films for their own staff and client training programs came to show their films to the students. One dealt with the importance of systems specification and showed what could go wrong when this was not clarified. In addition to examining the role of the various user departments, the DP manager and project manager, the film also looked at the role of the accountant who sat on the the delopment committee.

The second film dealt with the control issues which came to light after a systems analyst left suddenly and the financial implications for the business. Again the role of the accountant was crucial.

A major problem in a course of this sort is the type of course assessment that validly measures the students' achievement in understanding the course content. A further problem is that students in the UK are used to having their performance assessed soley in terms of a final examination at the end of their academic year and yet it is difficult to set examination questions which will validly test all the knowledge and skills they have acquired in the course. It can therefore be very difficult to get them to do their course work with any sustained effort.

It was therefore decided to set a project which would count for 60% of the final marks and an essay, written in examination conditions on a pre-determined topic, which would count for 40% of the final marks.

A project was set which involved giving the students a listing of four separate programs which together made up the elements of a very rudimentary stock control system. They were asked to make the system user friendly by merging the programs, using a menu, including more helpful screen messages, improve the usefulness of the reports and to improve the security by introducing password control and more details in the audit trail that logged the changes made to the stock levels.

In addition they were asked to provide documentation, ie to write a user manual and a detailed program specification and to produce a report reviewing the controls within the program.

A third film was used as the basis for the final examination which was to take the form of a prepared essay on control issues. The BBC had made dramatised version of "Equity Funding" and this was used as the basis of a compusory examination question on the use of control procedures by management to prevent and minimise the effects of such a fraud.

Thus it can be seen that the approach taken was to cover much of the

material covered in an I.S. course. The students achieved a very much higher level of knowledge and competence in programming than in previous years. On the whole their reaction to it was good, after their initial horror at the amount of work that was involved. Typical comments included :

"It was hard work, but it was worth it"

"It has increased my confidence, doing so well in a subject that I found so difficult at the beginning"

"I can understand articles in the computer press now"

"It's great being able to help others, I never thought that would happen!"

Students would stop to discuss issues that had arisen in the press or in their work that indicated a significant knowledge in the area.

There were several problems that arose. It is extremely time consuming, both in the extra staff/student contact this type of course work necessarily involves, and also in the testing of their programs and reading and assessing their documentation. (We have no teaching assistants in British universities and few student.. type their work.) Next time the students will be required to write their documentation on a word processor and more explicit instructions will be given on documentation and test data.

Despite these problems, the project was remarkably successful and will be used again, with these modifications, as the basis, in part, of the course assessment.

While a start had been made in integrating computing into the Accounting curriculum, via I.S., which had until 1987 been taught on a mainframe, there was still a need to teach the students to use the newer application sofware. The primary problem was that none of the teachers in the mainstream Accounting subjects wanted to teach computer software and hardware at the expense of class tinme in the primary discipline. But the other side of the problem was that experience had shown us that students wouldn't use the software unless it was incorporated into a mainstream subject.

The solution adopted was to teach the use of spreadsheets in the compulsory, second year, data processing course which is in fact a half course, front ending introductory finance. Computing and finance were to be integrated by teaching the programming to encompass both data processing and the calculation of financial problems such as NPV, IRR, gilts, mortgages, regression etc. After having solved the exercises, mathematically by programming the solutions, the students would be taught to use spreadsheets.

This puts greater onus on the computer teachers, since the only way that time can be made to cover all the material in finance and systems, is to teach programming in a hands on workshop only, without any lectures. However, significant numbers of students are now coming to University with some prior exposure to computers. In addition, the course will now be taught on the

department's Pcs which are easier to use than a mainframe, thus saving considerable time, especially in the initial stages for the computer novices. In addition the computer lab has been designed as a classroom, making it easier to teach and supervise the students.

Thus the computer part of the course will consist of data processing, spreadsheets and word processing for the documentation of the stock control project. The course assessment will include the stock control project with the amendments outlined above (60% marks).

The second part of the course assessment will require the students to work in groups on a large scale topic. They will have to prepare a plan for hospital management, using Lotus, from non-financial data such as bed-occupancy rates, length of stay etc. There are several educational objectives:

(1) to give the students experience in working as a team, helping each other etc. as discussed above.
(2) to tackle a much larger scale topic than could reasonably be asked of them if they were working on their own.
(3) to introduce students to other areas not so far covered in the mainstream accountiing courses, namely social accounting. The degree course is very much biased in favour of the the corporate sector. Social and public accounting is taught as an optional subject in the third year, but given that the students have had no exposure to this subject prior to the third year, not many chose to do it. Given, also that the computing and finance course is the only compulsory course in the second year, it seemed appropriate to use this opportunity to widen the scope of the course. It also happens to correspond to the interests of several of the teaching staff!

The students' projects will not be assessed as such. Rather the work will form the basis of one compulsory question in an examination - on the use of a computer as a decision support tool for planning and control. Once again, the purpose is to get the students to do some useful work and to obviate the need for any cramming and regurgitating of facts for the final examination. In any event our regulations require us to mark a student's work individually rather than as a group.

Thus the impetus for curriculum innovation and integration is coming from the I.S. course which is adapting to meet the needs of the department as a whole. As more Pcs become available, it is intended to allocate them to members of staff who are interested in using them for teaching purposes. It is hoped that the teachers of the second year courses (and later on the third year courses) will adapt their course material to encourage/require the students to use the software to produce innovative solutions. As more new staff are hired, it is noticeable that they are more likely to be willing/able to make use of the newer applications software.

Future Developments

There are several areas we would like to develop:

(1) We would like to obtain a set of company accounts to use as a data

base for students studying management accounting. i.e. so that exercises could be set which would require them to chose the appropriate data, "pull" it down from the data base, and analyse it.

(2) We would like to develop/obtain business games which could be used for tutorial exercises. As well as the obvious educational value in teaching the students skills in planning and decision making, they have another useful purpose - they serve as icebreakers, particularly at the beginning of the academic year. Typically, our courses are very large, students do not, in the main, know many of their fellow students, many students are foreign, and as a result, it can be very difficult to generate much discussion among them in tutorial groups. Interactive, team games could be useful in this respect.

(3) We have not so far discussed the use of computer based instruction in very much detail. Having looked at some of the material that is available in this country and assessed students' and our own reaction to it, we felt that such material would possibly be useful, but on a remedial basis only. i.e. it would be available as a resource for those students that were having difficulty with a particular topic, or who wanted additional practice, rather than compulsory for all.

The Plato, Mas and other authoring systems are available within the University, so that in addition to reviewing any commercially available accounting software, it was intended to investigate the potential value of designing our own software for use by students who wanted extra practice in certain techniques. So far, computer based instruction and exercises have been developed for ratio analysis, trial balance adjustments and inflation accounting.

(4) Some of the commercially available accounting software, e.g. incomplete records, may be useful for educational purposes. In addition, as has been stated earlier, some of the accounting firms have indicated their willingness to give us their software if we can design suitable exercises for student use.

Clearly there is scope for the development of educationally useful computer based case studies and other material which can be used in the accounting curriculum for illustrative purposes. This will need additional financial resources if these potentially promising areas are to be explored.

We are, however, very fortunate at Manchester University in that we offer a Joint Honours degree in Computer Science and Accounting. This degree requires the students to take several courses from each department. In the past, students have complained because the two sections of the course are not integrated at all. They had come to the University expecting to learn about computerised accounting systems and business applications of computers. The only course that brought the two sections of the degree together was the optional third year course in Accounting Information Systems. (The Computer Science students used to be exempt from the second year programming course.) Now that it explicitly covers the issues as they relate to accounting, the students are required to do the course, although they learn to use a database management system rather than BASIC.

A change has been made to this degree course. Students in the third year are required to do two one term assignments, preferably in groups, in any of a variety of subject areas, networks, graphics, etc. Now, accounting has been added to the list! This is not a taught course, but rather one of independent study.

Several different type of assignments have been set. The choice is entirely up to the students.

(1) A typical design project such as a hotel billing system, point of sales system, accounts payable, telephone invoicing etc. The programming language used is dBase.

(2) A design project for a "customer" within the University. e.g.forecasting the demand and comparing budgeted with actual expenditure on gas, electricty, oil for the University adminstration. Designing a debtors' diary system for the research contracts division using dBase, an income/expenditure program for an academic department using Lotus, timetable scheduling etc.

(3) Students may also suggest a topic that they would like to do that links up to one of their other courses. One student built a generalisable model, using Lotus, showing the economic effects of a plant closure. Other students built an Expert System for calculating and diagnosing the standard cost variances. An Expert System for portfolio management was also designed.

(4) We are also encouraging staff who have a model or an idea that they would like developing for their research or teaching, to offer these as suggestions for the Computer Science students' assignments. Thus we hope to develop and explore the usefulness of some of the ideas outlined above, with the students' help.

These assignments have proved extremely popular with the students. Nearly all the students are chosing to do at least one accounting assignment. They particularly appreciate the fact that their work is going to be used, either by staff, a "customer", or future students. Some of them have even suggested areas for development.

One other way that their work can be used as subsequent student exercises is for software evaluation - in terms of controls and user friendliness. We now have several versions of the hotel billing and point of sales systems which students on other course could compare and evaluate.

The point is that although it is costly (in terms of time and money) to develop or obtain software, there are potentially sources within the University system which can provide assistance.

Conclusions

The technology and software is constantly changing with the result that the curriculum will need to reflect these changes. We must constantly analyse

our experiences and draw out the lessons. More than many other subjects, this is an area that can be expected to change and to produce changes in the social relationships and methods of teaching. It is imperative to make these changes on the basis of the widest possible discussion with staff, students, other departments in the University, and with prospective employers.

These changes are undoubtedly very expensive. Finances have been difficult to obtain because in the past business subjects required few additional resources other than teaching staff and books. Consequently there is no mechanism within the budget for either capital expenditure or, perhaps even more importantly, recurrent expenditure for running costs and maintenance. But our experience has shown that inadequate finances, and uncertain finances, are extremely wasteful. There has to be a recognition that if the Universities are to be able to respond to the new technology, additional resources, including time and incentives to staff, must be made available. To be told that the money to fund the maintenance costs for undergraduate courses should come from courses put on for the community at weekends will exacerbate the situation not resolve it. It will be necessary to provide adequate funds for research and teaching programs that will support the integration of Information Systems, Decision Support Systems and Accounting education.

The day to day management and administration of a computing lab by a teaching department (as opposed to a computer centre) places an extra work load on the teaching staff. Again, additional finances need to be made available to cover the costs of technical and administrative support.

There is a contradiction here. THe use of computers by the profession reduces costs/increases productivity, but within the teaching function of the University system, it raises the revenue requirements without incurring any obvious cah savings to the University. That is, the public sector is bearing the cost of training students in the new technology for the benefit of future employers. In the short and medium term, the introduction of new technology is increasing the workload of the teaching staff. Thus only relatively large departments will be able to absorb this extra work load. In the longer term however, if the requirement for graduates is reduced, this will mean a reduction in the number of students enrolled in accounting courses, with the corresponding reduction in staffing requirements.

As accounting teaching becomes more capital intensive, it must accelerate the trend to reduce the number of institutions where accounting is taught. It will lead to mergers/closures of departments as some institutions are able to implement the new technolgy and others are not.

In the short term, those students who have received training in the new technology and have been exposed to a curriculum and educational methods that result from this, will be more productive and while these skills are still in relatively short supply, will have a competitive advantage in obtaining more highly paid jobs. In the longer term, however there may well be a reduction in the number of such students who are required.

Within a short time, as the requirements for computing on the other

accounting course increase, there will not be adequate facilities for the students. In part, this is because the equipment (with the relevant software) is only available till 6.30pm in the evenings, 5 days a week. Keeping buildings open for a longer period may be cheaper than buying more equipment. There are other Pcs available in the University, but they do not all have the relevant software, eg Lotus and dBase. Thus there has to be some coordination of selection of basic software for use by a large number of departments.

It is not at all clear what advantages there are in practice, of a networked system over a stand alone hard disc system. While the network allows students to share data files, this could be accomplished just as readily by a hard disc system. The network will allow access to other systems in the University. At the moment, it is not clear that this is essential. The main disadvantage of the network system has been the initial set up time.

Several commercial packages can be identified as a standard around which teaching can be based, eg Lotus and dBase.

The development of exercises and case studies, etc takes time and may well be beyond the resources of a small accounting department. A means of exchanging software/case studies between departments needs to be developed.

All these considerations show that the introduction of new technology in accounting departments meets severe constraints from the existing organisational structure and lack of finance. But it will be difficult to implement new educational techniques if these questions are not tackled.

However, it is already clear that new technology is having some impact on the accounting curriculum and that innovative methods of instruction and assessment follow on from these changes. The new technology, Information Systems and Decision Support Systems concepts provide new opportunities to address the area of accounting education, the emphasis to be given to different issues and the approaches to be taken to teach the subject.

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Appendix I

The use of microcomputers in the Accounting profession

Audit Applications

1. Working papers
   - Lead schedule preparation
     - Ratio analyses
     - Posting of adjustments
   - Consolidation
   - Downloading clients' data
   - Decision support systems - internal control
   - Analytical review
   - Financial statements - final reports
     - Balance sheet
     - Income statement
     - Changes in financial position - historical data
   - Accounts receivable circularisation
   - Flowcharting
   - Tax provision
   - Foreign currency translation
   - Funds flow statement
   - Documentation/memos
     - Standard programs
     - Standard checklists
     - Preparation of memos/letters

II Statistical analyses
   - Attribute sampling
     - Determination of required sample size
     - Random selection of sample
     - Evaluation of sample results
   - Regression analysis
   - Documentation of compliance testing
   - Documentation of substantive testing

III Leasing

IV Management
   - Staff scheduling
   - Time accounting
   - Client facts organiser
   - Project management

V Specially developed models/programs
   - Fixed asset/depreciation schedules
   - Analytical reviews
   - Other applications

Tax applications

In-house tax return preparation
Tax projections
Special projections
Retirement planning
Estate planning

Management consulting services applications

General ledger reporting package
Cost trend analysis
Graphics for reporting
Flowcharting
Time management
Special modeling and system development
  Forecasts and projections
  Leveraged buy out projections
  Lease v buy decisions
Evaluation of software packages

Administrative applications

Staff scheduling
Budgeting
Internal book keeping
Management system
Publication/library catalogue

Software

General ledger system
Fixed asset system
Lotus/Supercalc spreadsheets
Word processing
dBase III
Communications software
Graphics software
BASIC/C/Cobol

APPENDIX II

FORMAL APPLICATIONS SOFTWARE

Application	Arthur Andersen	Arthur Young	Coopers & Lybrand	Deloitte Haskins & Sells	Ernst & Whinney	Peat, Marwick, McLintock	Price Waterhouse	Touche Ross
Trial Balance and Lead Schedules	MTBS	AYASQ	Pre-Audit	Atom1-3	FAST	FSS	APSS	TR General Ledger Package
Consolidations	yes	yes	yes	no	yes	yes	yes	yes
Supporting Schedules	no	yes	no	no	yes	no	yes	no
Historical Comparison	1 year	1 year	1 year	4 years	1 year	1 year	1 year	2 years
Ratio Analysis	yes	yes	yes	yes	yes	no	yes	no
Final Report	Trial Balance	Financial Statements	Financial Statements	Financial Statements	Financial Statements	Financial Statements	Financial Statements	Financial Statements
with Footnotes	n/a	yes	yes	no	no	yes	no	no
Tax Provisions	yes	template	template	template	template	template	yes	template
Statistical Sampling	yes	yes	yes	no	yes	yes	yes	yes
Decision Support for IC Evaluation		yes	no	yes	no		no	no
Estimation Sampling and Regression Analysis	no	no	yes	yes	no	no	no	no