Contents

Use of TLTP materials in UK higher education - executive summary

The Teaching and Learning Technology Programme (TLTP) was a joint initiative of all the Higher Education Funding Councils. Its remit was to '*make teaching and learning more productive and efficient by harnessing modern technology*', creating computer-based learning materials in a wide range of subjects. The first two phases spanned 1992-1996, with over £11M from all the Funding Councils, plus institutional investments. An evaluation of the programme was carried out in 1996, however, at that time surveying the use of products of TLTP was felt to be premature as many had only just been released.

In January 1998 we were commissioned by the HEFCE to conduct a study of the use within UK higher education of the learning materials produced by TLTP. The study was carried out between February and August 1998.

Our key tasks were:

- to find out which TLTP products were being used, where and how

- to examine the pattern of usage of TLTP courseware in relation to other uses of C&IT within learning and teaching

- to explore how 'contextual' factors might have influenced the uptake of TLTP products

- to assess the overall impact of TLTP

- to conduct a bibliographic search to track existing studies of TLTP use

We approached these tasks with questionnaires to all TLTP projects, all teaching departments in all HEIs (3854), to courses/modules using TLTP in those departments, to key informants in 102 medium and large HEIs, and with data from the TLTP Co-ordinator. Case studies were created through interviews. The respondents were representative of the distribution of sizes, ages and locations of HEIs and subjects but the data needs to be treated with caution if extrapolating to the sector as a whole.

The four key findings are listed below followed by a fuller summary of the outcomes of each of our tasks.

Key findings

- more TLTP materials are in use in the HE sector than may be generally recognised, especially allowing for the failure of some staff to recognise the materials they were using as being from TLTP as such. They are embedded in conventional courses, alongside a very substantial use of other types of C&IT. Reasons for adopting these are mostly pedagogical rather than operational or tactical

- attitudes of many staff towards C&IT in learning and teaching are very positive - they already use it considerably in research and administration - and they see scope for expansion. These positive attitudes are largely independent of subject or type of institution

- significant barriers to wider uptake of C&IT into learning and teaching still exist. Technical infrastructure is now less important to most staff than the need for pedagogical support and many HEIs are addressing this need through appointment of a new group of staff, 'TLT officers'. Lack of recognition and rewards for innovation are still common issues in most HEIs

- within the HE sector there is substantial homogeneity of use of TLTP materials and C&IT in general. There appear to be no ' C&IT black holes' and this is probably in large part due to centrally-funded initiatives

Which TLTP products are in use?

- of the 919 departments/schools which responded to our questionnaire 33% were using the products of one or more TLTP projects, and most respondents appear to use TLTP products with several courses or modules (64%)

- for some projects there appeared to be a significant element of under-reporting of use, as some respondents were unaware, or had not recognised, that the courseware they were using was from TLTP. The complexity of sources for obtaining TLTP materials (e.g. projects, CTI Centres co-located with projects, commercial sources) may have contributed to this confusion

- more complete and standardised central data on the products, times of release, distribution etc would have been valuable for customers and evaluators alike

- a small set of five projects produced the materials which were in widest use, and a further group of thirteen projects' materials were in moderate use. These groupings need to be qualified as they do not take into account the size of the constituencies served by each project and so within the moderate group are projects which achieved essentially saturation penetration of their market which consisted of only a few HEIs

- many of the institutional projects created materials which were of interest at institutional rather than departmental level and are seen clearly only in information from institutional respondents

- it is likely that many of the little-used TLTP materials have spread only marginally beyond the consortia which created them

Where, how and why are TLTP products used?

- the majority of the 453 courses using TLTP materials did so within 'traditional' courses, on-campus and with face-to-face as opposed to resource-based teaching. Most were for first or second year undergraduates

- the student enrolment on the majority of these courses/modules was less than 100. At the outset TLTP had been focussed on large, early year classes with the aim of achieving some economies of scale and efficiency gains. One reason for the relatively small enrolments may be that they are mostly in degree programmes with large numbers of modules

- in the majority of courses, some or all of the knowledge and skills acquired by use of TLTP was directly assessed, and most staff obtained feedback from students about the materials

- the most common reasons given for using TLTP materials were pedagogical (e.g. novel learning opportunities, student centred) while staff with large classes often also gave operational reasons (e.g. remediation, replacing expensive classes)

- use of TLTP materials was strongly correlated with subject area, with most use in the physical sciences and numerical business areas, and least in visual and performing arts and caring professions. These relative uses largely reflect the availability of subject-specific TLTP materials

Factors influencing uptake of TLTP materials

We examined various factors within academic departments and institutions which provide part of the context within TLTP materials are used. The major themes which emerged were:

- most departments self-rated their C&IT level (on a criterion referenced scale) in the top 25% of the scale. High self-rated departments used more TLTP materials

- very few respondents thought that their subject lent itself very little to use of C&IT, or that scope for expansion of this use was small

- the great majority of departments used much less courseware (including TLTP) than they did other forms of C&IT, with productivity tools (such as wordprocessors and spreadsheets) being used most, followed by communication tools (e.g. email) and then WWW

- staff used C&IT for teaching much less than they did for administration and research

- there was a strong correlation between use of TLTP materials and presence of a departmental strategy for student IT skills

- limitations on technical infrastructure and support were still barriers to most staff in adoption of C&IT and may be most important for courseware, especially when delivered across networks

- pedagogical support was still lacking for staff, to enable them to integrate materials into courses and assist students to learn with these new media. This area is probably more important for most staff as the technical barriers come down. Many HEIs have addressed this issue by appointment of TLT officers, some from TLTP and related initiatives

- the pioneer or innovator is still crucial in initiating uptake of TLTP (and other C&IT) materials, with the responsive HEIs providing support and encouraging those actions

- recognition and rewards for innovation in teaching were still perceived to be lacking in most HEIs

Impact of TLTP

It is clear that for a programme such as TLTP, with a substantial breadth of involvement of HEIs and their staff, there are likely to be outcomes beyond the materials which were produced and the uses to which these were put. We used mainly open-ended answers and interviews to explore the impact of use of TLTP:

- on learning and teaching

- leading to other C&IT developments

- beyond C&IT

The major themes which emerged were:

- **use of TLTP materials had had a positive impact** on both staff and students. This was reflected in student feedback and also staff recognition of the need to re-think the courses into which these materials were brought. Assessment, student and staff support, curriculum design, infrastructure issues all came into sharper focus

- **networks of people**, in academic departments and in institutional roles, who continue to work together to varying degrees. These networks bring a substantial expertise to the system - pedagogical, project management, and how to use C&IT in learning and teaching

- **changes in HEI activities**, as a consequence of the need to deliver TLTP materials. Technical and pedagogical challenges have arisen and few HEIs were equipped to deal with these in the early 1990s

- **further successful projects both funded and un-funded** - building upon the expertise which resides in individuals and networks. Examples of such external sources are European Union and FDTL, and internal sources are 'teaching innovation funds'

- **a pool of staff involved with TLTP moving into more senior posts**, especially with responsibility for C&IT and for learning and teaching. These staff are able to bring a new perspective to the construction of L&T strategies and the likely routes to successful implementation

- **there is a greater homogeneity within the UK HE sector** with respect to use of C&IT in learning and teaching than in other countries, largely due to the effect of centrally-funded initiatives

Bibliographic database of uses of TLTP materials

This was constructed from on-line and literature searches. It contains 158 items and can be downloaded from TLTP and our own websites.

http://www.tltp.ac.uk/tltp

http://www.flp.ed.ac.uk/tltp

1. Background: The Teaching & Learning Technology Programme 1990-98

The growth of Communication and Information Technology (C&IT) within UK higher education during the 1990s is best perceived not as a linear narrative but as a complex tapestry of interwoven developments. In the early part of the decade the need for change within the HE sector was becoming apparent in terms of:

- greater emphasis on active learning

- pressure for improved access to provision

- the need for flexibility and transferability within the curriculum exemplified by modularisation and credit schemes

- pressure for enhanced graduate employability

- a growing emphasis on quality and accountability

- the ending of the 'binary line' between universities, polytechnics and colleges

- increasingly large and more diverse student enrolments

- constrained resources

In this introductory overview we locate the origin of TLTP within the important transformation of higher education at the start of this decade in terms of new pedagogical directions and changing modes of delivery. We emphasise the unprecedented rates of development within computer and information technology that have continued throughout the decade, particularly the dynamic state of web and internet technology. We also draw attention to the substantial political shifts taking place at that time in terms of the revised governance of higher education and the planned expansion of student numbers. It is against this background that we outline the nature and purpose of the first two phases of the TLTP initiative.

1.1 The changing nature of higher education in the 1990s

The last decade has witnessed an unprecedented burgeoning of research literature and staff development activity in aspects of learning and teaching in higher education. Much of this work has emphasised the value and effectiveness of an *active learning* approach that requires learning by doing, a task-based focus and the interactivity of the learner with tutor, peers or materials. Such approaches have been found to foster a 'deep' or transformative approach to learning (Entwistle, Thompson and Tait 1992).

UK higher education in the 1990s has also been characterised by a concern for the development of wider core skills or *personal transferable skills* to help graduates prepare for an increasingly competitive world of work. The Enterprise in Higher Education Initiative (EHE) did much to foster developments in this area, and communication and information skills featured prominently in many of its initiatives.

The curriculum in many HE institutions during the decade has undergone a process of *modularisation* often as part of a credit accumulation and transfer framework. This has been for a variety of reasons including student subject choice, increased flexibility of access to HE, efficiency gains or administrative convenience. As Darby (1995) points out, though the technological capacity for flexibly delivered provision has been in place for some considerable time, the key catalyst of such developments is the combination of learning technology *with* modularisation.

This re-orienting of higher education has continued throughout the 1990s, and throughout the duration of the TLTP programme. As we approach the close of the decade emphasis is placed increasingly upon *lifelong learning* and the notion of a 'learning society'. The former is becoming commonly identified with home-based and work-based learning through C&IT. A University for Industry and a National

Learning Grid have been proposed as possible means of provision of CBL materials. The Report of the National Committee of Inquiry into Higher Education (The Dearing Report, NCIHE 1997, Recommendations 14 and 15), recommended that all HEIs should have institutional strategies for the development and use of C&IT in place by the year 2000. It also recommended that an Institute for Learning and Teaching in Higher Education (ILTHE) be established which should, as part of its remit:

> develop, over the medium term, a system of kitemarking to identify good computer-based learning materials; co-ordinate the national development, over the medium and long term, of computer-based learning materials, and manage initiatives to develop such materials...

The Government, in its response to Dearing (DfEE 1998, Section 7.9), has:

> welcomed the intention of the HE funding bodies to build on their experience with the Computers in Teaching Initiative and the Teaching and Learning Technology Programme and to consider with the institutional representative bodies how such initiatives can have maximum impact...

It is with these background developments in mind that our consideration of the impact and penetration of the first two Phases of TLTP has been undertaken in this report.

1.2 The rise of the Internet and Web technology

Any consideration of the effects of the TLTP programme has to be set against the continuously dynamic state of technological development in this period. During the implementation of the first two Phases of TLTP, communication and information technologies have been developing at an unprecedented and increasingly rapid pace. The processing power and storage capacity of computing technology has been increasing at an exponential rate, and the cost of the technology has been reducing proportionately. The use of the Internet, and in particular the World Wide Web, has revolutionised communications and is likely to cause radical developments in the ways universities and colleges enable their staff and students to find and create knowledge and interact with each other. Web technology is now capable of supporting multimedia pages, computer conferencing and real-time streaming of audio and video data. Point-to-point video-conferencing is well established and desktop video-conferencing is developing rapidly. Web technology is now fast approaching the status of a broadcast medium rather than a mere publishing mechanism for graphical data. It affords a flexibility and adaptability to the user of educational materials that the more closed CAL technologies of the earlier TLTP products did not. Moreover the negative 'technical' image from which computer technology suffered in universities has been superseded as academics increasingly view learning technology as a powerful communicative tool and a means of access to academic networks and communities.

Various earlier technologies have, of course, been falsely heralded as transformations of classroom practice. There are, however, technological factors that render modern learning technology qualitatively different (Mayes 1995). The new technologies are unquestionably more powerful, and increasing in power. The speed of take-up of the technology is unprecedented and the technology of personal computers is general purpose. The technology is increasingly familiar to students as they arrive on campus, and the steady decline in cost means that many already arrive on campus with their own hardware and software. These developments pose both a challenge and an opportunity for the future use and adaptation of existing TLTP products.

1.3 Expansion and the revised governance of HE

The TLTP initiative also has to be seen as coming into being during a period of radical revision of the modes of governance of higher education. In May 1991 the Government White Paper *Higher Education - a New Framework* (Cm 1541) proposed a number of substantial changes in the funding and governance of higher education, the most significant of which was to be the abolition of the so-called 'binary line' between the universities and the polytechnics and colleges. Since 1988 these two sectors had been governed and funded separately through, respectively, the Universities Funding Council (UFC) and the Polytechnics and Colleges Funding Council (PCFC). In the following March the Further and Higher Education Act (1992) was passed establishing a unitary system of higher education and separate Higher Education Funding Councils for England (HEFCE), Scotland (SHEFC) and Wales (HEFCW). Funding of higher education in Northern Ireland continued to be the responsibility of the Department of

Education of the Northern Ireland Office (DENI). Under the 1992 Act the 33 former polytechnics and 4 Scottish Central Institutions achieved university status. The newly-established unitary HE sector now contained some 111 institutions of university status and 58 colleges of higher education.

Following the publication of the 1991 White Paper, and again after the 1992 Act, the Secretary of State for Education sent 'substantial letters of Guidance' to the Chairs of the Funding Councils of the day. These indicated a range of priorities for the future governance of higher education which included continued expansion of undergraduate provision, quality audit of institutions, the quality assessment of teaching (TQA) and increasing selectivity in the allocation of research resources based on the continuation of quality assessments of research (RAE).

These developments signalled the Government's intention to embark upon a process of rapid expansion of the UK higher education sector. This expansion was to take place against a declining unit of resource and within a culture of public accountability for quality. In the previous three decades there had been marked shifts in the Higher Education Age Participation Index (API) from 6% in 1961 to 28% in 1992, with a period of consolidation in the 1970s. The trends were as follows:

Table 1.1

Year	1961	1970	1980	1990	1991	1992	
API	6%	14%	13%	19%	22%	28%	Source: HEFCE 1994

This process has continued under subsequent governments so that the current (1998) API stands at around 33% for England and Wales and 43% for Scotland. These figures chart the development of UK higher education throughout the 1990s into a technically-defined 'mass' system. It was against the background of such substantial shifts in the governance of UK higher education, and as one significant response to the priorities raised by the Secretary of State, that the TLTP initiative came into being.

1.4 The Teaching and Learning Technology Programme

In February 1992 the UFC launched Phase 1 of a national Teaching and Learning Technology Programme (TLTP) intended '*to make teaching and learning more productive and efficient by harnessing modern technology*'.

Particular importance was attached to ensuring that the benefits of the programme were spread across the sector by supporting bids from consortia of institutions and by giving priority to projects which incorporated a high degree of transportability. It was recognised that the possibilities were very wide and that there were many approaches available involving recent developments in authoring tools, software delivery and multimedia devices. (HEFCE 1994).

The UFC made available £7.5 million per annum over three years. The group of universities nowadays categorised as 'traditional' universities were invited to bid for funding for projects to develop new methods of learning and teaching using C&IT.

Circular 8/92 stated that the programme was intended to '*help institutions to respond effectively to the current substantial growth in student numbers and to promote and maintain the quality of their provision*'.

Approximately 160 submissions were received by the UFC and, in August 1992, it was announced that 43 projects were to receive funding under this first phase in 1992-93. Around one quarter (11) of these projects addressed problems of implementation within single institutions, with staff development being a major component. The main aim of these institutional projects was to encourage and stimulate a new approach, within their own institutions, to the integration of learning technology into mainstream teaching and learning. The remainder of the projects (32) were concerned with courseware development and involved academics from different institutions working as consortia. The size of consortia ranged from two to forty-four members and the projects covered a wide range of subject disciplines.

In April 1993 the four new funding bodies agreed jointly to fund a second phase of the programme. The 'new' (post-1992) universities were now eligible to bid to host projects, though in the event the greater part of the involvement of the new institutions tended to be as junior consortia members. Only six of the

newly funded projects were located solely within a new university. The call for bids generated a lively response with a total of three hundred and sixty-seven bids being received. In August 1993 the funding councils announced that a further thirty-three projects were to be funded totalling £3.75 million in their first year, 1993-94.

Both phases of the programme were intended to run for up to three years, subject to review of available funds on an annual basis, and most institutions submitted bids for funding over a two to three year period.

1.5 Programme Objectives

In order to fulfil its declared aims of productivity, efficiency and maintenance of quality in a period of expansion of student numbers, the TLTP initiative sought to achieve a number of more specific objectives. These were as follows:

- to ensure that the benefits of the programme could spread throughout higher education as a whole
- to encourage consortium projects in order to enhance opportunities for disseminating the benefits of the programme
- to improve the productivity of teaching and learning
- to involve main teaching departments and to have the active support of the institutions' senior management
- to integrate technology into the delivery of existing or planned courses
- to make use of relevant past and present activity in the area of introducing technology into teaching
- to ensure that the developments were accessible and capable of use by all relevant teaching staff and students

1.6 Central Co-ordination

From its inception the Programme has had an Advisory Group whose role is to oversee, steer and advise the Funding Councils about the programme. Administrative support has been provided by a central secretariat based within HEFCE. There was, however, no national co-ordinator or central co-ordination team in the early stages of the programme. A small co-ordination group was established at a later stage (early 1993), based in Bristol. This group is led by a National Co-ordinator whose major activity focuses on support for individual projects, national-level dissemination and the establishing of networks. The central unit has subsequently developed a programme of workshops, newsletters and regional and national conferences, in addition to providing an information service, technical support, and a limited distribution operation.

1.7 Subsequent developments

In 1995 continuation funding was allocated to a selected range of projects. A condition of the allocation of funding was the drawing up of a business plan with proposals for commercialisation of products. In January 1996 the Teaching and Learning Technology Support Network (TLTSN) was established to disseminate the experiences of the TLTP Institutional projects to the wider academic community. The TLTSN is funded by the four UK Funding Councils and comprises nine support centres, drawn from nine of the Teaching and Learning Technology Programme's three-year institutional projects. An independent evaluation of the first two phases of TLTP, jointly commissioned from Coopers & Lybrand, the Institute of Education and the Tavistock Institute, was published in June 1996. Several of the recommendations of this report, particularly the requirements for greater central co-ordination, progress monitoring and both formative and summative project evaluation, have become conditions of the Phase 3 TLTP funding which was announced in May 1998. The HEFCE and the Department of Education, Northern Ireland (DENI) allocated £3.5 million a year for three years to fund 32 projects. Most of these projects are for implementation, to increase the use of technology-based materials in teaching and learning. Four projects are to develop new materials.

Fig 1 here

TLTP has logical relationships, and often close points of contact, with a range of concurrent initiatives which are represented diagrammatically in Fig.1. Perhaps the closest link is with the Computers in Teaching Initiative, which shared the same Advisory Group as TLTP. Several of the discipline-based CTIs are located within the same universities as the lead partners of TLTP consortia in that same discipline.

In the light of this overview of the origins of TLTP and the background developments that have accompanied its implementation, we move on now to discuss the methodology which we adopted for our study.

2. Methods: general approach and data-gathering activities

This section summarises the rationale behind our selection of sources of information and the approach which we have taken to the design of survey instruments. It concludes with a brief examination of the validity and reliability of our data.

2.1 Key tasks

To achieve our purpose of examining the use of TLTP products within the UK higher education sector, we were faced with the following principal tasks:

- to find out where TLTP products were being used

- to detail how these products were being used

- to examine the pattern of usage of TLTP courseware in relation to other uses of C&IT within teaching and learning

- to explore how 'contextual' factors might have influenced the uptake of TLTP products

- to conduct a bibliographic search to track existing studies of TLTP use.

To complete these key tasks successfully we had to establish the range of products that had been produced by TLTP projects, to characterise the nature of these products and as far as possible to gain a sense of which products are still viable.

2.2 Methodological challenges

In carrying out our study, we had to meet a number of methodological challenges, including difficulties inherent in conducting any retrospective survey. A particular challenge that we faced arose from our objective of gaining a fairly detailed picture of what types of courses are using TLTP products and how individual products have been used within particular courses. Given the diversity of HEIs with respect to course structure and delivery, designing a set of research instruments that would be applicable to all institutions was not a straightforward matter.

In addition, we have had to confront the general difficulty that faces any research study which investigates backwards over time. There are clearly distinct limits on the extent to which data can be retrieved when one is dealing with past events. Memories fade; and the pace of technological change means that products created in the early phase of TLTP may no longer be as relevant now, and hence less salient to respondents. The size of the potential user base may also have changed over the course of the two phases of TLTP being investigated. Many of the Phase 1 projects are no longer active. Both within the projects themselves and in academic departments using TLTP products, key personnel may have moved on. For these reasons the extent and pattern of usage in the earlier years of TLTP cannot be fully recalled and represented: we have tried to achieve the best possible estimate of usage in one particular period of time, in effect a 'snapshot' taken in the first half of 1998.

2.3 General strategies

Gaining different perspectives on the use of TLTP products

Given these concerns about the attrition of data over time and the robustness of the data that remain, it was imperative to *maximise access* to information on the use of TLTP products by employing different routes into different sources. Concentrating effort solely on one main means of gathering facts and opinions would have been an inappropriate way to address our objective. Independently of this aim to maximise access to available data, it appeared important in terms of ensuring the validity and reliability of our research findings to view the usage of TLTP products from a number of different perspectives. This would allow 'cross-checks' to be carried out on the pattern of findings from different perspectives and would also provide a fuller, and thus possibly more nuanced, picture of product use.

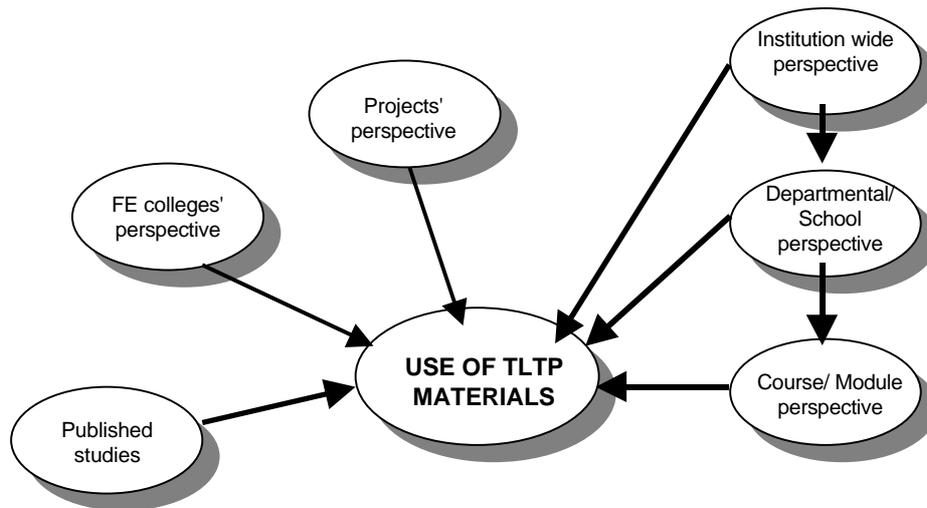Figure 2.1: **Perspectives on the use of TLTP materials**

Figure 2.1 shows the main perspectives that we set out to capture. Information was gathered from the vantage points of: the TLTP projects themselves; from individual courses; from departments and from key informants with an informed overview of the use of TLTP products within individual HEIs. In addition to allowing for checks on data reliability, gathering data from separate levels within HEIs had the advantage of giving a view from differently located 'fixed points'. Course organisers could provide a fine-grained, more narrowly-focused account of the use of TLTP materials, whereas informants with an institution-wide perspective could provide a more broad-brush account, situating the use of TLTP products within the wider context of a university's overall use of C&IT for learning and teaching.

A considerable proportion of HE courses are now delivered through franchising arrangements with FE colleges. For the sake of completeness, it was appropriate to gain information from the FE colleges thought to deliver HE courses on the extent of their TLTP usage.

Published articles and reports on the incorporation of TLTP materials into courses added another perspective to the study, given that they, by and large, are written from the viewpoint of developers, enthusiastic adopters and those making innovative use of the products.

Exploring the context of use

If the focus of our efforts had been confined simply to the use of TLTP products, the resulting picture would not only have been a very skeletal outline but also misleading. The extent and pattern of use cannot be clearly and appropriately understood until they are viewed in relation to the wider picture of:

• the use of C&IT for learning and teaching

• the contextual resources and constraints influencing both C&IT use and the progress of educational innovation.

Accordingly we decided to build up this wider picture within which the use of TLTP materials can be viewed. Measures have been taken of departments' reported levels of general C&IT usage and that used in learning and teaching. As a result a clear summary picture of current C&IT use for learning and teaching in higher education has emerged from our survey work.

With regard to contextual resources and constraints, it is useful to think of context in terms of a number of layers, as Figure 2 illustrates. One possible important determinant of the uptake of TLTP materials could be the *discipline/subject area* taught by a particular department – the degree to which TLTP courseware is seen as consonant with the practices of a discipline and the current level of commitment in that discipline to using C&IT in learning and teaching. *Course* characteristics, including the ones listed in Figure 2.2 of level, size and mode of delivery also need to be taken into consideration. The use of C&IT within courses will itself in turn be affected by a *department's* general use of C&IT, its access to

resources and its openness to innovation. Finally the characteristics of individual higher education *institutions*, including their particular strategy for supporting C&IT in learning and teaching and the extent to which a defined strategy has been implemented, may impact on the use of TLTP courseware.

Figure 2.2: **TLTP materials in context**

| INSTITUTIONAL CHARACTERISTICS |
| DEPARTMENTAL CHARACTERISTICS |
| COURSE CHARACTERISTICS |
| DISCIPLINARY |
| USE OF TLTP MATERIAL |
| *SCOPE AND INTEREST* |
| *LEVEL, SIZE, MODE OF DELIVERY* |
| *ACCESS TO C&IT RESOURCES, GENERAL USE OF C&IT, OPENNESS TO INNOVATION* |
| *SIZE, AGE, C&IT RESOURCES, STRATEGY* |
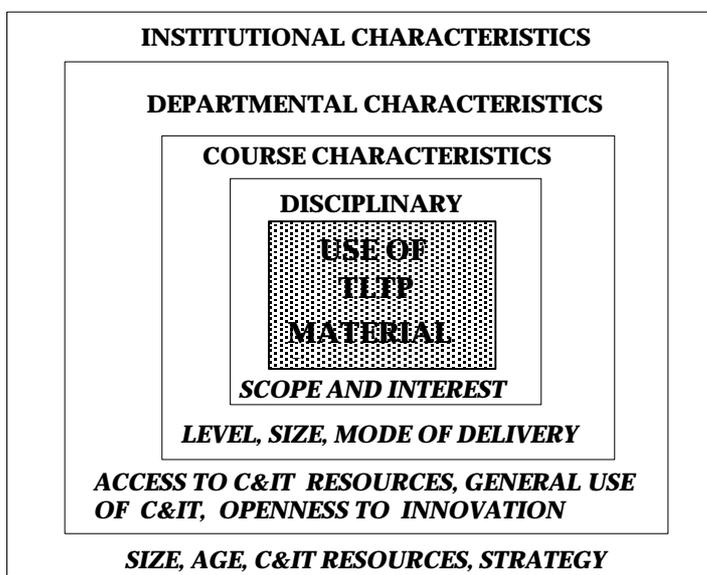
2.4 Specific data gathering instruments and activities

Overview of principal data gathering activities

Translating into action our desire to capture the different perspectives on TLTP use and to delineate the contexts where TLTP products have been used, or have failed to find a place, we have made use of the following methods of enquiry :-

Projects

A survey, addressed to named contacts in all of the 76 Phase 1 and Phase 2 TLTP projects, collected information on matters such as mechanisms for distributing materials, strategy and methods employed to disseminate materials, possible case studies of use of their products, their perceptions of the factors which helped and hindered TLTP materials reaching potential users.

Departments /Schools: courses/modules

All teaching departments in HE institutions within Britain were surveyed using a two-tiered approach. As an initial point of contact, questionnaires were sent to the Head of Department/School who was asked to forward them to the person in the department who was 'most knowledgeable' about the use of C&IT in learning and teaching.

Tier one: *Departmental /school level.*

The 'most knowledgeable person' answered questions, *inter alia*, on: the number of courses/modules using TLTP project materials; the general C&IT level of the department; types of C&IT used in learning and teaching; the department's attitude to innovation; infrastructure limitations, etc.

Tier two: *Course/module level*.

Multiple copies of a course level questionnaire were sent to each department to be distributed by the 'most knowledgeable person' to the organisers of courses and modules using TLTP project materials. Among the information collected by this survey was: exactly which TLTP materials were currently being used or have been used in the past; how they were being used; their degree of integration into the course; their source; reasons for adopting them; the effects of their use on staff and students. In addition background information was collected on the course, its level, mode of delivery, etc.

HEI key informants survey

A survey of teaching and learning technology support personnel, within large to medium sized HEIs, who could act as 'key informants' providing an informed institution-wide perspective on topics including: which TLTP project materials were in use within their institution; possible case studies; the impact of TLTP within their institution; general developments in the use of C&IT for teaching and learning within higher education.

FE colleges survey

A survey addressed to heads of FE colleges thought to have HE courses, collecting data, *inter alia*, on which TLTP project products were in use, the extent of staff C&IT usage, and how developments in C&IT for learning and teaching are initiated and supported.

Case studies

Production of six case studies, five of which look in detail at the use of materials from specific TLTP projects, and one which examines universities where there was an 'institutional initiative' to increase use of TLTP and C&IT (Section 10).

Bibliography

A search for articles and reports on the use of TLTP materials, and construction of a bibliography of these publications (available from http://www.tltp.ac.uk/tltp and http://www.flp.ed.ac.uk/tltp).

2.5 Validity and reliability of data

We have taken several measures of the validity and reliability of our data.

Table 2.1 provides information on the number of questionnaires mailed out in each of the surveys and the appropriate response rate.

Of the TLTP projects which responded to our questionnaire, 52% were from Phase 1 (78% of this Phase) and 48% were from Phase 2 (83% of this Phase). The majority of respondents were the project leaders or managers and most gave detailed answers to open-ended questions as well as completing the tick boxes. This is a very satisfactory level of return.

Table 2.1: **Survey types, questionnaires sent out, valid returns, % response rate.**

Survey types	Questionnaires sent out	valid returns	% response rate
Projects	76	61	80%
Department	3854	919	24%
Institution wide	102	52	51%
FE colleges	154	48	31%

We analysed the patterns of mailing and of responses for both institutional key informants and the departmental respondents, and found an overall reasonable correspondence between mailed and returned for both surveys (Fig 2.3). Thus although the response rates of 51% and 24% were lower than for the TLTP projects, for postal surveys they are certainly respectable, and the reasonable match between mailed and returned questionnaires suggests that we have probably avoided major difficulties due to region, age or size of HEIs.

As with all surveys where the return is less than 100% the issue of skew in the nature of the respondents is present, and it is possible that our respondents may have been skewed to those who are most interested in C&IT, with the less interested failing to return questionnaires proportionally. However, it is less clear what would be the effects on the data of such a skewed distribution. It is not necessarily the case that it would put 'a positive spin' on the data. 'Experts' can be **more critical** than 'non-experts' of lack of progress or resources. They may be **less** inclined to see the progress made and look instead to targets still to achieve. We found this to be clearly the case in a previous study for SHEFC of C&IT use across the Scottish HE sector, with positive views of the use of C&IT in teaching emerging just as much from those who felt themselves to be less experienced than their peers about this topic [Day *et al* 1997].

Fig 2.3 Departments mailed and responding by size, age and geographical location of their HEI

3. TLTP projects and their products

This and the following five sections of our report are concerned with our analysis of the substantial body of evidence which we collected from our various surveys, about the use of TLTP materials in particular and of C&IT in general in teaching and learning. We begin with a description and classification of the TLTP products and the projects in which they were produced.

We then examine the more general use of C&IT in teaching and learning in HE, at both institutional and departmental levels, as this provides the context within which TLTP materials were used.

From there we move on to explore methods by which projects promoted and distributed these products, and the management of those processes. This is followed by a detailed review of our evidence on the extent of use of TLTP products, where, how and why they are being used, concluding with the impact of that use on staff and students.

In the final section of findings, we look at some of the factors which influence the use of TLTP materials and the wider impact of the whole TLTP initiative on the HE sector.

3.1 Timescale

The TLTP materials which were the subject of our study were created by seventy six projects over the six year period 1992 to 1998. In 1995 continuation funding provided additional support for those projects which had produced satisfactory 'business plans' for their futures. Thus the timescale over which materials were produced and made available to the sector by these TLTP projects has been extensive, with some delivering their early products (or at least prototypes) within a few months of start-up and some only just reaching delivery by mid 1998. Thus for a survey within a 6 month timespan in 1998, for some members of staff in HEIs we were asking them to think back several years to when TLTP began, whereas for others they had only recently begun to see relevant products appearing. Any study of this kind will be too early for some and too late for others, and reinforces the need for continuous data gathering.

3.2 Project types

Three main types of projects were funded, institutional projects, academic subject-based projects and generic staff development/study skills projects.

The smallest group were the staff development/study skills projects (8) which created materials in a range of media (print, computer-based, video) aimed mainly at staff developers or learning support staff. Some of these materials were appropriate for use within academic departments.

The next group were the institutional projects (11), which were located in a single HEI and operated widely within it. The products of these projects were in many cases the least portable to most members of staff in academic departments but were of value to staff involved in supporting institutional developments in the use of C&IT in learning and teaching e.g. pro-vice chancellors, vice principals, TLT officers, staff developers. Although some of these projects produced computer-based learning materials (e.g. QUTAL) several did not and focused on the processes of support and training needed to effect institutional change. Their products for the sector were largely reports and case studies (e.g. VARSETILE).

The largest group of projects were subject-based, divided by TLTP into five 'cognate groups' (medical sciences [9], science, maths and computing [16], engineering [12], business & economics [5] and arts, humanities & social sciences [14]). The distribution of projects across the range of academic subjects is clearly skewed with respect to the sector-wide distribution of departments delivering courses and student numbers in them. This probably reflects a combination between the views held within these subjects of the relative value of computer-based learning materials and the terms of reference defined for TLTP bids.

The great majority of the Phase 1 and 2 non-institutional projects were formed by consortia of departments and units within two or more universities. In general, each consortium had a lead site which was responsible for the management of the project and the finances flowed through the lead site to the members of the consortium, which ranged in terms of input from active creators of materials, through evaluation sites for early versions of materials, to interested parties. The official list of lead sites and members as defined on the original bid document and in central TLTP records did not always match the actual involvement of departments and institutions during the development of materials.

Most currently- or recently-active projects have web sites and these usually provide their view of the consortium membership. These ambiguities about involvement of departments complicated our analysis of uptake by departments of materials from given projects, as the categories 'lead site' and 'consortium member' proved difficult to apply with certainty, and hence the spread of materials beyond consortia was not easy to define. Some consortia had a large membership, for example History Courseware Consortium with 40, and in a few cases the consortium was essentially the whole community within a discipline (e.g. CLIVE in Veterinary Medicine).

3.3 Range of materials

A range of different 'products' were created by the 76 TLTP projects. The majority of the projects produced computer-based materials, with some supporting 'teacher user guides'. There were however a few projects in this group which used video as a major (Chemistry Video Consortium) or minor (Multimedia Marketing Learning Programme) part of their output. Products of the subject-based projects were most likely to be used in academic departments or supplied by central services to students via networks. For institutional and some subject-based projects their aim was mainly to influence the way in which learning and teaching took place rather than to produce courseware, computer-based or otherwise.

The majority of projects set out to create tangible materials which could be used within courses (albeit with the same broad aim of affecting teaching practice, but this was not centre stage in their activities). The authors of the 1996 evaluation of TLTP divided courseware into several categories, reflecting different approaches to presenting learning opportunities for students. Although we have some reservations about the extent to which some of their categories are really discrete (e.g. Hyperstacks and drill programs), broadly they map onto our examples of categories below:

Table 3.1 - Categories of TLTP products and purposes

MEDIUM	FORMAT	PURPOSE
paper	student user guide	to guide student in effective use of courseware
	staff user guide	to support staff with technical and pedagogical issues
	generic integration, institutional policy reports	for staff with strategic and tactical roles within HEIs
video	clips within courseware	to exemplify and illustrate
	extended video sequence	as demonstrator or resource-based materials
computer-based	tutorial	acquisition or reinforcement of knowledge or skills, including problem-solving abilities
	generic skills developer	IT or study skills
	simulation	replacement or supplement of labs, clinics
	drill and practice	range from simple to complex skills and knowledge testing
	diagnostic tool	primarily for staff use to assess student or class abilities

Irrespective of the categories chosen, they cannot be applied 'cleanly' to the output of many projects which often span more than one category, and different approaches are commonly used in different modules. For example, computer-based courseware might contain an authored tutorial for delivering information to students, and contain self-assessment 'tests' to reinforce this. It could be mounted and used by staff with help from a user guide, and supported for students by their own user guide.

Thus unless one is able to look at single modules and analyse their use in detail the categories are of little use. It is not realistic to carry out analysis to such a degree of detail, although the bibliography we have provided at the end of the report was constructed to provide access to the literature on use of TLTP materials and some of this finer grain is available through the references.

A further complication at the level of single modules is the discrepancies between records held centrally about each project and the views within the project of their materials, both in terms of names, numbers and nomenclature. There have clearly been problems for both the projects and the central Co-ordination Unit in keeping records synchronised between them, and in defining the extent of availability of products and their versions. It is interesting to note this C&IT-oriented programme relying mainly on a paper-based catalogue rather than a searchable database. We do not wish to criticise either projects or co-ordination for these problems - TLTP was a substantial learning experience for many participants - but more systematic thought about, and action on, these issues might help users of future programmes.

4. The HE context for TLTP products

4.1 C&IT in teaching and learning at institutional level

Our sample of institutional key informants was selected primarily to enable us to get an alternative view of the use of TLTP materials in medium and large HEIs, as well as to obtain information on C&IT in general. Because this survey largely omitted the small HEIs, so does our knowledge of C&IT use within them.

Within the 52 HEIs where the key informants responded to our questionnaire, almost half have an explicit strategy for the use of C&IT in teaching and learning. Of these, several were embryonic but there was a sense of gathering momentum, with establishment of new posts, units, changes in senior managerial remits, and staff training all being mentioned.

Most developments in this area are initiated at a variety of levels, central, local (department, school) and individual, and supported in a similarly distributed way. However, there was clear evidence that individuals were more important in initiating use of C&IT, and also, but less strongly, in supporting it. This parallels what we know from other sources about the need for 'top-down + bottom-up' and the continuing importance of single members of staff ('enthusiasts', 'pioneers') in this area.

Our key informants were asked, from their knowledge of their institution, to indicate the extent to which staff used C&IT for research, admin and teaching, and this is shown below:

Table 4.1 Frequencies of purposes of use of C&IT within HE

purpose	high use	moderate use	low use
research	54%	33%	13%
admin	37%	54%	9%
teaching	4%	57%	39%

That this reflects a certain stereotype of academic behaviour is a conclusion hard to avoid! However, it also contrasts somewhat with the extent to which departmental representatives have reported their actual use of C&IT in courses and their attitudes towards it in teaching (see below).

When these different uses of C&IT are broken down by type of institutions, some differences can be seen but these are not significant and small numbers in individual categories make interpretation suspect.

Key informants estimated the proportion of subject-based courseware in use to be much lower than other C&IT tools (means of 17% vs 81%).

4.2 C&IT in teaching and learning at departmental level

Indicators of C&IT maturity

A variety of measures were taken of the extent and sophistication of use of C&IT in departments in HEIs, both users and non-users of TLTP materials. The simplest measure was to ask the most knowledgeable person whether the department had a written C&IT plan or strategy for enhancement of student IT skills. Most (58%) replied that they were 'developing' one, 27% stated that they had one and the remainder were without.

We asked respondents to self-rate their department for 'C&IT level' on an analogue criterion-referenced scale which spanned high use (rated 0) to low use (rated 10). It was notable that 60% of respondents rated their departments in the top 25% of the C&IT scale. While this may be a bias towards increased likelihood of return of the questionnaire by active departments, it probably also reflects the fact that most departments have already reached a 'threshold' level of C&IT use, because our top criterion point

(*networked PC on each staff desk, frequent use of email and WWW*) was not especially challenging, and the overall self-rating therefore reflects a positive picture of the preparedness of the community to make increasing use of C&IT in all aspects of its work.

There was a strong correlation within departments between this self-rated C&IT level and the presence of a student IT skills strategy. Those with such a strategy self-rated on average at 1.0, whereas those developing a strategy or without one self-rated lower at averages of 2.2 and 2.5 respectively. Respondents in departments in new HEIs self-rated their C&IT levels at 2.4, significantly lower than in middle-aged (1.5) and old (1.7) institutions. Departments in large and middle-sized institutions had C&IT levels higher than those in small institutions (2.0, 2.0, 2.3 respectively). There was no geographical effect on C&IT levels - institutions of varying sizes and ages being randomly distributed - and such an effect would have been difficult to explain.

For most departments, their C&IT level had increased either 'moderately' (61% of departments) or 'substantially' (24% of departments) changed over the last two academic years. Only two respondents reported a decline and the rest (24%) thought that it had remained stable. There were trends towards greater changes in small HEIs as compared to departments in large and medium, and in new HEIs as compared to middle-aged and old institutions.

We also have circumstantial evidence which supports this view of the threshold level of C&IT in departments. When we contacted staff and educational development units for departmental names and addresses, we offered email attachments as a method of return of the data. These departments are not likely to be above average in respect of C&IT use but one third used email as their preferred delivery route.

C&IT in teaching and learning

The great majority (82%) of departmental respondents felt that there was a favourable climate in their departments towards the introduction of new ways of teaching and learning, with only 15% judging it to be indifferent and very few (3%) believing it to be discouraging. This positive view is encouraging but has to be set against the barriers which many feel still exist in the way of actually implementing these changes.

This positive view was also reflected in views of the 'value' of C&IT in their department's academic subject area and its teaching. Thirty-one percent of respondents thought that their subject 'lends itself' greatly to the use of C&IT in teaching and learning, with 60% feeling that it did so moderately (i.e. over 90% feel positively about use of C&IT), and when asked about the scope for expansion of use of C&IT, 44% thought that this was substantial, 51% that it was moderate and only 4% thought that there was little room for greater use in teaching.

There is a strong association between views on how much the subject lends itself to the use of C&IT in learning and teaching and the C&IT level of the department. The greater the perceived utility, the higher the C&IT level. In contrast, there is no correlation between views of the scope for expansion and C&IT level. As it was likely that views of perceived utility of C&IT and scope for expansion of use would be dependent upon subject area we analysed this relationship and found that those subjects which have traditionally high computer-based or numerical components cluster together whilst those with a traditionally low IT base also cluster together. Similar findings are seen when subject areas are ranked by C&IT level. However, there is sufficient mobility of individual subjects within the rankings so that consistent significant effects for scope, utility and C&IT level do not emerge.

To explore the breadth of C&IT in use alongside, or instead of, TLTP materials we asked respondents about current departmental requirements of, or strong recommendations to, students to use different types of C&IT within their courses and modules. Generic productivity tools were most widely used, followed by communications applications, WWW and last content-based courseware. Not surprisingly, extent of use of these tools correlated strongly with the departmental C&IT level.

Table 4.2 Prevalence of types of C&IT in teaching

tool/facility	all/most courses/ modules		~50% courses/ modules		few/no courses/ modules	
	% depart-ments	C&IT level	% depart-ments	C&IT level	% depart-ments	C&IT level
WWW	11%	1.27	28%	1.68	61%	2.13
Communications tools	17%	1.02	22%	1.73	60%	2.25
content-based courseware	7%	1.15	26%	1.74	67%	2.05
productivity tools	57%	1.61	28%	2.14	16%	2.55

These relative uses of C&IT tools correspond well with the institutional key informants' views of the proportions of courseware to other C&IT tools.

Limitations on use of C&IT in learning and teaching

One reason for departments not to use C&IT in teaching could be constraints on student access to hardware or user support, or staff feeling that this was a limitation on their freedom to innovate. Not surprisingly, perceived limitations on staff were similar to those for students, around half reporting that limitations were slight, with just over a quarter stating that they were severe.

When we examined the relationship between the use of different types of C&IT in teaching and the limitations on its use, we found that an association was present between use of communications tools, productivity tools and content-based courseware, but was absent for the use of WWW. We interpret this to be due to the overheads involved in mounting and directing student use of the first three types of C&IT, which is absent for WWW browsers which *'are on the PC and just run'*. A fairly similar relationship was seen earlier between C&IT level and use of these types of applications.

Open-ended questions in the TLTP project and HEI key informants questionnaires also elicited comments about limitations on staff due to lack of technical and human infrastructure - '*staff may have been keen but lack of the right facilities on which to run and access materials has put them off*'.'

Sources of information about C&IT in learning and teaching

To provide us with some information about the ways in which academic staff who are deemed by their department to be knowledgeable about C&IT obtain information about its use in learning and teaching, we asked them about their sources. Many respondents did not complete this large matrix of options but a few clear messages emerge. More staff used discipline-based sources (both print, Web and workshop/ seminars) than generic sources, many quoting subject-specific agencies. CTI Centres were the most cited single agency, presumably because of their subject orientation, with LTDI following close behind for Scottish respondents. (This is a useful quality check on the ability of respondents to discriminate between agencies, the values UK-wide for use of LTDI being very low. Scots also rated FDTL very low as a source, in line with its non-Scottish funding and operation.) TLTP is the next favoured source. Forty percent of the 113 respondents who gave other important sources for information, named staff development and C&IT agencies or units within their own HEI.

5. Awareness-raising and distribution of materials

5.1 Awareness-raising

The awareness-raising, promotion and distribution of materials from projects to potential users was essentially the responsibility of the projects. The TLTP Co-ordinator played an important part in this by providing vehicles through which they could advertise and later also by setting up a central ordering point. There were no firm guidelines or protocols for projects to follow with respect to these activities, and each project chose the methods which it felt would best suit its materials and its audience. The 1996 evaluation of TLTP commented on an apparent lack of dissemination strategies in projects at the outset (Section IV).

Sixty-one TLTP projects replied to our questionnaire. The main publicity methods which they used, in descending order of frequency of use, were:

- their own web sites

- workshops, seminars and conferences (equally split between their own, the C&IT community's and the subject/profession's)

- printed materials (mostly their own but also those of the C&IT and subject communities)

- their own email lists

Other major methods included targeted mailshots, visits to departments and HEIs, video or demonstrator courseware.

They judged that most effort went into presentational approaches, followed by use of printed materials and computer-mediated routes.

The projects were also asked for their views on which publicity methods had been most effective, a challenging question, and several felt that it was not possible to give a simple answer. Overall, most rated presentational work as most effective, followed by printed output and computer-mediated routes, which on the face of it matches the efforts put into those areas. The importance of '*face-to-face*' work with the '*discipline community*' comes across strongly. We are uncertain of the extent to which the estimates of effectiveness are based upon hard evidence, since collecting such data would probably have required more resources than most projects could afford to invest.

The majority (73%) of projects stated that they had an awareness-raising strategy from the outset, two thirds of them reporting that the strategy developed over time, and 20% stated that they began without a strategy but developed one. Prime responsibility for awareness-raising was mostly taken by the lead site (72%) rather than being shared amongst members of the consortium. Two-thirds of projects favoured promoting uptake of their products over increasing general use of C&IT in teaching and learning.

As a final comment on promotion and awareness, it was clear to us from letters, phone calls and emails during our surveys that there were significant numbers of individuals within the HE and FE sector who were unaware of TLTP and its products. This is not to criticise TLTP projects or the Co-ordinator but to reinforce the fact that the dynamic nature of staffing of departments and courses/modules requires a continuous mechanism of awareness raising so that just-in-time awareness can be achieved. (Hopefully, some of the individuals whom we re-directed to TLTP will find something of use to them there!)

5.2 Distribution

In order to understand the extent to which TLTP materials are in use within higher education, knowledge is needed of the methods employed by the projects to distribute their materials and their use of demonstration and beta versions of their courseware. For a short period (1996-97) distribution was arranged through a commercial agency (BUDS) but for most of the time, until the present, it has been

located within the Co-ordination unit at Bristol or has been directly from projects. We asked projects to provide us with information about their distribution methods and their record-keeping of transactions, and later in our study we spoke to a selection of project leaders about their perceptions of uptake of their materials.

Almost 50% of responding TLTP projects made substantial use of demonstrator and beta versions of their courseware, a few circulating copies very widely within their constituencies. Although this was clearly a rational tactic for increasing awareness, it makes analysis of uptake of products with respect to time of final delivery more difficult as *project staff* may know when they shipped the final version, *recipients* of them are likely to be less discriminating about these dates. We return to the impact of pre-release and demo versions of courseware later in the report (6.1).

As with awareness-raising, most projects (73%) had a strategy for distributing materials from the beginning, with most allowing for some evolution, whilst 16% started without a strategy and developed one over time. The lead site was responsible for distribution in 83% of respondent projects.

The main route for distribution was from projects to consumers, with the next most common methods being downloads from servers and distribution via the central unit(s). Some projects distributed via publishers and agencies such as CTI and TLTSN. A few projects noted that they would have liked to have used distribution via publishers but could not establish an agreement with one, and others would have used Web-based delivery but were unable to do so for technical reasons.

On the consumer side, those staff using TLTP materials reported that they mostly obtained these directly from projects (62%), the next most frequent source being CTI Centres (18%) and the least common the central TLTP unit (9%). This attribution of source to CTI Centres may be due to actual distribution via CTI, to co-location of some of them with the TLTP project, or may merely reflect respondents' memories of the sources of *information* rather than *materials*.

6. Patterns of usage of TLTP products

We have divided this section into several parts, each of which explores in some detail dimensions of the current use of TLTP products within UK higher education.

These dimensions are:

- relative levels of use of the products of different projects

- location of this usage within the sector

- modes of use of the products

- staff reasons for selecting the products which they are using

Most of the data are drawn directly from our surveys of departments and institutions, with contributions from email and telephone interviews with staff during the preparation of case studies.

6.1 Which TLTP products are in use?

At the simplest level of analysis, the numbers of departments which report using some of the products of each of the TLTP projects cover a spectrum which can be divided into three broad bands: high use, moderate use and little or no use. The projects which feature in the high band are unlikely to surprise anyone active in or knowledgeable about this area, for they feature prominently in publicity materials, in the educational literature and in case studies about TLTP. Those in the moderate group are probably less well known beyond their academic community but nevertheless may have strong followings there, whereas many of those in the lowest group probably never delivered much material to the HE sector or their community, being largely restricted to the consortium members.

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Table 6.1 - TLTP Projects most frequently reported in use in UK HE

(number of HEI key informants reporting use, number of departments reporting use)

Mathwise: UK Mathematics Courseware Consortium (25,19)	TILT: Teaching with Independent Learning Technology (10,6)
STEPS: Statistics Consortium (9,20)	IT in Teaching & Learning: A Staff Development Pack (14,0)
TELL Consortium: Technology Enhanced Language Learning (20,16)	CALGroup Engineering Consortium (11,5)
WinEcon: Economics Consortium (28,21)	StoMP: Software Teaching of Modular Physics (14,9)
GeographyCal: Computer assisted Learning Consortium in Geography (13,21)	Biodiversity Consortium (15,9)
PCCAL: Pharmacy Consortium for Computer Aided Learning (6,16)	BioNet: Changing Patterns of Teaching in Biology & Preclinical Medicine (14,5)
Law Courseware Consortium (15,11)	UK Earth Sciences Courseware Consortium (13,11)
Core Resources for Historians: History Courseware Consortium (7,11)	Chemistry Consortium Project (12,6)
Pharma-CAL-ogy (13,13)	The Development of Courseware for Chemistry Teaching (11,7)

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However, this simple analysis ignores several important and anticipated issues which affect the meaning of the term 'usage'. These are:

- the 'extent' of use within any given department - used by one course/module or all courses/modules at a given level. Our approach to data collection from departments addressed this problem by asking for a return from every course or module using a TLTP product. We have analysed use by department and by course/module.

- the 'degree' of use of products. For one course, provision for self-access by students of a small module from a given project might constitute its usage whereas for another usage might be all modules from that project used in assessed and scheduled classes.

- the size of the constituency and the relative penetration of it by a given project's materials. For some projects this was relatively easy to define as only departments within a tightly defined subject area were likely to adopt the materials (e.g. clinical medicine), whereas for others many subjects might adopt the materials (e.g. maths). So there is a potential and a proportional uptake to consider.

A further factor, somewhat unexpectedly, turned out to be the ability of academic staff to identify materials as originating from a TLTP project and not from a commercial source or created within their own department as discussed below.

In addition, due to the way in which many respondents completed the questionnaires, and difficulties in distinguishing individual modules from whole collections of courseware, we could not reliably analyse the use of individual courseware items by departments.

In all surveys of this type there is a concern as to the relationship between the respondents' answers and the 'actuality' on the ground. Because it was clear that we were not going to receive responses from all departments we applied a cross-check on the pattern of responses by selecting key informants at institutional level in large and medium HEIs, and asked them to use their general knowledge about C&IT in teaching within their institutions to report to us which projects' materials were in use. This was a challenging task and we were pleased to find that 50% of them replied, and that there was a very high correlation (0.78) between their estimates of use of different TLTP materials in their HEIs and that which we obtained by surveying departments. The respondents in the departmental and institutional informants groups were different individuals. The institutional informants were carefully selected to be mostly in roles within their HEIs which required them to take an institutional perspective on C&IT use (a role which is sometimes called TLT officer or TLT support). Thus we are confident that the pattern of use of the products of each TLTP project is reasonably representative of the relative distribution of actual use.

There is a particular problem with identifying use of the outcomes of institutional projects as many of these are probably of less value to most subject-based staff than the subject-based courseware. It is mainly through the institutional informants that we can see much uptake of these materials as they are most likely to be useful to this group of individuals and their colleagues.

Finally, how representative is the picture which we have obtained of the use of the products of TLTP within the sector? Is it reasonable to extrapolate from our data to the sector as a whole? Our experiences during case study interviews with staff whom we identified from their departmental and course/module questionnaires leads us to believe that usage is somewhat under-reported, mainly due to the failure of some respondents to recognise that the materials which they were using originated with TLTP. Some academic staff thought that the materials they were using were commercial in origin, and it is likely that this view will be encouraged by the marketing deals with publishers used by some TLTP projects. Other staff thought that the materials had been created within their own departments, even when their department appeared never to have been a member of the particular TLTP consortium. This problem was greatest where materials could be tailored to the department's needs. Where one member of staff has done this and then the materials have passed into general use the likelihood of this mistake is highest. This loss of identity has a positive and a negative side. Viewed positively, the greater the sense of ownership the more likely materials are to be used (counteracts the 'not invented here' syndrome), but negatively it makes it difficult to survey use when non-users turn out to be users on closer inspection!

Whatever the effects of such under-reporting, the overall picture was that 33% of responding departments/schools were using the products of one or more TLTP projects, and of these 74% were users of a single project, 18% of two projects. More respondents appear to use TLTP products with several courses or modules (64%) than with only one (36%).

The views of some TLTP projects that uptake of their products was very widespread and that most departments in their constituency were using, as opposed to possessing, them do appear to be over-optimistic. Major hurdles lie in between possession and implementation of computer-based learning materials, as we shall discuss later in the report.

6.2 Where are TLTP products being used?
Within the education sector, TLTP products could be in use within higher education, within further education and in the later years of school. Our remit was to study use of these materials in HE and so the great majority of our effort has been focussed on this, but as we are aware of the growing importance of HE provision by the FE sector we have also carried out a small scale study of the use of TLTP materials in FE colleges.

The HE sector is very diverse in terms of the types and locations of its institutions. We have classified HEIs on the basis of:

Age

old   pre-Robbins

middle-aged   Robbins to 1992

New   post-1992

Size - based on 1996 HESA data

Large   >=10,000 undergraduate FTEs

Medium   9999-4000 UG FTEs

Small   <4000 UG FTEs

location

East Anglia	London	Midlands	Northeast	Northwest	South
Southeast	Southwest	N. Ireland	Scotland	Wales	

Within institutions, traditionally location of use could be described in terms of departments but with the recent trend towards combining small units into larger ones such as schools and faculties, this classification has become more difficult. We have chosen to use the QAA subject classification to assign a subject area to each 'departmental' response, accepting that some of these are rather arbitrary assignments where composite schools and faculties are concerned.

For the first pass analysis, we assigned the descriptor 'user' or 'non-user' to each department, to indicate whether or not they reported use of any TLTP product and examined the distribution of users by size of their institution, its age and its geographical location. User departments constitute 33% of the respondents.

The reported use of TLTP materials is highest in departments in medium-sized institutions (37%), next are the large institutions (32%) and least in small HEIs (24%). The last is most probably explained by the subjects offered by many of the small institutions which deliver the majority of education in visual and performing arts, teacher training, etc which were little represented in Phase 1 or 2 of TLTP. There is no correlation with age of institutions, not unexpected as large, medium and small HEIs are distributed across the age range but there are some geographical variations. The London area reports low usage, perhaps a reflection of more small HEIs. Northern Ireland reports high usage, but with only two HEIs, one of which had an institutional TLTP project, this is difficult to evaluate. Regions with small numbers of HEIs may be influenced by the levels of reporting as well as actual use within one or a small number of large HEIs. Scotland has had its own C&IT initiatives in addition to the UK-wide programmes, and these might have been expected to raise the use of TLTP products along with other C&IT. However, there is no evidence to support this view.

Some institutional projects were established to promote use of C&IT across their institutions, some by developing learning materials as well as supporting staff to implement use of whatever appropriate materials existed. We examined the departmental responses of this group of institutions as compared to all other departments in medium and large HEIs (institutional projects of this type were all located in these groups) but could see no clear evidence of differences in uptake of TLTP materials, which could be used as a rough proxy measure for use of CAL. However, the sample number is small and so this does not preclude other effects within HEIs with an institutional project which it would be hard for us to measure, such as quality of use.

Finally, our survey of FE colleges thought to deliver HE courses indicates some use of TLTP materials. The numerical returns were small and most colleges reported no use but from those which did, the most popular materials appear to be in vocational areas such as business subjects and caring professions. These questionnaires produced a significant number of enquiries to us about TLTP in general, suggesting a potential market with low awareness of the products available. We are also aware from personal contacts and the membership of some user groups that the upper end of secondary school provides an outlet for a selection of TLTP materials. This is in line with the academic level at which some TLTP materials were targeted.

6.3 How are TLTP products used?

The wide variety in the styles adopted for their learning materials by TLTP projects gives scope for much complexity in the ways in which they were used. A detailed exploration on a project-by-project basis was beyond the scope of this study with the exception of the most widely used materials.

Most courses which use TLTP materials are face-to-face, on-campus (91%) rather than off-campus and/or resource-based, and are for first and second year students (84%), i.e. the 'classical' undergraduate courses which probably still make up the majority of HE provision. There is a small taught postgraduate use (11%) which appears to reflect Masters courses in vocational subjects.

Class sizes vary across a wide range from around 10 students to over 500. The mean enrolment of courses using TLTP materials is 83, and median 60.

Table 6.2 Use of TLTP materials vs course enrolment

Enrolment	0-50	51-100	101-150	>150
% of courses using TLTP	40%	26%	16%	18%

This evidence of greater use in relatively small classes ('teaching units') is particularly interesting in view of the initial emphasis in TLTP on efficiency and cost-effectiveness with large first and second year classes, at a time when staff:student ratios were rising. This may reflect two forces. Firstly, the trend to modularisation has increased the number of teaching management units and decreased enrolments on them in comparison to the number of units in pre-modular curricula. Secondly, for many departments the overheads on management of very large units, e.g. enrolments of 250+, may be such that only relatively basic traditional teaching is feasible, that being very lecture-based. Limitations on infrastructure (room availability, microlabs etc) and staff (part-time, availability for time-tabled sessions) may make adoption of computer-based techniques too difficult. We also have a little evidence from interviews that staff may abandon use of TLTP materials if enrolments rise too far. Several HEI key informants commented on the need for all TLTP materials to be more 'modular' in form to fit better into existing curricular structures.

When we analysed the distribution of reasons for adopting TLTP materials vs course enrolment, a clear difference between large and small courses emerged. The staff on large courses were more likely than staff on small courses to state that '*coping with increased enrolments*' and '*reducing expensive classes*' were their reasons for adopting.

A spectrum exists of possible use of any computer-based learning material, which extends on one side to the course being 'designed around it', incorporating it as a mainstream, core element with support (we can call this 'fully-integrated' or 'built-in') to the other side where it is available for students and they are told of its existence but it essentially stands alone, supplementary, unsupported, and largely unrelated to course objectives or assessment (we can call this 'bolt-on'). Any type of use of courseware (or indeed any learning tool) can be positioned at different points on the spectrum. For example, a piece

of courseware can be used for remediation for some students in a class in a stand-alone, self-directed mode. If this use is planned to ensure that they can get ready access, have guidance as to what to do with it and get support if problems arise, and learning derived from it is explicitly assessed then it is 'integrated'. If they are merely pointed to a server-mounted item and told to 'fix their deficiencies' then it is 'bolt-on'.

There are various measures which can stand as proxies for degree of integration, the most important being direct and explicit assessment of knowledge and skills acquired by use of the materials, another being collection of student feedback about them.

The majority of course/module respondents (76%) stated that they 'required' students to use the TLTP materials, although there might be some ambiguity in this because for many academic staff 'required' has a different meaning to that given to it by students, as can be seen by differing views of the importance of the lecture. The staff view of the material as essential is reinforced by their linking of assessment to it.

Table 6.3 - Assessment of learning gained by use of TLTP materials

Assess knowledge/skills acquired from use of…	all TLTP materials	some of TLTP materials	none of TLTP materials
	28%	43%	29%

Seventy-one percent of respondents stated that they directly and explicitly assess some or all of the knowledge and skills obtained through this medium. (Again there may be a degree of ambiguity about the extent to which all respondents attach the same meaning to the words 'directly and explicitly', but there clearly is a minority of staff who use these materials with students in an at-will, supplementary and un-assessed fashion). This commitment is also reflected in the fact that 79% of courses collected feedback from students about their views of these TLTP materials. The most common methods were questionnaires (52%) or discussion (29%).

In our case studies we interviewed staff who appeared to us from course/module responses to be at various points along the spectrum. Their statements about types of use show that materials from these TLTP projects were employed as primary learning materials, as supplementation to add extra learning opportunities, as remediation, as replacements for labs and tutorials etc. There were those who used them in a fully-integrated form ('*the course is the courseware*') and those who used them in an entirely bolt-on way ('*it's there while they wait for things to start*'; '*on the server if they want to use them but I don't know if they do*').

Few students were expected to work in groups with the courseware, and approximately half the courses required them to use it unsupervised. The authors of the 1996 evaluation of TLTP commented that the design of most materials was not shaped for groupwork (Section II).

Half of the courses using TLTP materials reported having moderate or substantial CAL content, the rest reporting minor use (presumably mostly contributed by TLTP). There was a direct relationship between the extent of CAL use and the extent to which these staff assessed the knowledge and skills derived from the use of TLTP materials. Staff who had substantial CAL in their course were almost four times as likely to assess all their TLTP material than they were to assess none of it, suggesting a significant degree of integration of C&IT in general into their courses.

Extent of assessment did not appear to vary significantly between courses using materials from different TLTP projects. The small numbers of respondents for many projects made such a detailed analysis suspect.

6.4 Staff reasons for using TLTP products

The rationale for establishing TLTP in 1992 and the stated purpose for several years was to achieve greater efficiency in teaching in HEIs, especially in large classes, by use of new technologies, and projects were obliged to respond to this in their bids for funding by estimating efficiency gains. A later shift in emphasis led to the inclusion of the alternative aim of improving effectiveness of learning, as it became clear that useful measures of efficiency were hard to define and apply. For staff who choose to employ TLTP products in their teaching, a different set of reasons might be in operation, and so we asked users to indicate their principal reasons, although without asking them to rank them in importance.

The reasons which we suggested to respondents fell into two sets (presented randomly): pedagogical and operational. The majority of responses fell into the former rather than the latter set. The 1996 evaluation of TLTP noted that the projects themselves were reluctant to view efficiency gains as the major driver in their work, and that quality enhancement was uppermost in their minds (Section V).

Table 6.4 - Staff reasons for using TLTP materials

reason (pedagogical)	%	reason (operational)	%
increase variety	83	save staff time	28
novel ways to learn	58	remediation	34
increase student autonomy	55	response to increased enrolments	15
		flexibility	26
		replace expensive classes	8

On closer investigation of these data at least two groupings appear to emerge. There is a group of staff for whom pedagogical reasons are dominant, and a group for whom operational reasons are dominant. (There may also be a third cluster which overlaps with both the others, in which reasons such as flexibility have been translated as meaning 'for students' by one group and 'for the system' by another group.)

Reasons for using TLTP products varied by age and size of institutions.

Increasing student autonomy was quoted as a reason for adoption by staff in new HEIs more than by those in middle-aged, and was quoted least by staff in old HEIs (67%, 57%, 48% respectively). Flexibility of access to the curriculum was most quoted by staff in new HEIs, next by staff in old HEIs and least by those in middle-aged HEIs (33%, 25%, 19% respectively). No other reasons showed dependency on age of institution.

Saving staff time was seen as more of an issue in the decision to deploy courseware in large institutions (35%) than the medium-sized (24%) or the small (8%). Staff in middle-sized HEIs were more likely to offer increased variety of learning opportunities as a reason for use (87%), followed by staff in large (79%) and small (75%) HEIs. There was a suggestion that flexibility of access to the curriculum was more important in large than medium or small HEIs (30%, 24%, 12% respectively). Finally, small institutions regarded remediation as more important than did medium or large institutions in adopting TLTP products.

Interviews with users of various TLTP products confirmed these reasons. There were uses for remediation when coping with enrolments with heterogeneous backgrounds and for 'acceptable repetition' (i.e. practice and consolidation). Evidence of compliance with pressures and the need to appear 'modern' in approach also emerged, along with other operational reasons such as creating timetable flexibility for accommodation and for staff scheduling.

7. Factors influencing uptake of TLTP materials

In this section, we turn our attention to the factors which appear to have influenced the extent to which TLTP materials have been taken up and used by departments and across institutions. Notwithstanding the difficulties in ascertaining the direction of causality, there do seem to be some suggestive associations between use of TLTP materials and aspects of the environments in which they are being used.

There is a real danger in reviewing progress with respect to any initiative such as TLTP in collecting a large number of criticisms and negative views and omitting to collect praise or failing to attribute enough importance to progress already made. It is worth re-stating here that of the 25% of UK HE departments which responded to our questionnaire, from all sizes and ages of institutions and ranges of subject areas, 33% report using some materials from at least one TLTP project. In addition, the information from institutional key informants suggests that large and medium HEIs are using around 10-12 projects' materials on average (largely from the same group of projects). This confirms the belief of projects that they have managed to get usage as well as uptake, and although a significant proportion of this is likely to be from use of materials within consortia, especially large consortia, much of it appears to be in use at sites outwith them.

7.2 Departmental factors

Departments with explicit strategies for student IT skills were much more likely to use TLTP materials than those with no real strategy (40% vs. 19%), although interestingly there is no relationship between TLTP use and the respondents' perceptions of the climate for change within their departments. (This needs to be viewed in the light of the overwhelmingly positive climate for change reported to exist in departments.) Possibly this latter question was too difficult to answer for many respondents, as large departments can have 'pockets' of support, and even hostile departments may not prevent the enthusiast from using courseware of their choice.

The extent to which the respondents saw their subject as 'lending itself' to C&IT in teaching and the scope for expansion of this use were both correlated with higher use of TLTP materials (e.g. 43% of TLTP users vs. 7% of non-users thought that their subject lends itself greatly to C&IT), but there was no correlation between this TLTP use and the extent of use of other C&IT (communication, web, productivity tools), except for the use of courseware which of course also includes TLTP.

The overall C&IT level correlated strongly with use of TLTP products - user departments rated themselves at a mean of 1.5 versus 2.1 for non-users.

The relationship between limitations on resources for staff and students and use of TLTP materials produced an interesting effect. There was a greater proportion of non-users than users who felt that there were no limitations. This may mean that non-users have not tried to implement TLTP materials and therefore not realised that limitations exist, but this is a weak effect and too much should not be read into it.

Our interviews with staff at universities and colleges around the UK have provided insights into the reasons why they did, or did not, adopt TLTP courseware. Critical factors which have emerged from these interviews, and from answers to open-ended questions in surveys are:

Need for support for academic staff, both pedagogical to enable them to incorporate computer-based materials into the curriculum, and technical to enable students to access the materials. Neither of these are simple issues.

On the pedagogical side, it is worthy of note that smaller items are easier to use than large integrated packages, that items which require less curriculum modification are simpler to incorporate (e.g. video), that items which can be modified to suit the course are adopted more easily (indeed may even come to be seen as 'created by the course'), where TLTP projects helped with these issues staff felt more comfortable about using them, and user groups are helpful for mutual support. CTI Centres helped many individuals - both to find materials and to 'get them going'.

On the technical side, more attention could have been paid by TLTP projects to the different (network) environments in which their materials would need to be used. Technical support in institutions were not always prepared to try to get courseware mounted and working, and some made blanket rejections of 'non-commercial software' or adopted a sceptical attitude to all TLTP materials on the basis of some poor demos.

In spite of a lack of these pedagogical and technical supports, many staff have managed to install and use TLTP materials. This emphasises the continuing need for enthusiasts, champions, leaders - both technical and educational, both formal and informal - to get something started in each department despite barriers. For some the TQA was a spur, for others it was a lever they could use to 'move' their department.

On the other hand, disincentives were the pressures of the RAE, lack of recognition or rewards, short-term funding, lack of senior management interest or support. Quality of materials and enough choice were still issues - some staff felt that much TLTP material was too low level and not sufficiently challenging for their students. Others thought that TLTP had been overtaken by developments in the web and software standards and so had dated too quickly.

Use of TLTP materials was strongly associated with QAA subject area. In general, the most computer-oriented and numerical subjects such as physics, economics and biosciences had highest use, whilst the visual and performing arts and the humanities had the least. The distribution maps reasonably well onto the subject areas in which subject-based TLTP materials were available.

7.3 Views from TLTP projects

Around 80% of the TLTP projects provided us with their views of the factors, including awareness-raising and distribution, which influenced uptake, and what might have improved it. A significant number thought that '*awareness of their products was not really the issue*' - this was probably fairly high, and that institutional factors were more important - '*awareness on its own won't initiate change*'. Others felt that the projects should have spent more time and effort in awareness-raising, but given the resources available to them thought that this was largely unrealistic. Many respondents thought that better support from agencies, not all funding council provided but including professional bodies, would have helped in both promotion and distribution. The projects also considered that they were not always able to make best use of more technical distribution routes such as CD and FTP and central help would have been useful here too. Factors other than promotion and distribution were cited by around two thirds of projects. Those which aided materials reaching potential users were the consortia which gave 'street cred' to the products; channels through agencies such as CTI, TLTSN, LTDI; changes in the climate of responsiveness in HE. However, more projects thought that hindering factors were dominant, perhaps a little unreasonably given the overall usage which we have found. These included ways the projects worked; the resourcing of them and the central unit; the quality and image of their products; problems with promotion and products which were felt to be supplied '*too cheaply*'. Many projects saw problems with staff rewards, attitudes and resources as being major factors in preventing changes of the sort which would favour use of TLTP and other C&IT materials.

Many of the comments from projects about distribution suggested that they had '*got this right*' and had reached their targets. Not all agreed however, and some felt that more central management would have helped '*via a carefully thought-out policy developed in collaboration with project teams on what might be optimal*'. There is a big difference, however, between 'getting it there' and 'getting it used', as many projects were clearly aware. Key informants in institutions were generally selected as being concerned with implementation of C&IT, including TLTP, within courses, and their choice of factors influencing uptake (given by 90% of respondents) strongly reflect their institutional view. The comments fell into three groups, related to their institution, the TLTP products themselves, and their promotion and distribution.

Institutional factors were: the need for change in the culture; staff development and training; senior management encouragement; specific C&IT support staff and units; and better technical infrastructure.

On the products side, they commented on the need for better focus and quality of materials; greater adaptability and ease of delivery; and more pedagogical input and support.

There were also requests for more and better dissemination and demonstration materials, although whether this could ever satisfy demand is an open question! A more reasonable request was for better cataloguing, details of products and sourcing.

Some of these issues could be addressed by future initiatives, others are outwith the remit of courseware development groups and can only be tackled by institutions themselves or by initiatives targeted directly at them.

8. The impact of TLTP on the higher education sector

8.1 Impact of use of TLTP products on teaching and learning

Most users of TLTP products (55%) felt that their experiences with them had had some impact on their views about the value of CAL and C&IT, with a further 39% reporting that the influence had been high. Few reported no influence. Overwhelmingly these effects were viewed as positive, for both staff and students.

Table 8.1 - Perception of benefits of use of TLTP materials

direction of effect	benefits to staff	benefits to students
more positive	66%	68%
unchanged	29%	26%
less positive	4%	6%

Not surprisingly there is a strong association between respondents' views about perceived benefits for staff and for students.

Whilst the views of staff are very positive towards the effects of the use of TLTP materials, it may be that their reasons for choosing them in the first place might colour how the benefits are perceived. Moreover, the vast majority appear to be using them in largely face-to-face teaching environments on-campus, that is they are assimilating them into traditional settings.

There is a strong relationship between the extent of assessment of students' knowledge and skills acquired from use of TLTP materials and their positive impact on the staff using them. The greater the extent of assessment the higher the impact. This is also reflected in the perceived benefits to both staff and students. Of course, deciding to assess the outcomes of the use of these materials is a an act of commitment to them and hence may predispose staff to see their value as positive.

As noted earlier, most courses collected student opinion about TLTP materials. This was reported to be very positive with respect to both interest (76%) and impact on learning (67%).

Almost two thirds of TLTP projects also gave us their views on the impact of their projects on themselves, their colleagues and their students. Almost all were very positive about the outcomes of TLTP for themselves and colleagues in their teaching and often these were influences on pedagogy as much as in promoting greater use of C&IT. They reinforced the responses given by course/module respondents about the positive view that students expressed about use of these materials - *'there has been a clear and almost uniformly positive response from students'*. They also commented on the value of these materials for creating greater flexibility for staff and for students, offering an expansion of learning styles and self-pacing. As with the course/module respondents, TLTP projects focused much more on educational than operational benefits. There is little mention of staff time-savings - *'increases effectiveness but does not reduce time'*- but promotion of staff as well as student IT skills features as a general gain.

The impact of TLTP can be considered not only in terms of its ability to get its products into use within HE, but in wider terms, by changes in the use of C&IT in general, and more fundamentally by educational and managerial changes. These effects can be located at the level of students, staff, the institution or the sector and beyond this to impact on the general managerial and educational processes.

8.2 TLTP leading to other C&IT developments

Project contacts, institutional key informants and interviewees all gave us their views on the wider effects of the TLTP programme on changes in the use of C&IT in general . From these we have extracted main themes which emerge frequently in their comments. These are:

- awareness raising of the value of C&IT in teaching and learning, some of which has resulted in more TLTP use and some has led to other uses of C&IT

- practical experience '*with something*', for in the absence of some materials to try ideas out with, staff will be forced to develop something themselves - a costly process - or do nothing.

- development of core experience with TLTP to build on and go further - once staff had used TLTP materials they then sometimes looked around for other C&IT based materials

- promoted integration activities

- promoted institutional support activities - the TLT officers often came out of TLTP projects, and HEIs had to respond to the need to deliver TLTP courseware to students

- promoted success in gaining further funding, both from within and outwith HEI - several projects reported success with further funding bids, either within their HEIs or beyond, which they felt had been a direct result of experience gained in TLTP.

- bringing a sharper focus on issues such as network infrastructure and mechanisms of delivery to staff and students, and the need for change at institutional level as well as departmental

8.3 Impact of TLTP beyond C&IT

Themes which emerged from respondents were:

- increased experience of collaboration within and outwith the HE sector which has been reflected in better management of later initiatives and projects

- new and stronger networks of people, academic, TLT officers and support staff - reflections of this can be seen in the appearance of societies and mailservers, and in the same staff re-grouping in new ventures

- increase in research into the educational experiences of students, reflected perhaps also in the proposed changes to the education section of the next RAE?

- creation of a new distributed skills-base, in technical as well as pedagogical areas which is able to support academic staff in use of C&IT

- impact on teaching and learning practice, resulting from a better appreciation of the need for clear objectives, definition of learning outcomes, use of a wider range of assessment techniques, etc

We have reviewed impacts of TLTP from the level of teaching and learning in courses to wider impacts on the institution and the sector. This is, of course, not linear for the higher level outcomes will feed back on to the staff who teach courses and open more options for them to innovate. Indeed, without a combination of 'top-down' and 'bottom-up' developments there is unlikely to be systematic and sustained change.

9. Issues and reflections

So far we have reviewed our findings on higher education's use of TLTP materials and the context within which this use is set. We have also explored some of the impacts of the TLT Programme at different levels within the sector. As we reach the end of our report, we wish to turn our attention briefly to the items which have stood out strongly for us and some issues which we see emerging from our study, to draw out some pointers which might prove useful to the Funding Councils and HEIs in their future planning.

1. We were impressed by the extent of use of TLTP and other C&IT within the sector, and the breadth of subjects within which they are being used. Notwithstanding the possibility that these particular data may be somewhat biased towards a favourable view, the level of internal consistency is high, and it relates well to other sources external to this survey. We feel that this implies a solid base on which to move forward, and it would make sense to capitalise speedily upon it. Most respondents felt the need for greater support to enable them to translate their intentions into practice.

2. In Section 6 we outlined a model of use of computer-based learning materials which is common in the minds of those active in this area, namely that there is a spectrum of usage which goes from fully-integrated use on the one hand ('built-in') through degrees of integration (more or less 'bolt-on') to non-use. This spectrum applies to all types of C&IT, including that from TLTP. What have we learned from our interviews and surveys about why staff find themselves at different points on this spectrum?

Table 9.1 - Factors affecting degree of integration of C&IT

factor	fully integrated	partially integrated	entirely bolt-on
pedagogical issues technical issues	staff have understanding and solutions + good support	staff have some solutions and understanding, support often limited	staff fail to understand issues and resolve them - no or very limited support
teaching and learning styles	flexible, adaptable	limited flexibility, adaptability	little ability or desire to adapt
acceptance of innovation	high	moderate	low, traditional dominates

Staff are able to fully integrate C&IT materials into their courses when these factors have been moved from barrier to solution, and will make little durable progress where few or none have been resolved. Many staff will find themselves in a middle area where they have limitations on one or more of support, room for manoeuvre in course design, and understanding of the issues.

Materials are used in contexts. Staff largely assimilate them into existing courses, shaping both the course and the use of the materials to fit each other. Small modules are most adaptable to this process. However, the impact of these assimilations is much wider than often recognised, for their use begins to raise questions about course objectives, about valid assessments, and they begin to modify thinking about teaching and learning practice in general. It is also interesting that staff have by and large chosen TLTP materials mainly for pedagogical rather than operational reasons.

3. TLTP has had an impact which is much wider than the simple use of its tangible products and greater than it is often given credit for. The programme drew in a very large number of staff from a wide range of departments, and many of the networks, both formal and informal, which were established have continued past the end of the project. For many staff there was also a substantial gain of experience of working collaboratively in consortia, and this was to a degree independent of the success of their project. This collaborative work in teaching and learning was rare nationally and internationally and has been adopted by others since. Finally, there have been a variety of effects on HEIs from having TLTP projects located within them, and the pool of ex-TLTP staff have continued to give valuable input to their HEIs in other posts.

4. The role of HEIs in supporting and guiding innovations of all kinds is crucial, especially for the use of C&IT. This is now generally accepted within the sector for technical infrastructural areas, but the importance of pedagogical support is perhaps less widely noted or acted upon. The emergence of a new academic-related group of staff (which we have called TLT officers, adopting the name used by TLTSN) is evidence of the institutional shifts taking place. Drawing them into the mainstream of staff development will be needed to ensure that they are able to exert maximum effect.

5. Quality control of the products of programmes such as TLTP is essential if users are to have confidence that they are getting value for money. A frequent comment in open-ended questions in our surveys was about the poor quality of many materials and the lack of good attention to market needs. More robust external scrutiny of the materials might have mitigated some of these problems.

We feel that the difficulties which the Co-ordination Unit found in obtaining and standardising records and data about projects reflects a lack of clarity over the locus of managerial responsibility for the programme. Greater authority to direct some projects might have been to these projects' benefit as well as to the sector's. The 1996 evaluation of TLTP made a similar comment (Section VI). This is particularly important in the light of the proposal from the CTI-TLTSN Review Group that several programmes and initiatives should be brought under the control of a single co-ordination unit.

10. Abbreviated case studies

Case Study Summaries

In addition to the survey work that has been presented in the earlier sections of this report, we conducted case studies to give a more fine grained account of the use of materials from selected projects than could be achieved through a survey. They allowed us to get closer to the experience of the users of TLTP materials and to be alert to any insights and issues that might emerge through the more exploratory approach that case studies usually entail. The projects chosen for analysis in the five case studies were largely selected on the grounds that it was clear from our surveys that their products had achieved relatively widespread uptake. It therefore seemed likely that these projects might provide some interesting pointers to factors which might make for successful uptake and continuity of use of courseware. A sixth case study examined five universities with institutional initiatives to promote the use of C&IT, including TLTP, in teaching. We selected staff at three managerial levels (strategic, tactical and operational) and asked them about the nature of the initiative and their perceptions of its effectiveness.

The specific procedures used in the five case studies of an individual TLTP project or projects had to be tailored to fit the nature of that project and to address the issues that emerged in the course of the investigation. All of the TLTP project case studies, however, involved a core set of research tasks:

- building a profile of the objectives, and history of, the project

- examining the nature of the materials that the project had produced

- conducting telephone interviews with 'users', 'non-users' and 'abandoners' of the materials of the project

The full text of these six case studies can be found at: http://www.tltp.ac.uk/ and http://www.flp.ed.ac.uk/tltp/

The following pages provide a synopsis of some of the main issues which arose within the individual case studies but across the whole set of case studies a number of common themes can be discerned:

Common Themes

- these projects showed evidence of having been effectively managed, albeit in differing styles, and of having had a clear vision that sustained their efforts

- there were flexible approaches towards ensuring future survival of products, evidence of long term commitment

- almost all of the projects examined had worked closely with, and been responsive to, their user communities

- most of the projects examined in the case studies had distributed the task of producing materials among a fairly large team of academic developers drawn from different universities. This development strategy appeared to have had a helpful effect in encouraging ownership of these materials by the academic community

- the relatively low cost of TLTP materials appeared to be an important factor in ensuring their uptake

- all of the projects examined in the case studies had engaged in enthusiastic, determined promotion and dissemination of their materials; and some had made active attempts to build up a formal user community

- some respondents saw the academic level of TLTP materials as insufficiently demanding – a view which points up the difficulty of creating sets of materials that will be perceived as appropriate by all sections of the diverse HE sector

- both the development and dissemination work of some projects was considerably aided by the existence of a supportive relationship with a CTI centre and/or a professional association

1: Resources in Chemistry

The Chemistry Courseware Consortium (C3, or C-Cubed) based in the CTI Centre for Chemistry at the University of Liverpool, and the Chemistry Video Consortium based at the University of Southampton, have both been successful as determined by the breadth of use found in the present study, and through the follow-up contacts maintained by the projects themselves. They involve the use of very different technologies, while addressing the same market constituency.

C3 produced over its funding, 22 pieces of computer-assisted learning material and a number of generic 'tools' which could be used in conjunction with the content-related courseware modules or freestanding in other learning situations.

The Chemistry Video Consortium has breathed fresh life into the use of video records for introductory demonstrations in the teaching of Chemistry. The basic product of the work has been 19 thirty minute demonstration videos providing an introduction to chemical laboratory procedures and techniques. In addition to making the recording available on VHS tape, the project has also provided laser disc versions. The benefit of video disc over tape (direct access to any point in the recording without having to 'fast forward') has been augmented by the use of a bar-code system to automate the indexing of the recordings.

Themes

- both projects have been successful examples of the concept of "consortium", capitalizing on the pre-established market which the convening of the consortium implied. The consortium approach also promoted a feeling of ownership of the project products across a wide sector of the community, encouraging take-up and use

- the Video Consortium received important support from the Royal Society of Chemistry, that support being important in the establishment of professional credibility and the provision of communicative links which helped both in the specification of the task (for example, the topics which should be addressed) and also at the phase of dissemination

- C3 was located within the CTI Centre for Chemistry, and thus benefited from the expertise, reputation and communicative links of the Centre. Again, this association provided advantages at the time of task specification and in establishing the potential market

- both projects demonstrate the importance of prolonged and sustained personal contacts in the business of dissemination. It is clear that good materials would have gone unused but for the enthusiastic and conscientious promotion of the developers

- while the video materials, produced and distributed on laser disc and with the bar-code system for control, are perceived as "state of the art", their potential use is easily understandable even by the least technically experienced and aware. The value of video recordings can be directly appreciated by most teachers from their own direct experience of video tape whether in the academic or domestic setting

- as the hardware necessary to make use of laser disc video is relatively expensive and it is unusual for a department to have access to more than one disc player, the one-to-many demonstration is the obvious setting in which to use the resource. Thus, the materials can be readily incorporated into existing styles of teaching, and can make a significant impact on the quality of the students' experience without any radical departures in teaching style or practice on the part of the staff

- while the cost of the dedicated equipment necessary to make use of the laser disc materials might have proven to be a barrier to the penetration of such video products, accounts from the Project suggested that this had not been the case. Indeed evidence was that the significant costs contributed to more planning before adoption, and a greater feeling of accountability after, both factors leading to higher levels of commitment to making the initiative work for the adopting department

- by contrast, the apparent ease with which the C3 materials could be obtained meant that there was little to be lost if the innovation failed, so less effort was invested to ensure its success. In some cases the software was acquired with little more being done to promote its use than making it available to students

- C3 has plans that their materials will soon be available for purchase by students for use on their own PCs. The experience of C3 provides a microcosm of the developments which departments and institutions will have to come to terms with as they establish policy on students computer ownership, and the extent to which student access to IT can be supplemented and enhanced in this way

- similarly, the Video Consortium has plans to transfer some or all of its materials to CD-ROM, to capitalize on the increasing availability of highly functioned multimedia PCs, thus changing the dynamic of the deployment of the materials through organised demonstration to the increased potential for personal use by students working on their own or in groups around a PC

2: Mathwise

A consistent picture emerges from our surveys that materials from the Mathwise project have a high position in a ranking of reported usage by project.

The Mathwise project was set up in 1992 and achieved continuation funding to keep the project active until December of 1998. Funding for the project has not been continuous over this period, however; and gaps in funding over the two phases of TLTP have caused difficulties, resulting in the loss of software developers and other core staff and a 'stop/start scenario'. During the last six years the momentum and focus of the project have been sustained by an executive committee which could draw on the commitment and interest of a core group of CAL enthusiasts; and the support of the CTI Maths & Stats. centre has also been of key importance during periods when there was a funding gap. The development of materials was distributed to individual authors drawn from academic departments throughout the UK, which can be seen to have the advantage of encouraging ownership of these materials by the academic community.

With NAG as partners, Mathwise released a CD in December 1997 which contains 48 modules covering a wide range of mathematical topics taught in first year at university and "a number of key topics in second-year university courses", together with pre-university material. Inspection of the current version of the Mathwise materials suggests that the authors have largely achieved a common 'look and feel' across the different modules.

Themes

- users had found Mathwise easy to obtain and those who had sought technical support from the project were satisfied with this service. The fact that Mathwise has been available cheaply to the academic community would seem to have been a major 'selling point' for the materials. Particularly in comparison to certain other courseware products for first year mathematics teaching, Mathwise was viewed as technically robust, and more importantly free from errors in the exposition and illustration of mathematical concepts. Ease of student use was seen as another positive feature of Mathwise materials

- the contrasting experiences of students from two different engineering departments using Mathwise on a maths service course serves as a reminder of the well established finding from research on CAL that the manner in which students' learning with a particular piece of software is structured has a central effect on the processes and outcomes of learning. In one of the departments, where Mathwise was very much used as a 'bolt-on' to the course, the number of students attending

Mathwise sessions declined and feedback from the students was not enthusiastic. In the other department by contrast all students were given encouragement to make use of Mathwise; and support and direction in the use of the modules. In this second department, the use of Mathwise materials was viewed to have been fairly successful and student feedback was largely positive

- the evidence of our survey returns shows fairly equal proportions of departments from old and from new universities reporting use of Mathwise materials. However, some respondents perceived the Mathwise materials as more suited to lower-level teaching/student learning activities that were not appropriate for their 'high achieving' students. These perceptions highlight the problem of creating a set of courseware materials that will be viewed as relevant to all sections of the diverse higher education student body. This is likely to be a particularly acute difficulty in an area such as mathematics, where large service courses have to be taught and the range of ability to be catered for may be wider than in many other subjects

- recognising the need to avoid the danger of penetration being limited to isolated enthusiasts using individual modules, the Mathwise project has focused considerable attention, effort and funding in the last few years on the task of publicising its materials and developing a constituency of users. Two key activities in this drive to build up a user base have been the production of a widely distributed termly newsletter and a series of workshops held throughout the UK. At the end of June 1998 there were over 100 members registered in the User Group. The user group has its own web-site and an electronic discussion facility, as well as a password-protected collection of support materials, including case studies of use and student worksheets and booklets

3: Pharma-CAL-ogy

The clear aim of Pharma-CAL-ogy was to develop modules that would focus on well defined topic areas in pharmacology, medical and dental sciences courses and that would be flexible and versatile using various approaches. It was decided to have a consistent initial interface but not to impose a standard 'house style' - in hopes that this would help foster creativity and increase each development site's sense of ownership.

Themes

- there was an indication that the products had been well publicised and were easy to obtain

- mention was made of the positive role of the British Pharmacological Society, in addition to the project's own web site and formal linkages with another successful TLTP project, PCCAL the producer of Pharmacy materials. The overlap of interests among some of the two projects' target audiences was reflected in the high proportion of courses/modules reporting dual usage

- the overall quality of the materials obtained was thought to be high, though perhaps not unexpectedly there was variability between the approaches and the extent to which particular modules would fit well with the content and emphasis of local curricula. They were felt to be best suited to first and second year use because they are dealing with basic but essential content; but it was pointed out that much can depend on the shape of the curriculum, for example, within a medical course or with students undertaking final year projects

- positive comments were made about the concentration on key aspects, though one person believed there was considerable scope for the production of more advanced materials. It was recognised that the more that materials were at the cutting edge, the shorter their likely shelf life, and the quicker amendments need to be made. In general ageing was not seen as a problem (especially for the video-based materials), and favourable comments were also made about the project's updating policy

- commonly, the materials were not bought with any specific application in mind and the intervening period was spent deciding how to make best use of them

- sometimes decisions about what to adopt and how to adapt were self evident, as in the case where only the video materials could be used because of platform incompatibilities

- there was some comment about the size occupied by some of the programmes which occasionally entailed technical difficulties including reloading on the server

- users were motivated to enhance students' learning, but with the very real difficulty of creating the time to think properly about curriculum development or to explore and evaluate new possibilities

- the user guides accompanying the Pharma-CAL-ogy materials were viewed as mostly useful, but also as necessarily generic

- there was variability in use. In some instances use was encouraged rather than simply optional, for example as an adjunct to practicals. Although no-one tried to track how often such materials were accessed, the impression people had was of relatively low levels overall, but of a small percentage of students using it a lot. The more integrated uses of the pharmacology materials included guided video work with handouts, which became the basis for further group discussion. Another course has allowed the cohort of sixty students to be split into two groups and to be resourced by one member of staff moving between them

- as regards students' reactions, these were reported to be mainly positive, particularly when the usage was well thought out and when it was one element in a varied course

- there were some indications too that successful usage had the effect of inspiring others to use similar materials in their own modules or courses

4: WinEcon

The study identified WinEcon as one of the more salient projects in terms of penetration of, and impact on, courses in introductory economics in UK higher education institutions. The lead site for WinEcon was based within the same university as the CTI for Economics and the inter-relationship between the two appears to have been mutually beneficial, with the latter often a useful dissemination conduit for WinEcon. Consortium members visited other institutions and relevant conferences to demonstrate project materials and such demonstrations were cited as an important factor in departmental decisions to purchase materials. A commercial publishing agreement was signed six months before the end of the project with Blackwells who now handle the distribution and sell the software directly through their retail outlets.

Themes

- the initiative adopted a strong project management approach from the outset, centred on the lead site, and this, with a clearly devolved responsibility to consortium partners for production of specific chapters of the courseware seems to have produced effective results. A democratic style of inter-institutional monitoring of the quality of materials at the development stage, along with the use of advisory evaluators from institutions outside the consortium seems to have operated as an effective quality assurance mechanism

- the comprehensiveness of the project materials was widely praised in terms of their applicability to the first year Economics undergraduate curriculum. The interactivity and task-based nature of the software was seen as a strong positive feature, as was the self-evident and self-documenting nature of much of the courseware which respondents found their students were able to gain mastery of without extensive time-consuming training

- respondents tended to be generally confident that the courseware content would remain current and vital over the foreseeable future as the nature of the material was deemed comparatively 'timeless'

- users praised the consistency of style and presentation throughout the courseware and the emphasis placed on flexibility. Students were able to 'jump' between tutorials via the menu, or exploit the comprehensive cross-referencing between topics. Lecturers, similarly, were free to cluster topics together into sections of their own choice, with customised introduction and summary text

- in Economics departments where WinEcon had not been adopted the most common reason was lack of appropriate technological infrastructure, particularly student access to computer labs.

Furthermore, the difficulty of having to interweave lab sessions with tutorials within a university-wide timetabling system indicates the need for institutional arrangements to be brought into line to support such proposed innovations. Institutional administrative rigidity can undermine innovations even when the pedagogic and technological aspects of the innovation are deemed relatively satisfactory

- the more successful approaches to integration followed a pattern of matching the number of face-to-face tutorials with resource-based WinEcon lab sessions. This offered potential for efficiency gain, though any further reductions of conventional face-to-face tutorials tended to provoke student resistance and criticism

- both users and non-users stressed the need for investment and development not in further software and technology but in 'human capital', particularly the need for department level proselytisers to drive the innovation forward, provide a model of practice and encourage the involvement of colleagues

5: TELL: Technology Enhanced Language Learning

TELL was a large consortium Phase 1 project with its lead site at the University of Hull. 13 development and 22 evaluation sites produced a wide range of products for Modern Language learning, only a few of which did not continue into commercial production.

From our data we estimate that approximately one third of the language departments and centres which responded to us are using at least one of the TELL products. However, this is certainly an underestimate for the following reasons.

The ability to tailor TELL courseware to suit the staff and students was seen as a great advantage. This may have resulted in a noticeably large number of 'non-recognisers' in the language departments who reported that they did not use TELL products and were selected by us as 'non-users' but turned out on closer inspection to be using TELL products without realising that they were from TLTP. This feeling of ownership of the material meant that the original source had ceased to matter. The commercial sourcing may compound this ambiguity too. Moreover, the project was closely associated with the CTI Centre for Modern Languages, and some users appear not to have distinguished between the two.

TELL began to release beta versions of materials early in the TLTP programme and so some have been in circulation almost 6 years, but commercially packaged for one or two years. Its courseware has been distributed very widely since its creation - the beta versions were sent to all universities via their vice-chancellors. This meant that the products came to the attention of departments at an early stage in development.

Themes

- most users reported the quality of the products to be high, in a market where there are commercial products available. For some the academic level of some courseware was felt to be a bit low and was used mostly with first and second year students. There was evidence of it being used in FE colleges

- use spanned a wide range, from fully-integrated where TELL was the course through to bolt-on remediation. It was used in language labs with staff support and in resource-based learning mode. One non-user reported that they had experimented with early versions of material but that students had not used it in self-access mode and that staff felt it to be largely ineffective when used in this way

- there appears to be moderate turnover in staffing of language courses, and it was evident that several of the TELL users had inherited it from their predecessors. It is widely accepted that there is often a failure to continue with courseware when course leadership changes, and so the stability of TELL is a tribute to the value of the materials to the course, and perhaps also to their degree of integration

- several respondents reported that they used TELL materials to save staff time, especially with the more routine tasks. Some tutorials could be replaced with lab sessions whilst maintaining student interest. One commented that it gave the students further skills. However, there were non-users who felt that these were not issues for them and considered that their very interactive, face-to-face style of teaching would not accommodate use of TELL materials, or indeed computer-aided language materials in general

- the TELL project gave excellent support to users, and several felt that this was important in their successful adoption. The support came via newsletters, email, helpline, workshops and seminars. They could not solve problems with network delivery but had a support line that could suggest solutions

- the courseware came with supporting study guides, etc which could be copied in-house, and some staff modified these to suit their local needs. This was felt to be a valuable additional resource

- the widespread use of TELL materials led to further spread because potential users found that there were peers and colleagues nearby who could help and who gave a seal of approval to the product making it a safer bet – in one instance a department bought one, another bought three and then they joined forces and bought one together

- some aspects of language learning are very suited to computer-based methods (and some have been in use for a long time), so departments will be geared up to using these in their teaching

6: Institutional initiatives to promote use of C&IT, including TLTP, in teaching

Responsibility for and location of initiatives

The majority of the five HEIs studied, had within their 'teaching strategies' some reference to C&IT developments, and had located overall responsibility with senior managers or university committees, but for the minority the initiative appeared to have emanated largely independently of senior management. The locations of the initiatives were generally centred on the computing services, the libraries or the teaching and learning services, and in a few institutions some of these had merged to form integrated information or academic services. A common theme which emerged was that of devolved responsibility for action, it was up to largely autonomous departments to decide whether and how to use facilities and services. The extent to which the initiative was resourced was partly an outcome of the degree of strategic control of finances, and this was variable between HEIs.

Nature of the initiatives

All the initiatives with senior management responsibility, focussed on teaching and learning in general, and not C&IT or TLTP in particular. This was often seen by senior managers as part of the broader need within the institution to increase/maintain the quality of education as part of keeping a competitive advantage or holding their own. For some it was mostly about mounting CAL materials on servers, either for staff or for students, uncensored, with an on-line library of TLTP and other CAL. For others it was mainly about working with a selection of departments to help deliver specific changes to the curriculum. The need always to integrate CAL into courses was the focus of the actions of several respondents at tactical level.

For those initiatives which appeared not to be directly related to senior management actions, the response was a technical one, trying to tackle access and delivery problems with respect to CAL, although not able to offer a broader service.

Themes

- it must be recognised that implementation ultimately relies on academic staff time, enthusiasm, commitment. This is the bottom-up input, and many of these staff said that they would do it anyway, initiative or not, but to reach a wider audience needs a tangible commitment from the top

- some staff see their peers and the professional bodies/learned societies as more relevant sources than a generic internal unit, thus these units need to follow the academic staff lead and form networks and contacts with external agencies to make their work more effective and relevant

- C&IT support units need a very wide range of skills within them to be successful. This probably requires a different 'breed' of service staff member who is comfortable with C&IT, and with teaching and learning, and also understands institutional policy, strategy and tactics. Some/many of the TLT officers we relied upon seemed to posses these attributes

- the unit has to take a pro-active stance. Just providing workshops and waiting for academic staff to come to them rarely works. Getting CAL into use is a shop-floor activity, and those individuals helped by tactical units and their staff generally felt that it had made a difference to their ability to modify their teaching provision

- CAL materials need to be readily available to staff at their desktops or as close to that as can be reached. Then someone is needed to push busy staff to use the reference collection, to monitor their access and assist them to use it to select materials to try. Easing this technical barrier is an important first step

- indeed, many of the tactical developments came out of a recognition that the system was failing to solve the CAL access and delivery problems. It is not simple to get C&IT into the mainstream - our respondents who had had a measure of success by *becoming* a one-stop shop noted the difficulties and barriers in the way. For instance, getting many TLTP materials to work on networks, the prime delivery vehicle for most institutions, had been a nightmare with insufficient assistance from the projects

- senior management need to consider how best to supply adequate resources, a difficult task in highly devolved budgeting systems and this may have more direct effect on infrastructure than on courses

- it is not obvious that the five HEIs studied have a higher level of C&IT use in L&T than do peer institutions which appear to have no defined initiative. A reasonable conclusion, given the large number of small developments reported by key informants to be taking place in most HEIs, is that both single, large and distributed, small developments are equally effective

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12. Glossary of terms and acronyms

ALT	Association for Learning Technology
C&IT	communication and information technology
CAL	Computer Assisted Learning
CTI	Computers in Teaching Initiative
CTISS	Computers in Teaching Initiative Support Service
DENI	Department of Education Northern Ireland
EHE	Enterprise in Higher Education
ELTHE	Evaluation of Learning Technology in Higher Education
FDTL	Fund for the Development of Teaching and Learning
FE	further education
HE	higher education
HEFCE	Higher Education Funding Council for England
HEFCW	Higher Education Funding Council for Wales
HEI	Higher Education Institution
ILTHE	Institute of Learning and Teaching in Higher Education
IT	information technology
ITTI	Information Technology Training Initiative
JISC	Joint Information Systems Committee
LT	learning technology
LTDI	Learning Technology Dissemination Initiative
MAN	Metropolitan Area Network
PCFC	Polytechnics and Colleges Funding Council
TQA	Teaching Quality Assessment
RAE	Research Assessment Exercise
SCONUL	Standing Conference of National and University Libraries
SHEFC	Scottish Higher Education Funding Council
TALiSMAN	Teaching & Learning in Scottish Metropolitan Area Networks
TLTP	Teaching & Learning Technology Programme
TLTSN	Teaching & Learning Technology Support Network
UFC	Universities Funding Council
UMI	Use of the MANs Initiative
WWW	World Wide Web

courseware   learning materials which have been specifically designed to be used by students within courses and either related to subject areas or in generic areas (eg study skills). They are often created using authoring languages (eg

Toolbook and Authorware) and examples can be found in many TLTP products and more recently in the WWW-based formats created by UMI projects

learning technology   computer-based materials (both productivity tools and courseware) used to aid learning. Although not strictly implying solely computer-based formats, (it could also include video, audio) in general the term is used with this implication.

productivity tools   standard commercial packages which can be adopted by education as learning tools (eg learning about data analysis using a spreadsheet) or are used as productivity tools in their own right (eg word processors for essays).

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