

## **Annex 3**

### **Learning products and services for the e-U**

## **Contents**

### **Introduction**

The use of technology in teaching  
Basic model for the e-U

### **Learning materials and the learning environment**

Benchmarks for on-line learning  
The effectiveness of on-line learning  
A framework for tools and services

### **Production of learning materials**

Production framework  
Production methods  
Emerging international standards  
Innovation in developing learning materials

### **Commissioning of courseware**

Content asset management facilities  
Ownership of course materials

### **Supporting on-line learning**

Learning support services  
Learning assessment and awards  
Library services  
Learning programme management

# 1 Introduction

1. In this annex, we examine issues relating to the delivery of a high quality learning experience on-line, including a consideration of the basic components of a framework for the development of learning materials. Just as teaching in a traditional university environment draws upon material from a range of sources, so the same will be necessary for programmes developed for delivery on-line. Other services will also be required to support the learner and the tutor both as part of a conventional learning environment and as part of a distance learning provision. We also propose the development of new quality assurance methods for material production more suited to meeting the circumstances of a technology-based approach.

2. This annex is not intended to be a detailed prescription for the operations of the e-U, since those will need to be developed by the e-U itself. Our purpose is to suggest the elements of the approach that the e-U might consider, which, if accepted, the e-U would then develop into its own design.

## **The use of technology in teaching**

3. As computer technology continues to develop, it is evident that the underlying power and speed of computation combines with the power of software applications to provide creative interfaces to enhance the computer as a tool in teaching. The use of simulations, to take one example, to illustrate complex physical or economic situations can be used to considerable advantage in teaching and learning, providing opportunities for deeper understanding and insight into the subject. Such applications increase the effectiveness of technology used as a tool in teaching and learning. This can only improve further as the underlying technology develops in the coming years.

4. The other technology that, in a very short period of time, has had a profound effect on the way we access information, is the internet. The growth of access to the internet is unparalleled and has had the effect of reducing or eliminating the effect of distance. Communication technology is the additional underpinning element facilitating the move to e-learning.

5. These forms of technology are different but complementary. The use of computers as a teaching tool is creating a new paradigm for teaching methods – even when only used as an adjunct. The development of the internet and the World Wide Web has provided access and the ability to communicate with large numbers of people all over the globe. The two taken together are fundamental ingredients for distance learning. They are each necessary but not yet sufficient for its effective delivery. The current version of the internet and connections to it are not entirely satisfactory for the general user who has to make use of a relatively slow dial-up connection. The advent of the next version of the internet promises far greater bandwidth in communications, making it possible, for example, to deliver high speed video to the home. The combination of very high speed communication links and the further enhancement of the power of networked computers provides the potential for

further innovation and creativity in designing many new applications, including those for teaching and learning.

6. On this basis, current distance learning applications contain only a fraction of the functionality that will be possible with the next generations of technology. No one has yet fully explored even the current potential, which gives an opportunity for the e-U to lead the field. We should not be too hasty in making judgements about the use of today's technology, as the rate of change is such that what was unknown five years ago can today be taken as a way of life. More importantly, the existence of a capability now, however rudimentary and incomplete, can stimulate creativity in its use, and form the first step along the path to a vision.

7. Another important development is the formation of the Technology Integration Centre (TIC). The TIC is funded by the Joint Information Systems Committee (JISC) of the UK higher education funding bodies. Its focus is on the identification, proving and development of new technologies which could be applied to learning and teaching. The TIC could therefore help with the development of the technology used by the e-U both in the creation of learning materials and in the delivery of programmes to learners.

8. The effectiveness of technology in teaching has still to be demonstrated convincingly but research is already pointing to new paradigms in teaching methods. What is not fully known at present is how best to use the technology in the light of the complexities associated with the processes of education. There are many pressing and challenging issues to be addressed, for instance, the extent to which it is possible to deliver a quality educational process wholly on-line with only on-line intervention of a tutor. The use of the technology can be the tool to explore the underlying processes that, in the end, effect the transfer of knowledge and development of understanding. Our concern is to look forward to the next generation of technology whilst considering how best to use it in the provision of e-learning.

9. Equally important is to recognise that there are different groups who might benefit from learning on-line. At least initially, the expectation is that the needs of those groups seeking continuous professional development and lifelong learning will be met most effectively by e-based provision. More traditional undergraduate needs may be a little further behind. Different levels of maturity, levels of experience, different job functions and so on all require different forms of learning experience tailored to specific requirements. In comparison, the world of education delivery has changed far less than the commercial world of high technology production and services. Major opportunities for educators, identified in many studies – including the HEFCE/CVCP report on 'The Business of Borderless Education' – arise from these different requirements for access to education by different classes of learner with solutions that, in some cases, will require the use of new and evolving technology.

#### **The basic model for the e-University**

10. Our report outlines the recommended models for structuring the e-U. Within the following discussion of courseware production and of the various tools and services required by the e-U, there are several ways in which the e-U could operate. At one end of the spectrum – not proposed in the main report – the e-U could operate as a fairly conventional and complete but ‘virtual’ university, with software systems to provide effective learning and support environments for both learners and tutors. It could also provide a raft of other services to support the management of learning, the administration of programmes, learners and tutors, quality management, financial control and records of learning and other functions associated with the delivery of an on-line service. To create an entity working in this way, the e-U would need to put in place all the infrastructure and platforms to support the on-line services mentioned.

11. At the other end of the spectrum, the e-U could function exclusively as a provider of tools and services for use by other universities. This is a component of the model proposed in our report. As a service provider, it could license its tools and services to say, University A. University A would then use them to develop its own distance learning programmes, serving its own markets and carry its own ‘branding’ on the programmes. The advantage to University A is that it would not have to find the capital cost of establishing and maintaining the expensive tools and services that form the essential underpinning.

12. Many of the tools and services could be maintained centrally and delivered and used in geographically dispersed locations with suitably fast internet connections. From a technology standpoint, this type of provision of tools and services would form an Application Service Provider (ASP) function. Other services, such as those associated with instructional design, quality management of programmes and so on could be provided by the e-U working with members of University A, either centrally or on the same site.

13. There are many points in between these two extremes. Our report proposes that the e-U should start towards the middle of the spectrum. It would not make its own provision but would provide a facility for others, with suitable quality control, to make provision using the e-U’s expertise, brand and marketing – perhaps jointly with their own. The e-U would also be proactive in developing provision, but it may, under agreement, also act as an ASP for some types of provision.

14. Even within this construct, there are alternative models depending on how the content of learning programmes is provided and by whom. University A could for instance use (and pay for the use of) the e-U tools and services to construct a learning programme for its own postgraduate degree. Alternatively the e-U might agree that University A would provide the subject expertise from amongst its academic staff to assist in the construction of a postgraduate learning programme under e-U auspices. The e-U would then market and sell the programme to learners both overseas and in the UK. If University A wished to market the same learning programme, this would only be possible under a pre-arranged agreement.

15. There are, of course, important issues associated with the ownership and copyright of the material, many of which will be affected by the policy of individual institutions. These will have to be addressed up front to avoid them becoming contentious. Ownership of on-line courseware materials has occupied the minds of many in the US, and the matter has been considered in some detail in a recent report on the subject ('Who owns on-line courses and course materials? – Intellectual property policies for a new learning environment' Carol Twigg, Centre For Academic Transformation at the Rensselaer Polytechnic Institute, 2000). We cover this point in more detail later in this annex.

16. By working with the e-U in this way, each UK HEI would be able to add distance learning provision to its own distinctive portfolio without the need for a large capital investment or a significant budget to maintain services and standards. An HEI may also wish to offer distance learning programmes that combine modules created by its own staff with those created elsewhere (with or without the e-U's delivery mechanism). To facilitate this, the e-U would have a repository of learning material produced and marketed under its own auspices, which would be available to any HEI wishing to purchase a licence for its use. A repository of learning material is in principle an attractive proposition because it would lead to the re-use of materials and an eventual cost saving in the development of new learning programmes. Reusable modules of learning are common within many traditional higher education programmes, but there would need to be ways of ensuring coherence of modules of computer-based material.

17. The above has been expressed from the perspective of the supply side. As our report makes clear, the important flexibility offered by the e-U is to the demand side, as consumers of e-U based materials would be able to package modules from different sources on their own – with the assistance and advice of a navigator service. Coherence would then be the responsibility of the awarding body (and/or the navigator).

18. This annex identifies the issues that are important in the development of learning materials and the support services for the e-U and which will need to be developed in greater detail for the operation of the e-U venture. The two most fundamental components of the infrastructure are the ability to design effective learning programmes and the ability to provide effective support for both the learner and the tutor. The first of these issues is addressed in sections 2, 3 and 4; the second in section 5.

19. We summarise our starting point as follows:

- a. The e-U would provide opportunities, assisted as necessary by the use of its tools and services, for HEIs to contribute modules and courses to learning options marketed by the e-U, subject to quality conditions.
- b. The e-U tools and services might also be made available, under an ASP approach, to those HEIs wishing to develop their own e-learning capacity (and/or to convert their existing courseware materials). The provision of such

expensive infrastructure would benefit the sector and could be a key commercial offering from the e-U – although the e-U would need to take care not to undermine provision made under its own auspices.

20. The anticipated spread of high bandwidth internet capacity to the workplace and home, and the development of hand-held and other devices connected to it, require learning content that can be provided through different delivery channels and devices. The e-U tools and services would need to anticipate these developments in the provision of an e-learning Content Asset Management arrangement.

## **2 Learning materials and the learning environment**

### **Benchmarks for on-line learning**

21. The growth of access to the internet has been led by users in the US. The number of US universities and colleges now offering distance learning education has grown strongly in recent years. The number of distance programmes increased by 72 per cent from 1994-95 to 1997-98, with over 1.6 million students enrolled in distance education programmes. Accompanying this enthusiasm for on-line education has been some scepticism, reflected in a number of studies into the effectiveness and quality of on-line education.

22. To help the debate, a study of several US institutions with considerable experience of offering distance learning programmes set out 24 benchmarks for success in internet-based distance education. Whilst these are not a definitive set, they list the issues that should be taken into account under seven headings – albeit within a fairly traditional ‘virtual university’ setting. We would refer HEIs wishing to make distance learning provision to the full list (‘Quality on the line – benchmarks for success in internet-based distance education’, April 2000, the Institute For Higher Education Policy). The headings suggested are: institutional support, course development, teaching/learning, course structure, student support, faculty support, evaluation and assessment.

### **The effectiveness of on-line learning**

23. There has been considerable debate about the effectiveness of on-line learning in comparison with traditional learning – see for example the much quoted report by Phipps and Merisotis entitled ‘What’s the difference? A review of contemporary research on the effectiveness of distance learning in higher education’ published by the US Institute For Higher Education Policy. This carried out a detailed study of the methods of research used to investigate the advantages and disadvantages of on-line education.

24. The main arguments levelled against the use of on-line learning reflect concerns that there might be a lack of interaction between student and tutor, based on physical presence, and the difficulty of forming a community of learners. Work on learning styles points to the variations in the way people learn and surveys reveal that, at least at undergraduate level, students learn better by active participation

rather than by passively listening in large lecture classes. However, other work suggests that insufficient attention has so far been paid to the potential uses of the new technology. Those actively engaged in the exploration of technology in teaching outline a new paradigm for teaching, and stress the importance of the need to avoid simply trying to replicate the old way of doing things using the new technological base.

25. While the role of the tutor as mentor and instructor is important, on-line interaction with tutors is now being incorporated into commercial courseware provision, and collaboration tools are being used to create communities of learners. Innovation in the use of such tools will follow as the functionality and capabilities of the technologies are explored and investigated. From work carried out using these tools, it is apparent that a combination of sound instructional design applied to the development of the learning materials, coupled with some mediated collaboration on-line, can provide an effective learning experience for the learner.

26. A prime imperative for the e-U is to recognise that there are different categories of people who would benefit from on-line learning. Young undergraduates have learning requirements that are quite different from those of highly motivated mature learners in the professional workplace. An understanding of the relevance of learning requirements and styles must precede the design and implementation of learning programmes. The learning environment and the facilities available to support the learner, both on-line and off, should reflect the elements of sound pedagogy relevant to the groups concerned. It is the design of these facilities that will be so important to the success of the e-U concept.

27. The e-U must approach this task in an open and forward looking way and be willing to explore new paradigms of teaching and learning that make full use of the technology. It should not attempt to replicate the lecture on-line and it should not limit its consideration to the technology available today. Projecting the likely technological scene three years hence carries a risk, but there are sufficient indications in some areas, for example in communications technology, to give good confidence about bandwidth realisation etc. What is less easy to foresee is the use that will be made of the innovative technology and how this will fundamentally change the approaches to teaching and learning.

28. On top of all this, market pressures are also likely to change attitudes fundamentally and will certainly create opportunities for new developments in e-learning – we have already noted the huge interest in the use of the internet to deliver training in the commercial sector. The number of companies now offering on-line courses has increased markedly even in the past six months. Others have developed innovative products incorporating fairly full on-line support for the learner. The challenge facing the e-U is to capture innovation in the design of tools and services in order to support innovative design of courseware and interactive learning environments and so guarantee a quality learning experience.

29. The e-U might seek to contribute to thinking on the development of on-line educational provision, not least by means of studies which systematically investigate

comparisons of effectiveness between traditional and technology-based methods of learning. Such work would assist the e-U to develop learning environments which provided new ways for learners to organise their studies more effectively within the construction of programmes.

30. There would need to be a way of evaluating the effectiveness of any learning programme across a range of learners and over a period of time. Such evaluations would help build an understanding of the pedagogical effectiveness of programmes – although little systematic evaluation of this form has been reported in the literature. Perhaps even more important is the need to be able to evaluate the complete learning experience of the learner, covering all the modules studied and the services received. Such evaluation for any programme leading to an award would normally be undertaken by the awarding body but with the results of the evaluation passed back to the e-U for its own evaluation purposes. In addition to acting as a gateway for proposed material, the e-U’s committee for academic quality, described in our report, would also keep modules under review to ensure they were up-to-date and would seek re-provision when needed.

#### **A framework for tools and services**

31. To ensure its success the e-U should play a central role in establishing a framework within which high quality courseware materials can be designed and thus from which effective learning programmes can be created. It should also be responsible for ensuring there is an effective learning environment available to support the learner. The supporting services within the framework should form an integral part of the whole that distinguishes the nature of the ‘brand’ of the e-U provision.

32. A fundamental objective of the e-U is that it should deliver excellence in the context of ‘fitness for purpose’. It must therefore recognise that different categories of learners will have different requirements both for materials and for various levels and types of support. This will mean that the levels of support may well range from none over and above that built into the courseware materials, to full on-line support provided by a tutor. In some cases, especially where there is a certified programme of learning, the body making the award may wish to specify the type and level of support which learners should use. In other cases it will be the learners who decide on the support they want.

33. Different categories of on-line learners will have different learning requirements and these will need to be reflected in the construction of the learning programmes they use. Just as traditional learning materials for a single course are drawn from different sources, so on-line courseware will be composed of material drawn from different sources. In the traditional case, the integration and creative interpretation of the material is carried out by the tutor, who then guides and encourages the student through complex sets of interactions, formal and informal. By their very nature, learning and understanding involve more than a single mode of ‘delivery’: computer-based learning will only be a part of the total learning



experience of e-U students, with the other parts arranged by themselves, their employer or other third parties.

34. Our report proposes a design for the e-U in which:
- a. The e-U would not be a traditional university implemented virtually, but rather the vehicle for delivering new high quality learning experiences matched to the needs of the individual and the demands of the market. It will provide a wide variety of learning modules and programmes and choices of delivery channels and support services, matched to market demands.
  - b. The e-U would be able to provide for differing balances between richness and reach. Traditional distance learning has achieved good reach whereas conventional campus-based education can achieve high levels of richness. The e-U will be able to provide varying balances of richness and reach on demand, with the appropriate combinations of learning and support. In this way the reach of traditional distance education can be combined with a richness not hitherto available to distance learners.

### **3 Production of learning materials**

35. The framework for the production of learning materials should allow for several modes of operation of the e-U concept as set out in section 1 of this annex, but always with the highest quality and effectiveness assured and maintained over time. We can envisage several different ways, each of which the e-U should operate, to assist with the production of courseware materials:

- a. Draw upon, by commission, the subject expertise of academics (and others) to design courseware materials for specific market opportunities under the e-U auspices. For any one programme the expertise might be drawn from one or several institutions, companies or other organisations.
- b. Provide repositories of e-U quality-controlled learning materials.
- c. Provide teams expert in instructional design and the construction of learning materials, and provide other tools and services (under contract) to any HEI wishing to construct on-line learning provision for its own purposes.
- d. Be a ‘facilitator’ to allow any HEI to offer its own on-line material under the e-U brand (subject to quality control), supported by the services of the e-U.

36. The framework for the production of learning materials should be sufficiently flexible to allow for each of these different modes of operation.

#### **Production framework**

37. Some HEIs already have facilities for the design of high quality courseware materials and, in principle, could become suppliers of a service to the e-U. However,

most current courseware design methods rely on proprietary authoring tools that do not support interoperability, so materials obtained from several sources cannot easily be integrated. A framework to provide interoperability of e-U based materials would be a requirement to achieve flexibility in learning programmes. While most authoring tools produce material that can be run in a standard 'browser', developments within the international standards bodies will increasingly expect the use of 'metadata' to describe the content in ways that allow it to be described and searched. In future the construction of electronic documents of all types will increasingly be XML-based (Extensible Mark-up Language) to allow a separation of structure, content and format.

38. Within some HEIs, the 'production process' tends to rely on the enthusiasm of a few members of the academic staff – which does not always produce an effective operational process and can result in insufficient involvement of the 'subject experts'. It is neither desirable nor appropriate for large numbers of academic staff to become expert in the use of courseware authoring tools. In any case, the design of effective courseware materials involves much more than the use of an authoring tool. In the development of materials, it is more appropriate that subject experts should be creative and work with and advise experts in instructional design, in graphical design, in the production of audio and video materials and in a range of other services to ensure the high quality needed to meet the standards which will be specified by the e-U. Many such services are available from specialist suppliers, who could operate within a framework of specifications defined by the e-U. Such a framework must not constrain creativity in the design of interactive learning experiences. The scaleable production processes should be based on tools and services that provide the infrastructure to facilitate the design and delivery of high quality, effective and assessable learning experiences within a well defined and supportive learning environment.

39. In seeking subject expertise for the content of learning modules and programmes, the e-U may need to use a brokering activity. Such a service could be provided through the Subject Centres of the UK-wide Learning and Teaching Support Network (LTSN), which is supported by the UK higher education funding bodies. The LTSN has associated with it 24 Subject Centres and the Generic Learning and Teaching Centre (GLTC). The principal functions of the LTSN with respect to learning, teaching and assessment are the creation and facilitation of networks, the promotion and transfer of good practices, and the brokering of knowledge, information and expertise. The Subject Centres may thus develop a view on best practice of the use of technology in teaching. Sharing best practice in both directions could benefit both the e-U and the sector.

#### **Production methods**

40. The overall design of learning materials for provision by the e-U would be the responsibility of a team including one or more subject experts. The processes would be driven by pedagogy based on sound instructional design principles and would use technology where appropriate to create an effective learning experience. The team could work with the technology-based tools and services provided as part of the e-U

infrastructure, but would have the flexibility to use the most appropriate authoring tools for the task as long as they resulted in interoperable materials.

41. We would suggest that the actual production of courseware materials might also be guided by a process framework containing, at least, an agreed set of guidelines. The guidelines could take the form of a set of steps for each stage in the process, starting with the specification of requirements through to the implementation of the material in the learning environment.

42. The guidelines might cover the following points:

- a. Development of the requirements for the design of courseware materials for delivery partly or wholly on-line.
- b. Functional and technical specifications for the courseware materials.
- c. Instructional design practice which matches the learning experience to the required learning objectives.
- d. Inclusion of appropriate forms of formative assessment to assess the progress of the learner.
- e. Inclusion of appropriate forms of summative assessment to assess the achievement of the actual learning outcomes against the learning objectives.
- f. Exercises to explore the learners' ability to integrate and use knowledge.
- g. Structuring of the courseware into 'modules' etc within an agreed curricular taxonomy.
- h. Ways of ensuring effective inputs from subject experts on the conceptualisation and exposition of knowledge.
- i. Use of 'best practice' in innovation in the use of technology to achieve novel and effective learning experiences.
- j. Where appropriate, ways of integrating modules to form coherent learning programmes that would meet specified learning objectives.
- k. Quality assurance procedures to test the technical precision of the design against the requirements specification.
- l. Quality assurance procedures for the operational accuracy of the product against the functional and technical specifications.
- m. Quality assurance procedures relating to the pedagogical effectiveness of the product.

n. Compliance criteria to ensure the courseware material is acceptable in relation to the emerging international standards for interoperability across delivery platforms and for re-use.

43. A published reference guide might be produced by the e-U, but we suggest that it might also consider ways of driving the production processes using a set of templates, especially for those courseware materials that were assembled using 'learning objects' from different sources. The purpose of a template would be to assist in the collection of the required information and relevant parameters in a structured and efficient manner. Structuring the design processes in this way would ensure that all the relevant information was available to those who would carry out the creative design but without constraining their creativity. Templates could be produced for each stage in the overall process, and could be computer-based and semi-automated to help the design teams structure the workflow processing.

44. There are several advantages of using template-driven processes. Where production was taking place in several centres, a greater degree of uniformity and consistent high quality could be achieved, as the templates would drive the team interfaces and would include the parameters relating to the various measures of quality. Quality assurance would then become quality management for each of the individual steps. Each stage of the design process could not be signed off until the specific quality measures associated with it had been supplied and accepted. Quality measures would thus be designed into all stages of the process and so would be fundamental to the whole operational framework.

45. On this approach, the e-U would define the steps of the production process and might also suggest which services could be provided by external specialist providers. To illustrate the point, the suggested production process might include the following:

- a. Determine the level of demand for a particular learning programme by reference to the market surveys or potential customers/clients (which might have been done by the e-U itself).
- b. Assemble the internal design team to be responsible for the development of the material, including subject experts on the content.
- c. Produce an outline plan of the courseware materials in terms of the learning objectives and required learning outcomes. Sign off description of the intended material with the customer/client (which would often be the e-U itself).
- d. Conceptualise, capture and illustrate the subject knowledge required to meet the learning objectives.
- e. Structure and design the learning experience to be provided by the courseware materials in terms of the size of modules (if more than one) and the coherence of the programme (if a full course).

- f. For each module, decide the functional specification in terms of the interactivity with the learner, the level and ways of building tutorial support into the material itself and the links with other materials.
- g. Decide the appropriate formative assessment exercises and the ways of providing feedback to the learner (and to the tutor if appropriate).
- h. Decide the summative assessment associated with each module and the criteria for the levels of learner achievement.
- i. Establish a range for the possible levels of on-line tutor support for each module.
- j. Consider the interface between the learning programme and its sub-parts and the administrative support software tools.
- k. Review, perhaps with additional external peer subject experts, the evolving design in terms of subject accuracy and coherence of the modules within the overall learning experience.
- l. Complete the detailed specification of each module (if more than one) in preparation for the detailed design and coding stages of production; sign off the specification with the customer/client.
- m. Identify appropriate authoring tool specialists and/or service providers and discuss the specification of the functionality of each module.
- n. Identify appropriate graphic design service providers and discuss the required overall presentation of the learning materials with the customer/client.
- o. Agree the milestones and associated demonstrations of modules; sign off the technical and functional specifications with the design service providers and then commission the design of the learning programme.
- p. Track the module design process and apply quality assurance procedures to all stages of the design process.
- q. Receive designed modules (and programme) and carry out testing of each part in accordance with the technical and functional specifications.
- r. Receive module design and put through acceptance tests.
- s. Review modules with peer subject experts and customer/client for completeness and pedagogical effectiveness.
- t. Where possible, carry out a controlled release of the materials with a selected set of learners to identify any issues regarding the overall learning experience.

- u. Sign off the developed learning materials with the customer/client.

46. All the above steps would be captured in a series of templates within a set of linked processes and could be part of a semi-automated set of tools provided by the e-U. The design and implementation of the toolset itself could be done by one or more specialist service providers, although the overall responsibility for the specification of the design would rest with the e-U – as would the critical quality-related tasks to establish the framework. Some aspects of the creative parts of the process could be assisted, or even provided, by the e-U itself. Detailed coding, using specialist authoring tools and graphic design activities could be outsourced to specialist suppliers. These production services can be supported by workflow tools available now and could be used to support the overall production environment.

47. Well defined, template-driven procedures would greatly assist for work which was outsourced to specialist suppliers. The templates would structure the processes associated with the workflow without constraining the creativity involved in the design of each task involved. Structuring in this way would provide the opportunity to design computer-based support tools that would enable the processes to be scaled to handle large volumes in module design. The parameters identified as relevant to each stage in the process would be identified and monitored. Some would relate to the quality of the task and would be needed to control the quality of the step in the overall process. In this way the quality of the whole process would be managed within an overall quality framework. Because the templates would be computer based, the whole process could be tracked – which would be an essential feature of quality audit procedures. For work outsourced to specialist organisations, they would be informed of the measures to be applied by the e-U in making quality judgements about their outputs.

48. Overall the whole set of processes and services would form the integrated framework of the production system for learning materials within the e-U. The tools and services themselves could also be used (under contract and at a price) by any external organisation which wished to produce their own materials to service their own markets. In many cases such tools and services can be used at a distance and delivered using standard networked technologies.

49. Learning programmes and modules would be subject to a final review process defined by the e-U's committee for academic quality to ensure they were fit for their purpose – as set out in our report. Where a learning programme led to a professional qualification, the awarding body would wish to ensure that it was also acceptable to the professional body. Accreditation of programmes would require external assessment of the whole learning experience in terms of its fitness for purpose in preparing the learner for professional practice.

#### **Emerging international standards for learning materials**

50. In recent years there has been considerable activity in developing standards to apply to the structure and delivery of commercial and academic learning programmes. The main concerns have arisen because of the high cost of bespoke

courseware materials and the lack of usable standards for making courseware interoperable and reusable. 'Interoperable' is the term used for the multiple use of learning materials in different delivery systems; 'reusable' is the term used to describe multiple uses of the same learning modules in the context of different learning programmes. International standards, defined by the Institution of Electrical and Electronic Engineers (IEEE), generally emerge after a long process of detailed consideration of the issues, by committees whose members are drawn from the academic and commercial communities. The major bodies involved have been:

- the IEEE Learning Technology Standards Committee (LTSC)
- the Aviation Industry CBT Committee (AICC)
- the Instructional Management Project (IMS)
- the EU 'ARIADNE' project
- the Advanced Distributed Learning (ADL) initiative of the US Department of Defence – 'SCORM' (Shareable Courseware Object Reference Model) recommendations
- the Microsoft Learning Resource Interchange (LRI) specification.

51. The work of these bodies has been extensive. The IEEE LTSC has been developing definitions of all aspects of learning technology drawing from the experiences of commercial companies and from the academic world. It introduced the broad definition of 'learning objects', and much subsequent thinking has assured their existence – although more work is still needed to define their granularity.

52. Other work, such as that of the AICC, has been driven by the requirements of a regulated industry where complex products require regular updates for all staff, from engineers through to marketing and sales. In Europe, the EU has made recommendations through the Learning Technologies Workshop (LTW) of the CEN/ISSS organisation (CEN - European Committee for Standardisation, ISSS - Information Society Standardisation System). In particular the LTW is working on localisation of the IEEE LTSC Learning Object Metadata (LOM) to take account of differences in culture and language throughout the EU. The work programme for the EU standards activities in the area of learning technologies has recently been published and contains recommendations on these issues.

53. The level of granularity of learning material units within the e-U is likely to change over time. At the outset it is likely that the size would be relatively large structures, perhaps even corresponding to learning modules taken by students (within the current curricular taxonomy of higher education courses). As experience with XML representations of learning materials becomes greater, the level of granularity of products may reduce in size so the learning modules have a sub-structure. Such a concept – of 'learning objects' – is already built into the standards being developed

by the standards bodies mentioned earlier, although a formal definition of a learning object has yet to be included in the standards. If the standards were to be adopted, there is likely to be an accepted convention about the size of a learning object. The prospect of a learning object economy – with tools to construct, edit and link learning objects – is a real one if the market predictions for educational services are realistic.

54. The development of any form of global ‘education industry’ would be greatly facilitated by an agreed set of standards. The work of the various bodies is converging, and the publication of the SCORM recommendations by the US Defence Department in January 2000 was partly designed to accelerate this process and encourage commercial courseware providers to adopt a compliance policy. The recommendations cover issues relating to the structuring of courseware from component parts as well as issues relating to the delivery of learning programmes from a server using a learning programme management system.

55. Probably the most far-reaching development, in relation to the future description of learning materials, has been the strong advocacy for the definition and use of the XML standard for representing the structure of courseware components. A generalised document represented in XML carries with it a description of its content and its structure. The SCORM recommendations are specific about the use of XML to represent the structure and to describe learning materials. The interchange of learning materials and the definition of open standards for learning materials would be greatly facilitated by the use of XML. The hope would then be that public and private repositories of learning materials and courseware components would be developed. There are also likely to be a number of significant developments in the functionality of tools for the design of XML-based learning materials in the short term, and this could fundamentally affect the way learning programmes are constructed.

56. Courseware components would carry with them rich metadata descriptions allowing degrees of tailoring not available with current generation tools and materials. The metadata descriptions of courseware components would facilitate searches when the material was stored in accessible databases and repositories. Nine categories of metadata elements are currently proposed by IEEE/IMS. The growing use of metadata to describe and structure generalised documents is leading to the concept of reusable information objects which would be relevant not just to learning materials but to all forms of documentation within an organisation. The impact of XML to facilitate the representation and the transfer of electronic documents is expected to play an important part in the growth of e-commerce and associated services.

57. The structure of learning materials should reflect the curricular taxonomies appropriate to the type of learning programmes. Where a university postgraduate course, say, is converted to being on-line, the design is likely to reflect the traditional structuring of the course. This has been the case in centres in the US and Australia when course modules have been converted to on-line versions. In centres where there has been a considerable amount of experience in running courses on-line (such as the Telelearning Network Project in Canada), the pedagogical issues associated



with novel use of the technology are better understood, and programmes have been designed from the standpoint of the knowledge building experience. The e-U will wish to learn from such experience, and the design teams should explore best practice in developing their own design methods.

58. In summary, we would suggest that modules should have associated standards-based metadata descriptions and be stored within the e-U infrastructure. Learning modules would be stored in an e-U repository. Learning content would be categorised and accessed using a content asset management system. Delivery of a learning programme might be facilitated through a commercial Learning Management System, as part of the delivery platform, using commercial browser technology to supply a set of services to support the wider learning experience.

#### **Innovation in developing learning materials**

59. The convergence of the fundamental technologies associated with communications and computing will continue to influence the application of information technology. The power/cost ratio for computation continues to rise, and the availability of broadband connection to the home and office is expected in the short term (in the US, Europe and selected areas elsewhere). All this prepares the ground for innovation in teaching and learning. Commercial courseware providers are already forming partnerships with universities and colleges to develop educational products. A competitive market for educational products is likely to follow these developments, but no one has yet explored the full extent of what is possible – even using the currently available technology.

60. The e-U would provide students with options for different levels of assistance with courseware materials. At the most basic level, learners should be able to use some e-U learning material with no or minimal (but on-line) assistance. At the other extreme, learners might choose to have regular access to an on-line tutor – for an assessed course, this might even be required. There are varying degrees of on-line assistance between these two levels.

61. The design of the courseware materials is the starting point for the development of the required learning experience. The tools now available to author courseware provide an ever growing number of ways to interact with the learner which will improve the effectiveness of the learning experience. More can be done in designing tutorial help into the way the material unfolds within the learning module itself. While context-sensitive help has been part of computer applications for some time, so far there has been only limited experimentation with more intelligent features in current applications. For example, the use of text and audio files to answer frequently asked questions could provide a more ‘user-friendly’ interface than is currently usual.

62. Work with ‘software agents’ is beginning to be used in the development of learning environments. For example, the Microsoft intelligent agent tools have been used in one application and, coupled with speech recognition and synthesis, provide an effective environment for language teaching. The authoring systems employing

agent technology require careful analysis of likely scenarios for learners, to enable the agent to anticipate difficulties and build in appropriate advice. We think that such intelligent assistance should be built directly into the design of e-U learning materials during their production stages.

63. The recommendations of the Advanced Distributed Learning initiative (SCORM) point to the need for learning management systems to communicate actively with the learning material as it is executed by the learner. Working in this way, the learning management system can provide valuable information about the way the learner interacts with the learning material. The operations of the e-U will provide a new opportunity to create pedagogical tools to study the effectiveness of different innovations in the design of learning materials. The internal evaluation of programmes can then be based more on data derived from the actual usage of programmes.

#### **4 Commissioning of courseware**

64. Our report suggests that the initial market for e-U courseware products is expected to be CPD and related professional development opportunities, together with some postgraduate offerings. Customers of the e-U might be individuals, companies, HEIs or governments. The front line products of the e-U will be the provision of courseware materials – as well as tools and services relating to the development of, and access to, various forms of learning services. On the supply side, the e-U will need to operate within a broadly commercial framework for commissioning the design of materials in accordance with its standards and quality procedures.

65. The process by which the e-U sought to commission the development of course materials for learning programmes would be flexible. It could be through a bidding process, through the use of broker services or by direct approaches to HEIs, subject experts (individually or in groups), or private companies. Alternatively an HEI (or any other potential provider) could approach the e-U with a proposition to create a learning programme for the requirements of an identified market. The e-U would normally be prepared to invest in only one module for any given topic and for any one specified market. It would try to ensure that its investment was the ‘best of breed’ within the UK system. The production of certain generic modules would simplify the creation of subsequent new material and would also stimulate the learning object economy referred to above.

66. Suppliers of content to the e-U will fall into several categories, including:

- private training companies
- HEIs, departments, multi-media centres, etc
- media companies and other content-rich organisations

- subject experts, either individually or in groups
- public content repositories
- content and learning material exchanges.

67. Any such supplier would enter into an agreement with the e-U and would be expected to work within the production framework to ensure standards for the integration of courseware materials. The e-U would provide administrative procedures as part of its production framework. The central e-U might make available a design team, either in-house or contracted, to help the supplier with the design of the learning programme. The supplier would either use its own subject experts or would contract with other subject experts, directly or through their employer, for assistance with the development of the learning programme. Prior agreements would determine the intellectual property rights as well as the resulting distribution of generated income. The e-U would take delivery of the resulting material and conduct a final quality acceptance test.

68. Once a particular programme had been structured and its technical and functional specification completed, the coding of the material could be outsourced to appropriate suppliers. The e-U would maintain a list of preferred suppliers for design services that would be subject to periodic review. In this way, the e-U would be in a position to manage the production of quality materials without the need to employ large numbers of programmers and authoring tool experts.

69. The commercial aspects of commissioning learning material should be based on normal contractual principles. Funding for the work could come both from the e-U and, to varying degrees, from other contributing parties and/or from private investors. Customers and clients of the e-U would enter commercial agreements of various kinds for the delivery of learning programmes.

70. A particularly interesting source of material could be the large media-rich organisations – some of which are already showing interest in potential markets for the conversion of their content into a form applicable to learning programmes. Repositories of content could be formed and made available for use in the development of new learning programmes. Partnerships with such organisations and joint developments would be possible as the e-U would be a good potential partner for such organisations.

71. The growth of the education market may lead to increasing opportunities for the exchange of learning materials (both into and out of the e-U repository). Exchanges are closely related to the development of e-commerce services, and learning services would be just one of the range of services available to the professional in the workplace. Content exchanges would facilitate the transfer of learning material between repositories as searches were made for materials in the construction of specialised and tailored learning programmes. In this way we expect to see the growth of a market for learning materials as part of the more general development of e-commerce services.

### **Content asset management facilities**

72. Some of the materials produced under the auspices of the e-U would be fully owned by the e-U itself, others would be wholly owned by their producers, but most would be in between. Even where ownership of the material lay outside the e-U, there would be occasions where it could be used in the construction of new e-U programmes. Where possible, the re-use of courseware materials could represent a significant saving of development costs. It could also lead to the generation of an income stream from the licensing of modules.

73. For this to be done efficiently, available material would need to be properly described (using standards-based metadata) and stored in one or more databases or repositories in ways which could be searched. The e-U would keep a repository of all the material produced under its auspices and which satisfied its quality criteria. There would be an advantage in a second tier central repository of all e-learning material, and the e-U would clearly be a candidate for holding it – although it would have to make a clear disclaimer about its quality.

74. Repositories are at the heart of a content asset management system. In the case of the e-U, the content would be of modules of learning materials and /or associated learning programmes and, over time, of learning objects too. The infrastructure services of the e-U should therefore include a learning content repository and associated search functions to keep track of these valuable assets as they were accumulated. As the granularity of the components of learning programmes was reduced, so the number of components in any specific programme would grow. Equally, as the degree of personalisation and tailoring of learning programmes increased, so would the number of components from which learning programmes could be built. Metadata descriptions of learning components would provide ways of distinguishing between different styles of learning and different competence profiles of learners. All this information could be available to the learning programme design teams and could be reflected in the functionality of the tools used to access the repositories.

75. As not all learners will have access to high end computing equipment with full multi-media capability, there may need to be some tailoring of components of the learning programme to match delivery environments. This would be easier if the relevant information was contained in the description of the learning materials held in the repository. A rich description of learning material would also be required if components were to be re-used in different forms, perhaps as part of a more general knowledge management system within an organisation.

### **Ownership of on-line course materials**

76. Ownership of materials and IPR will be major issues for the e-U, and will be among the key factors that will determine the success or otherwise of the business model.

77. There would seem to be three basic approaches:

- a. The e-U could invest in the production of a module by paying for its production, including fees to the various contributors; the e-U would own it and its IPR and would receive any subsequent payment for its use.
- b. The producer(s) of a module could fund the production themselves – including paying the e-U for its services, would retain ownership (and IPR) and would then receive the payments for its use. The producers would pay some ongoing fee to the e-U for making the module part of the e-U portfolio.
- c. The middle road, in which the investment would be shared and therefore IPR and income shared on an agreed basis.

78. In all cases the module would need to satisfy the e-U's quality requirements operated by its committee for academic quality, and the prospective learner should not be able to detect a difference in source (so, for example, there would need to be consistent pricing).

79. The model may well change over time. In the start-up period, the e-U itself is likely to pump prime a significant part of the funding for module production which would normally result in the module belonging to the e-U. We would anticipate that, as the tools and design services become more widely available (and accepted), and as the e-U brand became established and was shown to work, producers would be willing and able to invest their own funds in material development in order to access the e-U infrastructure.

80. In the past the issue of ownership of course materials (and the related issue of copyright) has not received a great deal of attention. Now that there is the prospect of taking lectures, re-packaging them in digital form and distributing them on the internet, their value is more recognised – although not all courses would generate net income even if they were converted to such a compelling interactive form. HEIs are looking into the conditions under which part of the newly recognised value of the course can be attributed to, and so claimed by, the institution.

81. The arguments in this debate are complex and interacting. Should academic staff be encouraged to seek to use new technology and to find interesting and novel ways to teach the subject? To what degree should HEIs seek to limit such work undertaken by academic staff outside their commitment to the institution? Should HEIs seek to own the intellectual property associated with the creative interpretation of knowledge and its presentation to learners carried out by their own academic staff in the course of their research and teaching? These are examples of the issues being raised and for which several institutions are seeking to put new policies in place.

82. These matters will be of great interest to members of the academic and administrative communities in HEIs in the UK and elsewhere. We already have examples of collaborative ventures that span the Atlantic, and there may well be differences in the way the ownership of material is interpreted. It is clearly a matter for which the e-U will need to have a policy as part of the agreement with individuals

and with universities and colleges.

## **5 Supporting on-line learning**

83. The products of the e-U will be delivered in different ways to match the differing requirements of learners. Some learners will require small quantities of learning material delivered in a short period of time in the professional workplace. Others will want to learn over a longer period of time, especially if a qualification is sought at the end of the programme. Many learners will require support on-line, but the form of the support is likely to vary according to the type of programme and the category of learner. At one end of the scale, a learner may not require any support other than what was already built into the design of the learning material. At the other end of the scale, there will be learners who will require considerable support on a day-to-day basis (for which they would pay). The e-U concept will need to facilitate these various forms and levels of support for learners.

84. A distinction can be made between on-line support through a general information centre and on-line support through tuition for a specific learning programme – perhaps coupled with community and peer group interactions. In any case, the learning experience will probably involve not only interaction with the learning material but also activities in libraries, in laboratories, in learning centres and in the workplace.

85. In general, a learner might expect to find a number of services available through the e-U. Services might fall into the following categories:

- tutorial support for learning
- assessments, schedules and arrangements
- library services and access to other learning facilities
- wider services.

86. These are covered in the following sub-sections.

### **Learning support services**

87. Our report suggests that the e-U will make available a range of tutorial support services so that learners can choose (and be advised on) the level of support most suited to their particular circumstances. Any such service provided by on-line tutors would be within a framework of style and quality set by the e-U as part of its brand definition. The services would be quality assured through the committee for academic quality. A potential service provider would have to satisfy the committee on matters relating to educational level, experience and competence in working with students.

The e-U could require providers to be accredited by means of an e-U approved or produced training package.

88. Services available could include specific forms of interaction – including on-line communication, telephone support and even face-to-face tutorial support in specific situations. Tutorial services might also provide comment and feedback on student assessments; for courses leading to an award, this might be obligatory for the learner. Tutors should monitor their own performance, for example through feedback, and training updates could be provided to ensure that their standard was maintained at a high level.

89. There are several examples in the US where the tutor runs on-line help directly. Tutors using these facilities report considerable success if the conversations are properly mediated, and encouragement given to students to participate in the discussion. Using this technology with groups of up to 30 participants can generate a community feeling in the group. Other centres are proposing to use such facilities in seminar mode, where the numbers of participants can be significantly higher. The e-U will wish to explore how such technology might be used in its provision.

90. Peer group interaction can also be helpful between learners by providing a feeling of belonging to a learning community. There are many forms of on-line interaction that have gained popularity in recent years, including e-mail, bulletin boards and chat rooms. More recently, the advent of mediated web-conference services has provided a useful and effective way to make presentations and create discussions which bring together geographically dispersed participants. Other products allow shared whiteboard facilities on-line so that learners in different geographical spaces can share the same writing space to encourage discussion.

91. Video links are also possible, even over current modem connections, but the quality is poor compared with traditional video conferencing. The expected increase in bandwidth will provide greater opportunities for groupware products in the short term (in some developed countries). For the present, mediated web discussions and e-mail can provide sufficient interaction between learners to generate effective communications to support the community aspects of learning amongst those in a cohort.

92. As a teaching tool, computer-mediated conference or collaboration (CMC) has been used with varying degrees of success. There are advocates of it in the US who report considerable success in encouraging students to participate actively in threaded discussions and thereby join in the knowledge building and the understanding process. The role of the tutor is critical in moderating the discussions, particularly in knowing when to stimulate the discussion and when just to let it move discursively.

93. To back up the tutorial support which is built into some learning materials, on-line training companies are already providing live ‘chat’ assistance to learners. As the learner progresses through the courseware, there is the opportunity to ask questions by selecting the associated ‘chat’ channel in the toolbar. In response, a

chat window opens and the learner is greeted and invited to describe the assistance sought, in text form. The person who answers the questions is part of a call centre and is specifically trained to answer questions about the courseware. An e-conversation between the learner and the mentor can proceed at an acceptable rate even with the slow speed connection via a modem. If the mentor is unable to answer a question, it is referred to a tutor with superior subject expertise, who returns a full answer to the learner by e-mail within a set period. In a university environment, the first level mentors are the equivalent of teaching assistants.

94. Dedicated chat facilities are now used for several types of internet-based services, and text may be replaced by voice as the voice-over Internet Protocol (IP) technology becomes more widely available (although text requires questions to be phrased with more thought). Some on-line educational support is also often provided using telephone services and e-mail messages. The success of this form of support will depend on the competence and dedication of those providing the service. It is not something that can be done without specific training, and the e-U should require specific service contracts with those offering this form of service.

95. Other products are now appearing that make use of artificial intelligence algorithms to track and personalise general web interactions, so that users can rely on tools which automatically search for items of interest to them. Little has yet been done to explore the use of similar techniques in learning and teaching applications, but doubtless these products will soon appear in the market.

96. For the e-U, on-line tutoring services may be provided in a number of ways depending upon how the market develops. Just as there are specialist assessment service providers, so we can expect to find specialist services established to tutor specific subject areas – as is already happening in the US. An HEI may decide to be a service provider of this type and offer specially trained on-line tutors to answer questions from learners in specified subject areas. Such services could be offered on a commercial basis and would operate to an agreed level of service.

97. For learning support, it may be sufficient for the checks by the committee for academic quality to cover the quality and training of the proposed tutors and the proposed method of operating (including the means of obtaining and responding to feedback); and to check subsequent feedback from user surveys (the market operation will also provide post-hoc checks) – including the possibility of providers being removed from the approved list.

98. Having specified the quality criteria for on-line tutor support and the tools for it, the e-U would be in a position to quality assure aspiring service providers – which could include commercial ones (such as Tutor.com or Smarthinking). It could set up an approved database of providers of tutorial support (individual HEIs, consortia, private companies, or arrangements with local back-up) who had satisfied the committee for academic quality criteria. Providers of support could limit themselves to a few specific modules (eg ones that they had produced) or could be more generic (eg by subject area). Providers would need to specify the type of support they were able to offer (eg 7 days x 24 hours, e-mail, call centres, languages, if face-to-face



support then how and where) and their charges. The extent to which providers were used would be driven by learners' demands – apart from those learners seeking an award, for whom the awarding body might require a specified level of tutor involvement.

99. Some HEIs are using e-moderation as a teaching tool as they develop their on-line teaching. They report significant gains in terms of active student participation if the mediation is correctly applied. To use e-moderation effectively in on-line teaching, the moderator needs to be trained in using the method. It combines various skills including teaching, interpersonal skills, technical skills, techniques and content expertise. Analysis of the transcripts of threaded conversations in a mediated environment can provide an important record of the way knowledge is built up among the group of collaborating learners.

100. Tutors providing any form of on-line support to learners will in turn require their own support and, in particular, will need training in the use of the technology for teaching and learning. They will themselves also form a community and as such will wish to communicate with each other to discuss best practice. Tutors working with learners will also need to have information about the learners. This will require the administrative systems of the e-U to contain sufficient functionality to build a 'cohort view' to supply relevant information to (and about) the tutor. In addition, the tutor and learner will each need an easy-to-use interface so that the technology does not get in the way and detract from the teaching and learning issues.

101. The e-U should work with the suppliers of such services to define appropriate functionality to maximise the effectiveness of tutors working on-line and to enrich the learning experience for both tutors and learners. For support based on 'call centre' technology and applied on-line, the e-U should define the service requirements with specialist suppliers.

102. Tutor support arranged under the auspices of the e-U, and the way in which it is perceived by learners, will quickly determine the success of a learning programme or module. The e-U thus needs to set and monitor the effectiveness of the tutor-learner interface.

103. The e-U may also wish to offer counselling and pastoral services to learners using material or services provided under its auspices. Such services could be provided as part of a general set of services made available to learners through the on-line learning environment or through telephone contact. A range of other services for learners is likely to become available from private suppliers, some of which are already evident in the US from suppliers such as StudentAdvantage and VarsityBooks. There may be opportunities for the e-U to negotiate special provision with suppliers in return for their inclusion in the e-U learning environment.

#### **Learning assessment and awards**

104. The specification of a module of learning for the e-U would include a definition of the outcomes of the learning experience in terms of what the learner

should know and/or be able to do on completion of the module. Instructional designers would work with the subject experts to convert concepts and knowledge into illustrations, actions and activities to illustrate, conceptualise and reinforce the understanding of the topic.

105. For each module there will be assessments to exercise the learner. These would be designed and built into the module and should be matched to criteria that test that the learning objectives have been achieved. Formative assessments would take place during the learning process, designed to provide feedback to both learner and tutor (if any) in monitoring progress. Summative assessment would take place at the end of a course or module. Understanding also derives from shared experience and discourse amongst peers and mentors, so analysis of the transcripts of mediated collaboration sessions could provide insight into the way understanding was built from tutorial, group and other interactions.

106. Some assessments could be carried out on-line. There are already many examples of on-line learning where formative assessment exercises have been included within the design of the learning materials. External forms of assessment (ie not simply self-assessment) would normally be required to test the learners' comprehension, application, synthesis and evaluation of knowledge. Such assessments could be by means of assignments posted on-line or through an examination. We expect further innovation in the forms of assessment that could be built into the design of the learning materials as the technology develops.

107. Where the completion of the learning was intended to lead to an award, it would be necessary for the awarding body to use its own approved assessment methods. Tutor-marked assignments are used in many distance education programmes. The e-U would need to provide the infrastructure to support tutor-marked assignments as part of the learning programme tools and services. Although opportunities exist for outsourcing the administration of the assessment process, responsibility for the content of the assessment would clearly be that of the awarding body. The e-U framework could define the quality requirements for the outsourcing of assessment processes, especially if they also involved the service of marking assignments (as exam boards do for their examiners).

108. It would be possible for HEIs to offer assessment services to the e-U, and there are private companies and others which already provide these services – such as the British Council and private sector suppliers such as Sylvan and QuestionMark. Sylvan is able to administer secure testing both for educational organisations and for companies. Its services include on-line testing and face-to-face testing at learning centres worldwide in over 3,500 testing centres in 128 countries and with 10 call centres operating in 25 different languages. QuestionMark offers services and tools for the design of on-line tests and operates in 40 countries. The software it provides enables users to write, deliver and mark tests and questionnaires. As the demand for these services increases, new assessment service providers will arise offering innovative products and services both in the UK and overseas.

109. Any such service providers which the e-U was prepared to endorse would, as with the other e-U services, have to satisfy the quality requirements set by the e-U. Specific quality measures would need to be established to support the authenticity of the processes, for example to demonstrate anti-cheating devices (eg through real time discussions or calibration of a learner's style). The design of assessment systems to match the learning provision would be a function on which the e-U could advise those putting together learning modules – although the final responsibility would, of course, be that of the awarding body itself. The methods available should be evaluated regularly as part of the quality management of the e-U.

110. Some learning materials would have been developed by more than one institution. If such material were aimed at an award, the contributing parties would need to agree beforehand which of them was to take responsibility for the award: there may be legal issues involved. Others may also have an interest if the award was to be accredited by a professional body. There are also national differences in the way professional bodies handle the accreditation of qualifications. The e-U could help UK institution(s) to decide how best to meet any such overseas requirements.

111. Stand-alone learning materials not designed as part of an awardbearing programme would still include assessments as on-line exercises and perhaps also as tutor-marked assignments, not least because they would be available to potential learners and to other design teams for inclusion in learning programmes which might lead to an award. The aggregation of modules from various sources would be a task for which most learners would need assistance – this would be the role of the navigator service, as explained in our report.

112. Over time, as noted in our report, this could lead to a system of agreed credits and/or to institutions being prepared to make awards on the basis of a learner's performance in examinations. We do not think either possibility should be ruled out. Nor should the possibility of the e-U itself becoming an awarding body for some multi-sourced programmes.

### **Library services**

113. Part of the educational process involves scholarship requiring access to wider resources for research and the integration of knowledge. In traditional courses, students are able to access vast resources in the libraries associated with their institution. Many university and college libraries are already heavily involved in securing access to resources on-line following the publication of recommendations contained in the Follett Report some years ago. The work of UKOLN (UK Office for Library and Information Networking) is the focus for co-ordinating much of the effort in creating digital libraries and dealing with the problems associated with interoperability in securing access to national and international resources.

114. Many HEIs in the UK are supporting their own distance education programmes which require them to establish access to library provision for students working at a distance. Some have set up units within the library structure specifically to accommodate the requirements of remote access to resources, sometimes through

their web-sites. Such services are an important part of the support for on-line learners, and access to library provision should be a high priority for e-U. This is another area where there is considerable scope for services to be provided by external organisations.

115. There are also current public sector projects in the UK to provide an integrated approach to the use of information and communications technology within local government. These include broadband initiatives to support local and community grids for learning incorporating education establishments, learning centres, libraries, hospitals, museums, galleries and leisure services. Plans for these facilities are well advanced. For example, in the West Midlands region they involve the creation of a high-speed core network capable of carrying concurrent live video, audio and data traffic, and supporting multiple secure Private Virtual Networks (to service communities of common interest) across the same physical network. The intention is that these networks will initially be used for library and school connections and later connect to other services. Extension of the facility to other regions is a logical next step, eventually linking to a national network of services. The major journal publishers have also already moved to the point where most mainstream journals are now available to subscribers on-line.

116. In the US there are a number of interesting developments designed to provide greater opportunity for on-line learners to access library resources. There are moves to digitise and make available on-line the text of hundreds of thousands of books. Questia, founded in 1998, is intending to provide students with access to 50,000 text books when it opens next spring, with a goal of 250,000 books on-line within 3 years. Ebray plans to launch shortly: it claims to have some 300,000 volumes already on its demonstration database and expects some 600,000 by the time it is launched. Although access and search is expected to be freely available, the user would be charged to download material.

117. With predictions of strong growth in the market for e-books, there will be more organisations and companies offering these services in the future. There will be opportunities for the e-U to form alliances with such organisations and to work with them to define other specialist services which relate to the products to be offered by the e-U. The simplest arrangement might be for links to company web-sites within the learning environment. There may well also be opportunities to provide study packs of pre-researched resources and specialised search facilities in defined subject areas. All such opportunities should be investigated by the e-U with a view to negotiating an acceptable level of service to back up its learning material.

#### **Learning programme management**

118. The remaining services are mainly concerned with the management of information about on-line learners. At least initially, the e-U will not have any students which it 'owns' in the sense that a traditional HEI does. Its requirements for systems will thus be very different from theirs. Current vendors of Learning Management Systems (primarily for companies) provide functions that link to the human resources (HR) and financial systems of the organisation and maintain a

record of the learning experiences of the staff. Some go further and provide functionality to link learning content products with the process of promoting interventions for learners, following a 'gap analysis' of an individual's knowledge and skills within a competence framework. Tailored and personalised learning programmes are becoming more standard in HR departments, and the ability to custom design learning programmes is a new goal of those who provide learning programmes.

119. The administration of on-line learning for learners taking e-U modules will depend on the extent to which the e-U becomes directly involved with the student experience itself, but, as a minimum, will need to help track what learners are using in order to arrange billing and to receive income. A complete auditable record of the transactions involving the components of learning programmes would be needed to take proper account of IPR, copyrights and royalty payments.

120. As the amount of e-learning material grows, so will the task of keeping track of the content assets. We have mentioned earlier the need for a content asset management system in connection with the establishment of repositories of learning programme components. Content asset management will also help the task of building whole learning programmes. The e-U should demonstrate very effective management of its learning material – which will belong to a variety of sources in varying degrees. Whatever the ownership, these materials should be subject to rigorous inventory and tracking requirements associated with their IPR and with e-commerce transactions.

