Educating the Masses — Is IT a Tricky Business?

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The increased use of Information Technology (IT) applications has changed the world of business, commerce and industry significantly over recent years and, consequently, the training and education of managers in this field. This has led to universities and colleges of higher education to invest heavily in the area of IT. Furthermore, the continued popularity of business and management degree programmes, coupled with an expansion of student numbers, has resulted in many institutions re-evaluating their curricula with respect to their students' acquisition and development of IT expertise. This paper is based on research conducted by the authors and looks at IT provision within such courses at UK institutions of higher education. A key element of this work is the identification of trends in this area with particular emphasis on 'good practice' in the teaching of IT to business students.

1. INTRODUCTION

Over the last few years there has been a significant growth in the number of students embarking on business and management courses at UK institutions of higher education. Annual statistical reports published by the Polytechnic Central Admissions System (PCAS), for example, confirm this apparent trend with well over 100 000 students applying for business and management degree courses each year, the highest figure of all subject areas. However, while in 1986 approximately 5.3% of these applicants secured places on available courses, the development of new business related courses, coupled with a planned expansion of student numbers, has resulted in a corresponding figure of 11.4% for 1990–91 [5].

The influx of increasing numbers of students has had significant ramifications on resourcing in higher education, not least in the area of Information Technology (IT) and its incorporation within the curriculum. Furthermore, as technology has evolved, IT in a business context has subsequently changed, resulting in a shift from data processing and computer programming to the use of standard software packages (typically word processing, spreadsheets and databases) based on PC configurations, as opposed to the large mainframe systems of yesteryear.

The importance of IT has also been recognised by the validatory bodies overseeing the activities of institutions offering business and management education within the UK, manifesting itself in a number of review reports over the last five years [1–3]. Limitations in technical and human resourcing, as well as shortfalls in existing staff expertise, have consistently been identified as barriers to the development of IT within the curriculum. Furthermore, the teaching of IT in a business context has not always mirrored the requirements and corresponding growth within industry and commerce.

Against this backdrop, in 1991, the authors conducted a fairly wide ranging survey of UK institutions of higher education, with a view to securing a snap-shot of the current state of IT provision and associated teaching practices within business and management courses. The survey was restricted to the newly established UK universities (formerly polytechnics) and colleges of higher education, due to a combination of time and cost factors, but essentially because this sector has traditionally specialized in business education and is responsible for producing the majority of business graduates when compared with the 'traditional' university sector [6].

A wide range of issues were investigated in the survey covering various aspects of IT education in business courses. Specifically, the following were addressed,

1. Changes in prior learning of undergraduate and postgraduate students, and the impact of these changes upon the design and delivery of IT within business and management degree courses.
2. A general overview of current hardware and software provision, and how these resources are used within the teaching of business and management courses.
3. The IT competencies of staff and students, and how these translate into the needs of business and industry.
4. Good practice in the design, delivery and teaching of IT within business and management degree courses.
5. The extent to which IT is incorporated in strategic planning policies within institutions.
6. Plans for the further development of IT within business and management degree courses.

This paper provides discussion and summaries of the key findings, with particular emphasis on the IT skills acquired by students within their courses, as well as other curriculum related matters. A full version of the survey findings appears in [4].

2. METHODOLOGY

The survey was initially conducted by postal questionnaire distributed to a population of 51 institutions, each offering a combination of undergraduate, postgraduate, full-time and part-time business and management programmes. From these, a further 10 were then selected for personal interviews, aimed at extracting more qualitative information than it was possible to provide from the questionnaire. All telephone and postal contact was made with the Deans/Heads of Faculties at the various institutions, although senior staff with responsibility for IT were occasionally used at the personal interview stage.

The range of business and management courses offered at both undergraduate and postgraduate levels is extensive. For this reason BA (Hons) Business Studies (both sandwich and part-time) was targeted; at postgraduate level, DMS and MBA courses (full- and part-time) were considered, since one or other (or both) are offered by the majority of institutions.

Some attempt was made to try and ensure that both institutions offering well established undergraduate and postgraduate courses (both full- and part-time) and institutions with relatively new business and management courses were selected.

Prior to the main survey a pilot study was carried out at three institutions, with a further institution participating at the interview stage. Questionnaires were distributed in March 1991, with the interviews taking place in May/June 1991.

Thirty five questionnaires were returned giving a highly respectable response rate of 69%, with eight out of 10 of the targeted institutions agreeing to be interviewed.

3. ANALYSIS AND DISCUSSION

3.1. Policy issues

To assess whether the integration and development of IT within business faculties has evolved naturally or has been part of a longer term strategic plan, respondents were asked to state whether they have an institutional, faculty and/or departmental policy, specifically addressing the incorporation of IT within the curriculum. Approximately 70% of respondents appear to have one or more of these policies, most being at faculty or departmental level, few having been in existence for more than 5 years. The contents of such policies vary from institution to institution, although common trends do emerge. For example, none have any stipulated criteria for students' IT competencies on entering their institution, but for students leaving, 80% of respondents indicated that this is stated in their policies. In terms of future development of IT within their courses, institutional policies have a tendency to concentrate more on hardware, software and accommodation provision, than issues of curriculum development, whereas faculty and departmental policies are more likely to incorporate plans for future development from both a technical and human resourcing perspective.

For those having policies, a variety of reasons are put forward in terms of the benefits accruing, most centring around technical resourcing. Specifically, it appears that a major reason for adoption of an IT policy is the standardization of resources and economies of scale, thereby helping to reduce redundant hardware and software. As yet, policies largely ignore specific curriculum matters in favour of issues of central purchasing.

3.2. IT competencies — prior knowledge, tuition and assessment

Most students (80%) embark upon their business courses with no IT related qualifications. Few undergraduates have any prior exposure to IT either through work, educational or personal use and of those that do, it appears that this is almost entirely attributable to 'working' students embarking on part-time degree courses or mature students with previous work experience. Seldom is any expertise or potential ability (e.g. assessed via aptitude tests) looked for during recruitment of undergraduates. However, at postgraduate level about half have some previous IT experience, with approximately a quarter of respondents surveyed actively looking for IT experience or potential ability/aptitude in their postgraduate selection process.

Traditionally, full-time undergraduate business degree courses have been structured to assume that students have no IT knowledge or experience and this still appears to be the case. All first year students receive some formal tuition, with roughly equal proportions of respondents having 1, 2 or 3 h per week of tuition (or equivalent hours) over a typical academic year. In 10% of cases, more than 3 h per week is devoted to IT tuition throughout the year. However, for some part-time courses, a student's previous experience (or lack of it) determines whether a IT foundation course must be attended when embarking on their degree programme. The picture changes slightly in the second year, with approximately one fifth of respondents indicating that their students receive no formal tuition. The majority receive either 1 or 2 h per week, on average. The figures for the third (typically a placement year) and fourth years differ quite noticeably and are often dependent on options and electives taken. Thus, it is conceivable that a large proportion of students receive no tuition at all during these years, even though they will almost certainly be using IT skills and knowledge acquired earlier in their courses. Indeed, most interviewees indicated that this is usually the case. At postgraduate level, far fewer hours are devoted to formal IT tuition and this is clearly influenced by the prior knowledge of students, as mentioned earlier. At this level, tuition is more likely to take the form of a short programme of study, designed to refresh students' knowledge, with greater emphasis placed on self development. Most institutions offer addi-

tional remedial support for students. The format of this is varied and includes surgeries/help desks, self learning materials, video facilities and computer aided learning packages. In the case of part-time students, 'hotlines' may even be provided.

All institutions expect their students to graduate with IT skills in word-processing and spreadsheets, together with a working knowledge of operating systems. At undergraduate level this is true of databases, accounts/finance packages and statistical/mathematical packages, with approximately a half of respondents expecting students to possess knowledge of graphics packages, although it is highly likely that such expertise is accounted for via the graphics facilities offered by many spreadsheets. Other areas, such as desk top publishing (DTP), expert systems, programming languages, networks and communications, are more specialized and tend to be taught only in IT/information systems modules offered in years 3 and 4 of undergraduate courses. Integrated packages which typically incorporate word processing, spreadsheets and databases, are also in use in a small number of institutions.

In terms of software adopted within business faculties, Figures 1–9 give some indication of this. Often a range of software was quoted for each type of package but unfortunately there was seldom any indication as to which is the most frequently used. Nevertheless, there are obvious trends apparent and certain brand names
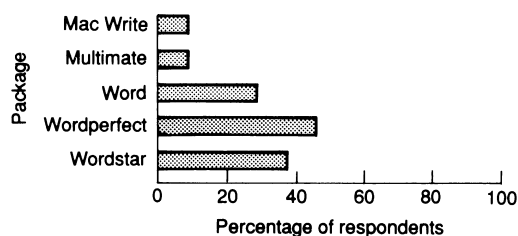
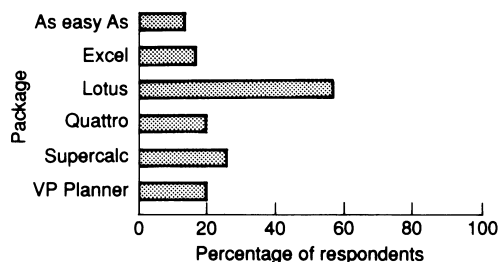FIGURE 1. Word-processing packages. Number of responses = 35.

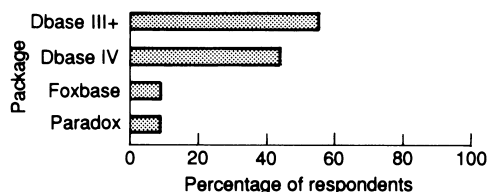FIGURE 2. Spreadsheet packages. Number of responses = 35.

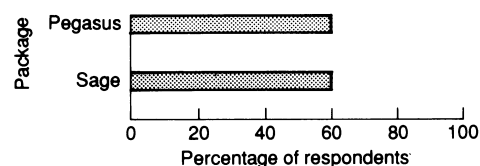FIGURE 3. Database packages. Number of responses = 34.

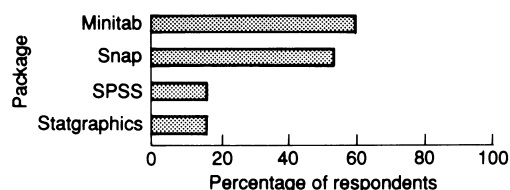FIGURE 4. Accounts/finance packages. Number of responses = 30.

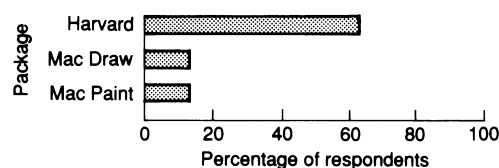FIGURE 5. Statistics/mathematical packages. Number of responses = 32.

FIGURE 6. Graphics packages. Number of responses = 30.

FIGURE 7. DTP packages. Number of responses = 23.
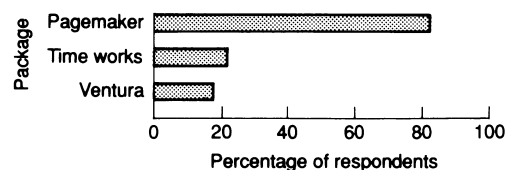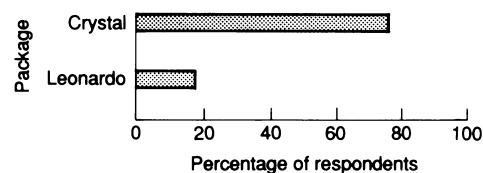
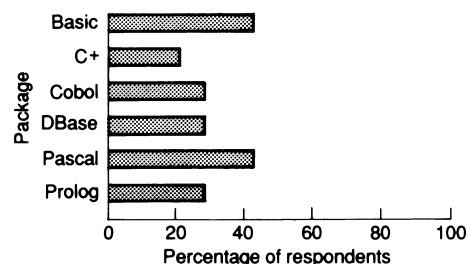FIGURE 8. Expert systems packages. Number of responses = 17.

FIGURE 9. Programming languages. Number of responses = 14.

appear to be in more widespread use than others. (Note that only those brands mentioned by at least three respondents appear in any of the graphs).

The rationale for adopting specific software packages is not always clear. In certain institutions, an evaluation

process is carried out based on specified criteria. Typically, ease of use, text-processing facilities, industry compatibility and market share are frequently cited, with ease of data transfer between software packages becoming an increasingly important consideration. Others are constrained more by limitations in finance rather than any formal evaluation criteria. Broadly speaking while there is no overall consensus on which criteria should be adopted, the institutions/faculties with planned IT strategies tend to have more structured mechanisms for the selection of software. While certain software appears to be used more often than others, most respondents stress that the skills acquired by students are very much transferable from one package to the next.

It would appear that the teaching of IT competencies is still firmly in the domain of dedicated IT classes, although not surprisingly the teaching of accounts packages falls within the accounts/finance area and statistical/mathematical packages falls within quantitative techniques. Information systems is an area responsible for teaching not only common skills but also many of the more specialist skills, e.g. DTP, expert systems, etc. While other areas of the curriculum clearly make and have use of IT skills/knowledge, there is little evidence to indicate such integration, in all but a few isolated cases.

The diversity of approaches to the incorporation of IT within business courses is also reflected in the range of delivery techniques available to staff within each institution, governed not only by the resources available but also highly subject dependent. As regards methods of delivery, staff supervised workshops and formal lectures seem to be the most popular. The latter can be particularly effective when using support technology such as hardware/software linked to overhead projectors, for example. It might be argued that this is a better use of staff time than the often intensive workshop sessions. Certainly this approach can help to motivate students and staff (as regards lecture preparation and delivery), and seems to find favour, particularly at postgraduate level. Unsupported self-tuition and computer aided learning appear to have limited appeal.

Assessment of students' IT competencies varies depending on the skills to be monitored but tends to be through integrated assignments and in some cases, dedicated assignments. Formal computer-based examinations receive little favour. Much of the assessment tends to be implicit and in many faculties, there is often the stipulation that all reports should be word processed, with other IT tools used, as appropriate. Knowledge of operating systems is unlikely to be assessed explicitly. At postgraduate level, assessment centres around integrated assignments, although in many instances no explicit assessments of the various skills are made.

3.3. Barriers to the acquisition of IT skills

The types of IT skills acquired by students following business and management degree courses are determined by educationalists with a wide range of expertise in the application of IT in business and industry but is also greatly influenced by the needs of potential employers. The majority of institutions are confident that the skills acquired by their students are meeting the needs of industry, although this tends to be through informal discussion with placement companies and employers, rather than any formal mechanism for assessing this within the various business faculties.

However, despite this confidence, certain factors were cited as being particular barriers to the education of business students in their quest for IT competence. At undergraduate level, it was apparent that lack of non-specialist staff capable of teaching IT is perceived as the major barrier to students acquiring IT competencies required by industry. Quantity of hardware, accommodation restrictions, the number of specialist staff and limitations in technical support are also cited as limiting factors. Variety of software is also important but hardware/software non-compatibility with industry and lack of involvement by industry are not particularly seen as problems.

A similar pattern is observed at postgraduate level, with non-specialists capable of teaching IT being the major constraint, although quantity of hardware and accommodation restrictions were emphasised slightly more than lack of IT specialists and technical support restrictions.

3.4. Resourcing issues

The design and delivery of the curriculum is greatly influenced by the facilities and resources available to the various institutions.

In terms of staff expertise, the survey illustrated marked differences across institutions, not only in the quantity of staff within business faculties but also in the number actively using their IT skills both for personal and lecturing purposes. Although few details are given here, it would be fair to say that as a whole, the responsibility for teaching IT skills lies in the hands of a few so-called specialists typically in the areas of quantitative methods, finance and information systems.

The use of demonstrators is not particularly widespread, with only four respondents actually having any. There is a general feeling that they are a 'luxury' that most business faculties cannot afford. However, to those institutions already employing them, the benefits are clear. Not only do they assist in the teaching of IT skills to students but also prepare open learning and self study materials. Hours devoted to basic IT skills teaching by lecturing staff can be reduced and technicians can concentrate on 'technical' aspects, rather than constantly assisting students with software problems. Furthermore, demonstrators can assist academic staff in their own IT development.

Technician support is also highly variable both in terms of quality and quantity. Most business faculties

had experienced difficulties in this area and the role of technicians appeared to be a rather emotive issue.

As regards physical resources, wide variations were reported in the availability of hardware and software, due to the differing resourcing structures at the various institutions. While many faculties control their own hardware facilities, others share institution wide resources, normally operated under the umbrella of 'Central Computing Services' or some such title. In certain cases, while stand alone or networked machines may be in the hands of the business faculty, access to centrally controlled mainframe or minicomputer resources is usually another facility offered to business and management students, although less and less reliance is being placed on this type of resource.

Most have a combination of resources, although at each institution there is a tendency to veer towards stand alone machines with a few networked machines or vice versa. About three quarters of respondents have up to 100 stand alone PCs designated for teaching purposes, with a corresponding figure of 80% having up to 100 networked PCs. These figures fall dramatically when considering stand alone and networked PCs devoted to casual or open access only, with just 39% of respondents having any of the former and 20%, the latter. It should be pointed out, however, that time-tabled laboratories effectively become casual/open access when not in use.

On the basis of responses at interview, machines based on a 80286 processor appeared to be the most common format for the PC-based resources, with many stating that an upgrade to 80386 processor (or above) based machines was likely, thereby allowing the effective operation of a Windows (tradename of Microsoft Inc.) environment.

By and large, the choice of machines depends on a combination of financial constraints, compatibility with existing institutional and/or business faculty equipment, as well as attempting to provide similar hardware as used in business. On this latter point, most respondents seem committed to keeping up or getting ahead of industry.

Another important aspect of resourcing is access to equipment, which is available for use by students for at least 5 days a week. Nearly all respondents have facilities which are available for more than 8 h a day (Monday–Thursday), although for Fridays only two thirds of respondents offer an evening service. Of the 60% of institutions offering weekend access, half are open on Saturday mornings only with less than 20% open on Sundays. About a third of respondents also indicate that some form of booking system is employed in the use of the casual/open access facilities and in some cases, restrictions are placed on the length of time a student is permitted to use the facilities.

As regards the supervision of casual/open access facilities, various personnel are employed, including technicians, demonstrators and postgraduate students.

However, while some evening supervision takes place in certain institutions, most operate a '9-to-5' system only. At unsupervized times, problems can arise, although assistance from central computing services may be called upon.

3.5. Good practice

Perhaps the most important aspect of this research was the identification of 'good practice' in the teaching and delivery of IT within the curriculum, and this was probed on both the questionnaire and at the interview stage. This is particularly pertinent with the apparently ever increasing numbers of students being admitted to the nation's universities.

Many respondents felt that courses should be vocational in nature and that by keeping in touch with industry, via placement students and research/consultancy activity, relevant and up to date courses could be designed to fulfil the needs of employers.

The development of staff appears to be an essential ingredient of good practice, as they must be seen to be competent, up to date and knowledgeable about IT within their own subject area. In this way, staff lead by example. There was common agreement that a number of specialist staff, preferably with recent business experience, are essential in any business faculty. They, in conjunction with a committed Dean/Head who is prepared to allocate time and resources, are responsible for creating and maintaining an 'intelligent user ethos'. A clear and supportive IT development strategy catering for the needs of non-specialists is seen as a key element of such an environment and the availability of appropriate and easily accessible technical resources for all staff is also an important consideration. Such an approach promotes an atmosphere of good practice, permeating through the curriculum to the students.

Respondents also believe that good practice manifests itself in the careful design and delivery of the curriculum. Co-ordination, integration and monitoring of both IT teaching and the learning experiences of students is a necessary requirement. Greater emphasis on information as a resource and its value to managers is also a desirable feature, as is the embedding of IT within all functional subject areas, where appropriate, so that it is seen as a tool and not a means to an end.

The development of good, professional, self learning materials, as well as the use of realistic examples via case studies emphasizing problems encountered in reality, is also perceived as an essential ingredient of good practice.

In terms of delivery of the curriculum, a variety of modes can be used ranging from the traditional lecture/seminar to less structured self study, supported by high quality learning material, where students can progress at their own rate. Resourcing constraints have tended to push many institutions towards non-contact use of IT, either through project work or self supported

study, rather than formal classes and this is a particularly favoured approach at postgraduate/post experience level where it is not good use of contact time in most subjects. However, doubts persist as to whether this is good practice, unless carried out in an supportive IT environment.

The use of live classroom demonstrations, with relevant hardware and software, can also be a useful tool in motivating both staff and students, allowing the emphasis of both techniques and applications.

Hands on experience is essential for both staff and students. The provision of appropriate quality industry standard hardware and software is an obvious requirement, as is easy access, both in terms of quantity of hardware/software and times of access. Standardisation of institution wide and certainly faculty wide resources is also desirable. Good quality technical support should be a natural assumption.

3.6. Future trends

This is clearly a difficult aspect to assess, but respondents were asked to comment and clearly opinions do exist. A knowledge of likely future trends was perceived to be quite critical in the design and delivery of the IT curriculum.

There is a general consensus that the number of hours devoted to teaching basic IT skills will decrease but disagreement exists on how this will be achieved, some favouring a self motivated approach with open learning materials, others favouring a group based learning environment. The success of either method, it is felt, will be determined only by paying more attention to the design of leading edge syllabi and modes of delivery within the curriculum. The move towards modular degree courses may also have a bearing on this. The use of live demonstrations with computer links to overhead projectors will become more widespread and this is seen as an extremely valuable teaching aid.

To a large extent, much depends on the availability of a variety of modern integrated and commercial software, with easy access to appropriate technology. Many respondents felt that communications technology will become a key element in future IT development, particularly for part-time students and as flexible distance learning programmes develop.

The use of networked, rather than stand alone machines is perceived as a likely trend, and the housing of such business faculty networks in centralised accommodation for the purposes of casual/open access, is seen as good use of technical resources. There was also a hard-core of respondents who believe that a Windows environment will become the accepted norm, although this was based on increasing trends in market share, rather than whole hearted commitment from academic staff.

More 'advanced' business schools had already started to investigate the use of 'syndicate' rooms, particularly at postgraduate level, whereby interactive group decision making could take place with resident and portable support technology. Such trends seem likely to receive more widespread acceptance in future.

However, there was a strong feeling that all such developments should be firmly within the control of business faculties, with minimal involvement from centralised computing services.

Finally, there were some respondents who believed that IT would become as an important a tool as books and that in future, IT will centre around 'intelligent decision making'.

4. CONCLUSIONS

One of the most noticeable features of the responses to the questionnaire and which is also supported by the personal interviews, are the wide variations in approaches to IT teaching within business and management degree courses.

Despite the commonality of many degree programmes the approaches to IT education vary enormously. There is no doubt that some institutions are at the early stages of the learning curve in this respect. Others have more experience in these matters and it is probably true to say that the existence of an 'IT Culture' appears to be a feature of these business faculties. While this is not an easy term to define, there are several facets common to these institutions. Firstly, a faculty IT policy is usually in existence encompassing a range of aspects of IT within the curriculum, and not just from a technical resources viewpoint. Secondly, a supportive Dean/Head of faculty who is aware of IT issues, with its curriculum and staffing implications and is actually prepared to translate ideas into reality. Thirdly, a designated leader responsible for IT development who is well versed in the problems encountered by staff and students and is responsible for communicating and liaising with all parties. A sympathetic and supportive environment for the development and integration of IT within subject specialisms is also indicative of such a culture.

In relation to the design of syllabi, these appear not to have been greatly influenced by the prior IT knowledge of incoming students, certainly at undergraduate level. Indeed, the vast majority of undergraduate students seem to have no formal academic qualifications or experience of IT on entry, although the latter may not be true for part-time students. The picture is slightly different at postgraduate level since while similar proportions of incoming students have no IT based qualification, experience of IT gained in their previous work environment can often be assumed.

Resources, both hardware, software and accommodation, are extremely variable from institution to institution. This will always be the case and is made worse by the ongoing problem of constantly changing technology and increasing student numbers, placing further demands on accommodation and equipment. Additionally these

problems can be further exacerbated by lack of technical support.

An abundance of up to date hardware and software is cited as an essential requirement of all business and management courses, if students are to gain relevant knowledge and skills. There is a move towards the use of networked systems and the availability of open/casual access machines within a central accommodation base for use by business and management students is being considered by several schools/faculties. Many institutions also believe that a Windows environment is likely to become more widespread in future and have already started to introduce such software on a gradual basis, with every new PC update.

Where computing resources are wholly centrally controlled, there is some dissent on the part of business faculties, on the grounds of failure to accommodate the needs of their students in terms of appropriate hardware and software. Those business faculties having previously 'broken away', also echo these sentiments.

In terms of good practice, many respondents believe that while access to sufficient up to date hardware and software is a necessary prerequisite for all business faculties, the development of existing staff is the key to future success. Increasing their awareness of IT, not only in their own subject areas but across the whole curriculum, allows staff to lead by example.

The use of good quality teaching and support materials are also essential in the delivery of the curriculum, and appropriate use of computer demonstrations in a lecture environment is seen as a valuable way of presenting and integrating IT.

5. RECOMMENDATIONS

The varying approaches to teaching IT in business and management degree courses make generalizations across the whole sector of higher education somewhat difficult. However, based on the findings of the questionnaire distributed to a wide range of institutions, as well as the interviews conducted at a smaller number of institutions, the following seem particularly pertinent for the development of a framework to ensure and encourage successful development and integration of IT within business and management degree programmes.

1. While the possession of an IT policy at institutional/-faculty/departmental level is not a guarantee of success in itself, those business faculties which have adopted such policies appear to have developed at a faster rate than those which have not. While it is true to say that most policies tend to be resource based, the development of staff is clearly an area that needs to be taken on board, rather than merely a passing comment within documented policies. Without knowledgeable lecturing staff with an awareness of the role of IT across all functional areas, the creation of a conducive environment is unlikely to arise. Exactly how this is achieved is a matter for the policy making

bodies at the various institutions but the introduction of development programmes has much to do with Deans/Heads of faculty.

2. Lack of prior IT qualifications and experience of incoming undergraduate students necessitates the use of formal IT skills teaching. While presently this is carried out by lecturing staff at most institutions, the creation of demonstrator posts to help in this respect, should certainly be a serious consideration. Apart from 'freeing' academic staff from basic IT skills teaching, they may also contribute to the development of good quality self-tuition materials. Additionally, demonstrators can also assist in the development of existing staff, either through the preparation of learning materials or short courses.

3. A variety of methods of delivery are currently employed in most business faculties, with supervised workshops being particularly common. However, greater use of the formal lecture environment supported by 'live' computer demonstrations can, in many cases, help to stimulate interest and provide motivation on the part of both staff and students.

4. A central accommodation base for open/casual access, in close proximity of lecture rooms and solely for the use of business and management students, appears to be high priority of many institutions. There are many advantages in doing this, not least the technician support that can be offered in this environment, as well as allowing the possibility of extended hours of opening.

5. Access to IT facilities for part-time students can be a serious problem. Clearly, better provision is desirable for such students, in terms of allowing them easier access to appropriate hardware and software. However, as communications technology develops and PC ownership increases such problems may largely disappear.

6. Development of IT within business faculties may be restricted by the conflicting demands of other departments, in respect of IT facilities provided by central computing services. Business faculties still reliant on these services as their main resource providers, might be advised to take more control of such provision, if at all possible, in the interests of their own future development.

7. In order to provide a focus for IT issues, an IT subject leader, responsible for the co-ordination of IT across the curriculum and the ongoing development of staff, is seen as a desirable feature of many business faculties.

Many of these issues are already addressed at certain institutions. However, collectively it is felt, that such a combination provides a coherent strategy for the development of IT within business and management degree programmes, and a framework that encourages new ideas in what is clearly a constantly changing and fast moving aspect of business education.

A follow-up survey is due to be conducted by the authors in 1993 to examine whether there have been any changes in approaches to the incorporation of IT within the business and management courses. It is anticipated that the findings will be published in late 1993.

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