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Technology-Based Training in the Australian Army: A Decade of Development

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Abstract: In the space of a decade the Australian Army has moved from developing its first CD-ROM training package (Army Doctrine Electronic Library – ADEL), to the establishment of a series of technology-based Regional Training Centres using staff produced CD-ROM packages (developed in Macromedia Director™) and in 2004 to the development and deployment of browser-based packages for networked delivery (using Outstart's Evolution® and ThinQ's™ Learner Management System) over the Defence Online Management and Instructional Network (DOMAIN). Implementing such changes within an inherently traditional, hierarchical organization has required vision and determination by individual champions supporting technology based training supported by systematic planning. The major driver has been the new focus on learner facilitation rather than training provision. This paper outlines the key stages in this evolution and suggests some of the challenges that lie ahead.

Introduction

There is a need for more exploratory case study research into the thinking that lies behind the process of adopting and developing e-learning in organisations (Schofield, 2002). Further, understanding the influence of different workplace organisational contexts on e-learning is also not well researched (Bonk, 2002). Reporting from the knowledge-based industries, such as computing and communications industries, where computers are usually an integral part of their business has created a bias in the e-learning case study literature (Newton, Hase & Ellis, 2002). Also, need for caution in assuming that what works for e-learning in education applies in a training context was highlighted by Bonk and Wisher (2000) from their research on military e-learning. Further, for organisations where it is essential for the workforce to gain practical skill competencies that are generally unrelated to using computers, e-learning implementation faces some specific challenges. Where incorrect learning can lead to injury or death, the need for valid e-learning is further heightened.

Dobbs (2000, p.114) warned of the potential problems for organisations rushing to move online “regardless of whether they had a clear reason to do so”. This lack of planning led Hase and Ellis (2001) to propose that potential implementation problems are “systemic, not technical” and can be related to inadequate strategic support and alignment of stakeholders' expectations of e-learning. Schofield's case study research (2002) confirmed this proposal with a reported low priority for skills development (and using e-learning as a specific tool to achieve it) in corporate strategic planning. Thus, there is a need to better understand the thinking behind the decision to adopt e-learning and approaches taken in relation to the organisational context.

This historical case study of the Australian Army provides insight into the choices of approach to technology-based training (TBT) and the decisions taken during development and implementation. The definition of TBT used by the Army is: “the use of electronic media to deliver, assess and manage learning. It includes the Internet, intranets, CD-ROM and DVD” (Training Technology Centre-Army, 2003a, p.3). Further, a proposed blended model of TBT qualified this definition: “TBT will not totally replace current conventional training methods, but will complement and enhance them”. The Australian Army has used CD-ROM based training since 1993 and with strategic support since 1996. Although this provides a unique context for TBT, the issues raised in this case study can be related the thinking behind the choices made when adopting TBT in other organisations.

The data for this case study was provided from analysis of key Army documents related to TBT, supplemented by five interviews with senior Australian Army personnel involved in the development and

implementation of TBT within Army. The data was triangulated across these sources, seeking confirmation of the main ideas. This historical review is part of a larger project that will be developed through 2004-2005 that will focus on evaluating factors influencing effective eLearning in the Australian Army. Some screen shots of the content of the CD-ROM courses are included and some courses will be demonstrated live as part of the conference presentation.

Training Context

The Australian Army has traditionally utilized two types of training: individual training (typically classroom) and collective training (typically team-based in the field). The transition of knowledge and skills from individual to collective performance was achieved primarily by team training. Prior to 1997 individual training was concentrated at over 50 training establishments throughout Australia. Individual training was co-ordinated and delivered by Army's Training Command and collective training was co-ordinated and conducted by Land Command involved in field training and assessment. Training was traditionally delivered as face-to-face training through classroom based residential courses and as field based training. Distance learning has not been used in any long term way except by the Australian Infantry Forces Education Service to service overseas troops during periods of war beginning in 1918 (Training Technology Centre-Army, 2003a, p.2).

In 1996 the Defence Efficiency Review (Department of Defence 1996, p.1) aimed to "produce the most efficient and effective Defence Force possible within current budgetary restraints". This externally driven review generated the requirement for the Army to reduce training operating costs and led Army Training Command to propose that: "The selective exploitation of technology holds significant promise to enhance the Command's training and doctrine by optimising the effectiveness of available manpower and resources." (Training Command, 1996, p.1). This goal resulted in the Technology-Simulation (TECHSIM) Development Project by Training Command that provided an overview of the state of TBT in the Army and objectives for the future.

The logistics of Army training prior to 1997 were enormous with more than 27,000 people being trained annually on more than 1,200 courses ranging in duration from less than a week to over 18 months, and from basic level skills to university masters level. Typically each of the 50 training centres specialised in a type of training (e.g. catering, signals) and trainees had to be transported and accommodated at these centralised sites for the residential training. With this conventional classroom training, it has been estimated that 70% of the costs were attributable to indirect costs such as trainee travel, accommodation and time off from regular duties (Training Technology Centre 2003a, p.2). These face-to-face classes were also very resource intensive with high expenditure on materials and staffing. For some practical skills these resource costs were very high, such as ammunition for practising target shooting. Given the rising costs of this training approach, particularly indirect costs, alternative delivery modes were sought.

Prior to 1997, there was a small, dispersed group of individuals within Army's Training Command involved in the development and delivery of TBT, including computer-aided learning that included the use of multimedia. The most common form of TBT was based on the use of Freelance Graphics, the LitePro projector and accompanying high gain screens. This development included: a self-paced learning package based on Lotus Approach to familiarise and practise students in Services Discipline Law at the Land Warfare Centre; 30 multimedia instruction packages developed at the Royal Military College; 14 packages on specific mechanical training developed by the Army Logistics Centre, and multimedia packages specific to rotary wing aircraft developed by the Aircraft Maintenance School (Training Command, 1996). Initially the main multimedia development tools used were Authorware Professional™ and Macromedia Director™. With increasing demand for media rich content, particularly video clips, more and more work was done in Macromedia Director™ until the decision was taken in 2001 to make it the sole authoring package.

It was noted in the TECHSIM document (1996, p.7) that although both instructors and students "valued the use of technology in instruction" there were technical and educational problems. For example, although instructors were enthusiastic there was no formal guidance or training on the appropriate use of these technologies for learning. There were also problems with conflicting hardware, such as the existing LitePros not projecting high resolution multimedia and the laptops in service that were unable to be used to access multimedia packages.

Also as these projects depended on the interest of a few individuals and they were not centrally coordinated for staffing or funding, the development was erratic and often inadequate. The standard of this training also varied considerably, depending on the skills of staff involved. For the TBT that worked well, the importance of these individual drivers for change was acknowledged: "...it worked well because you had an individual in the training establishment who had an idea, was committed to it and followed it through with enormous energy and personal commitment" (Interview). Further, the erratic development of any TBT at that stage was exacerbated by the lack of

corporate commitment to TBT and so it tended to be “on the periphery of training” (Interview). As people receive regular 2-3 year posting cycles through the various Army sections or Commands, including Training Command, even if an individual staff member developed a TBT project, “it died very quickly when they moved on” (Interview).

There was one centralised CD-ROM package developed in 1993 from the Army’s paper-based doctrine library into the Army Doctrine Electronic Library (ADEL). This development was driven by the need for a standardised repository of military knowledge that needs to “penetrate all levels of military training so as to remain the firm foundation upon which the Army can train” (Training Command, 1996, p. 3). The CD-ROM media was found to be “robust and portable” that enabled access to the ADEL for personnel at home, while travelling, overseas and in the field. The ADEL was developed as a CD-ROM based resource that runs in a standard Army Standard Hardware and Software Environment (ASHSE). In 1996 it contained 172 publications and incorporated graphics, video and a small selection of multimedia packages. The need for relevance and currency led to a system of “use by dates” on these CD-ROMs. In 1996 there were problems accessing the ADEL due to insufficient supply of personal computers and peripherals (particularly CD-ROM drives with sound capability), network cabling, and limited bandwidth in the work area. Also, as the ADEL was not publicised or distributed well, use of it was limited (Interview). With a change in leadership of Training Command, the ADEL was moved to the Defence Intranet in 1998 so that amendments could be published immediately at very low cost and it could be distributed more widely.

There were also some centres that used virtual simulation packages for weapons and vehicle training, however, these developments were also fragmented and depended on the availability of suitable staff and infrastructure. Due to the high cost of ammunition, the Weapons Training Simulation System was supported for further development with final delivery in 1998. This simulation has been found to greatly reduce the resource consumption and provides a staged learning process through weapons assembly and safety procedures before going to the field for live practice and assessment.

At the time of the Defence Efficiency Review in 1996 there were also other Army “strategic imperatives” for some senior Training Command staff who considered that learners’ needs that were not necessarily being met by the traditional training methods (Interview). The Review provided the policy vehicle to support and scaffold the changes required to refocus priorities for training in the Army. These priorities were:

“...to minimise the disruption to units, trainees and their families arising from their participation in training; wherever possible (and necessary), to deliver the same training to Regular and Reserve members; to guarantee the standardisation of training even when delivered in a range of different locations simultaneously; to create a reserve of instructor capacity - a surge capacity; and, most importantly to optimise the quality of the learning experience provided to trainees” (Interviews).

Thus, the TECHSIM review of TBT in the Army was seen as strategic support to meet the priorities of both the external efficiency review and the learners’ needs. This review resulted in acceptance across the chain of command for the development of a high-technology learning environment with a coordinated approach to the development of content, training methods and infrastructure requirements.

New Learning Environment

Developing this new learning environment was described as “a challenge” requiring “a fundamental shift in the way training was viewed and carried out” (Interview). It was determined that operating costs could be reduced while addressing the other strategic needs by moving to more decentralised arrangements in which a significant part of the training was delivered more flexibly as Distance Education and Training (DET) and TBT with mentor or tutor support and regional residential training through high technology, flexible learning centres (Regional Training Centres-RTCs).

These RTCs were to be located in every major concentration of military population to provide training at times, in locations and in formats that reduced the requirement for travel, but also minimised the disruption to Army units and maximised the opportunities for both full time and part time members to undertake training. The aim was to develop the RTCs to provide a flexible learning environment providing access to face-to-face instruction and self-paced independent learning. A prototype RTC was developed in Brisbane, Southern Queensland in 1998 which allowed testing of the infrastructure and piloting of courses as well as allowing the showcasing of this new approach to decision makers including top level politicians who ultimately had to be brought onsite.

Accompanying this decentralisation of the training centres was the recommendation for centralised organisational infrastructure support, including: development of the network connectivity throughout Training Command; development of technical architectural standards that promoted the re-use of technologies across multiple systems and interoperability between systems; modification of the Commands’ procurement processes to maintain

currency in technologies; establishment of a technology coordination agency to interface with external providers; enhancement of the technical expertise and awareness of Army personnel to maximise the successful exploitation of technology (Training Command, 1996).

To achieve specific learning outcomes there was also a push from within Training Command to move the focus from the delivery of training to learning facilitation that catered more effectively for individual needs through e-learning:

“In particular, we needed to be clear on whether we were delivering information or achieving specific learning outcomes. We believed that our response to this fundamental question dictated our entire approach to e-learning. There is obviously a significant difference between delivering information and facilitating learning...we decided that our core business was facilitating learning and therefore e-learning required us to present our learners with text, audio, graphics, video, animation and virtual reality files integrated in accordance with a detailed and comprehensive instructional design and rigorous software engineering specification, and implemented with mentor/tutor support in conjunction with complementary residential training, to optimally satisfy our learners’ requirements. This was our eLearning definition” (Interview).

Thus, an externally driven policy requirement for efficiencies in training provided the organisational support to implement infrastructure for TBT development. This strategic support enabled the broader acceptance of a cultural shift in the training focus. These decisions culminated in the formation of the Technology Training Centre (TTC) in September 2000 whose aims include “designing, developing and evaluating all DET and TBT for the Army’s training Command” (Training Command, 2003, p.12).

The Shift from Training Delivery to Learning Facilitation

To reflect the refocus on learning facilitation, Training Command’s “Flexible Delivery of Training Plan” (2003, p.6) outlines a combination of delivery methods for TBT that could include “CD-ROM or DVD, and the Intranet or Internet for online delivery”. These methods were proposed with the expectation of changing methods “as technologies evolve and change”. The change in training culture is also reflected in the main selection criteria for delivery method; it “will be guided by the optimum means of satisfying the learning requirements”.

In response to the technical and operational requirements, Training Command did not initially focus on the development of online (networked) learning development:

“With the exception of a learner management system, this will not initially include on-line delivery until a number of issues are resolved, such as:

- a. Soldiers spend much of the year training in the field, where they do not have access to the Intranet or Internet;
- b. The limited bandwidth available on the Defence Network significantly restricts the instructional design of electronic and TBT products; and,
- c. The Defence Restricted Network (DRN) is not yet considered sufficiently reliable to support the efficient delivery of training” (Training Command, 2003, p.7).

These infrastructure conditions resulted in a focus on the development of CD-ROMs that aimed to provide high quality (commercial games quality) multimedia courses. Courses selected for TBT development were based on a broad range of criteria including: content, that is, largely information based, indications that flexible delivery would reduce operating costs, and large numbers of staff are required to be trained. The first courses to be targeted for TBT development included subjects that involved high student movement costs and high training costs, such as those courses requiring regular refresher training for all personnel (e.g. navigation and first aid), and core courses for promotion (Subject 1 Sergeant and Subject 1 Corporal). Other legislated courses were also targeted for TBT (e.g. equity and diversity, fraud and ethics) with the aim that all staff can do the courses at the most convenient time and at their own pace.

A navigation training package, ‘Navpac’, (Training Technology Centre-Army, 2000) was the first CD-ROM package to be developed by the TTC. This topic was selected for development on the basis that large numbers were involved in this core skill refresher training each year. The importance of student engagement through authentic learning activities and formative assessment are highlighted in the goals set for the package:

“...to produce a package that is actually fun to engage in, make it visually interesting... in the end you are dumped into a virtual landscape where you can use the tools in an appropriate way, so you can demonstrate that you have the fundamentals of navigation in hand.” (Interview).

While this package is considered a “little primitive” now it is still used extensively throughout Army as it provides the consistency and efficiency required for refresher training required across all ranks (Interview).

Underpinning the TTC development of the instructional design specifications for Army TBT has been their research into instructional design, adult learning theories and online usability. It is described as an “eclectic” approach to instructional design with the TTC selecting “design tenants that it considers appropriate for the development of its TBT” (Technology Training Centre, 2003a, p.4). The Army has traditionally adopted a behaviourist approach to training based upon the Army Training System (ATS), “the cornerstone for all military instruction” (Technology Training Centre, 2003a, p.12). To comply with the ATS all TBT needs to have a behaviourist structure: introduction, instruction and conclusion. However, TBT courses can incorporate other learning orientations, such as a constructivist approach within the body of a basically behaviourist lesson:

“For example, [course] scripts have an objectivist orientation, but embedded within the scripts are features found within a constructivist approach-the aim is to empower the trainees to select an approach to assimilate the material that best suits them.” (Technology Training Centre, 2003a, p. 4).

Achieving a more constructivist approach has been interpreted by the TTC in terms of providing the learner with options of entry points to the content they need to cover and interactive learning activities. Providing a combination of media that reflects a range of learning styles (e.g. visual, auditory) has also been incorporated into the TBT design guidelines to better cater for individual learning needs. Thus, maintaining the more traditional approaches to training while blending in the multimedia and content interactive features that encourage a constructivist approach has been important.

Instructional designers in the TTC are trained in various multimedia development products and select a learning orientation based on their assessment of the appropriateness of the content for TBT: “TBT packages are put together by instructional designers who are driven by the aim to facilitate learning: they are not put together by ‘propeller heads’ whose aim is to demonstrate technology.”(Technology Training Centre, 2003a, p.43). For example, providing vicarious learning in the CD-ROM packages through the use of “virtual mentors” who are dressed, act and speak in the required Army protocols has been integrated into all the packages (Figure 1). This was considered vital to provide a “human feel” and a sense of empathy with the characters who model skills and lead the learners through the package. .



Figure 1: Screen grab illustrating the use of virtual mentors. Each section of the course is introduced by a specific mentor who upon activating steps forward to give a high quality video presentation.

Providing problem-solving activities to develop higher order thinking skills and application of their learning is an important element of the packages. Learners are provided a realistic learning environment through the use of text based role-play simulations for leadership skills (Figure 1) or drag and drop simulations for practical skills (Figure 2).

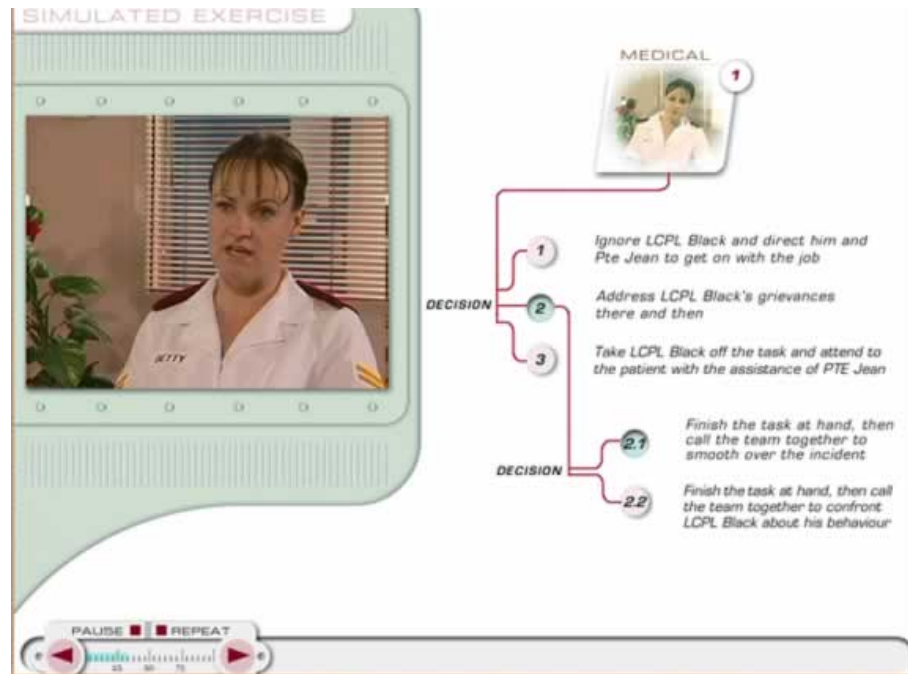


Figure 2: Simulations employ video clips and problem-solving flowcharts to teach leadership skills in authentic Army situations.

The learners are required to make a decision and they are provided with feedback on that decision. It has been found that this makes the trainees more field-operational. This has been provided through Quicktime™ video clips (Figure 2) or through animation (Figure 3).



Figure 3: Use of animation in a realistically portrayed, authentic setting provides a safe problem solving practical skills learning environment

A strong safety culture needs to come through every package. By incorporating safety problem solving tasks and virtual mentors, dangerous situations can be practiced and wrong decisions made as a learning feature without harm to the trainees or wasting resources (Figure 3). The development of this animation to games quality multimedia is thought to be both attractive to the X-generation trainees and provides a realistic and safe training environment (Figure 3).

The newest phase of TBT development commenced in late 2003 and initial packages will be delivered and evaluated in the first half of 2004. This involves Army working within the phased roll out of the Defence Department's e-learning network, the Defence Online Management and Instructional Network (DOMAIN). This provides the Australian Defence Organisation with an integrated Learner Management Systems (LMS) and Learner Content Management System (LCMS). The first phase of the project, which is one of the largest e-learning project ever undertaken in Australia, went live in November 2003 to the Defence Materials Organisation (DMO) and Army staff. The full roll out which will be completed by December 2004, will involve Navy, Army, Air Force and 11 defence civilian groups (Mills, 2003). Key new development tools are the LMS ThinQ™ and Outlook's Evolution®. The latter allows for multiple forms of output: Web, CD-ROM, print-based student guides, classroom training resources and hand held devices.

Conclusion

This case study highlights some of the key organisational factors that have influenced the decision making behind TBT development and its implementation and the role of visionary individuals who were able to appreciate high-level pressures and inspire lower level work teams. It also demonstrates the need for TBT to reflect the organisation's "inherited culture of learning" (Lea, 2003, p.218) that requires an understanding of the learners' needs and the organisational identity and ethos. For effective implementation, this vision needs to be linked to the contribution TBT can make to the organisation's priorities as well its relevance to learners' needs. These priorities need to be expressed in an organisational strategy that supports TBT as an integral part of the training and organisational agenda. This commitment is particularly important for sustainability in a rapidly changing operational environment.

Schofield (2003, p. 168) also found that "the link to corporate strategy" is important for all corporate training and development, including e-learning. Coming from a competitive corporate context she describes how skills development usually ranks low in business planning, a "fourth order" issue. However, training in the Army is a vital part of the Army ethos as it provides the skills, knowledge and attitudes from the doctrine that are essential for the development of trainees at all levels: "In peace time the most important thing in Army is training. It gives you your base" (Interview). Also "training is the only vehicle by which Army can remain capable. Unlike other employers, Defence/Army is not able to laterally recruit those with the required skill sets." (Interview). The Army has a strong tradition in training underpinned by a very structured and didactic approach to planning and delivery. Such traditions do not necessarily lead to an environment conducive to implementing change, such as implementing TBT. However, when TBT is promoted as offering solutions to strategic problems (both external and internal to the organisation), this culture can provide the mechanism to provide the organisation structures to support TBT successful development and implementation.

The selection of TBT has been a function of the available technology, staff interest and skills, and the cultural environment that influenced how TBT was related to organisational priorities. In particular, this case study has revealed the importance of alignment between the TBT approach adopted and the learning culture. This supports Rogers' (1995) proposal that the decision to adopt an innovation is more acceptable if it is perceived as compatible with the existing organisational culture. That is, if there is the perception that TBT can be integrated to support existing priorities it is more likely to be adopted.

However, it is also evident that TBT development in the next decade will need to be flexible to take advantage of changes in technology and training needs. While this flexibility is acknowledged by the TTC, the opportunities for more flexible learning and collaborative learning offered by networked based learning tools will need to be carefully explored and evaluated. Rapid development in wireless technologies (Alesso & Craig, 2002) and tutoring programs that are backed by sophisticated levels of artificial intelligence have the potential to make stand alone CD-ROM training look as traditional as classroom training did when CD-ROMs were first introduced. The next decade will almost certainly see as much, if not more change and development as the last, as increasing computing power, faster and more widespread connectivity and small mobile instructional devices challenge developers and instructors.

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