JSP 822

Part 5: Chapter 5

Defence Training Support Manual 5

TECHNOLOGY BASED TRAINING DELIVERY SOLUTIONS

Director General Training and Education

JSP 822

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DOCUMENT QUALITY RECORD

The following quality control statements are made in accordance with the requirements of the Defence Systems Approach to Training Quality System (DSAT QS):

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2.   **Authority:** This Training Support Manual is published under the Authority of the Director General Training and Education (DGT&E), MoD.

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    a.   **Amendments:** Individual pages that are replaced during the amendment process should be disposed of according to the document's security classification in accordance with local instructions.

    b.   **Re-Issue:** On occasion the entire manual will be re-issued and under those circumstances the old version of the manual must be destroyed, without undue delay, upon receipt of the later version.

AMENDMENT RECORD

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REFERENCES

DEFENCE PUBLICATIONS

UK Defence e-Learning Strategic Vision and Policy 2003.

Defence SCORM Guidelines for Producers V1.0.

Procurement Rules Sets Draft v0.9 May 2005.

E-Learning Decision Toolkit.

E-Learning Content Toolkit.

SINGLE SERVICE PUBLICATIONS

RAF e-Learning Accessibility Matrix.

RAF e-Learning Accessibility Matrix Supporting Guidelines.

RAF TSP5 – Computer Based Training (CBT).

RN TBT Guide TG5.

Army e-Learning Guidelines 2005.

FOREWORD

1.　　For the purpose of this document, the term training[1] encompasses all Learning[2], Education[3] and Personal Development[4] that has the objective of developing the knowledge, skills and/or attitudes of an individual in terms of preparing that individual for his/her role.

2.　　**JSP 822.** JSP 822 sets the policy framework for the management of individual training across Defence and details the key areas of Training Management (TM), Training Requirements Authority[5] (TRA) and Training Delivery Authority[6] (TDA) roles and Customer Executive Board (CEB) function. It is the high level policy that defines who is responsible for what in Defence Individual Training.

3.　　**Defence Systems Approach to Training Quality Standard (DSAT QS).** DSAT QS sets out the strategic principles to be applied to all Individual Training provided by, or on behalf of, Defence. The DSAT QS has been endorsed by the Training and Education Policy Group (TEPG) as the quality standard for the management of Individual Training across Defence. Any activity that has the objective of developing the knowledge, skills and/or attitudes of an individual for their current or future role must comply with DSAT QS.

4.　　**Defence Training Support Manuals (DTSMs).** The DSAT QS is underpinned and supported by DTSMs that direct its implementation. There are 5 DTSMs:

　　　DTSM 1 - The Analysis, Design and Development of Training.

　　　DTSM 3 - Training Needs Analysis.

　　　DTSM 4 - The Evaluation of Training.

　　　DTSM 5 - Technology Based Training Solutions.

　　　DTSM 6 - The Audit and Inspection of Individual Training.

5.　　**DTSM 5 – Technology Based Training (TBT)[7] Delivery Solutions.** This guide outlines how those involved in training can achieve cost-effective exploitation and optimum

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[1] An activity that aims to impart the specific knowledge, skills and/or inculcate appropriate attitudes required by an individual in order to perform adequately a task or job.

[2] Learning is the acquisition of knowledge, skills and/or attitude.

[3] Education encompasses the development of intellectual capacity, the acquisition of general supporting knowledge and inculcation of attitudes, which underpin performance, and engender understanding, commitment and ethos.

[4] Personal Development is the enhancement of personal and/or professional attributes arising from a combination of training, education and experience.

[5] The TRA represents the end-user of the trained output. It is the ultimate authority for the derivation and maintenance of the Operational Performance Statement (OPS) or Competence Framework (CF), and is responsible for the evaluation of the effect of the training and education in achieving that OPS/CF (delivered both in the training school/organisation and the workplace).

[6] The TDA is the organisation responsible for the provision of individual training or education, to agreed standards and in accordance with extant and funded Defence and single Service policies, on behalf of the customer(s). It is the conduit through which a Training Organisation/School is commanded/headed, resourced and administered.

[7] TBT is defined as 'Any use of CBT, CAI, Computer Simulation/Emulation or interactive video', The Glossary of Defence Training Terminology.

application of TBT (including e-Learning) to support training delivery[8] across Defence. It is intended to be used a guide for training developers who may have little experience in the development of TBT delivery solutions, whether in-house or through the use of external contractors. Version 1 has its emphasis on e-Learning however, it is intended to fully develop the simulation and video sections in the near future. DTSM5 was written to coincide with the launch of the Defence Learning Portal (DLP), which is explained in detail in section 12 of this manual. (Note. A glossary of TBT terms can be found within DTSM 2).

6.   For further information and advice contact:

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[8] That is the use of technology for the delivery of training based on the training objectives produced by Training Design and Development. This guidance does not cover technologies that support the design and development of training solutions and their lifecycle maintained.

SECTION 1 - INTRODUCTION

1.1   Prior to the advent of the computer and Information Communication Technologies (ICT), training was conducted using a number of traditional approaches such as instructor-led theoretical classroom tuition, practical equipment-based exercises and on-the-job training. The training tools used ranged from textbooks and handouts, to slides, wall charts and physical models.

1.2   Whilst the power, portability and interactive nature of the computer is undisputed, TBT solutions should not be procured simply because they are innovative or novel. Generally, as with all training solutions, they should be procured to meet an identified training requirement, and only after careful analysis that proves a TBT delivery solution to be more cost effective than any other. However, TBT can provide a powerful component of a distributed training requirement.

1.3   The effectiveness of an instructor-led lesson using nothing more than a whiteboard to highlight key points should never be underestimated or ignored. Selection of methods and media to meet training needs will be through the Training Needs Analysis (TNA) process, which involves a Training Options Analysis (TOA) as described in DTSM 3. The effectiveness of any TOA will therefore rely on the TNA practitioner being fully aware of all of the training methods and media available at the time, and their advantages and disadvantages.

1.4   Opportunities now exist for a change of emphasis from predominantly residential, classroom-based training towards a more distributed learner centric approach. Web delivered and managed e-Learning will need to be made available through all access points to the Defence Information Infrastructure (DII), any internet connected device and all electronic learning centres. Furthermore, from a learning management perspective, the use of technology should enable automated tracking of student progress, increase the reusability and speed of update of training material and reduce disruption to both domestic and work place environments. Courses should move to have sufficiently flexible structures to allow accreditation for prior learning and minimise the impact of back classing (if relevant). The training regime should be reflective with both the causes of success and failure being scrutinised to enable subsequent improvements to training methodology.

1.5   Technology can play an important part in Training Management, Delivery and Support. This guidance is mainly focused on using technology to support training delivery[9]. Training delivery concerns a range of activities such as:

    a.   Learner Management.

    b.   Enrolment.

    c.   Virtual Classroom Network and Special Purpose Classrooms.

    d.   Collaboration and Support.

    e.   Learner performance tracking etc.

1.6   These activities are often managed by a learning management system (LMS), or interface with an LMS, and concern the 'D' layer as shown in the diagram below.

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[9] Delivery of training based on the Training Objectives produced by Training Design and Development.

However, TBT concerns all the layers of the DAC model and in the case of e-Learning concern specific technologies highlighted below.

Developed by DefenceKnowledge 2005
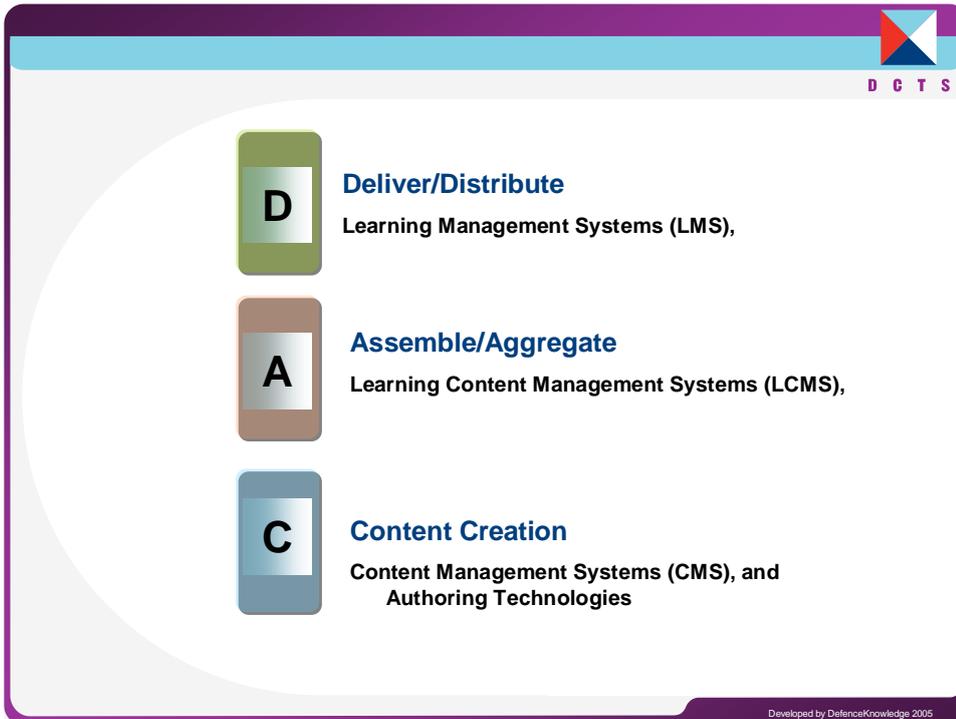
1.7   This guidance at present does not cover the selection and use of technologies that support the DAC model or the federation of training resources across Defence. However, it does cover high-level training design, development and delivery considerations as well as make reference to LMS and LCMS technologies within the context of DLP.

1.8   It is true to say that the increased use of technology in the design of learning environments has resulted in far greater attention being focused on issues of pedagogical and instructional design (or learning design[10]). The move away from a single method of instruction, i.e. the classroom based course, had provided the opportunity to explore some of the very good research carried out over the years by those interested in the pedagogical basis of instruction and training. This guidance does not discuss the range of instructional models[11] appropriate for TBT.

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[10] Learning design is about ensuring the performance gaps are adequately met and learning is sustained throughout the duration and evaluation of the learning process
[11] Instructional models are guidelines or sets of strategies on which the approaches to teaching by or with instructors are based. Effective instructional models are based on learning theories. Learning theories describe the ways that theorists believe people learn new ideas and concepts. Often, they explain the relationship between information we already know and the new information we are trying to learn.

SELECTION OF METHODS AND MEDIA

1.9   The selection of methods and media should consider many factors e.g.: the requirements identified by the Knowledge, Skills and Attitude (KSA) analysis (described in DTSM1), characteristics of intended students, characteristics of instructors, instructional (learning) strategies, cost effectiveness, training effectiveness, and availability of learning resources and identified constraints. Full details of 'Factors influencing Methods Selection' can be found in DTSM 1and the Defence Centre of Training Support Training Support Handbook on Instructional Design.

1.10   The selection of methods and media (DSAT QS001: 2003) shall take account of:

     a.   The TOs and key learning points (KLPs) to be achieved.

     b.   The characteristics, locations and numbers of students.

     c.   The availability of suitability qualified instructors.

     d.   The availability of training resources.

     e.   The applicability of emerging technologies.

     f.   The training effectiveness of the methods and media.

     g.   The cost.

FACTORS INFLUENCING MEDIA SELECTION

1.11   **Training Media.** The distinction between methods and media is in some ways rather an artificial one. If a particular method is chosen, the media appropriate to that method are immediately limited, and sometimes virtually defined. The process of selecting instructional media requires a good understanding of the Enabling Objectives (EOs) and knowledge of the available resources. The main consideration in selecting appropriate media must always be its effectiveness in supporting learning. Although the quality of presentation must not be neglected, what really counts is content; is the medium capable of presenting instructional stimuli for learning? Learning is influenced by the quality of the presentation only to the extent that the quality influences the clarity of the message. Often one medium is not enough for presenting the stimuli required and so a multi-media or "blended" approach is prescribed. Thus TBT can be a critical means of moving to a more distributed learner centric approach

1.12   **Variety of Media.** Using a variety of media when delivering instruction is enjoyable for both students and instructors, and there should be a good balance of different media to stimulate as many senses as possible provided this is cost effective. However, whether a medium is enjoyable is not an overriding factor in media selection. It is necessary to consider the characteristics of media in terms of whether they are essential or optional:

     a.   **Essential Media Characteristics**. These control the clarity of a message, ie learning a foreign vocabulary requires print (to recognise words) and audio media (to pronounce them). There are some considerations that can influence selection:

          (1)   Media appropriate to deliver the desired learning outcomes.

(2)   Media that provides an appropriate level of fidelity.

(3)   Media that can cope with student throughput.

b.   **Optional Media Characteristics**. These improve the quality of the presentation. There are some considerations that can influence selection:

(1)   Attractiveness to the learner - using colour, animation, illustration.

(2)   The learners' study habits or work environmental factors (if training is on the job).

(3)   The instructors' style, habits and skills.

(4)   Choosing media that from experience and research improves learning efficiency.

(5)   Choosing media that allows the efficient management of training.

(6)   Choosing media that has low risk of failure (for whatever reason).

METHOD AND MEDIA SELECTION PROCESS

1.13   The selection of the most cost effective way to meet a training requirement involves identifying a range of possible training solutions, in terms of the methods and media to be used. The choice of options will be dependent upon the type of project, training policy, training throughput and best practice. These can then be evaluated by comparing the training and cost effectiveness of each option, from which the most suitable solution can be chosen and recommended with supporting justification.

1.14   Although from a purely instructional standpoint, a particular training media may appear to be best suited to a particular training event, it can only be adopted as the final solution if all resourcing issues (manpower, facilities etc) combine to produce the most effective, efficient and economic overall through-life package. The resources required to properly support training will vary from case to case but in general all of the following areas should be considered.

1.15   **Training Effectiveness**. This can be predicted or assessed by evaluating the ability of a particular method or media to achieve a TO. This information can be obtained by comparing the training option against similar proven methods and media, and/or research carried out with new technologies. As this is a subjective process wide consultation should take place with SMEs. The decision making process should identify all the criteria that contribute to an ideal solution and then rank how well each option meets each criterion. An example of the sort of questions to base your criteria on are:

a.   Productivity - Are blocks to productive training removed?
b.   Simplicity - What sources of complexity are reduced?
c.   Convenience - How is inconvenience removed?
d.   Risk - What uncertainties are eliminated?
e.   Fun/image - Is emotion or cachet added?

1.16   **Manpower**. It is important to determine the personnel involved with the training event, not just the number of instructors and students, but those involved in conducting the

need analysis, developing TOs, course development, programming, lesson planning, consultant/SME advice, evaluation, as well as clerical and administrative staff. It is useful to estimate the time taken with these activities as well as determining the class contact time for instructors.

1.17 **Training Equipment and Facilities**. The training equipment, hardware, software and infrastructure needs to be identified, as well as the through-life support. Physical assets like classrooms, buildings and offices need to be identified as well as accommodation and food for staff and students where applicable. This also includes the training material, reproduction and graphic facilities as well as administrative support. In addition digital assets required to support training delivery like PCs, electronic whiteboards, digital training resources etc. also need to be identified.

1.18 **Nature of the Content.** Some learning resources will have a very short shelf life while others will remain relevant for longer, and some learning resources will be much more costly to re-engineer and/or maintain than others. All of this will have an impact on suitability of the media and costs.

1.19 **Cost Effectiveness**. This can be analysed at a simple level by comparing costs for a number of different areas that relate to three core elements of courseware, delivery and management. Examples of the types of areas are:

    a.   Student salaries.

    b.   Instructor costs.

    c.   Support staff costs.

    d.   Travel and subsistence costs.

    e.   Training equipment hardware/software/infrastructure (initial costs and running costs).

    f.   Equipment maintenance costs.

    g.   Production and maintenance of training materials cost.

    h.   Classroom overheads.

    i.   Course materials.

    j.   Administrative support.

    k.   Accommodation and food where appropriate.

1.20 When developing a proposal for a training solution it is important to make the estimates as accurate as possible and record the actual costs incurred in order to provide a basis for estimates in the future. Advice and guidance should be sought from budget/finance managers.

1.21 Once cost and training effectiveness data have been gathered a trade-off must be made between the two. For bespoke projects this may just involve a broad qualitative

comparison leading to a recommended training solution. Where acquisition is required a cost benefit analysis should be conducted. However, approval for resources and expenditure should be sought as soon as possible so that training is in place in time to support the operational/business need.

1.22   The selection and subsequent recommendation of a training solution should include the following elements:

a.   A list of methods and media considered.

b.   A description of the methods and media options that will partially or fully meet the training requirements, as described by the TOs.
c.   An estimation of the relative effectiveness of each media option.
d.   The training penalties of each option stated in terms of the degradation of the performance, conditions and standards specified by the TOs.
e.   A cost benefit analysis using a broad order of costs.

SO WHY USE TBT?

1.23   Computers and ICT are able to deliver training and practice to a level that is difficult, and sometimes impossible to attain by using other media or delivery channel. TBT involves the student as an active participant in the learning process on a one-to-one basis. This is rarely achievable, using instructors and some training will not suit being individualised. In addition to delivering 'mainline' course materials, TBT can provide opportunities for extended practice, remediation, and enrichment/elaboration of elements of the course content.

1.24   TBT can be available on demand, permitting flexible scheduling of students and classes, including opportunities for 'after hours' study and on-the-job training. It also provides standardisation of training content, delivery, and assessment. Training using TBT can also, but not always, be scaled up at comparatively low cost and at short notice.

ORGANISATIONAL BENEFITS

1.25   There are a number of benefits that the training organisation, or their clients, may expect when adopting TBT to support training delivery.

1.26   **Increased availability of training**. Conventionally, courses are run either at set times in the year or when there are sufficient students to justify the provision of a course. Subject to proper training administration and management, TBT courses can be run at any time and can be modularised to fit in better with the work environment. This leads to less time away from work on courses.

1.27   **Reduced training time**. Several studies of a range of TBT projects show that, when compared to conventional methods of training, TBT is able to reduce the time needed to cover the same amount of material, to the same standard, by about 30 – 50% but costs of delivery are not always lower. These time savings result from the more efficient learning methods used, and in particular:

a.   The opportunity for learners to proceed at their own pace and control their own learning sequences.

b.   The opportunity for personalised learning based on the 'real' training gap of that individual learner rather than "a one size fits all" course.

c.   Increased level of one-to-one interactions.

d.   Instant task-orientated and personalised feedback.

e.   Freedom of instructional staff to concentrate on slower learners.

1.28   **Distributed training**. Provided that suitable facilities are available, TBT may be

delivered at the workplace, a learning resource centre or home rather than at a central

training establishment. The immediate benefits are:

a.   Reduced costs for travel and subsistence.

b.   Less time away from place of work.

1.29   **Fewer training resources**. Staggered demand for student workstations by extending the working day, coupled with the reduced time required for training actually reduces the number of training places to cope with throughput.

INSTRUCTIONAL BENEFITS

1.30   TBT adds to the effectiveness of instruction in terms other than time and is a key concern in the instructional design process. Although these effects do not provide immediate cost benefits, long-term efficiencies may be expected because of a reduction of skill fade. Current learning theories show that the following benefits of TBT improve achievement and increase retention:

a.   **Student profiling**. By analysing students' responses and comparing these with one or more models, TBT can be used to identify specific areas of weakness in skills and knowledge. Specific weaknesses can then be automatically targeted with remedial work.

b.   **Increased participation**. Properly designed TBT is an inherently active mode of instruction in which the learner is constantly involved and is often based on a more self-service model (particularly relevant for lifelong learning needs or distributed training requirements).

c.   **Immediate, individualised feedback**. Responses from the computer are immediate and can be tailored to each student's performance.

d.   **Student motivation**. Material can be delivered by computer using a wide range of visual and auditory techniques. Careful design of TBT will ensure that an appropriate range of alternative media is available for a specific target student population. Providing a choice of media gives a powerful motivational stimulus and encourages efficient learning. TBT also offers the student the opportunity to make mistakes in private; for many a desirable attribute.

e.   **Assessment and monitoring**. Records of progress and reports may be automatically generated, both for individuals and classes. The level of detail of these reports can be far greater than is normally practicable for conventional training.

f.   **Training consistency**. The care taken in designing TBT ensures that training material is consistent in content and standard. With conventional training,

on the other hand, instructional content can vary between instructors and from day to day with the same instructor.

g.   **Training time**. Well-designed TBT can adapt to the varying needs and progress of the individual. As a result, training failure due to time limits may be significantly reduced in comparison to conventional training.

h.   **Safe training environment**. Computers may be used to represent potentially dangerous or unusual circumstances by simulating the conditions in which students will be required to operate, either during or after training. By this means, training may be undertaken without risk either to the student or to the assets of the organisation.

SECTION 2 - TBT LIFECYCLE

2.1   The aim of this section is to describe the stages leading to the delivery and use of TBT packages and how the whole process fits into the DSAT QS. A TBT package might be a simple web-based e-learning course to be delivered by a known learning platform[12] such as over the Defence Learning Portal (DLP – see section 12) or a complex simulation to be locally hosted in a specialist classroom, or a combination of classroom training, web-based distributed training and performance support.

<div align="center">LIFECYCLE ELEMENTS</div>

2.2   The 'waterfall' model below, is a simple model to illustrate the possible phases of a TBT project lifecycle:
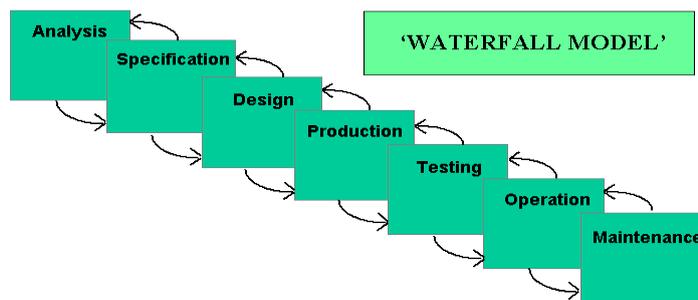
2.3   **Another example of a TBT project lifecycle is shown below:**

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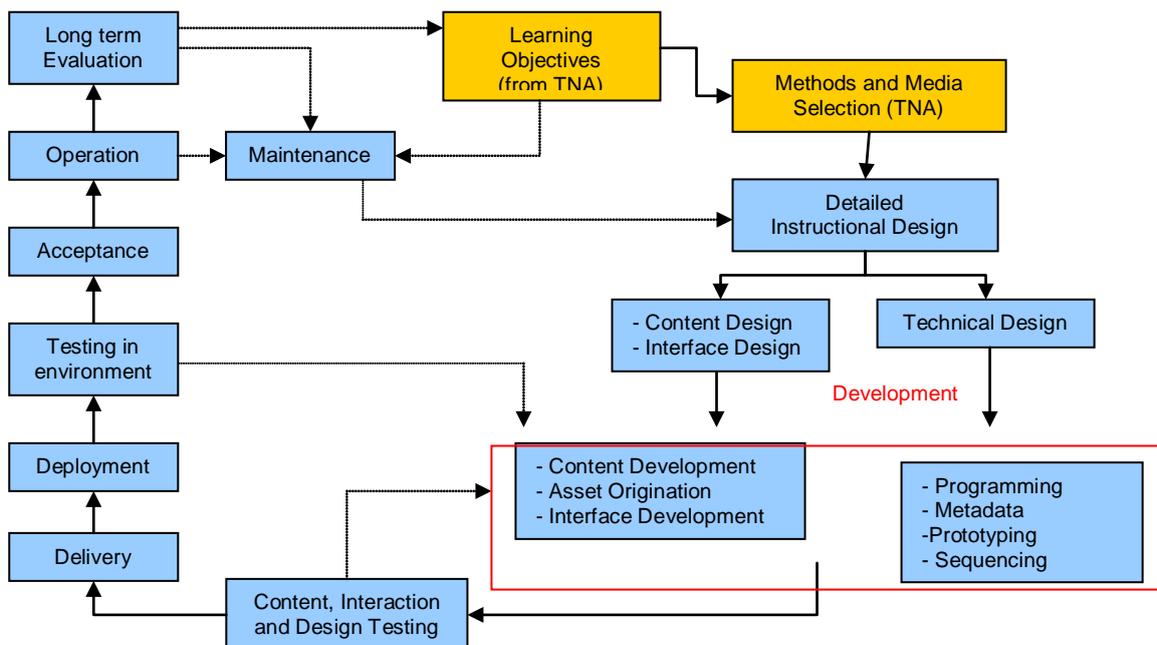
[12] A 'learning platform' is a generic term used to describe a system of information and communication technologies that is used to deliver and support learning. A learning platform usually combines several functions into a coherent environment. A learning platform may be a single product or may be made up of several independent modules that can interact.

FEASIBILITY PHASE

2.5   The purpose of the Feasibility Phase is to focus thoughts. With a detailed TNA completed, the overall course objectives, instructional strategy and constraints should have been determined. The user is likely to arrive at this phase with a 'TBT concept' (or inherit a 'TBT' concept that needs refining or validating), based on their requirements and what they think can be achieved using their knowledge or experience of similar products. The project manager must re-analyse the problem from a TBT viewpoint to decide whether proposals are achievable and supportable. This is done through a Scoping Study.

> a.   **Scoping Study**. A study of this nature will allow the identification of the major requirements for the training need. TBT proposals can then be put to the customer as possible solutions to be considered.

> b.   **Project Initiation Document**. This document would outline a plan for the approach of how the TBT package would be designed, produced, tested and implemented.

SPECIFICATION PHASE

2.6   Successful TBT Projects rely on the specification to be complete and consistent, specifying the user requirements, so that the product will meet all the training needs. The specification then becomes a cornerstone for the project to be based around. The two main aspects of this concern the conceptual design of the end product (i.e. courseware) and the design of the overall learning experience to be achieved.   The planning of the product should include a consideration of the full learning platforms associated with the delivery and use of the courseware.

2.7   **Outline Functional Specification[13].** This is often produced by the Customer or more often in consultation with the Customer and Supplier. This is the first, best guess, by the Customer, to try and determine the training requirements. At this stage the Customer may not be aware of the Supplier's capabilities or what they can produce. Therefore, the outline specification acts as a guide, for the producer to build a first prototype (perhaps to qualify instructional models), which then becomes a discussion point to build upon. It is often easier for the Customer to determine whether the first prototype is something like what was expected or not, as opposed to trying to visualising the product by a list of requirements. Some initial instructional design is then required before a functional specification can be produced.

2.8   **Functional Specification**. This is a progression from the Outline Functional Specification and combines a statement describing the training requirements with clear details of the associated restrictions and limitations. It should be a statement of all the user requirements, consisting of the mandatory features of the training delivery (which would usually include courseware). It should be detailed enough to form a contract between the Customer and Supplier, specifying all the system functions and giving the following features:

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[13] In some cases this will be called a Requirements Specification

a. A clear, concise and unambiguous picture of the requirements and instructional models.

b. Firm control of the development process of the courseware based on an appropriate development model, through stating mandatory requirements and deliverables for the management of the project.

c. Detailed descriptions of the learning delivery platforms to be used (i.e. DLP) or the requirements of the delivery platform to be provided (i.e. provision of an assessment environment) or interfaces to other training environments.

d. Protects the customer or sponsoring establishment from high-risk suppliers, by including, as mandatory requirements, all of the required features of the proposed system.

e. Protects the supplier, by ensuring that the customer can only move the 'goalposts' after negotiating a change to the contract, through the contract change control procedure.

f. Ensures that both the supplier and the user are in no doubt as to the scope of the project, from the award of the contract, until after the final acceptance, and in particular, that they are aware of the precise responsibilities they have under the contract.

g. Defines specific business rules – for example the DSCORM Procurement Rulesets.

h. Defines any additional learning platform requirements including any conformance requirements.

Note in some case the final specifications will not be completed until after the design stage.

DESIGN PHASE

2.9 There are several different approaches that can be taken when designing and developing TBT, but the one that is the most commonly used, throughout industry; is called Instructional Design. Although it has many variations, it basically consists of a framework and a set of procedures that ensures the lesson material meets the training needs and objectives set. Most systems are based on a five-phase model, consisting of Analysis, Design, Development, Implementation and Evaluation. The design and development of lessons is the most critical aspect of successful TBT packages, as the lesson itself determines whether your training or teaching needs are going to be accomplished.

2.10 Different TBT packages will have specific Instructional Design considerations. For example, if the delivery solution contains the delivery of SCORM Conformant Content on DLP then the content designer will have additional instructional design considerations.

2.11 During the design phase of TBT courseware a number of factors are often set by the nature of the design and therefore an outline design is usually produced, so that the following factors can be decided on:

a.   Development and delivery technologies.

b.   Media technologies for animation etc.

c.   Security issues related to the delivery environment and courseware.

d.   Standards[14] and Interoperability.

e.   House style, look and feel essential to the brand image.

f.   Interfaces to other components of the training environment (i.e. interfacing to an EPSS environment).

g.   Delivery technology services, hosting issues etc.

h.   Usability and Accessibility of the learning resources in the learning environment.

i.   Design of assessments.

j.   Selection of appropriate pedagogy.

k.   Design methodologies and the selection of an appropriate development model.

l.   Copyright and intellectual property rights (see section 11).

m.   Technical support infrastructure.

2.12   **Interpretation & Implementation**. The user requirements and training objectives are usually laid down in the TBT specification. These will have already been discussed and agreed with the sponsor and project manager of the project. The lesson structure will determine how effective the interpretation of the lesson material has been and user trials will show how well the training objectives have been implemented into the lesson structure.

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[14] For example there are specific standards for e-Learning called SCORM – see section 7

DESIGN FEATURES

2.13   **Subject Matter Format**. It will be an advantage to formulate a lesson plan and produce a Content Outline (often called a content map), which lists and describes the topics to be covered. First find out what the student needs to achieve. This is usually determined by the training syllabus, in which the training objectives are specified. Decide how the material is going to be taught and rearrange the lesson material considering the importance of the topics and designing it into a sequence of lessons. The format needs to be arranged into a logical framework in order to enhance learning. Will the lesson structure be linear or branching, whole-to-part, known to unknown? The lesson material may have several different levels of difficulty; make sure that the lesson builds up towards the difficult areas, as opposed to jumping straight in at the deep end! An assessment structure can then be built into the lesson plan to assess how well the student has understood the lesson.

2.14   **TBT Learning Styles**. These are somewhat dependant on the material content and learning objectives set. Learning in most cases, can be interpreted as a cyclic process, which could be a mixture between Exploratory and Analytical learning processes. For example, learning could be gained through the experience of an event, where the student analyses the experience and tries to interpret and translate the event with what he/she is familiar with. They could seek clarification from colleagues, friends and mentors and try to reflect on exactly what happened and why it happened. On evaluating the experience they may start to understand the logic behind what has happened. They may then ask questions to show their level of understanding and try to put their theories to the test. Feedback is then necessary to ensure that the student has fully understood the event. The student can then review the whole incident and consolidate his/her ideas of the event. Learning styles vary depending on the student and lesson material, so by using a variety or a combination of learning styles, TBT can enhance the students learning capabilities. There are 4 main styles that are commonly used:

    a.   **Informed Learning**. The student is given the information in a step-by-step logical sequence they then remember it as a concept and then apply it to a task.

    b.   **Experimental Learning**. The student is given the basic tools and relevant instructions needed, and then they try them out, experimenting to complete the task.

    c.   **Exploratory Learning**. The student is given the aim, tools and guidance they ask for and then they achieve the aim by discovering principles and making as many mistakes as they need to and therefore learn from the experience.

    d.   **Analytical Learning**. The student is given information about the aim and tools to be used, these are concepts, and the method used to achieve the aim can then be worked out.

2.15   By considering these types of learning styles, it should be possible to ensure that the student uses several learning styles to improve their learning capabilities. However, students do have different ways of learning and what suits one will not automatically suit another. The knowledge of these processes should therefore affect the way in which material is delivered and taught.

2.16   **TBT Learning Strategy**. This type of strategy cannot be formulated without first knowing your audience. Firstly you need to know what the students' needs are and how

the majority of your audience will learn the material. So you need to find out their current level of knowledge, skills and type of motivation that the students have. The type of student is determined by the way they learn. They can normally be categorised into 4 main types:

      a.   **Serialist**. These learn information from sequential lists. They are precise and accurate in their recall of information, but often miss the 'big' picture.

      b.   **Holist**. These like to see the 'whole picture' to see the links and relationships between parts, but are not good at remembering all the details.

      c.   **Surface Processor**. These students go for the superficial understanding of new material, recalling important keywords and phrases rather than gaining a real understanding of it.

      d.   **Deep Processor**. These are the reverse of the surface processors, who like to gain in-depth knowledge and understanding.

2.17   It is believed that although students might normally adopt one of these approaches, some individuals actually flip between 2 different styles, depending on the circumstances. Decide how the student is going to be assessed by using different testing styles and consider the type of feedback, which will help the student to learn, either through hints or tips or maybe re-direct them to a summary page.

2.18   **Learning Journeys and Learning Pathways**. The training solution may have to support informal learning as well as formal structured training. Formal structured training can be defined as approved learning pathways/combinations of modules but how will informal learning be supported and recorded as a learning journey? There is increasing use of e-portfolios to support learning journeys.

2.19   **Assessment Strategy**. An assessment scheme should be considered to help consolidate the learning experience. There are many ways to test the student, the difficult part is deciding what the pass mark will be and determining which questions the student must get right. This is mainly because all lesson parts taught are required and therefore have a level of importance, or else they wouldn't have to be included in the lesson. Therefore a decision has to be made on the percentage of questions, or the number of mistakes that the student is allowed to make, for them to still be able to pass the lesson.

2.20   Different TBT packages will have specific and additional assessment requirements. For example, the assessment data and records may need to be expressible so it can be exchanged with an Awarding Body for accreditation of qualifications.

WHY ASSESS?

2.21   **Student's Point of View**. The student often needs a goal to work towards; it gives them an aim and direction. Assessing can be a positive motivator, encouraging the student to buckle down and do some work. By testing the student's knowledge it can often give them an indication of gaps or lack of depth in their knowledge and identifies weak areas in subjects. An assessment can give the student a measure of achievement, against training objectives and assessment criteria, which have been set. The student is able to analysis

their own performance, not only by their results, but also through feedback, which can indicate where they went wrong.

2.22   **Instructor's Point of View**. Assessment often highlights a student's weak point, giving an instructor an opportunity to help them improve in this area. Assessment of performance can be linked to a degree of competence, showing a student's level of ability to do a particular job or task. It can be a way of predicting future potential for promotion or qualification for a specific job type. Training can be evaluated through a form of assessment. To judge the effectiveness of training is often useful for improvements to be made next time the course is run. Assessment does not necessarily have to tell you how well the students have learnt, but how effective the planning, timetable, teaching, resources and feedback have been. However, an assessment scheme can often limit the scope of teaching for an instructor.

2.23   There are a number of ways in which a student can be assessed using TBT, depending upon what you need to test the student on.

      a.   **Knowledge**. This is the straight recall of facts and figures.

      b.   **Analysis / Deduction**. The mental processing of facts and figures to produce a logical outcome.

      c.   **Process**. The way in which an outcome is reached may be important if, for example, there are several different ways of achieving it, some longer and less logical than others. Many programs are able to track student actions for subsequent analysis.

      d.   **Dexterity**. The speed and/or skill with which a task can be completed using standard input media, such as a keyboard, mouse or special media, such as a joystick or touch screens. If dexterity is to be tested, it is important that the medium is representative, there is little point in testing for speed of performing a set of actions using the mouse when, in reality, the student would actually push buttons or rotate knobs.

    e. **Attitude**. Attitude is difficult to assess using a computer. The usual method is to ask a series of associated questions. There is a danger, however, that the student may give the answer he/she thinks is expected rather than what he/she genuinely feels or believes.

2.24   Always consider the student before starting to design and structure any lesson material. You need to know and understand your audience before you can teach them. The learning process can often be used to help format lessons, which need to be planned and laid out carefully in order to enhance the students' learning. Instructors may be able to draw on, or need to define, examples of learning pathways and different routes/destinations including a list of various delivery options, if applicable. To ensure that the student has been learning effectively, an assessment strategy needs to be formulated and then put into practice. This will not only aid the instructor but the student also. By assessing the student, their knowledge can be assessed aiding reinforcement of lesson

material. The teacher will be able to assess their learning progress and will be able to give them feedback about how they did during the assessment. This will encourage the student to learn more and rapidly progress through the courseware.

DEVELOPMENT PHASE

2.25   The development of lessons is one of the most critical aspects of successful TBT packages, as the lesson itself determines whether your training or teaching needs are going to be accomplished within the boundaries of the defined training delivery environment. Therefore, it is advantageous to plan the structure of your lesson to determine the order of contents, progression of difficulty, assessment and feedback strategies, in order to achieve your teaching aims. The first step is to look at flow diagrams to set the lesson into a pattern, which will aid student learning.

2.26   **Flow Diagrams:**

    a.   **Lesson Flow Diagrams.** This diagram charts the sequence (often called a sequence map or activity tree) in which the student will encounter the lesson material. This sequence is designed to lead students to the accomplishment of sub-ordinate objectives and therefore the achievement of the lesson objectives. The sequence maybe published as a defined learning pathway.

    b.   **Storyboards**. A storyboard is a screen-by-screen detailed description of the lesson. It is the most important document to be produced, as it contains all the information necessary to build the lesson screens. The storyboards are a blueprint for creating the lesson. Each individual storyboard should contain the title of the lesson, issue and page numbers, screen name and number, author and date produced.

    c.   **Screen Sequence Diagrams**. As part of the development process, a Screen Sequence Diagram should be developed. This diagram charts the screen-by-screen movement of the lesson. The information is graphically represented and is therefore more readable and easier to understand at a glance.

2.27   It should be noted that DTSM 1 clearly states that "content is presented in a format which readily identifies both the link between the content and the TOs, and the sequencing of the content".

2.28   **Sequencing Instruction**. Before any production of the TBT can begin, several documents have to be produced and agreed upon. These documents are used as a guide, as all the specifications and requirements should be laid down in order to design and develop the courseware. Part of this is defined in DSAT where a requirement for the production of say an Assessment Specification (ASpec) is defined. However, different TBT packages may require the production of other detailed specifications. For example, the production of SCORM Conformant Courseware for deployment on DLP recommends the production of a Content Design Specification (see section 7).

    a.   **Content Outline/Map**. This is the first document to be produced and it aims to describe the topics and contents, which are to be covered in the lesson. The lesson has to be structured in a logical framework, in order to produce effective TBT.

    b.   **Lesson Objectives**. These are the aims and objectives, which the lesson has to cover. With these in mind a teaching strategy can be formulated, and are often collated into an Instructional Scalar.

    c.   **Learning Strategy**. Deciding on a teaching strategy to adopt is not always easy. Consideration has to be given to how the student will be assessed during the lesson, to ensure that the package is effective.

    d.   **Style Guide**. This is often produced to aid the production team in the consistent design layout of modules, as several different production personnel could produce these modules. It is important that the modules can be put together and assembled in a logical manner, so that testing procedures are straightforward. The document covers all aspects of screen layout and defines how the courseware will work, look and feel when it is completed.

2.29   **Development Features**. When developing TBT courseware there are a number of features to be considered before any sort of detailed production can be done. These features are often defined in the Style Guide, Design Specification or both, which gives the courseware consistency in the layout of the material to be taught.

    a.   **Content**. Ensure that the content of the material you use is concise and accurate.

    b.   **Structure**. How you present the content of the lesson is as important as the content you present. There are many different styles of TBT, but the most effective way a student can learn is by involving them in the lesson structure. It is true to say, that if you lecture to students they will forget, by teaching through doing they will learn and will understand if they take part. So TBT has to be designed correctly for maximum effect, and therefore with the student in mind at all times. By considering the way in which students learn, is an important factor in being able to correctly structure a learning program.

    c.   **Interaction**. Students tend to learn more effectively if they are involved in the lesson and there are several ways in which this can be achieved. There are various interaction display screens available. These are multiple choice, fill in the blank, matching and application/simulation. Interaction should aim to encourage mental activity and involvement on the part of the student.

    d.   **Control**. It is important for a student to have a certain amount of control over the lesson material. Every student has a different learning pace and it may be that one student is a lot slower or faster than the next. It is therefore necessary to give the student an option to repeat lessons or go over material again, if they need to.

    e.   **Feedback**. Feedback is a vital factor for students to learn. They must know if they are giving correct or wrong responses to the questions being asked. However, the feedback given to the student must be non-judgemental, patient, non-threatening and understanding in approach, style, tone and language used. It is a known fact that user-friendly lessons are much more effective than those that fail to make the student comfortable, with the lesson material and medium used.

    f.   **Monitoring**. Some lessons require a student management system in order that results can be monitored after each lesson has been completed. If this is the case, it is important to inform the student that the results of their tests are being recorded, and how they are going to be used for their benefit, after the exercise.

TESTING PHASE

2.30   The testing of any software products must be carried out throughout the products lifecycle; it must not be treated as a separate activity. As the courseware is developed incrementally, it must also be tested and reviewed by both developers and users to ensure

that the development is moving forward not only in the right business direction, but is also technically sound. Towards the end of a project the focus is on verifying that the whole system operates in accordance with the Specification.

2.31   The Fundamental Test Process comprises of 5 activities: Planning, Specification, Execution, Recording, and Checking for Test Completion. The test process always begins with Planning and ends with Checking for Test Completion. Any and all of the activities may be repeated (or at least revisited) since a number of iterations may be required before the completion criteria defined during the Planning activity are met. One activity does not have to be finished before another is started; later activities for one test case may occur before earlier activities for another.

2.32   On some project the complexity of the TBT package(s) and delivery environment may require very early prototyping. If this is the case, this must be detailed in the test specification or plan.

2.33   For some delivery environments, for example DLP, there may be specific testing requirements as part of validation and deployment processes.

SECTION 3 - INTRODUCING TBT INTO A TRAINING SYSTEM

3.1   The introduction of technology-based solutions into a training curriculum may have a large impact on the Trainer and other involved in supporting the learning process through a new delivery channel(s). This impact may take effect prior to, during and after delivery, with the effects varying between those instructors heavily involved in the project's procurement and development, to those only exposed to the media in the training classroom. Instructors will need to be supported in accessing and selecting approved learning pathways and creating new pathways for different routes/destinations including selecting delivery options. This level of support should not be underestimated. The instructor may also be required to be an e-mentor and may not possess the suitable skills required. Therefore considerations should be made for appropriate instructor training.

3.2   Those supporting delivery platforms may provide specific training services to aid the transition of your instructors; so check out what is already available. For example, DCTS provides training for those involved in supporting students on DLP.

CONSIDERATIONS PRE-DELIVERY

3.3   During the production of the technology-based media, the SMEs and instructors must be consulted in the analysis, design, development and testing stages, and may take on particular project management responsibilities. They may also need training in new design methodologies. Without user involvement the project risks failure, with a training system delivered that will be more of an obstacle to training than an aid. Issues to be addressed pre-delivery are:

     a.   **Technophobia**. Some SMEs and instructors may be wary of new technology, and thus timely and thorough training should be implemented to overcome this.

     b.   **Technoromanticism ('Gucci kit')**. Some users may be keen on technology merely for technology's sake, and will place more importance upon the technology than its use in overcoming a training need. This should be avoided, with procurement of a technology solution only proceeding if it has been proven to be the most cost-effective means of meeting the training requirement.

     c.   **Lack of Ownership**. Users not involved in the development of the courseware may feel removed from it and begrudge its use. A user who is involved in the courseware development process will gain confidence in its employment and be able to explain and make best use of the benefits.

     d.   **Network Management**. If the training system is situated on a network, then network management may become part of the trainer's functions. This can be a complex task requiring specialised training and devotion of considerable time and resources. There may be network constraints (i.e. will the network support the required bandwidth?) and costs that also need to be understood. SMEs and instructors should ensure there are appropriate technical resources allocated to assess network and infrastructure issues and costs.

     e.   **Integration into the Curriculum**. Technology-based solutions must be used to be fully effective. This may require persuasion of instructors in order to

effect a change of attitude to TBT solutions. Training Design and Quality Assurance cells should also be involved. To ensure a smooth introduction of the TBT into the curriculum, parallel running of the new course with the old may provide fail-safe support.

CONSIDERATIONS POST-DELIVERY

3.4   Post delivery, the following issues should be addressed:

a.   **Location, Access, Security**. One of the great benefits of using technology-based approaches is that, video excluded; the delivery medium never tires. However, as the training material may still be restricted to a particular location, there can be resource-planning constraints resulting in limited access.

b.   **Handling Self-Paced Learning**. If training is to be self-paced then access to the training material and the implications on training management must be considered. How to manage students who are fast and complete the training ahead of schedule, and those who are slow and fail to complete the lesson within the allocated time must be well planned.

c.   **Creating Lessons (Authoring and Publishing).** If a "toolbox" approach has been used allowing the instructors or users to author new lessons, scenarios or tests, or define and publish new learning pathways then it is likely that training in such authoring and publishing procedures will be required. The type of "toolbox" approaches vary enormously so you must establish appropriateness first. In some cases a more sophisticated learning platform may be used to design, develop and manage digital resources for training (and perhaps performance support etc). Whatever solution is selected configuration management (i.e. versioning, digital rights etc.) is needed to manage the creation, adaptation or reuse digital resources for training.

d.   **Instructor Training.** Training will be required on the use of the new courseware. Instructors must have confidence in the product and be able to answer any questions on the way the system operates. Consideration must also be given to the training of instructors in e-mentoring skills and administrators who may be providing online support within a learning delivery platform.

e.   **Software Distribution.** To facilitate easy identification and ensure that all users are employing the most up to date training package, each new variant of the courseware should be given a unique version number (in accordance with any guidance provided or a formal registry service), and its distribution should be logged or registered (there may be a formal registry service) and held in a local database or submitted for hosting within the defined delivery environment.

f.   **Post-Project Evaluation (PPE).** This is conducted after the training system has been delivered and after sufficient students have used the courseware to allow an accurate assessment of its training effectiveness to be made. The users' views on the project and any problems and recommendations should be taken into account, as should their views on whether the product is meeting the training need. The PPE should be structured around the original requirements, and should generate a list of lessons learnt both positive and negative.

g.   **Courseware Review**. The trainers should be involved in the review of the courseware and its continuing development, to ensure that it remains up to date with the equipment or procedures that are being trained and that any shortcomings in the effectiveness of the training are rectified, preferably within the warranty period. In addition for some TBT packages there may be specific courseware review requirements.

h.   **Maintenance.** Software engineering research has shown that for some applications, up to 80% of the through-life costs of a project may be required for maintenance, either through error correction, or updating the software in line with modifications to the operational equipment or procedures. In view of this, funding should be sought early in order to maintain the training effectiveness of the application throughout the duration of its expected life. However, recent approaches to courseware production and management are rapidly reducing cost and effort and improving consistency and flexibility.

i.   **Execution**. Prior to delivery of the training delivery (i.e. execution) it is essential that the results from the design and development stages are brought together so those responsible for delivering the TBT Packages within the defined delivery environment have the requisite information. This is usually detailed in an Instructional Specification (I Spec) or Learning Specification.

EVALUATION

3.5   A major problem facing the introduction of new TBT is the ever present question, often based on the poor results of badly specified and integrated TBT – "Why?" Like all forms of training, TBT needs to be included into the Quality Control process of any training establishment. If this is done correctly, and if the metrics that are needed to properly evaluate the final product are planned for during the design phase, then gathering the information required for a valid Post Project Evaluation and subsequent course validation, is in theory, relatively easy. For detailed information on all 4 stages of evaluation as outlined in the DSAT QS, refer to DTSM 4.

3.6   Any TBT solution needs to remain flexible throughout its life, more so for skills based training than knowledge based solutions. Any form of training package will need two things to ensure that it continues to meet its requirement:

a.   A fully DSAT compliant audit trail, from initial analysis (TNA), through methods and media specification (TOA) and instructional specifications, to statistical data on the courses as they run.

b.   A regular and formal evaluation process, which re-assesses not only the package itself, but also the requirement that it is meant to fulfil.

3.7   It becomes obvious, therefore, that a TBT solution cannot be delivered as a complete package, and then be expected to run, unchanged and unassessed, throughout its planned lifetime. The ability to change, correct and update any TBT package after installation must be planned for at the analysis stage, and integrated into the design stage. The end users must then be trained on how to carry out these changes. In addition a learning delivery platform may change over the planned lifetime which requires careful planning and expert input.

SECTION 4 - E-LEARNING – THE BASICS

WHAT IS E-LEARNING?

4.1   "The collective term that encompasses web-based structured learning using computer and communications technologies delivered anywhere and at any time it is needed or desired" (Defence Training Review 2001).

4.2   The emphasis in e-Learning is not on the technology but rather the learning process. Technology is merely an enabler to that process. Therefore, to understand e-Learning it is necessary to look at the concept of learning before considering technologies.

4.3   The evolution of e-Learning has comprised several stages, progressing from the presentation of training material 'electronically' (known as Computer-Based Training, or CBT), to fully functional integrated platforms that support learners in a 'learner-centric model'.

4.4   A common problem is that the people and resources required to create the TBT packages or support the training delivery are not available when and where we need them. How many of us have wished that we could get on that course *now*? Because we need to be able to do something in our job now, not in 6 months time when a course vacancy finally becomes available.

4.5   This is where e-Learning offers some solutions. It offers the technology and connectivity to link learners to the learning resources they require, when they are needed.

4.6   e-Learning represents a significant opportunity for almost all organisations, but delivering the benefits requires an understanding of e-Learning design and development models, as well as specialist products constructed on those models. Experience indicates that success is about much more that putting content on-line. The design of the online experience is of paramount importance. The key is to ensure that the technology supports and delivers the required learning and not to allow the technology to dictate that learning.

4.7   A range of instructional design models are appropriate for e-learning. Many of these new pedagogies are based on collaborative and constructivist principles, experiential learning, problem-based learning, active learning, enquiry-guided learning etc. Selection will depend, in part, on the nature of the learning content, the overall objectives, plan and strategy that has been developed by the organisation developing and delivering the course, and the resources available to support the model selected. Many of the content development vendors have excellent whitepapers on instructional/learning design and e-Learning.

4.8   In the majority of cases an e-Learning delivery solution requires adherence to learning standards that underpin the need for accessibility, interoperability, durability and reusability so cost, flexibility and time benefits can be achieved. The principles and concepts that underpin these benefits are described in the e-Learning Content Toolkit (ELCT – see section 6).

4.9   Defence has published its learning standards requirements in the form of Defence SCORM Guidelines for Producers (see section 7). Additional Defence standards and guidance will be produced in due course.

E-LEARNING POLICY

4.10   The Defence e-Learning Strategic Vision and Policy was issued in Mar 2003. Its aim is to provide "Coherence to the Defence-wide exploitation of e-Learning as a cost effective training and education method and medium that will improve operational output by bringing the learner in contact with the wider world of knowledge in a more timely manner".

4.11   The strategic change of emphasis is to move away from predominantly residential classroom based training toward a more distributed learner-centric approach.

4.12   A key part of the DTR vision has been the provision of the Defence Learning Portal (DLP) to provide a single Defence delivery platform for e-Learning. DCTS DLP Service Team has also developed e-Learning services, guidance and toolkits designed to enable more affordable production and deployment of e-Learning.

ASPECTS OF E-LEARNING

4.13   A 'purist' view of e-Learning is that it is made up of 5 aspects. The diagram overleaf illustrates how e-Learning differs from Computer Based Training (CBT) that has been used across Defence for many years. The abbreviations "SCORM[15]", "LMS[16]" etc are explained later in these guidelines.

Aspects of e-Learning

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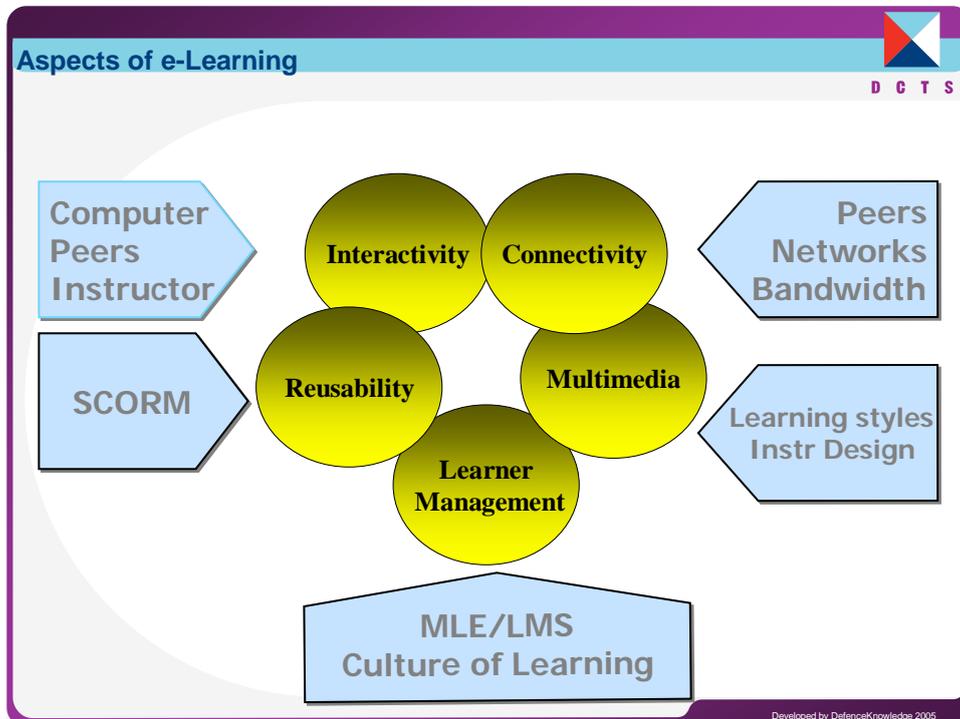
[15] SCORM stands for Sharable Content Object Reference Model (see section 7)

[16] LMS refers to Learning Management System. A learning management system is a software package used to administer one or more course or modules to one or more learners. An LMS is typically a web-based systems that allows learners to authenticate themselves, register for courses, complete courses and take assessments.

E-LEARNING – SCENE SETTING

4.14   e-Learning should first be understood from the instructional viewpoint. There is of course a technical view point but it is recommended that you seek appropriate technical advice and support before commencing an e-Learning project.

4.15   Learning should be part of a compelling learning experience. The use of technology to support the design and delivery of effective e-Learning requires an integrated approach involving the design of courseware and its delivery and support to the learner based on the requirements. It might be that e-Learning is used purely to provide online assessment or to centrally track a student's learning journey.

4.16   Traditionally CBT and e-Learning packages have been delivered as "black boxes". This has provided little opportunity for reuse or tailoring to individual learning needs or effective tracking of student progress.

4.17   The most effective use of TBT is likely to come from taking a blended approach where e-Learning courseware is mixed with other learning experiences including traditional methods. Within the scope of this guidance we shall only consider the technology supported aspects of e-Learning. However, the range and complexity of the workflow required for the coordination and communication e-learning specification, design, development and delivery activities should not be underestimated. The use of technology to support these workflow activities should be considered for any project of a reasonable scale.

4.18   **e-Learning – 10 Critical Issues**. e-Learning is still a maturing industry. It is useful to identify the critical issues in e-Learning which can be summarised as follows:

    a.   Moving from 'one course fits all' to object-based courseware that can address more modularised or personalised requirements.

    b.   Moving from 'a lesson plan' to the development and/or selection of appropriate learning pathways to meet the same training objective, and where the actual learning journey is recorded.

    c.   Increased variety and choice to meet different pedagogical and learning style requirements.

    d.   Increased interoperation of learning platforms, tools and content.

e.   Ability to manage a range of assessment activities and exchange assessment data and reports.

f.   The ability to share, reuse, repurpose, reference and exchange learning resources, learning objects, training objectives etc.

g.   Better narrative and structure in e-learning.

h.   Increased ability to deliver training to a range of distribution devices, i.e. tablet, mobile etc.

i.   Providing the same experience regardless of distribution technology.

j.   Improving how we motivate, reward, report and manage the activities and results of e-learning.

SO WHERE DO I START?

LEARNING STRATEGY

4.19   The outcome of a Training Options Analysis (TOA) should identify the learning strategy that is required. The learning strategy is a combination of methods, media and the environment used to deliver instruction, in other words, how the subject matter is delivered. The learning strategy must be based on the content to be delivered and the target audience for the learning.

4.20   There are a number of factors that must be considered when choosing a learning strategy such as:

a. Does the strategy support the learning needs, taking into account both the content

and the learner? What benefits does e-Learning bring and have these been articulated.

For example, are there any benefits of supporting greater use or reuse of the

courseware?

b.   What is the cost to implement this strategy? These costs must include the cost to design, develop, deliver and maintain the strategy.

c.   What are the through-life costs?

d.   What are the obstacle that will have to be addressed to ensure a successful implementation? Is everyone supportive of the solution? Does everyone have ready access to the required technology/resources? In other words is there appropriate "readiness".

4.21   Director General Training & Education (DGTE) have developed an e-Learning Decision Toolkit (eLDT) to assist in determining whether e-Learning is an appropriate learning strategy for a particular learning situation.

E-LEARNING DECISION TOOLKIT

4.22   The e-Learning Decision Toolkit supports users in making decisions about which courses should be delivered as e-Learning. It also forms part of the TNA process and helps a user build a business case for the development of e-Learning courseware. It is designed to support certain types of e-Learning, as shown in the table below:

Level	Type	Description
1	Electronic book	The most basic form of e-Learning. Mainly text, few graphics, limited interactivity and no sound or video. Used for conveying simple information
2	Web-based training with basic multimedia	Standard e-Learning, using a mix of graphics, some sound and simple animation and interactive exercises, but no video
3	Web-based simulation and/or rich multimedia	Web-based simulation or rich multimedia. Includes complex interactivity and/or complex graphics, sound, animation and possibly video. Richness of media may require delivery on CD ROM
4	Peer to peer (P2P)	Online discussion group and/or mentoring supporting electronic book or document repository[17]

WHO PRODUCED IT?

4.23   The toolkit was produced for DGT&E and is administered by the Defence Centre of Training Support (DCTS)

### WHERE CAN I FIND IT?

4.24   The toolkit can be found in the 'Reference and Guidance' section of the Defence Learning Portal website:

HOW DOES THE TOOLKIT WORK?

4.25   The toolkit consists of five stages with guidance notes. It is made up of a set of word documents explaining how each part of the kit works, word templates for you to complete, and Excel Workbooks for you to complete where calculations are required. The five stages are as follows:

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[17] A document repository refers to some centralised means of storing documents electronically so they can be retrieved, shared and distributed across the organisation

Overview of Framework

Developed by DefenceKnowledge 2005
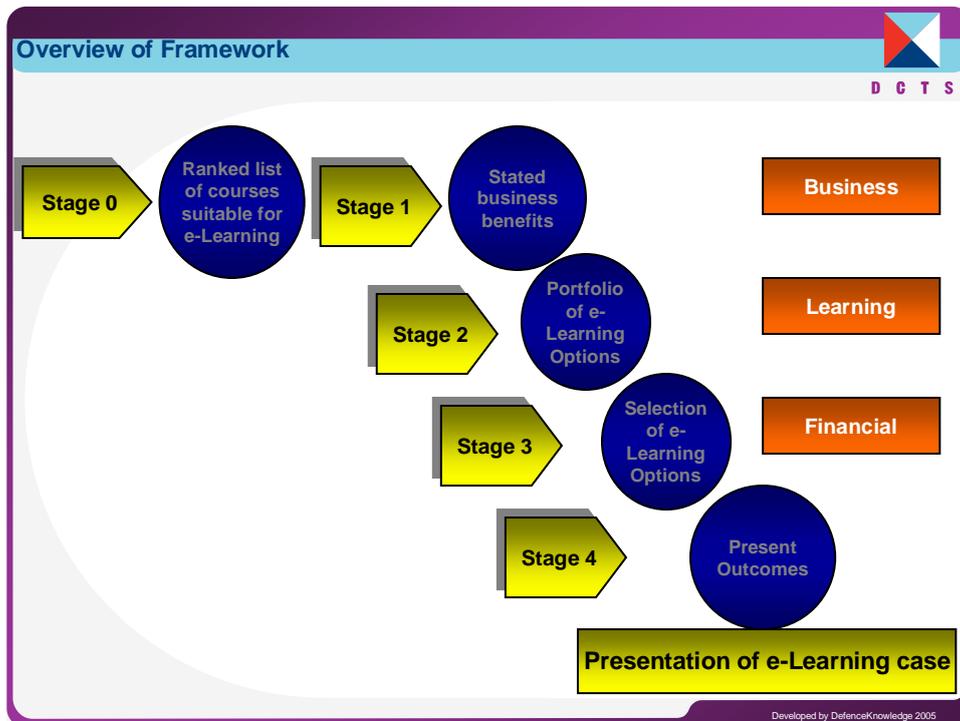
a.   **Stage 0 – Business Pre-Qualification.** This is an overall look at one or more courses run at a training establishment. This stage helps to select and rank the courses most suitable for e-Learning.

b.   **Stage 1 – Business Rationale**. Examines whether there is a business case for a course to be converted to e-Learning. This stage considers issues such as course throughput, number of times a course is run per year etc.

c.   **Stage 2 – Learning Rationale.** Considers what format of training or e-Learning may be appropriate, simulation, web based training etc.

d.   **Stage 3 – Financial Rationale.** Analyses the business case in considerable detail, ensuring that courses chosen to be delivered as e-Learning are fully justified in financial terms.

e.   **Stage 4 – E-Learning Case Collation**. Provides a standardised format for presentation of e-Learning business cases. By providing a clear rationale it maximises benefits and minimises risks.
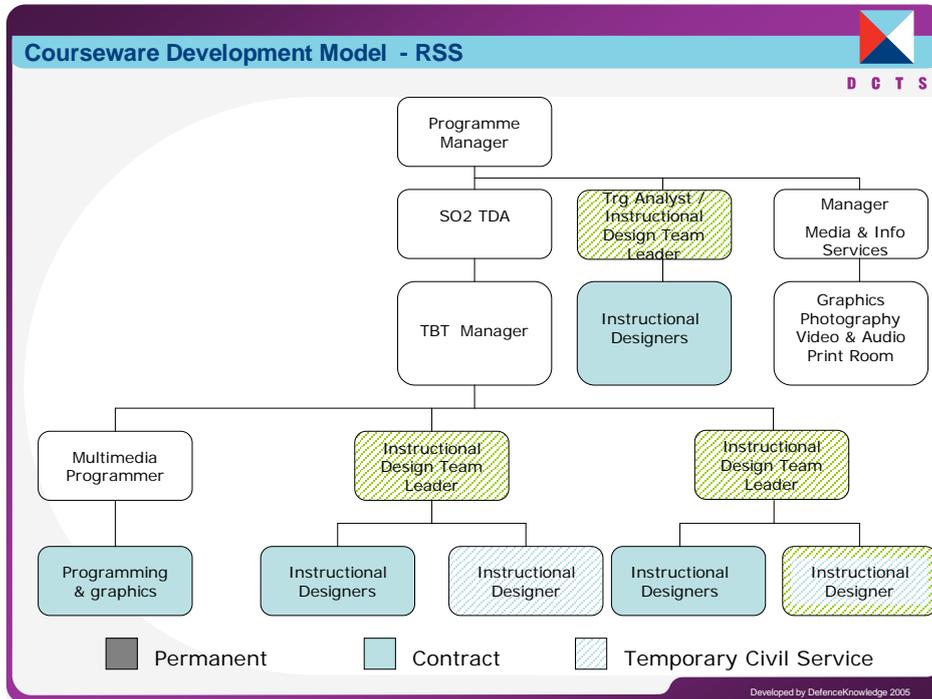
COURSEWARE DEVELOPMENT PROCESS

4.26   Courseware can be generic (available elsewhere or commercially off the shelf) or bespoke as Defence has specific requirements from the courseware. The bespoke content can be produced by third party suppliers or internal Defence production teams or media units. For example, in due course DCTS will provide a DLP Content Production and Management environment.

HOW IS E-LEARNING PRODUCED?

4.27   Once courses (or elements of a course) have been assessed as appropriate for development as e-Learning (using the eLDT) and funding has been secured, decisions

must be taken about how the courseware is to be produced based on an appropriate development model.

4.28   e-Learning courseware can be produced either in-house or externally by commercial companies or in a mixed development model. The diagram below shows an example of a mixed development model. A key task is the clear definition of the required development model.

4.29   The type of development model will influence the specification process, the procurement process, the evaluation and testing process, the workflow requirements and supporting technology as well as the business rules for content production and management. For example business rule guidance maybe required for the production of media assets. The coordination and management considerations, as well as the required benefits, of the development approach will determine whether a traditional course publishing model or single source, object-based production model is required. (Further details are provided in Defence SCORM Guidelines for Producers).

4.30   The following section details the 4 options open to a courseware sponsor.

SECTION 5 - E-LEARNING DEVELOPMENT OPTIONS

COMMERCIAL OFF THE SHELF (COTS) COURSEWARE

5.1   COTS software is readily available, cheap and obtainable from PC shops for the general public.

5.2   **Applicability**. COTS courseware is likely to be a cost-effective solution to the teaching of 'mass market' topics such as GCSE, BTEC, NVQ, RSA etc. There are also many packages available to support management training subjects and the teaching of standard IT packages such as word processors and spreadsheets.

5.3   **Typical Costs**. Costs vary enormously depending upon the medium used. Simple packages such as 'Teach Yourself Microsoft Word' are available from about £50 upwards. Multimedia CD-ROM based training packages can range from several hundred to several thousand pounds, depending on the subject matter.

5.4   **Advantages**. The advantages of COTS software are that it is probably the cheapest and quickest solution; it will be tested and proven and is likely to run on standard hardware components. Users can also normally try the package before they purchase it.

5.5   **Disadvantages**. There is a limited amount of COTS subject matter available, particularly for military topics, because production houses will only invest in courseware that sells in reasonable quantities. What is available will be based on content, style, order and depth of teaching, which has been decided on by a third party and which cannot be easily amended without incurring additional cost. Additional funding will probably be required to provide suitable hardware on which to run the courseware.

BESPOKE COURSEWARE

5.6   Bespoke Courseware is often produced for a specific purpose, as it is tailor-made to suit.

5.7   **Applicability**. Bespoke production is probably the only sensible solution for large projects with long lead times where in-house production is impractical. The greater the potential audience, the greater the cost-effectiveness.

5.8   **Advantages**. There are many advantages for bespoke production, the most significant being that users should receive courseware, which meets their specific training needs. If the CBT is equipment-related, there may be advantages buying in courseware from the equipment suppliers since they already have subject-matter expertise. Also, many large procurement projects now include training as part of the package; the responsibility for getting the CBT courseware written then rests with the prime contractor.

5.9   **Disadvantages**. There are several disadvantages to consider when choosing bespoke TBT:

    a.   **Costs**. Bespoke courseware is likely to be expensive, particularly if the only potential sales for the company are a few copies to Defence; however, companies may reduce initial costs in the hope of recouping revenue through long-term maintenance. There will probably also be additional costs associated with Defence involvement in the analysis, specification, design and testing of the courseware, as well as the provision of subject-matter expertise during development.

    b.   **Specification**. There have been costly examples in the past where, for a number of reasons, courseware did not meet users' expectations. Experience shows that, unlike buying a piece of equipment, it is very difficult to specify precisely what is required of the CBT at the start of a project. It is therefore important that the contract allows for prototyping at the start and regular reviews throughout the development process.

    c.   **Timescale**. The timescale for bespoke production can be long; however, this will not always present a problem for projects with long lead times and it may still be quicker than establishing and training an in-house team that must then gain experience before becoming fully productive.

    d.   **Maintenance**. If the CBT has been commercially sourced, a maintenance contract should have been let. This must specify an appropriate degree of support in a realistic timescale. Will the supplier merely carry out corrective maintenance (bug fixes) or will they also carry out adaptive maintenance to accommodate procedural or equipment changes? If one considers the frequency at which modifications are introduced to aircraft both old and new, adaptive maintenance will have to be carried out on any associated courseware at the same rate; changes which take 6, 12 or 18 months to implement will not suffice. Finally, the length of contract is important. One, which lapses after a year is of little use, but one, which supports courseware for 10 years with no provision, made for hardware upgrades, is likely to be equally unsatisfactory. Most manufacturers would hope to profit from continued maintenance contracts. They are therefore likely to charge highly to release all source materials. The onus will be on Defence to specify exactly what is required; this should include all documentation, source code, graphic files, libraries etc. It is strongly recommended that ownership of copyright be established since, over an extended period, the original courseware might become much improved and possibly marketable. The up-front costs of establishing, equipping and training staff must also be considered against the projected future workload.

5.10   There are many examples of bespoke courseware in Defence, which fully satisfy its users' needs. Regrettably, there are also examples where this has not been the case, for reasons which are many and varied. These failures, coupled with the cost of bespoke courseware, have been used to argue in favour of in-house development.

IN-HOUSE COURSEWARE

5.11   The case for in-house development is further strengthened when one considers that, even for a successful bespoke project, there is likely to have been considerable Defence investment in the training analysis, strategy and design processes, together with on going subject matter support and project liaison. It can therefore be felt that, for the sake of a little extra investment, the whole project could be undertaken in-house.

5.12   **Applicability**. If there are a number of small to medium-sized projects, particularly with specialised subject matter, or courseware which requires frequent minor changes, then in-house development on-unit by an established, trained and managed team can be a practicable solution. It is unlikely to prove cost-effective for either small one-off or very large projects.

5.13   **Typical Costs**. Each software producer in the in-house team will require setting-up, which can cost about £3k (multimedia PC, authoring software and training). If there is a large element of graphical presentation, either this will have to be bought in or the in-house team provided with graphical software and training, costing a further £2k per person. For each working day, a Service producer (Sgt/Cpl) will incur a capitation cost of £120-150, a supervisor £150-£175 and a project manager up to £200. Remember that new producers are likely to take longer to produce their first hours of CBT than the average, thus making costs higher.

5.14   **Advantages**. The major advantage of in-house development is that it gives users greater control over the courseware development. People who are likely to be both subject matter and 'Defence' experts can carry out work locally, they can produce exactly what is required and can respond quickly to change requests from users, both during development and for subsequent modifications. Cost is usually cited as an advantage and while this is often the case, calculations are sometimes flawed and the savings are not as great as estimated.

5.15   **Disadvantages**. There are several disadvantages to consider when choosing to produce TBT in-house:

  a.   **Personnel**. TBT is a complex medium, with production drawing on subject matter expertise and skills in training design, human computer interface (HCI) design, software engineering and often, media production. These are all very specialised disciplines in their own right and it follows that knowledge in one or two of these areas gives no guarantee of a successful project. By far the most common failing of in-house produced courseware is the HCI design, in terms of screen colours, content, layout and the degree of interactivity and means by which it is controlled. Most trainers can produce courseware in-house using modern authoring software; however, the quality of that courseware and its production time will often be far from acceptable. "It is all well and good to introduce a technology that enables the man in the street to give vent to his creative ability, but what if he does not have any?" (Barker, 1993).

  b.   **Project Management**. Development on a part-time basis, a few hours per week in between other tasks, will not work. Staff should be allocated on a full-time basis and given training, objectives, deadlines and encouragement. Discipline is crucial since a balance must be achieved between delivering on time, what is required and allowing users (often a number of different ones) or developers (whose

enthusiasm will know no bounds) to keep 'moving the goalposts'. Project management is the key to success: planning, co-ordinating, communicating (upwards, downwards and across), reviewing, standardising, testing, adapting, documenting and delivering.

c.   **Costs.** There are a number of 'up-front' costs, including the development hardware, authoring software and staff training. Staff capitation costs (not just developers, but also project managers, supervisors, graphics officers, subject matter experts etc) must be considered, as should the provision of target hardware to run the finished courseware and the means of maintaining that courseware. There may also be additional costs if the chosen authoring system cannot cope with all the users' requirements: additional software and training may be required and developers may need to spend a considerable amount of extra time becoming familiar with complex graphics packages or writing 'real' programming code.

d.   **Lead Times.** Lead times can be surprisingly long if in-house development is started from scratch. Personnel must be selected and trained, appropriate hardware and software selected and procured, project management and quality procedures devised. Trained personnel will then slowly develop experience over time but they are unlikely to be fully productive inside 6 months and this may be closer to 12, particularly if complex graphics or multimedia are involved.
"...our [Prudential Assurance] first in-house production overran in both development time and cost of production - by a factor of three! When it was first launched it was well liked but little used, as the product being trained on had been updated and our all-singing, all-dancing program was out of date." (Fellowes, 1994)

e.   **Maintenance.** In-house maintenance can be cheaper and more responsive but it should not be assumed that this would always be the case. If the courseware was produced in-house, the expertise will exist with which to maintain it, although this will become dispersed over time. Unless well-managed, there is a natural tendency for in-house developers to try and avoid the more mundane tasks associated with courseware such as documentation and data backups, the usual claim being that this will all be sorted out 'at the end'. However, by this stage staff, or their managers, tend to have their sights set on the next project. Care must therefore be taken to avoid the situation where a key member of staff leaves with much essential information 'in his head'.

TBT GROUP (DEFENCE CENTRE OF TRAINING SUPPORT (DCTS))

5.16   The TBT Group at DCTS has been established since 1994. It is recognised as a leader in multimedia desktop TBT with the capacity to offer TBT Services to other Defence units.

5.17   Any training requirement that a unit may have whether or not they think it is an appropriate medium for TBT, TBT Group can carry out a scoping study to determine whether TBT is the right route or not. This includes TBT for all desktop requirements, part task trainers, presentation systems, emulators and maintenance trainers. The production of TBT to the client's detailed requirements using our resources has many advantages:

a.   TBT Group are the focal point for TBT production within Defence and the 'keepers' of guidance on learning standards.

b.   It provides the client with a product that is directly owned by them.

c.   Uses standard coding languages or authoring tools to set coding conventions.

d.   Software can be quickly and easily maintained or amended.

5.18   Units are often involved in the training of new and specialised equipment, which can often be supplied with the order of equipment. It is, therefore, necessary for the people who are involved with the suppliers, to be aware of the key elements required for the production of a good piece of TBT. Therefore, the TBT Group are often approached to put together bespoke training courses for these units.

E-LEARNING CONTRACTS

5.19   Many e-Learning contracts are managed within existing framework agreements, such as dbLearning e-Learning Framework. However, DCTS have recently produced a set of new procurement rulesets that should be embedded in any e-Learning contract. See http://www.dlp.dii.r.mil.uk/ for further details.

SECTION 6 - E-LEARNING CONTENT TOOLKIT (eLCT)

6.1 The e-Learning Content Toolkit is designed to help project managers, designers and developers make the right decisions about how to design, develop and review e-Learning content for deployment on the Defence Learning Portal (DLP). It is primarily focused on meeting the requirements of e-Learning content projects that have the following parameters:

  a. There is an internal content design team with the resources and skills to follow the procedures provided in this toolkit.

  b. The content design team has used the Defence e-Learning Decision Toolkit to determine if e-Learning is a suitable and viable method (and there is the requisite readiness) to close a training or performance gap.

  c. Pure e-Learning, not blended learning or classroom training.

  d. The digital content will be developed using authoring tools (template or flash-based) designed for producing conformant web-based training content.

  e. The e-Learning product will be deployed on the DLP and support tracking and/or sequencing, and therefore must comply with the learning standards such as DSCORM.

  f. Low to medium training priority – there is no fast track route for high priority training.

  g. Low to medium fidelity – high fidelity projects would require more complex analysis.

6.2 In summary, the toolkit focus specifically on the "content" aspects of producing SCORM Conformant e-Learning for deployment on DLP and not how best to instructionally design a learning experience.

6.3 A prime purpose of DLP is reducing the time to produce and manage e-Learning content by enabling content designers and developers to provide the RIGHT Content (see diagram below):
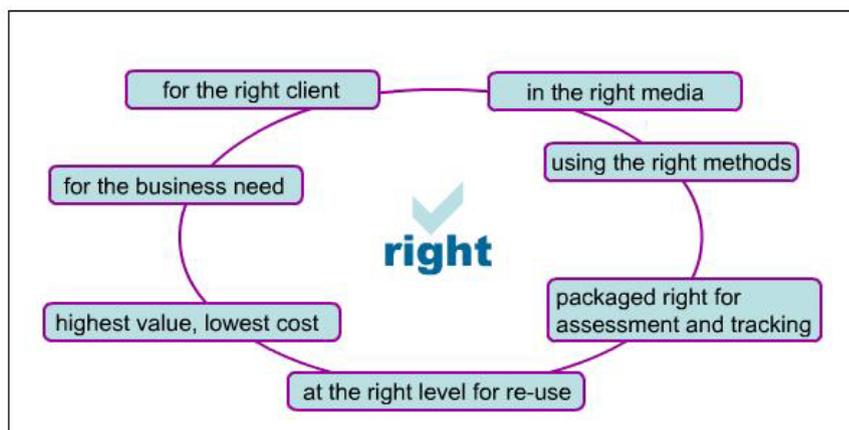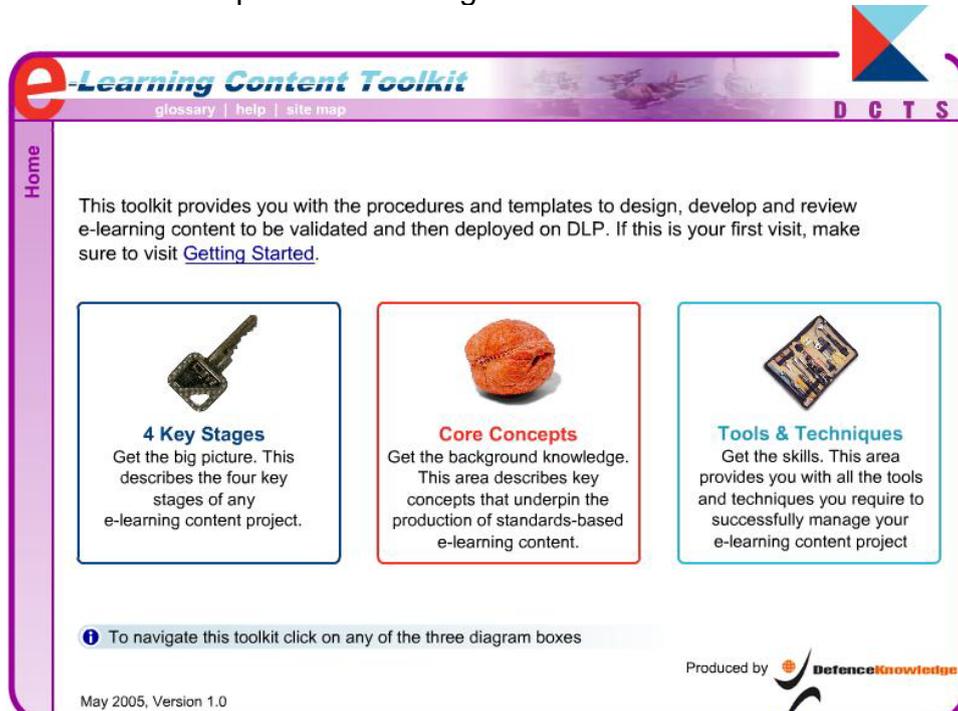
WHERE CAN I FIND IT?

6.4   The toolkit can be found in the 'Reference and Guidance' section of the Defence Learning Portal website: http://www.dlp.dii.r.mil.uk/

WHAT IS IN THE TOOLKIT?

6.5   The toolkit is made up of the following:

a.   The **4 Key Stages** area provides an overview of the four stages of any e-Learning content project and their outcomes (i.e. decide, design, develop and review[18]).

b.   The **Core Concept** area provides interactive Flash objects and PowerPoint slides to enable you to understand the purpose and application of learning standards.

c.   The **Tools & Techniques** area provides hands-on guidance and checklists to manage your e-Learning projects.

d.   A **Glossary** which summarises all the key terms used in the toolkit.

e.   A **Sitemap** which allows you to find any resource quickly.

WHAT SHOULD I DO FIRST?

6.6   Ideally, you should first get an overview of the **Key Stages** and activities of any e-Learning content project. With a clear understanding of the outcomes of each stage of an e-Learning project, you should then review the **Core Concepts** that underpin the production of standards-based e-Learning content. Finally, when you are ready to

commence your project and familiar with the overall production process you need to visit the **Tools & Techniques** area.

6.7   If you just need to review whether third party content can be easily deployed via the DLP, select the **Deployment Validation** box in the Tools & Techniques diagram. However, if you need to manage the custom development of e-Learning, commence with your project planning (select Project Plan in the Tools & Techniques diagram).

6.8   Please note that within your organisation there may be specific working practices that need to be adhered to. The procedures and checklists provided in this toolkit are not mandatory (though specific rule sets may be) and we would envisage that you will adapt them to your own methods of working within the scope of DSAT and DLP criteria.

CONTENT ITEMS

6.9   The content displayed consists of:

    a.   Interactive diagrams which enable you to link to other information.

    b.   Independent Flash objects that are displayed in a separate browser window, and have their own internal navigation aids.

  c.   Word, PDF and PowerPoint documents that are displayed in a separate browser

window.

TECHNICAL REQUIREMENTS FOR USE OF THE TOOLKIT

6.10   As a minimum you need a browser (preferably I.E. v 5.5 or above and Flash v6.0 or above) and Microsoft Word and PowerPoint – 97v1, as well as a PDF viewer on your computer.

6.11   The toolkit interface is designed for a minimum 800x600 screen resolution.

SECTION 7 - E-LEARNING STANDARDS AND SPECIFICATIONS

7.1   There are several major bodies currently developing specifications which are expected to be submitted to the IEEE Learning Technology Standards Committee. Just as you have a quality standard such as ISO or a standard such as DSAT.

WHY DO WE NEED STANDARDS?

7.2   Just as any petrol station sells petrol that will work in any car, e-Learning standards are necessary to facilitate interoperability of courseware as well as meet other principles of reusability, accessibility, durability etc. In e-Learning SCORM is one of the key standards (or to be exact a combination of standards and specifications).

SCORM Concept	Definition	Example
Reusable	Content is reused in a new context without any modification to its instructional treatment, context or content, and is able to "stand-alone". It can be used across communities for many different learners.	Content about the hydraulic mechanisms of a turbine engine can be used across communities of practice across the Navy as well as Defence without any additional effort.
Interoperable	Content will function in multiple applications, environments, and hardware and software configurations regardless of the tools used to create it and the platform on which it is delivered.	Content developed in a development software tool for delivery in an LMS will operate in any other SCORM-conformant LMS equally well.
Durable	Content does not require modification to operate as software systems and platforms are changed or upgraded.	Purchasing a new version of a development software tool or upgrading the existing development tools will have no impact on the delivery of content to the student.
Accessible	Content can be identified and located when it is needed and as it is needed to meet training and education requirements.	An Instructional Designer for Contractor A can search a repository for content for turbine engines and identify the existing content available for her course, based on descriptive information about the content supplied by the original owner.

7.3   From an instructional designer's point of view SCORM maybe adopted for a number of reasons as shown in the diagram below:

What Standards	
Why Implement SCORM?	**D C T S**

Organisations typically implement SCORM for one or more reasons:

Portability	Ability to deploy content in any SCORM-conformant Learning Management System (LMS)
Reusability	Ability to search and retrieve content objects, including lessons, modules, exercises, activities, media, etc., and reuse them
Data Tracking	Ability to track data about the learner and the learner's experience including scores, time, comments etc.
Sequencing	Ability to combine learning objects (SCOs) to achieve sequencing or navigation requirements

Developed by DefenceKnowledge Ltd 2005

WHAT'S THE DIFFERENCE BETWEEN STANDARDS AND SPECIFICATIONS

7.4   In the development of standards there is a process of specification, testing, change and then ratification of the standard.

7.5   In the e-Learning world there are very few ratified Standards and so vendors and users are at the stage of having to rely on specifications (such as IMS) and tested implementations (such as SCORM which itself incorporates several IMS specifications).

7.6   This is not so worrying if one understands the market demand is ALWAYS ahead of standards! It can now be said that SCORM is accepted as a "market" standard.

7.7   It is, therefore, important to keep track of the various version numbers of each specification in order to ensure interoperability. But, more importantly, to keep abreast of Defence policy on SCORM and other specifications. Other standards you should be aware of or maybe pertinent are referenced in Defence SCORM Guidelines for Producers (referred to as "D" SCORM).

SCORM

WHAT IS IT?

7.8   The Sharable Content Object Reference Model (SCORM) aims to foster the creation of reusable learning content as "instructional objects" within a common technical framework for computer and web-based learning. SCORM describes that technical framework by providing a harmonised set of guidelines, specifications and standards based on the work of several distinct e-Learning specifications and standards bodies.

7.9   SCORM is a collection of specification and standards that has been bundled into a collection of "technical books". Each can be viewed as separate books gathered together into a growing library. Nearly all the specifications and guidelines are taken from other

organisations (like IMS, AICC, etc.). These technical books are presently grouped under three main topics:

      a.   The "Content Aggregation Model (CAM)"

      a.   The "Run-time Environment (RTE)"

      c.   "Sequencing and Navigation (SN)" - new SCORM 2004 addition

<div align="center">WHAT IS THE VALUE OF SCORM?</div>

7.10   SCORM only has value if it is interpreted in the context of a specific task on an e-Learning content project where it helps clarify the rules. For example, when a designer is deciding whether or not summative assessments should be independent Sharable Content Objects (SCOs), SCORM contributes an interpretation in the context of the required outcomes (i.e. pass mark and tracking requirements etc.) to achieve certain benefits.

7.11   Not all parts of SCORM will be relevant to everyone! But many will benefit from some parts of SCORM, for example:

      a.   If you wish to track learner progress and mastery, and use rules to determine the learner's path through content, you will want to use the SCORM "Run-Time Environment" and "Sequencing" (SCORM 2004 only).

      b.   If you don't need to track the learner but want to export your content to other SCORM learning management or development environments, you will want to use Content Packaging in the CAM part of SCORM as an interchange format.

      c.   If you want your content to be discoverable or searchable and usable in particular contexts, you will probably want to use the metadata part of the CAM for tagging content.

7.12   There are many possible ways to use the parts of SCORM. It is up to designers and developers to determine which parts are appropriate. This is why additional technical expertise is usually required in a project to support the designers and developers.

7.13   Different content projects for different learning needs will require specific interpretations of SCORM. Rules have to be capable of adaptation. Although DCTS DLP Service Team's role is to provide generic advice and rulesets (some may be mandatory), it is the content designer's and developer's responsibility to determine and record how SCORM has been interpreted in the context of a particular project. For example, whether the content is designed in-house or externally, the designer must:

    "Determine the size of a SCO in accordance with (service-specific) organisation requirements (size)"

    or

"Articulate which assessment requirements should be implemented as separate SCOs to support reuse" etc.

7.14 So on any e-Learning project you need to review D SCORM in accordance with your requirements and from this define the key business rules for the production of SCORM conformant e-Learning content and then publish these requirements as an application profile.
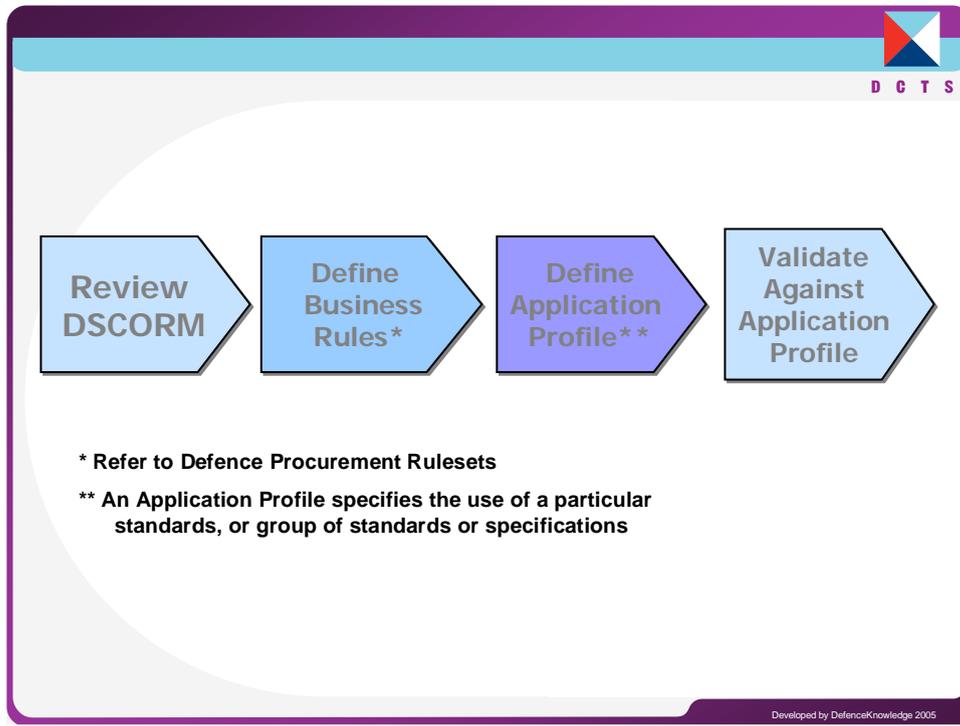
WHAT SCORM DOES NOT ADDRESS

7.15 It should be noted that SCORM does not actually address content or more specifically define a content object model or content design and development concerns. However, this does not imply that these concerns do not matter, just that an organisation needs to interpret SCORM in the context of its content practices, production model and desired benefits.

7.16 Many instructional designers express concern about the reusability and context-free aspects of SCORM. Instructional designers wonder how you can maintain the instructional integrity of SCORM content when you don't know who will use it, when they will use it, or with what other materials. SCORM provides no guidance on this. As a best practice, one of the easiest ways to ensure instructional integrity of SCORM content is to make each SCO a stand-alone "lesson" or instructional unit. Since a SCO is intended to be inherently small, it should represent a single instructional objective and all the required materials ands resources required to support that objective. Structured in this manner, the effective completion of the SCO will impart the knowledge and skills for which it was designed.

WHY DO I NEED TO KNOW ABOUT SCORM?

7.17   DSCORM is a UK Defence 'standard' for e-Learning courseware to ensure interoperability and reusability of courseware across Defence. Adhering to SCORM may impose constraints on the instructional design of courses and needs to be planned for.

7.18   You are advised to complete the "concepts" section of the e-Learning Content Toolkit (ELCT) to get an initial overview of SCORM.

DEFENCE IMPLEMENTATION OF SCORM STANDARDS

7.19   The 'Defence Implementation of SCORM Standards' is documented in DSCORM Guidelines for Producers and provides a set of guidelines for contracted producers and in-house production teams who are involved in creating conformant e-Learning content for deployment on Defence Learning Portal (DLP). It addresses the implementation of the SCORM standard, for deployment on DLP, and describes how the three parts of the standard should be implemented, namely: RTE, CAM, and Metadata.

7.20   It addresses the implementation of the SCORM 1.2 Technical Books for deployment on DLP, and describes how the following three specifications should be implemented in accordance with the Defence Procurement Rulesets, Defence Content Object Model (DCOM), sound instructional design, R3 (Reuse, Repurpose & Reference) and specific Extensible Markup Language (XML) and data design rules.:

      a.   SCORM Content Aggregation Model (CAM)

      b.   SCORM Learning Object Metadata (LOM)

      b.   SCORM Run-time Environment (RTE)

7.21   In due course Defence will migrate from SCORM 1.2 to 2004.

WHERE CAN I FIND IT?

7.22   The document is supported by the e-Learning Content Toolkit (eLCT) and can be found in the 'Reference and Guidance' section of the Defence Learning Portal website: http://www.dlp.dii.r.mil.uk/

SECTION 8 - E-LEARNING PROJECT MANAGEMENT

8.1   Creating successful e-Learning requires a number of different development processes and a range of expertise, probably drawn from several teams or organisations. To achieve its aims, keep all parties involved and on track and to stay within budget, e-Learning should be treated as a project (using PRINCE 2 methodology) and managed accordingly.

8.2   It is recommended that a Steering Group (or Project Board) is established at the outset to oversee the success of the project and that a full-time e-Learning Project Manager (SO2 or SO3) is appointed, who has command over the necessary team assets. This is necessary to ensure management 'buy-in', allocation of resources and the availability of key personnel. The Steering Group should agree the way forward and sign up to a High Level Design (HLD) plan and agreed outcomes (such as a User Requirements Document and System Requirements Document).

8.3   Dedicated project management is necessary whether e-Learning courseware development projects are undertaken in-house or by an external provider.

E-LEARNING PROJECT TEAM

8.4   Whether developing e-Learning courseware in-house or contracting out, a project team will be necessary. The minimum requirements are a full time Project Manager and dedicated Subject Matter Expert as well as some technical assistance. Project team members may be 'contracted in' to fill skills gaps. Several of the roles below may overlap or be carried out by multi-skilled personnel.

PROJECT TEAM COMPOSITION

8.5   **Project Manager**. Manage overall project to ensure that project is delivered on time, on budget and to quality standards. Probably an SO2/SO3 (or civilian equivalent) and ideally should command the project team, thus having control over the assets required to complete the e-Learning project. Project manager should report to a project board or steering group.

8.6   **Instructional Designer**. Develops standards and instructional strategies. Assists with content development and reviews completed lesson designs, flowcharts and storyboards for instructional integrity and suitability. Instructional designer has responsibility for the pedagogic (science of learning) elements of content production for an e-Learning course.

8.7   **Content Developer**. Works out the logic and programs lessons with programming languages (computer code) and/or authoring tools.

8.8   **Media Experts.** Develop the required media including graphics, illustrations, photography, video, audio, animation and simulation elements. Some media experts can also use authoring tools.

8.9   **Editor.** Reviews lesson designs, flowcharts, storyboards and courseware organization, readability, grammatical correctness, consistency and accuracy.

8.10　**Courseware Developers.**　Develop courseware based on instructional design decisions and products.

8.11　**Subject Matter Experts.**　Provides detailed information on content subject matter. Reviews lesson designs, flowcharts, storyboards and courseware for accuracy and currency.

8.12　**Technical Manager.**　Provides technical assistance on the use of TBT, with particular knowledge of the technical application of DSCORM and functionality of DLP.

8.13　**Quality Assurance Team.**　Provides an objective assessment of whether the courseware is 'fit for purpose' and report to project sponsor.

SECTION 9 - ACCESSIBILITY

WHAT IS ACCESSIBILITY?

9.1   Accessibility is the degree to which a product or website can be used effectively by people with disabilities (visual, hearing, motor or cognitive impairments). Accessibility design can also benefit users with older/slower software and hardware.

BACKGROUND

9.2   The Disability Discrimination Act (DDA) aims to end the discrimination which many disabled people face. The act gives disabled people rights in the areas of:

    a.   Employment.

    b.   Access to goods, facilities and services.

    c.   Buying or renting land or property.

9.3   All e-Learning content should be accessible to those with disabilities in order to meet the needs of the entire Defence community and the requirements of the DDA 1995.

APPLICATION OF THE DDA TO E-LEARNING

9.4   In respect of accessibility, the commissioning and creation of e-Learning content falls under DDA Part II, which deals with employment provisions. Part II states that there are two ways in which an employer might unlawfully discriminate against a disabled employee or job applicant, namely:

    a.   By treating him or her less favourably (without justification) than other employees or job applicants because of his or her disability.

  b.   By not making reasonable adjustments (without justification).

9.5   *However, Part II of the DDA does not apply to service in any of the Naval, Military or Air Forces of the Crown.* Therefore, the development of the e-Learning Accessibility Matrix has been driven by the desire of the Services to make all their e-Learning as accessible as possible for the service-personnel who are identified as the target audience for a piece of e-Learning courseware.

9.6   It may not always be the case that e-Learning projects are designed solely for the use of Service personnel, in this case if e-Learning content is being designed for a target audience that includes MOD Civilians (or contractors). In this case the Defence will **not** be exempt from the requirements of the DDA.

E-LEARNING ACCESSIBILITY MATRIX

9.7   The e-Learning Courseware Accessibility Matrix is a simple decision making matrix that has been developed to help those who are involved in either the commissioning of e-Learning courseware for Defence (ie project managing a contract with external contractors who are producing the content on behalf of Defence) or are directly involved in creating e-Learning courseware (an in-house content production team). The matrix allows the user to define the accessibility requirement parameters based on the analysis of the specific accessibility needs of the target audience.

9.8   The Accessibility Matrix and Guidelines can be found in the 'Reference and Guidance' section of the Defence Learning Portal website:
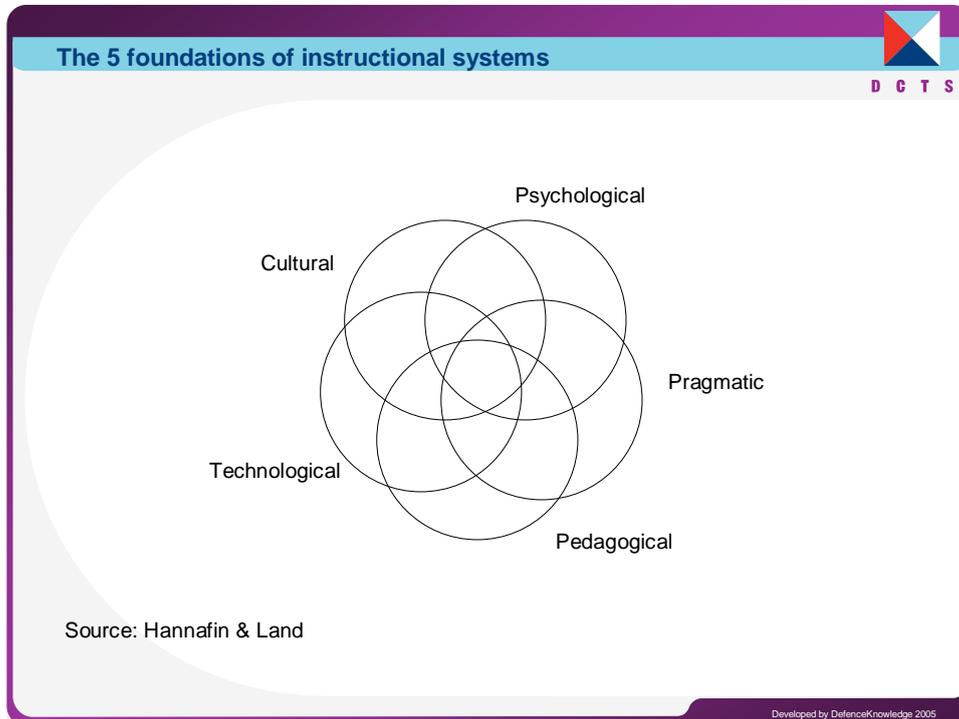http://www.dlp.dii.r.mil.uk/

SECTION 10 E-LEARNING & CULTURE

"Instructional design cannot, and does not, exist outside of considerations of culture"
Lyn Henderson

10.1   Cultural influences are embedded in every aspect of learning systems: design, content, technologies, deployment, administration etc.
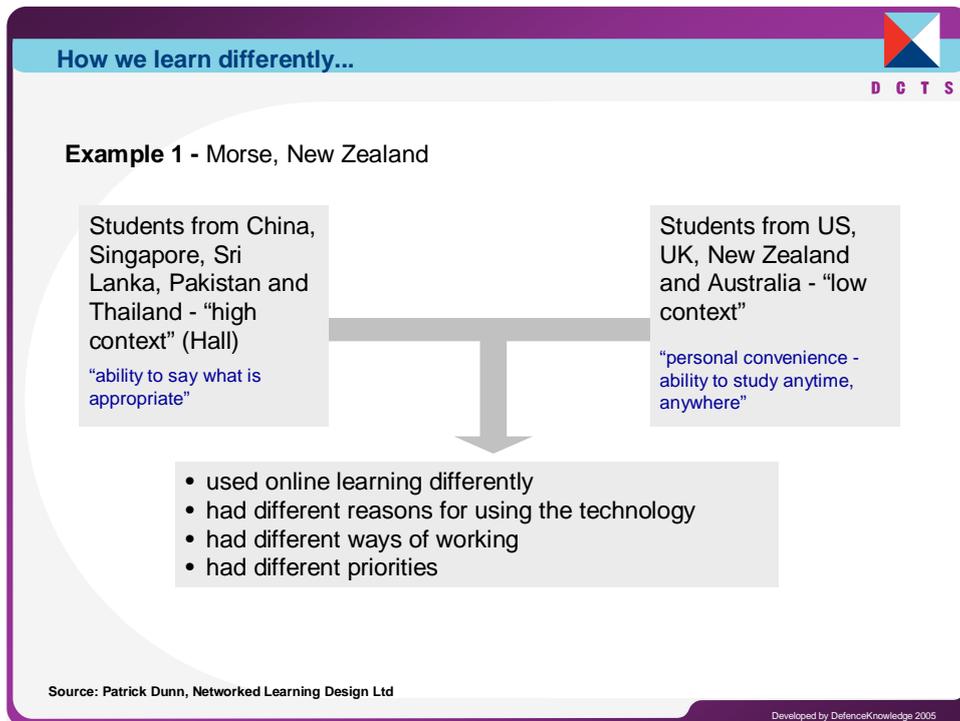

10.2   As the military continues to grow and support the training requirements of other military organisations around the world there will be an increasing requirement to understand the cultural influences in every aspect of training design, development and delivery.

10.3   All too often the focus in just on translation. Translating the system, or adjusting surface features like interface, colours, local references and so on, appeared less important than having the flexibility within the system allow learners to learn differently.

10.4   And the inverse of this is that if the system had been translated and so on, but did not have flexibility to learn differently, the cost of translation could well have been wasted. Presumably the learners would be uncomfortable, possibly use the system or the materials wrongly - or perhaps just ignore it.

10.5   It is clear culture affects the way we learn so designers and developers need to consider cultural contexts. As shown in the diagram on the next page there are differences depending on whether the culture is high or low context in accordance with Edward Halls' 'Dimensions of High and Low Context Cultures'.

How we learn differently...

Example 1 - Morse, New Zealand

Students from China, Singapore, Sri Lanka, Pakistan and Thailand - "high context" (Hall)

"ability to say what is appropriate"

Students from US, UK, New Zealand and Australia - "low context"

"personal convenience - ability to study anytime, anywhere"

- used online learning differently
- had different reasons for using the technology
- had different ways of working
- had different priorities

Source: Patrick Dunn, Networked Learning Design Ltd

Developed by DefenceKnowledge 2005

10.6   By looking at parts of a typical development cycle, you can see that cultural influences are embedded in every aspect of learning systems:

    a.   Design concepts and norms.

    b.   The subjects we choose.

    c.   The technologies and how we use them.

    d.   How we deploy and administer.

10.7   If your e-Learning package needs to support a multi-cultural audience then your design and delivery of the e-Learning package must take this into account.

LEARNING OBJECTS AND CULTURE

10.8   The learning object movement started in the US, with the Department of Defence being a prime leader in this. However, we should be aware that the learning standards movement and concepts such as "learning objects" have a culture bias.

10.9   "Any digital resource that can be reused to support learning. The term "learning objects" generally implies to educational materials designed and created in small chunks for the purpose of maximising the number of learning situations in which the resource can be utilised." (Wiley, 2002, p.1)

10.10 Learning objects are derived from and linked to training and enabling objectives as these objectives acts as a trigger for the definition, aggregation and sequencing of learning content.

SECTION 11 - INTELLECTUAL PROPERTY RIGHTS (IPR) & COPYRIGHT

11.1   **Copyright.** Provides legal protections against unauthorised exploitation of work (such as music, video, and photographs). For the purpose of copyright, a computer programme in any format is treated as a literacy piece. Maps, charts and plans are not protected as literacy works but as artistic works.

11.2   **Copyright Responsibilities**. Failure to clear copyright can lead to legal action and the payment of damages. So the use of a comedy video clip, or a particular photograph, in an e-Learning programme may need to be paid for before it is used.

11.3   Producers of e-Learning must clear with Copyright all photographs, video and audio clips etc. before use. All e-Learning produced by commercial companies or in-house must be Crown Copyright and Defence must retain all IPR.

11.4   **Intellectual Property Rights (IPR).** The IPR of a product govern its intellectual and commercial ownership. IPR helps protect a creator of a product from unauthorised exploitation. IPR issues must be considered when procuring e-Learning content services and products and for reuse and repurposing of e-Learning courseware. Further guidance is provided in DSCORM.

SECTION 12 - E-LEARNING DEPLOYMENT OPTIONS

FACTORS AFFECTING DEPLOYMENT OPTIONS

12.1   The following factors need to be considered when deciding how to deploy e-Learning courseware:

    a.   Student access to PCs.

    b.   Student access to the Internet/Intranet.

    c.   How media rich is the courseware? (Extensive use of video, animation etc requires greater bandwidth and those providing delivery platforms may have set specific bandwidth limits).

    d.   Requirement for student tracking by an LMS.

    e.   Requirement for e-support/peer to peer interaction and the readiness of those involved in this support.

WHERE WILL THE STUDENTS TAKE THE COURSE?

12.2   Sponsors will have to decide this early on in the development process as this decision may limit the way e-Learning courseware is designed. Some facilities such as Defence e-Learning Centres are already in place to provide access to PCs.

HOW DO THE DIFFERENT DEPLOYMENT OPTIONS AFFECT THE COURSEWARE?

12.3   **Office/Workplace – Internet/Intranet.**

    a.   Course Design should accommodate frequent interruptions by creating content in small chunks.

    b.   Bookmarking facility will assist students in coping with interrupted study. High bandwidth connections possible.

12.4   **Learning Resource Centre – Internet/Intranet**.

    a.   Students may have to schedule their study time.

    b.   High bandwidth connections possible.

    c.   Local staff may not be able to support the course.

12.5   **Deployed Laptop – CD ROM.**

    a.   May not have access to Internet/LMS tracking.

    b.   Courseware version control may be an issue.

    c.   All necessary plug-ins must be available on CD with the courseware or pre-loaded.

    d.   e-support may not be available.

12.6 **Home – Internet.**

    a.   Modem speeds will limit download times.

    b.   Bandwidth may limit multimedia possibilities.

    c.   Course design should accommodate frequent interruptions by creating content in small chunks.

    d.   Technical requirements should be minimised.

    e.   24 hour e-support may be essential.

DEFENCE LEARNING PORTAL (DLP)

12.7   The DLP is a collection of web-based services to enable the Defence-wide exploitation of e-Learning. The aim of the DLP is "to provide coherence to the Defence-wide exploitation of e-Learning as an efficient and cost-effective training medium." The key enabler to this objective is the provision of a technical solution that will enable user access to courseware, provide effective content management, and track learning activity.

12.8   Both Service and civilian e-Learning courseware will be available via the portal, and, as the capability develops, it is anticipated that all training activities may be managed via the resource. This includes e-Learning, pre-course and instructor-led training. The portal is therefore seen as a fundamental component to support the rationalisation of the training establishments under DTR.

<div align="center">BACKGROUND TO DLP</div>

12.9   DLP is Europe's largest e-Learning programme, which has been developed in partnership with BT and comprises of services to deliver a single Learning Management System (LMS) and Learning Content Management System (LCMS)[19]. It will also include learning management information and an environment for storing, managing and developing re-usable e-Learning courseware.

12.10 DLP is the mandated enabling capability for delivering all new distributed web-based eLearning in Defence. It will deliver the following benefits:

    a.   Increased accessibility of training, particularly for support to deployed operations.

    b.   Supports rationalisation of training establishments under DTR Transformation.

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[19] A learning content management system (LCMS) is primarily concerned with the 'assembly' layer of an integrated learning environment (see DAC model on page 2). It's prime purpose is to allow users to create, manage, assemble and deliver content to multiple channels (to meet different delivery requirements) as well as inject SCORM conformant content created by any tool and manage it, maintain itm and assemble it for delivery.

    c.   Reduces time spent on residential training.

    d.   More effective coordination of training through re-use of learning objects, co-ordinated management of e-Learning provision and delivery.

12.11 It is recognised that one of Defence's highest priorities is to train people for military operations. That training includes development of attributes such as leadership, teamwork, ethos and courage, which predominantly requires human interaction. Consequently Defence will continue to adopt a blended policy to learning but, as part of that policy, must take a progressive approach to eLearning in order to exploit known benefits and explore uncharted opportunities without undermining current output. Therefore, whilst traditional classroom based methods will never be entirely redundant, both web enabled and non web enabled eLearning will add considerably to the overall efficiency and effectiveness of the learning process.

12.12 It is expected that there will be 200,000 users by 2010, although DLP will have a potential user capacity of 300,000 by 2007.

<div align="center">WHY IS DLP NECESSARY?</div>

12.13 DLP provides the licensed LMS for Defence so individual course sponsors can avoid buying their own LMS or paying licence fees. DLP also provides a centralised repository for courseware, whoever developed it, which will facilitate re-use of e-Learning lessons & materials by other Defence users.

<div align="center">POLICY</div>

12.14 Once the DLP is operational, all new web-based e-Learning projects must use the DLP for training delivery. A revised policy emphasising this point will be issued as part of a Defence Instructional Notice (DIN) once the DLP launches live training.

<div align="center">WHO DO I CONTACT FOR AN INITIAL ENQUIRY ON DLP?</div>

12.15 For initial contact/enquiries, there is a BT DLP Service desk which can be contacted on **0800 1695061**. Further information can also be found on the DLP website: http://www.dlp.dii.r.mil.uk/

<div align="center">WHAT IS THE PROCESS I WOULD GO THROUGH?</div>

12.16 The process you would go through is captured in the diagram on the next page. As soon as you start thinking about e-Learning as a TBT package or one package within a complex training solution you should contact DLP DCTS Service Team.

12.17 DCTS DLP Service Team has a comprehensive set of services to support your e-Learning project from conception to business case to deployment on DLP. An integrated, but stepped approach allows potential DLP customers to simply initial log there interest in deploying an e-Learning package (they may already have produced or not) to request specific requirements specification support to request detailed business rules or guidance that need to be incorporated in contracting any third parties to develop courseware to requesting early prototyping of courseware on DLP.

12.18 It is also advisable to familiarise yourself in detail with DCTS DLP validation and deployment processes so can ensure self-testing of courseware is appropriately defined and rigorously defined. This will saved wasted effort for both parties.
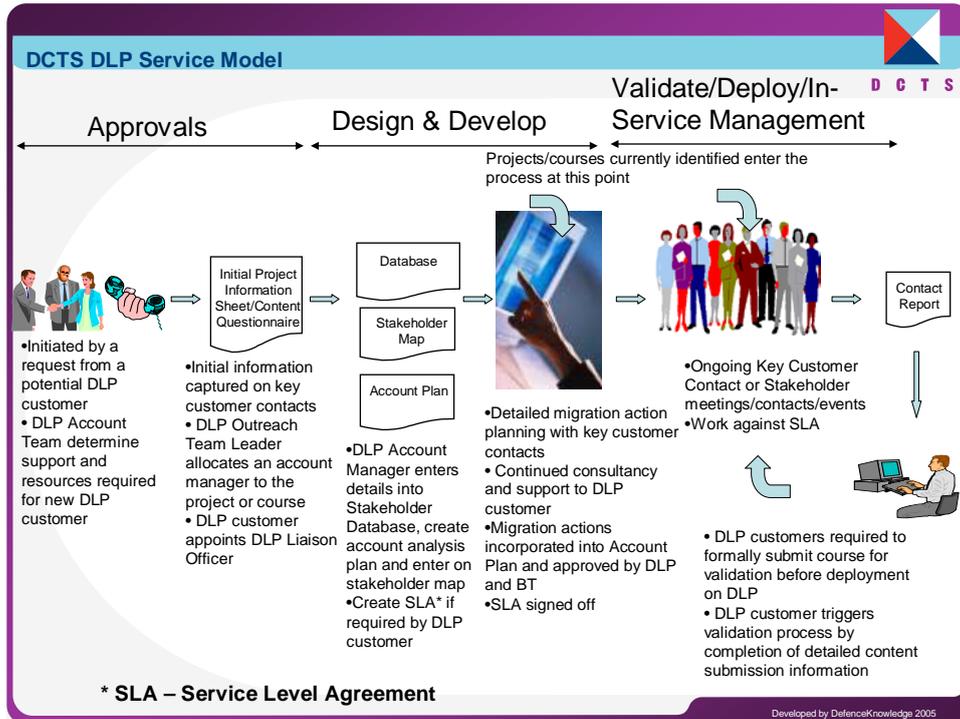
DEFENCE E-LEARNING CENTRES (DELCS)

12.19 DELCs are what used to be called ILCs and ILFs. The DELCs are provided for Defence by LogicaCMG.

WHAT DOES THE SERVICE CONSIST OF?

12.20 'Walk-in' DELCs spread across Defence deliver more 130+ courses covering Civil Service Core Competencies, Management, IT (such as ECDL™) and Defence specific subjects. There are currently 32 walk-in DELCs around the World (From Aldershot and Akrotiri to Rheindahlen and the British Embassy, Washington).

12.21 Rapid Reaction DELCs consist of a laptop server holding the courseware and up to 12 laptop learning stations. Rapid Reaction DELCs are for the use of deployed units and for interim training solutions.

12.22 A Pool of Loan Laptops is available to DEFENCE personnel for up to 8 weeks. The laptops are pre-loaded with the requested courses. This is a free service.

CAN DELCs BE USED TO HOST MY COURSEWARE?

12.23 Yes, courseware produced in-house or by commercial companies may be hosted on the DELCs. The courseware must be tested first and a charge may be applicable.

WHAT DO I HAVE TO PAY FOR?

12.24 The central infrastructure and courseware is centrally funded but hardware should be bought through the DCSA catalogue.

E-SUPPORT

WHAT IS E-SUPPORT?

12.25 "e-support" is a generic term that can be applied to any human assistance available to e-Learning students. e-support may take the form of a helpdesk facility or it may involve instructors and subject matter experts.

WHY IS E-SUPPORT IMPORTANT?

12.26 Providing learner support is integral to a successful e-Learning. An effective support network assists learners to overcome possible barriers and without this support, learners can feel isolated and de-motivated.

12.27 e-Support is an important factor to consider when deploying e-Learning. e-Support can generally take one of the following forms:

a.   **Helpdesk.** This could be available via telephone/email and exists to assist students with technical difficulties (e.g. logging on to their course) or administrative issues.

b.   **e-Mentors.** e-Mentors are 'sounding boards', someone who helps solve challenges and problems, who coaches, provides feedback from their experience, all via email or telephone.

c.   **e-Tutors.** These are online instructors who support students and deliver instruction via electronic means. e-Tutors may organise and co-ordinate online discussions, post tasks on the WWW and assess student work. e-Tutoring is a very different role to face to face instructing and therefore e-tutors should be carefully selected and trained as they require a different skills set.

d.   **Administrative support**. This can involve registering students, tracking their progress and record keeping.

SECTION 13 - SIMULATION

13.1   In a training context, simulation is a technique for imitating or replicating some aspect of the real world. Usually, the simulation simplifies reality by omitting or changing details. Students learn by interacting with the simulation in a way similar to that they would use in a real situation: by coming to understand the idiosyncrasies of a world and how to manipulate them; by solving problems; and by learning and practising processes and procedures. Like CBT, there are almost as many definitions of 'simulation' as there are people trying to define it. For the purposes of this manual, simulation as used in training is defined as:

" a dynamic representation of a system, process, or task."

13.2   A simulation must be configured according to its purpose but, however it is configured, the simulation will possess the following three characteristics:

    a.   It will represent a real situation: it will present to the student a situation in which the student carries out actions and is able to see the result of those actions.

    b.   It will provide control over the simulation: limits will be placed upon the situation which define the parameters of the simulation.

    c.   It will deliberately omit certain features of the real situation: limits will be placed upon the range of actions available to the student.

13.3   There are a number of ways to categorise simulation. For the purposes of the manual it is convenient to divide the most common forms of simulation into three categories: physical (or equipment) simulations, procedural simulations, and situational (or decision-making) simulations.
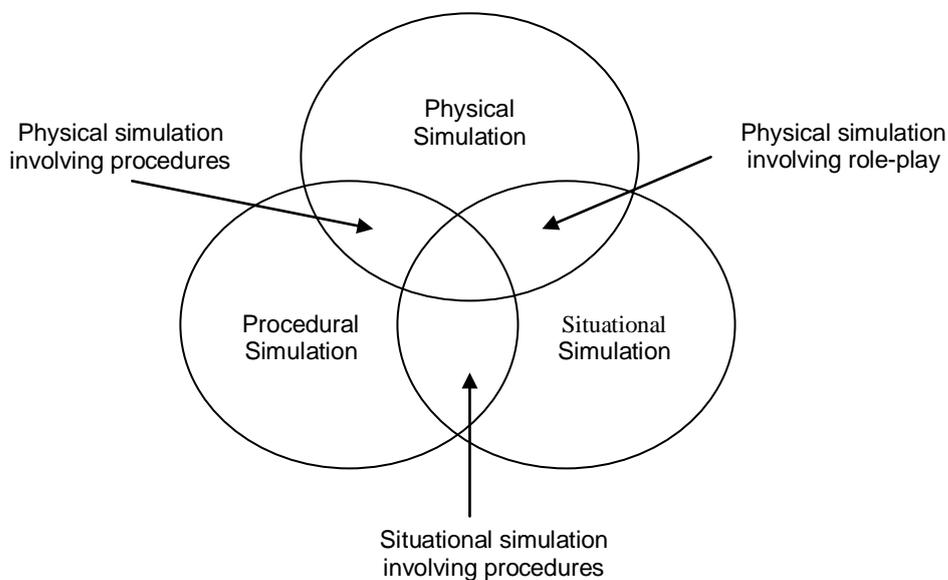
13.4   Whilst none of these "modes" of simulation are mutually exclusive, they each have a set of distinguishing characteristics. These characteristics are discussed below.

13.5   **Physical (Equipment) Simulation**. This is a representation of a physical object, usually a piece of equipment. A simulation becomes an emulation when the actions of the students or the equipment model are constrained, ie. The system demonstrates a functionality of less than 100%. By this definition, most military simulations are in fact emulations.

13.6   **Procedural Simulation**. Despite the fact that physical simulations are very common, most applications are in fact procedural simulations. There is a great deal of overlap between the two, physical simulations often being used to provide a vehicle for the procedural content. There may well be an equipment simulation embedded in a training package which provides a level of fidelity sufficient to allow the procedure to be practiced and the students actions monitored. This provides a discovery learning mode for drill and practice training, often as a later method after CBT has been used to train the drills and procedures.

13.7   **Situational Simulation**. These are primarily decision-making, or problem-solving, or role-playing simulations, and may well include a gaming or competitive element. They may also include elements of physical and procedural simulation. Whilst there will probably be a desirable goal, such as collision avoidance, or identifying a target, or survival against odds, very seldom is there a rigidly defined goal; students being allowed to explore the effects of different approaches to a situation. It may well be, though, that the student's actions will need to be monitored very closely, and there are a number of ways by which this might be achieved. Examples of this type of simulation include:

    a.   A radar trainer, in which the student has to react to a number of events according to pre-planned scenario.

    b.   An operational game, in which students input their decisions after reflecting upon initial scenario which is then updated, creating a dynamic situation to which students are required to respond.

13.8   There will often be a need for work to be done away from the computer in such simulations, in which case very careful thought would need to be given to the interrelationships between written materials, computer-presented information, and the environments in which the simulations take place.

ADVANTAGES AND DISADVANTAGES OF SIMULATION

13.9   **Learning Effectiveness**. Other than on the job training, simulation may well be the only way in which a task can be practiced. It allows the student to familiarise himself with the equipment, and can be integrated into associated CBT packages, reducing the requirement for an instructor to add the learning strategy. Simulations allow instructors to progress from simple (lowering the fidelity level of complex equipment for initial training) to complex scenarios, to replay scenarios, and to record student actions and replay them in a brief-monitor-debrief fashion.

13.10   **Feedback**. Simulation is a passive teaching method, in that it simply represents what would happen in the real world. This may be a disadvantage in that mistakes are not picked up immediately – they have to be identified and feedback produced by an external body. Also, although a student may successfully complete a scenario it may not be by the most successful method; only external feedback or trial and error on future re-runs would provide them with this experience.

13.11 **Cost.** The cost of the simulation may be lower than the cost of the real equipment or of recreating a specific situation using real equipment. Although initial cost of the simulation may be high, the cost to run a non-synthetic simulation may be much higher. Costs will rise with greater fidelity, but a fidelity analysis of the training requirement may well prove that a lower than 100% accurate representation of the real system/situation is sufficient to meet the training requirement.

13.12 **Safety.** Using simulations it is possible to practice scenarios which are dangerous or hazardous. Due to the ability of the operator to constrain the simulation, it is generally a safe and controlled environment in which to gain skills, knowledge and attitudes.

13.13 **Environmental Protection**. The operation of certain equipment or scenarios may lead to environmental damage and could therefore be constrained in time and realism. In such cases the only way in which practice may be allowed is by simulation.

13.14 **Need to Accurately Specify the Computer Simulation**. In all three modes of simulation there will be a need to accurately define the real system/situation in detail prior to development. All of the combinations of events or states that the simulation can take, and the constraints on the simulation (including fidelity levels and the differences between the simulation and the real world) have to be specified before the simulation is constructed. This can be a time consuming, and subsequently costly process, but is nonetheless crucial to a successful simulation.

13.15 **Training Path not Pre-set**. The difference between CBT and simulation is the ability of the student in simulation to train by free play. This has advantages and disadvantages which must be weighed against the training objectives.

13.16 **Adding the Training Strategy**. By its definition there is no training strategy incorporated within the simulation and this therefore has to be added. Traditionally this has been through the use of human tutors who monitor and then provide feedback on a student's performance. This is costly and may lead to important student actions/decisions being missed. To facilitate the monitoring and feedback process, monitoring facilities are frequently incorporated into computer simulations eg the recording of which measurements a student takes in a fault diagnosis simulation or the deployment of units in a war game.

EMULATION

13.17 Many people confuse 'simulation' and 'emulation'. They are not the same, although the distinction between the two is becoming smaller, it is important that they are not confused, particularly in the requirement specifications. Emulations is:

> *"a technique for making a computer behave as if it were another piece of equipment whilst maintaining the functionality of the computer".*

13.18 Emulation is a representation of the actual equipment and will perform all the functions of that equipment, however, the operating functions are those of the computer and not the real equipment. An example may be a control panel with various switches, as the switches are turned on and off the results are registered on different dials. On a simulator you would have the control panel and would physically move the switches, with the computer replicating the actions of the dials. An emulator would have a computer representation of the control panel and would move the switches by clicking on them with the cursor, which will be controlled by a mouse or keyboard.

13.19 The categories of simulation, described above, physical, procedural and situational apply equally to emulation. The main distinction between emulation and simulation lies in the transfer of learning. Emulation allows conceptual understanding to take place as the representation of the equipment, and the use of it is effectively that of the real equipment. However, the physical "hands-on" training still needs to take place so that the students' psychomotor skills are developed, although the transfer time from computer to real equipment should be considerably reduced.

13.20 **Fidelity**. The fidelity of an emulation or simulation relates to the degree to which real situations are modelled and represented on the computer. It does not follow that high fidelity or complexity of these systems will provide effective training. There are two reasons for this:

> a.   **Cost of High Fidelity**. The higher the fidelity the higher the cost – it is possible to build emulators and simulators that so closely resemble the real thing that they are virtually identical from the student's point of view.
> b.
> c.   **Needs of Students**. The higher the fidelity the greater is the potential for alienation – the distance between the student's present level of skill and knowledge and that required to function well on the emulator or simulator. There is here a dilemma for the designer: on the one hand success for the student depends upon his ability to cope with the system, and on the other it depends on the student's confidence that the system is a faithful representation of reality. It is possible to overcome this difficulty by gradually increasing complexity of the emulator/simulator as a student progresses and gains confidence. This will facilitate use of the emulator/simulator by students with a range of threshold skills.

13.21 Computer simulations have had a long and often successful history within the military training system and they form a medium that can be highly training and cost effective. They may be stand-alone for individual training or connected for part task or full team training. In the war-gaming situation this may in the near future see hundreds/thousands of simulations running together, with individual students seeing different views of the same scenario – an entire conflict without a single shot being fired.

SECTION 14 - VIDEO

INTRODUCTION

14.1   Video has become a widely used training medium across Defence having replaced 35mm and other film formats. Video-based training media is often an efficient, practical and convenient way to deliver instruction to a widely distributed audience.

14.2   Video like any other medium should be demonstrated to be the most cost-effective solution to the training requirement prior to its use.

14.3   Video expands on the visual presentation format with the addition of audio input, narration, scene setting music, or sound effects that all add to the learning experience, helping to enhance knowledge retention and understanding by acting upon two senses at a time.

ADVANTAGES AND DISADVANTAGES OF VIDEO

14.4   In general, the value of video lies in its ability to show motion and events by providing a high level of visual fidelity and literally bringing the world into the classroom. When used appropriately, it can have a stimulating effect on the student and may be an important medium for promoting interest and establishing attitudes.

14.5   Video is able to offer training opportunities that might otherwise be unavailable. It has often been used to demonstrate complex, dangerous or expensive processes to audiences that are separated (either geographically or chronologically) from the event.

14.6   The use of video can also increase the exposure of a training opportunity on a more local scale. For example, only one student might normally view the circuitry on a computer chip at a time through a microscope. The use of video allows the whole class to view the circuitry at the same time.

14.7   Special techniques such as slow motion or time lapse photography can be used to illustrate fast or slow motion. X ray and microphotography can show information that is invisible to the human eye. 3-D graphics and animation can also be used to enhance the final product.

14.8   Video can be used as the medium in which large-scale events can be compressed down onto video for analyses and instruction e.g. the reasons behind and the outcomes of international conflicts. It is often accompanied by audio, as with the selected images, the function of the audio needs to be analysed and designed to meet the training objectives. The audio may comprise an accompanying commentary that highlights key points and introduces and summaries the content of the video.

14.9   The audio may provide the necessary environmental fidelity in terms of ambient noise such as the noise provided by a failing component before any visual cues are apparent. The audio however may consist of an accompanying musical score designed to gain the student's attention by means of mood and volume.

The VHS format is rapidly being replaced with DVD throughout Defence. Even an expensively produced video can become very cost-effective due to its ability to reach a large audience at widespread locations over a period of time.

14.10 During training execution, video use must be controlled if it is to be effective. As with any other medium that presents information, the video must be clearly introduced and followed-up by assessment to ensure that knowledge transfer has occurred. The fundamental principle of active student participation within the training system is in danger if the video is used solely to present information and is not followed up with a question and answer session or other interactive training methods.

14.11 As with any other visual medium, the instructor must ensure that the audience has a clear view of the video screen or the projected image and that any audio commentary can be clearly heard.

14.12 Printed material may be required to assist the learning process by highlighting key points, summarising the material and/or introducing new terminology. Note taking during a video should be discouraged due to the possibility of breaking the student's attention.

14.13 The impact of video on the instructor is that although they may be provided with free time within the lesson, they will have to ensure that the video is an integral part of the training system. The instructor may have to design accompanying notes and follow-up training material etc.

14.14 Video may be an integral part of distance learning or student-centred training method. It provides the ability to provide consistent information into the training system at any time or in any place as long as the student has access to a delivery platform (a video player or a computer capable of playing digitised video).

14.15 Video has been used within the training system for many years and may therefore be regarded as a fairly 'traditional' form of technology-based training. Its main advantages including its ability to introduce animation and the 'real world' to a training situation via a readily accessible delivery platform and its disadvantages such as time consuming sequential access to specific footage and its lack of interactivity are relatively well known.

USE OF VIDEO IN MULTI MEDIA/EMBEDDING VIDEO

14.16 Advances in technology have allowed video to be brought to the desktop, either within multimedia packages (e.g. TBT) or simply as full screen video displayed on a PC screen, and residing on hard disk, CD-ROM, DVD or streamed from a network server.

14.17 The problems of large file size of digitised video are reducing through a mixture of compression software, large disk size and the ability to stream the video from a central server on demand. Capability in this area is increasing very rapidly, largely driven by the demands of the adult entertainment market.

14.18 Video is therefore now increasingly becoming an integral part of interactive training media.

ADVICE AND GUIDANCE

14.19 Video Production Group (VPG) at DCTS (Halton) has a team of specialists who provide a range of skills and services to customers. From broadcast professionals to Service personnel with operational experience, VPG has expertise in the production of audiovisual based media within Defence. VPG can offer a customer complete service from acquisition to delivery of the final product, as well as offering advice and guidance.

CONTACT

14.20 For more information, contact the Head of Video Production Group: 01296 65 6732 or mil 95237 6732.