Defence Academies & Colleges International Conference

Network Centric Learning: Towards Authentic ePractices

Stellenbosch University, 25TH - 27TH March 2009

PROCEEDINGS

D.A.C. eLEARNING

Cranfield UNIVERSITY

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Defence Academies and Colleges 2009 International Conference

"Network Centric Learning: Towards Authentic ePractices"

25th - 27th March 2009

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Introduction to Conference Proceedings

On behalf of the Conference Organising Committee we have great pleasure in presenting the first DACeL Conference Proceedings.

For those of you who attended the DACeL 2009 conference, these proceedings provide yet another opportunity to review and reflect on a range of papers and case studies presented and discussed in Stellenbosch. For those who did not attend, these double peer refereed papers offer an overview of the breadth of e-learning approaches taken by a wide spread of defence related academies, colleges, and organisations from Africa, Asia, Europe, Australia, and North America.

Whilst not all the presenters have submitted their paper or case study for inclusion in this publication, these proceedings offer a valuable snapshot of the contemporary state-of-play in the field of defence-related e-learning. Readers might also want to go to our DACeL website (http://www.dacel.com.au/) for information about other presentations, including keynote addresses. At any rate, these presentations and the collected papers included here offer insights into the many creative ways in which e-learning is put to use in widely differing, and often challenging defence-related contexts.

Because presenters are fresh from the realities of their daily workplaces they appear to be well-attuned to real-life dilemmas presented by their engagement in e-learning. Presenters from many backgrounds are represented at this conference: military personnel, academics, researchers, commercial consultants, representatives from various levels of government, mainstream systems developers and project managers. Importantly the conference attracted presenters and participants from small as well as large institutions including those from non-Western cultures.

Readers will discover that the variety of offerings is broad indeed and their content is rich. The papers bear witness to the definition of quality as 'fitness for purpose' in that e-learning practices, while varying enormously, can provide timely and effective solutions to the challenging demands posed by very different defence-related learning environments. As you will deduce from the papers, technology is merely the starting point. Given the constant developments in technologies and contrasting contexts, the papers therefore reflect different levels of analysis; different emphases on theory, practice, and research; different approaches to planning and implementation; and different reactions to practical problems.

The interest in e-learning is as evident here as it is worldwide. While many initiatives have already been operating for years, others are, as some participants suggested, still in the 'toddler' stage. Many e-learning systems are accessed by large hosts of users, while many other systems cater to the basic needs of specialist or niche groups. Other systems are well integrated into organisational processes, many have adopted novel interfaces and processes, while others are grafted successfully onto different types of larger networks. All however are invariably challenged by the vast-changing (and expensive) technologies of the post Web 1.0 era and ever-challenging operational contexts.

It is important to begin by placing these papers in the wider context of the 'big picture' as presented in the keynote and opening speeches. Charles Jennings, Global Head of Learning at Thomson Reuters, Jack Wills, Chair of The British Institute for Learning & Development, and Johann Moller of the University of South Africa (UniSA), as keynote speakers, and Dr. Henk Eijkman challenged participants to situate their thinking and practice within the bigger picture. Charles Jennings encouraged participants to take learning beyond the narrow confines of the industrial classroom and the 'conspiracy of convenience' and take more seriously the worlds of informal and workplace learning. Jack Wills challenges the traditional focus on content. He proposes a shift in favour of communication and information exchange activities that place much more emphasis on the social/personal aspects of learning especially in military contexts. He suggests that for the military, valuable **lessons** can be learned from the corporate world. Eijkman, summarised the contemporary trends in training, education and learning by way of three overarching 'megatrends'; the organisational turn in teaching, which takes us from industrial-age to post-information-age teaching practices; the social turn in learning theory that signals a paradigm shift away from psychologically oriented learning theories; and the participatory turn in technology signified by the post-Web 1.0 world of networked, immersive, and mobile learning. Möller (Benefits for DACeL in Lessons Learned in the Deployment of an LMS at Unisa) reflects on the ways in which Unisa has attempted to leverage the potential of e-Learning tools to take the distance out of distance education and how these have made flexible learning practices increasingly possible.

As indicated by these papers, many are struggling with issues about ongoing redirection and sustainability given constant advancements in digital learning technologies. All of them are subject to evaluative scrutiny from their stakeholder base, from their creators, from their funders and from their managers.

Looking at how academies in different continents approach e-learning, the papers by Esterhuyse, Pretorius, Van der Walt, and Venter & Meter, reflect on the specific challenges posed by their institutions in a highly complex South African context. Esterhuyse (Distance Education and e-Learning in the South African Military) sets the tone by exploring the nature of professional military education in the South African military from an historical perspective. His paper confronts the challenges of the post 1994 context and argues strongly for the role of professional military education in enhancing the effectiveness and efficiency of the South African National Defence Force. Pretorius and Van der Walt rise to the challenge, the former (The Role of an LMS in Improving Learning Effectiveness in a Military Academy) explores the factors that contribute towards learning effectiveness in e-learning courses and proposes a model to assess effectiveness of a LMS in online courses. Van der Walt's paper (A Distance Learning Model for Optimising Individualised Training in a Department of Defence) provides an excellent insight into how the South African National Defence Force, faced with a shrinking budget was able to meet huge training requirements by implementing an e-learning based interactive distance learning approach as an integral element of a highly viable, cost-effective human resource development strategy. The paper by Venter & Meter (The SITA/SANDF Learning Management System: An Evaluation of its Longevity in the SANDF) presents background information about the initial start of this LMS pilot project. The paper traces the history and approach of the College to this LMS and, on the basis of learner feedback on the attributes of this LMS and the challenges posed by implementing a LMS in the SANDF, discusses its success factors, lessons learnt, and its potential future.

From an Asian perspective, Juhary, from The National Defence University of Malaysia (NDUM) identifies the challenges of, and solutions to, developing content for e-learning at what is also the youngest public university in Malaysia. In regards to the challenges her paper (Content Development for e-Learning: The Challenges) points to a low awareness by academic staff about the importance of providing students with alternative or supporting tools for learning as well as the limitations security issues place on content development for military related courses.

Presentations from Australia focused on policy, practice and research. The paper by Yeomans (Key Policy Issues Around e-Learning at a Defence Academy: An Australian Case Study) focuses on the Australian Defence Force Academy (ADFA) as a unique and challenging environment. Operating as a partnership between the Australian Defence Force and the University of NSW, ADFA provides a liberal tertiary education within a tri-service military environment in which e-learning is an integral component of learning and teaching. His paper addresses a range of policy issues and practical matters relating to expansion of the nature and scope of online learning at ADFA and of the "tensions" that can arise when policy development trails practice. Savige, on the other hand, (Concrete Blogs) describes and analyses the implications of putting Web 2.0 into practice in ADFA's generally more traditional, face-to-face focused, learning environments. Eijkman and Herrmann (Beyond Stereotyping: Understanding Student Readiness for Network-centric Learning) present their research into the pre-entry ICT experiences of students and their expectations of using ICT in their learning. Aware of the increasing likelihood that new officers will be immersed in complex and digitally rich network-centric warfare and security environments they have begun a research project to link e-learning practices in a university operated military academy to the pre-entry experiences of students and to network-centric graduate attributes. They conclude their paper by inviting participants to join them in a wider research project to include other military academies around the globe.

Representing a strong Dutch contingent from the Netherlands Defence Academy, Broos (Management Education and Challenges for Staff Development) reflects on the complex challenge of dealing effectively with Information & Communication Technologies (ICT) in digitised working environments such as in the Netherlands Defence Organisation. Based on an in-depth research project, her paper analyses the often under-estimated role of managers and their need for Information Society competencies that enable them to engage effectively in a learning organisation, in knowledge management, in communities of practice and in ICT-security practices. She discusses the implications of her research for staff development interventions in e-learning training environments and for electronic performance support in digital working environments.

Defence-related e-learning experiences in the United Kingdom are also represented by a formidable set of papers. Rossiter takes the lead with her call for "Manning the Barricades: Managing Organisational boundaries for Effective e-Learning" in which she explores how organisational structural and cultural factors act as impediments to new or innovative education and training developments, such as e-learning. Drawing on theories and models of change as well as practical examples she analyses various aspects of boundary behaviour which occur at the margins – with particular reference to structural, process and human factors, and recommends a number of the key strategies for effectively managing such boundary activities and transitions. Sagar and Byatt quite literally respond as their paper is about "Generating Agile, Adaptable, and Capable Airmen" (sic). They use the "Review of Officer & Airmen Development" (ROAD) as a Case Study for re-shaping the Royal Air Force's (RAF's) generic distance learning program. In doing so they identify and examine five key issues; change management, cultural change, platform development, content development & usage, and future development. Harvey & Kennedy-Long in their paper "Reshaping Acquisition and Business Training for the MoD" trace the development of a comprehensive blended learning project for the Ministry of Defence (MoD).

This paper provides an overview of the expansion of the use of blended learning from one hour modules through to the development of 227 hours of e-learning with associated workshops and online

support tools. Sastry presents us with a much needed discussion "On e-assessment". Reflecting his original workshop, his paper reviews the state-of-play in e-assessment, and discussing its pros and cons. Starting with a review of the technology landscape, he moves on to a discussion of some of the concerns for embracing e-assessment as a diagnostic, formative and summative assessment tool. He concludes with a discussion on timely intelligent feedback which still remains a big challenge, and the opportunities that exists to address this issue. Saunders (Electronic Management of Training at the United Kingdom's (JSCSC) Joint Services' Command & Staff College) uses the design and implementation of 'Curriculum Manager' at JSCSC as part of a bespoke Managed Learning Environment (MLE) which is compliant with the UK MoD's Defence Systems Approach to Training (DSAT), as a case study to demonstrate how this innovative training design and course-prioritisation application ensures training delivered within the JSCSC satisfies its operational requirements. He points out how this application interfaces with a commercial off-the-shelf (COTS) management information system, and interconnects with a Virtual Learning Environment to allow for the timed release of electronic learning-based objects based on a relationship to timetabled events. In their paper (Education in and with Defence Modelling and Simulation – Experiences and Challenges) Searle, Bathe, Winston-Davis & Hoggard add to the discussion by identifying issues which need to be addressed in developing e-learning in highly innovative and quickly changing areas of knowledge. They raise questions of cost and maintenance.

The paper by Scott & Cong (Evaluating Course Design Principles for Multimedia Learning Materials) reports on evaluation studies of principles of course design for interactive multimedia learning materials developed at Cranfield University in collaboration with military colleagues at the UK Defence Academy. The overall findings suggest that, in general, students regard these course design principles as useful for effective learning. They also draw conclusions about what constitutes good course design and suggest issues for further research. Scott, MacLean, Janota, and Donald (Developing a web-based resource to support the professional development of e-learning practitioners) report on an ongoing project that aims to provide a high-quality resource to stimulate and support e-learning professional development in the UK HE sector. The project is aimed at all e-learning professionals involved in the design, development and delivery of e-learning and in particular supports professional accreditation in the field. The paper reports on project activities and progress to date, including the development of an ontology, metadata schema and work flows for content management. In the paper "Blended Learning – What's In It For Me?" Strang, Bonser & Fitzgerald put the case for increasing interest in the use of blended and e-learning for training and education in the defence and security sectors. In this paper, and relying on a review of some of the recent literature on the success of blended learning from within and without the defence sector, such as in healthcare and international development, they consider the business advantages and disadvantages that may be incurred by the various stakeholders- providers, purchasers and students in implementing blended learning approaches.

We take this opportunity to thank all of the participants for their individual contributions to their own institutions and organisations, and through their participation in DACeL 2009, to their wider defence related community of e-learning practitioners. Also our thanks to the members of the Organising and Scientific Committees, especially those in South Africa, without whom, this Conference and these Proceedings, would not have come to fruition. We commend these Proceedings to you. They represent a wonderful mix of diverse approaches, dedicated presenters, and well-articulated perspectives; in short, a practical and insightful array of approaches and ideas for any reviewer of the field of defence-related e-learning, whether from inside the DACeL network or outside it.

Henk Eijkman and Allan Herrmann,
University of New South Wales at the Australian Defence Force Academy
On behalf of the DACeL Scientific Committee

DACeL 09 – A Short Reflection on the Conference

Firstly, the organising committee would like to thank everyone for their full and willing participation in the conference. The positive 'buzz' and friendly interaction produced a high quality learning and networking experience.

The conference proved to be an intense but rewarding time with a very full program. This arose from having a large number of papers but only one 'stream'. There was a suggestion that future meetings might need to look at the provision of more time for reflection and discussion as a programming issue.

Broadly, the main themes permeating most presentations and discussions were those of:

- the focus on the learner and her/his needs and skills;
- the degree of cultural and organisational change needed to underpin any implementation of eLearning in a Defence environment;
- the importance of change management (including management of expectations of all involved) in the implementation of eLearning in a Defence environment; and
- the dichotomous nature (i.e. 'either /or') in which the implementation of eLearning in a Defence environment is often viewed. For example:
    - learning focus v economic drivers,
    - training v education;
    - proprietary v open access environments/tools;
    - contractual obligations v partnership relationships;
    - 'big bang' v incremental change;
    - carrots v sticks.

More specifically, key issues raised by speakers were:

- Firewalls / Security – but solutions can be developed in conjunction with local security support staff.
- Importance of context and the environment on effectiveness /impact of e-learning
- Commercial / business drivers – need to be considered as one of the overall dimensions of e-learning
- Variation in 'cost' e-learning development (for some models development costs very high - other models costs reduced – e.g. through rapid e-learning approaches)
- Quality Assurance methods and processes – Noted the existence of comprehensive QA models but other questions arise. Do these models reflect customer requirements as well as learning design / theories?
- Understanding the boundaries and managing the relationships which occur there
- Readiness or preparedness of military students for e-learning - culture does not support or foster self discipline required for independent learning. Furthermore, while using skills and tools which may have been developed elsewhere, the context does not always allow for direct transfer.
- Hierarchical structure of military organisations creates barriers or impasses to adoption/infusion/ implementation of e-learning.
- Emerging emphasis of social networks, learning to complement content development and delivery
- Value of adopting blended approaches, including the business case
- New options with 'post Web 1.0' social networking technologies and tools
- Move from a 'transmission' approach to more collaborative approaches
- Take full advantage of all of the modes and media available

Other notes:

- Real learning is about changing behaviour in the light of experience
- Business problems rarely related solely to lack of knowledge or skills – rather combination of the above plus motivation and the environment
- Emphasis should switch from training needs analysis to performance analysis
- Distance is not just about physical separation – students can be in the room but distant, students can be 'at a distance' but close
- Common reasons for failure of distance ed. – 'fear of failure', risk too big, too many workarounds emerge so passive resistance, analysis/ paralysis, too rapid change/ too incremental, only unimportant, surface changes – superficial
- Importance of institutional vision to direct change management.
- In context of information society, importance of behaving as a learning organisation; but within our organisations we face cultural problem of not everyone wanting to share information
- New management roles – managers are struggling and if managers struggle – initiatives will falter
- Important to have access to information: but how do you know if it is trusted
- How do you measure effectiveness in learning context
- Using technology as the beginning point for change, but underpinned by comprehensive training schema /curriculum
- Curriculum Manager – strong accountability tool for management
- Analysis of e-assessment items as diagnostic, formative and summative tool
- Use of open source – greater awareness, can be very cost effective
- Need structural organisational support
- Issue of web connectedness
- e-Learning provides real opportunity for reservists
- Stress on partnership intent, but practical issues of high military staff turnover (e.g. 2 yr timeframes), whereas university staff typically have much longer tenure
- Need to seek greater flexibility in ways we, as partners and sub/contractors, work together
- Enormous choice of e-tools and content, therefore need for management and facilitation skills
- Move form 'push' to 'pull' in education and training
- Good learning design is grounded in sound pedagogy and systems
- Change should be based on relevant evidence
- Case studies and principles behind failures as important as successes

A FUTURE FOR DACEL?

- DACeL forum for networking/ discussion
- Circulate list participant contacts and expertise subject to agreement
- Expertise/subject specialist can act as reference panel for research/projects.
- Projects for future collaboration – e.g. ECAR; eAssessment
- Possible annual event

NUMBERS:

Participants:	89
Presentations:	27
Workshops:	2
Countries represented:	6
Invited Speakers:	3

Management Education and Challenges for Staff Development

Dr. E. Broos
Faculty of Military Sciences, Netherlands Defence Academy

ABSTRACT

The way in which information is shared and managed in the current information society has changed. Managers find it a complex task to deal effectively with the information and communication technology in the digital work environment. Yet they play an important role in effectively implementing changed ways of working and coaching their staff in this regard. In order to obtain insight in the experiences of middle managers with their digital work environment a case study was conducted in the Netherlands defence organisation by means of a combination of in-depth interviews and a questionnaire. Research results suggest that it is necessary to reconsider the curricula of management education. A number of Information Society competencies for managers could be practiced across the curriculum in an e-learning environment. The implications thereof for staff development are considered.

Keywords: staff development, management training, information society, e-learning

INTRODUCTION

Working in a digital work environment is a complex task. A digital work environment is defined in this paper as a work environment where information and communication technologies like hardware, software, the Internet and mobile technologies are used. The information society is seen as a society in which organisations in modern countries currently need to operate in order to be effective and able to compete. Globalization as well as information and communication technologies are important characteristics of the information society (Feather, 2004). Aspects like knowledge management, establishing a learning organisation, finding information on the Internet as well as knowing how to work effectively with the applications in the work environment are especially important in the context of today (Belasen, 2000; Boonstra, 2000). Managers play a crucial part by implementing new ways of working themselves, but also by coaching their staff to participate in the new ways of working (Boonstra, 2005).

Earlier research findings provide some insight with regard to the software applications that managers find important in their work environment and in the competencies that are required by managers to work effectively in the information society (Broos and Cronjé, 2009; Broos, 2007). Some of the information society (IS) competencies of managers could be obtained by using e-learning across the curriculum and an integrated approach in various subjects and work context. Further implementation of e-learning has implications for staff development in management training programmes. In this paper those implications are investigated.

The focus of the literature review is twofold. In the first section the focus is on the changed ways of dealing with information in the information society as well as the role of managers to bring about change and to support their subordinates in the ever-changing ways of dealing with information. Thereafter the focus of the literature review is on the changed role of teachers in an e-learning environment.

MANAGERS AND CHANGED WAYS OF DEALING WITH INFORMATION IN THE INFORMATION SOCIETY

In order for organisations to participate effectively in the information society it is important that they become adaptive and flexible (Belasen, 2000) and change into learning organisations (Wenger, 2000; Hargrove, 2001). Establishing a learning organisation in which knowledge is effectively managed is difficult and a complex process (Harrison and Kessels, 2004). They claim that changes in processes, product and structures are required as well as changes in management and culture in organisations. The direction set out by the strategic top of the organisation needs to be clear in this regard including a reflection about an integral approach across an organisation whereby selections are made regarding suitable applications to support such initiatives (Boonstra, 2005). Hargrove (2001) and Kamperman (2005) state that learning processes of an organisation need to adjust to the new context of an organisation and visionary objectives. Managers play a crucial role in establishing a successful learning organisation and learning how to participate in a learning organisation is one of the important aspects that needs attention in a training programme for managers (Broos, 2007). Harrison and Kessels (2004) argue that effective knowledge management will not happen automatically, but that a human resource development programme should deal with those aspects.

A sound information management system is crucial towards establishing a successful knowledge environment that underpins integrated and cooperative working according to Haines and Dunn (2003). Certainly it can be argued that managers play an important role in establishing this. It is clear that the culture of a learning organisation needs to support the development and distribution of knowledge in the organisation (Davenport and Prusak, 1997; Rosenberg, 2006). They claim that trust between staff members and also between staff members and line management is important in a spirit of open communication, commitment and a willingness to work together for a common goal. Wenger (2000) argues that this can best be achieved when an organisation is able to design itself as a social learning system and communities of practice are created. He emphasizes the importance of the role of the leader in such communities.

A further cultural change is embedding the concept of lifelong learning in the work environment of the manager. In this regard the following quote by Drucker, P. in Davenport and Prusak (1997:28) is important:

"We will have to learn, before understanding any task, to first ask the question, "What information do I need, and in what form, and when?... The next question people have to learn to ask is, "To whom do I owe which information and when and where."

An important aspect of learning how to learn is certainly the ability of self-directed learning (Yukl, 2006; Poole and Axman, 2002). In this sense the computer could be seen as a cognitive tool and can be seen as a "*prosthesis for thinking, reasoning, estimating, experimenting and learning*" (Kommers, 2004:24). Yukl (2006) states that even a commitment to lifelong learning will not suffice any longer, but that individuals as well as organisations as a system need to learn how to learn and in this regard it is necessary to redefine and continue to redefine mental

models which he names meta-cognition. In this light it is interesting to note that Oliver (2002) as well as Collis and Margaryan (2005) found in their research that using ICT, changes the way learning takes place in the sense that it has become possible to focus more on the process of learning and finding information instead of learning content. Zaccaro et al (2004) claim in this regard that effective global leadership skills require changed ways of learning and thus different development strategies.

Providing effective performance support for learners and employees in organisations is becoming increasingly important and could complement training (Rosenberg, 2006; Rossett, 2007). As such providing performance support could be seen as a component of knowledge management in an organisation where the learner could access knowledge and information from a variety of resources (Rosenberg, 2003). Managing competencies of employees, taking into consideration the competencies that are needed in the organisation is also a complex task for which the managers are increasingly responsible (Nobre, 2002).

With improvements of the information and communication technology, the global security environment has also changed dramatically (English, 2005). It is thus increasingly important that managers are aware of the importance of managing the information they are responsible for effectively in terms of exclusivity, availability as well as ensuring correctness of information. Managers also play a role in making their staff aware of the ICT security risks (Boonstra, 2005; Siponen, 2001). Bonatti et al (2006) argue that one of the most important causes of computer security violations on the Internet is the lack of technical knowledge of the users.

Broos (in press) validated a model for Information Society (IS) competencies for managers. In this paper a competency is seen as a combination of commitment (attitude), knowledge about as well as skills and behaviour (Hoekstra and Sluijs, 2003).

The main competencies in that model are defined as follows:

- *Having operational knowledge and insight into ICT*

Operational ICT competence is competence in dealing with the digital work environment effectively. This includes knowledge about functionalities and limitations of generic and other applications, hardware as well as networks. It goes beyond mastery of applications (Martin, 2002; Town, 2003; Steyaert, 2000).

- *Finding and evaluating quality information on the Internet when needed*

This requires an understanding of the structure of the Internet in order to find suitable information on the open Internet as well as for those sections that authorization is required. It also requires an understanding of the relative importance of information and sources (Steyaert, 2000; Steyn, 2001; Town, 2003).

- *Learning how to learn*

This includes an understanding of the importance of lifelong learning, but also about how to learn effectively (Hargrove, 2001; Yukl, 2006; Kommers, 2004).

- *Participating in the learning organisation, incl. knowledge management in the wider context of the organisation*

Knowledge management can be seen as the development, sharing, evaluating and applying of knowledge (Weggeman, 2000). Knowledge is seen in this paper as more than information. It includes how and why this information can be used in the work context (Davenport and Prusak, 1997; Belasen, 2000; Senge, 1990). For a learning organisation to exist managers need to understand and support the organisational value of knowledge management as well as become involved themselves (Belasen, 2000; Hargrove, 2001; Boonstra, 2005; Harrison and Kessels, 2004).

- *Participating in communities of practice*

Managers need to understand the need for networking and the usability of sharing work experiences (Wenger, 2000; Preece et al, 2004; Kamperman, 2005).

- *Innovation and change management*

Managers need to know the effect of change and need to be able to deal with change and resistance against change effectively. Understanding the organisational culture is thereby important. Furthermore they need to stimulate an innovative work climate (Belasen, 2000; Hargrove, 2001; Davenport and Prusak, 1997; Burns, 2003; Yukl, 2006; Hoekstra and Sluijs, 2003).

- *Competency management*

Competency management means that managers have insight in competences and talents of their staff, have insight in their learning needs and are able to translate this in a development plan furthering the employability. Thereby also considering the competencies required in the organisation (Nobre, 2002; Hoekstra and Sluijs, 2003).

- *ICT security awareness management*

Ensuring security of information in the sense of exclusivity, integrity and availability as well as encouraging ICT security awareness amongst subordinates (Siponen, 2001; Bonatti et al., 2006).

According to Town (2003) a first step in finding a solution for the need for what he calls 'information literacy' is that policymakers recognize that the work situation has changed and that adjustments in the training are necessary. The achievement of information literacy should not be seen as merely a training of competence, but needs to be recognized as an educational challenge (Town, 2003). In the final section of the literature review the focus is on the challenges to involve teachers in an e-learning environment in the current information society.

CHANGED WAYS OF TEACHING IN AN E-LEARNING ENVIRONMENT

An e-learning environment can be seen as a social system (Koper, 2000) and in this light the interaction between the individuals and groups of people are very important. The teacher especially plays an essential role in this system to instruct and initiate activities and is in this sense a lot more than the provider of learning materials (Lam, Nab, Noorderwier and van Tartwijk, 2001). It is important that teachers see themselves as managers in the sense that they facilitate the learning environment and spend enough time guiding and communicating with the learners (Schlusmans, 2001).

Adendorff (2004) claims that teachers are reluctant to implement e-learning environments because they are insecure as to what it is that they need to do. Collis et al. (2000) have indicated in this regard four groups of factors that influence a teacher's likelihood of making use of technological innovation: environment (institutional culture), educational effectiveness (perceived or expected), ease of use and engagement, by which they mean the individual's personal response to technology as well as change.

According to Lieberman and Guskin (2002) higher education is marked by new instructional roles in many new educational settings. This is supported by other authors (Adendorff, 2004; McPherson and Nunes, 2004; Merrill, 2002; Turner, 2005). However different authors present the roles of teachers in an e-learning environment differently. A summary of the instructional roles and competencies for teachers in an e-learning environment is presented in table one. The summary is based on the ideas of the authors mentioned above.

Table 1 Summary of instructional roles and competencies for teachers in an e-learning environment

Role	*Tasks*	*Required competencies*	*Motivation for required competencies*	*Examples*
Administrator	Course administration	Managerial competencies Knowledge of LMS	Managing learning activities, clarifying procedural rules and decision-making criteria.	Keeping course particulars up-to- date. Placing presentations or video's of lessons in the e-learning environment for students to review or for students who were not able to attend the presentation.
Social supporter, mentor	Feedback, reflecting, motivating	Didactical principles. Interpersonal competencies	Understanding factors that influence the learning outcome.	Teacher ensures privacy and trust when learners use social software, like web logs. Teachers can review and comment on the progress of projects in a workplace, using blasts (quick forms of communication like an idea, attitude or posing a question).

Instructor. Facilitator of the learning process	Presenting courseware. Encourage interactivity so that learners construct new knowledge and are thus empowered.	Didactical principles, like setting objectives and problem-analysis. Instructional design principles. Technological competencies	Understanding factors that influence the learning outcome. Understanding instructional strategy principles. Understanding technological issues like downloading software, incl. e-books. Understanding educational copyright issues.	Workshop leader both for synchronous (e.g. a virtual workshop) and a-synchronous discussions. Encouraging communities of learners e.g. (inter)national research projects using wiki's. Using and adjusting learning repositories. Support could be given by experts.
Information guide	Provide additional information. Empower students to find information.	Didactical principles Technological competencies	Understanding factors that influence the learning outcome. Understanding aspects like the Deep Web and navigation skills.	Links can be provided to additional information. Answers to frequently asked questions can be placed on-line. Providing simulations or games.
Evaluator, mediator	Ensure fair play	Didactical principles Competency profile	Evaluating and reflecting if learning outcomes are achieved and how the course could be improved in future.	Teacher forms a partnership between faculty and co-curricular educators. Student competency profile. Online assessment and feedback. Ethical issues like copyright and plagiarism.

In research conducted by Cronjé et al (2006) the importance of the roles and competencies of the facilitator was emphasized as one of the factors that motivated learners to continue with online courses. Teachers should continually reflect about the educational process in order to participate effectively in this process (McPherson and Nunes, 2004).

METHOD

The research was conducted in the Netherlands defence organization by having twenty in-depth interviews with experienced managers from a variety of function areas, in order to obtain a expert perspective from the work field, followed by a questionnaire that was send to an a-select random sample of 700 managers in order to obtain an overall perspective from the work field. The questionnaire was completed by 246 respondents. The demographic variables of the respondents are representative for the research population. The questionnaire was designed based on the results of a literature review. The research results were analyzed using a combination of qualitative and quantitative techniques (Broos, 2007).

EXPERIENCES AND COMPETENCES OF MANAGERS IN THEIR DIGITAL WORK ENVIRONMENT

Managers spend on average between 20 and 22 hours per week working on a computer. Most have the opinion that ICT in their work environment has made them more productive, although about a third of the managers lose production time because they are not familiar enough with the software applications they are required to use. Most managers are fairly confident in using ICT in their work environment; however there are a substantial number of managers that are not confident in using ICT. The lack of confidence is often caused by a lack of knowledge about ICT and not being able to find required information using the Internet.

In general it can be said, based on the results from the interviews that applications change with time and are dependent on the choices that are made by the strategic top in the organisation. The need for specific applications is dependent on the main function area, but in general can be said that the company's Intranet, the generic office programs especially a spreadsheet, a presentation program and the Internet are important in a digital work environment for managers. Information management systems, tools to organize thoughts and project planning software are not widely used yet, but managers that use them find them increasingly important (Broos, 2007).

Managers need to be able to think systematically in terms of the information processes and translate this into relevant information products. Those processes and products are different for different function areas. Furthermore, managers needs to communicate in a socially acceptable way using e-mail dependent on the role, position, the situation and the topic. It is important to communicate effectively using the technology. An example is to present management information in a correct format, avoiding unnecessary information.

The respondents to the questionnaire were asked to evaluate their competence in a number of items on a scale from 1-5, where a score of 1 indicates 'does not apply' and 5 indicates 'applies entirely'. The items were obtained by combining the results from the literature and the in-depth interviews. The expectation thereby was that the managers should score at lea*st 4* (this corresponds to the option 'applies mainly'). Since, in addition to being competent themselves, they are also the coach in those areas for their subordinates. The results are shown in figure one.

Figure 1. Competence of managers regarding the IS competencies

A: Having operational knowledge and insight into ICT (mean 3.6; s.d. 0.6)

B: Finding and evaluating quality of information on the Internet (2.8;0.8)

C: Attitude towards learning (4.2;0.8)

D: Participating in the learning organisation (2.7;0.8)

E:: Knowledge management in own work unit (3.4;0.9)

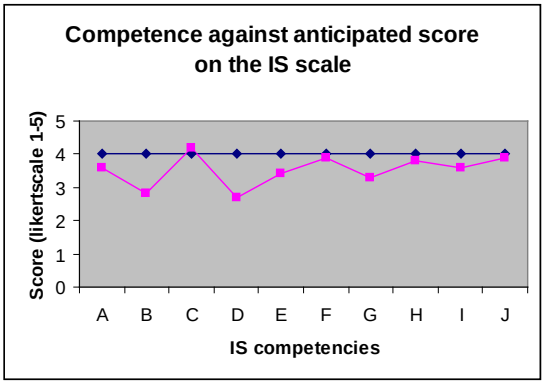
F: Innovation and change management (3.8;0.6)

G: Participating in communities of practice (3.3;0.8)

H: Competency management (3.8;0.8)

I: ICT security awareness management (3.6;0.8)

J: Creating an innovative work environment (3.9;0.6)



In figure one can be seen that the mean scores on the competencies 'Having operational knowledge and insight into ICT', 'Finding and evaluating quality of information on the Internet', Participating in the learning organisation', 'Knowledge management in own work unit', 'Participating in communities of practice' as well as 'ICT security awareness management' are considerably lower than expected. The standard deviation of the scores also indicates that more than half of the managers are in need of performance support. Remarkable is that although managers are aware that it is important that the organization becomes an effective learning organisation, they score on average relatively low on the scale for 'Participating in a learning organisation'.

It has also become clear from this research that communication using technology is not per definition the same as communication through languages (Hart-Davidson, 2001). A number of participants have indicated that they find it difficult to represent data effectively using the technology. In general it became clear from the interviews and the comments written on the questionnaires that the managers understand the importance of the new ways of working and are dedicated to creating and participating in a learning organisation. Life-long learning is seen as an important aspect with benefits for the organisation but also for individual careers and the careers of their subordinates.

However, there are also a number of obstacles varying from cultural issues for example that it is better for the career not to share lessons learnt and thereby indicating that mistakes have been made, to perceived ownership of knowledge. Some of the managers regard their experience, knowledge and even information as their property and as such provide them with a sense of power. This is also found in other organisations by Davenport and

Prusak (1997) who found that jealousy over resources and political battles frustrate the sharing of information. They claim that organisations need to develop an overall strategy for the use and sharing of information in which these aspects are taken into consideration. Some important questions in this regard are whether information must be seen as a commodity or a process, and whether it belongs to an individual or to the organisation by which the individual is employed.

The Intranet of the organization is seen by some managers as a means to store and distribute organisational knowledge, but some managers are also using a communal database to share information and best practices and manage the knowledge of the organisational unit they are responsible for. A number of knowledge management systems are in use whereby best practices are shared, and some communities of practice are established. Generally it was agreed that knowledge management is crucial for the organisation.

Generalizing from the case study there exist a need to include the following items in a training programme for managers.

- Functional knowledge of ICT
- Office applications

  The expectation is that these skills are sufficiently mastered during high school; however it is important to make sure that the students have mastered those applications sufficiently. A list of specific performance criteria in each of the applications could be compiled and the competence of each student regarding those items should be evaluated during the course of the study.

- Searching and evaluation skills using the Internet

  Students need to find and evaluate critically the information relevant to their research and future work field.

- Management of information and information management systems

  Students should have insight in the difference between data and management information and being able to present the information that they are responsible for in a suitable format as well as interpret information presented effectively. Furthermore, students should be given an opportunity to experience with information management systems in the context of their future work field.

- Communication on various levels using e-mail and other applications

  This aspect is emphasized by a number of interviewees who are of the opinion that students need to learn how to communicate appropriately using digital media.

- How to participate in a learning organization and knowledge management initiatives as well as and communities of practice
- ICT-security awareness

In general, interviewees indicated that they prefer that IS- competencies are developed *integrally in the context of the various subjects* and *the role of the leader needs to be emphasized throughout*. ICT needs to be seen as a tool to achieve effective leadership especially with regard to dealing with information and communication. In the training environment an integrated e-learning approach could be used to enhance most of the above items. This implies that the teaching staff needs to become involved in order to provide opportunities for the trainees to develop competence in those areas. In the last section of this paper the involvement of the academic staff in an integrated programme to support the development of IS competencies for managers is discussed.

INVOLVEMENT OF ACADEMIC STAFF IN AN E-LEARNING ENVIRONMENT

The teaching staff is an essential role player in implementing an e-learning environment (Reeves et al, 2005). Using the literature review, insight is obtained in factors that have an influence on learning and teaching in an e-learning environment and it can be concluded that teachers in an e-learning environment require different competencies compared to a face-to-face situation. It is important therefore that teaching staff members are properly prepared to deal with this adjusted way of teaching.

In order to prepare the teaching staff sufficiently to participate in this programme, it is proposed that a development programme for teaching staff will be made available. In this regard it is recommended a learning organization evolves where staff development and –support should be in constant demand.

From research done by Steyn (2001) about staff development it can be concluded that existing attitudes and learning cultures do not allow for self-development and that comprehensive staff development interventions are necessary. However, he has concluded that this is a complex problem and that different staff members will have different preferences in terms of developmental approach. Therefore, it is advisable that a variety of methods are used. Some examples are workshops and establishing communities of practice where best practices are discussed. Hence an ideal situation appears to be to create a learning organisation where as many staff as possible can seize opportunities and participate to create a blended learning environment where the students could develop the IS competencies that they need. In this light the results of the research done by Agelink (2004) are also relevant. He concluded that a community of practice for teachers offers advantages for the organisation, the teachers as a team as well as for individuals.

According to Steyn (2001), time constraints of teachers who want to become involved in such a development programme need to be solved. Furthermore, the increased workload as a result of participating in new ways of teaching needs to be taken into consideration (Adendorff, 2004). Another hindrance of teachers becoming involved in new initiatives is often a lack of confidence (Burns, 2003). This is a further motivation for a staff development intervention. Burns claims that teachers need to be empowered by giving them proper training, making resources available and giving encouragement so that teachers can become creative. He argues further that creative teachers can inspire students to become creative themselves and prepare them to become creative leaders. Creativity is one of the most important competencies of leaders in the current information society (Robbins and Coulter, 2003; Zaccaro et al 2006; Burns, 2003 and Yukl, 2006). According to De Villiers (2002) creativity could be enhanced in an e-learning environment. She claims that creative and innovative learning experiences motivate the students to participate as well as stimulate creative cognitive processes.

McPherson and Nunes (2004) argue that if learners are expected to develop high cognitive skills such as reflective analysis and meta-cognition, teachers should have these skills themselves. Zaccaro et al (2006) claim that adaptive performance like handling emergencies, crisis situations or unpredictable work situations could be enhanced using simulations and gaming.

To implement a successful digital learning programme across the curriculum it is important to ensure that the quality is acceptable. Geerligs, Mittendorf and Nieuwenhuis (2004) found in this regard that when the quality of such innovations is not ensured innovations often do not last. In this sense it is also important to make sure that the participating teachers are able and motivated to deliver the required quality (Fresen, 2005).

DISCUSSION AND RECOMMENDATIONS FOR FURTHER RESEARCH

The conclusion can be drawn from this research that when the technology is available it does not automatically happen that people know how to use it effectively. This is in accordance with the experience of Harrison and Kessels (2004) and Davenport and Prusak (1997). Furthermore, from this research can be concluded that it is important for managers to learn how to use software effectively in the context of their work situation. This is in accordance with the research results from den Boer and Hövels (2003). Hence, it appears to be important to design a specific learning programme so that learners could master the new format, content and variety of dealing with information effectively in the information society (Town, 2003) in the context of the work field. However, such a learning programme needs to be re-evaluated over relative short periods of time, along with corresponding competency models (Zaccaro et al., 2006).

Furthermore it needs to be noted however that innovation and change in education is a difficult process and that it has a serious impact on all the actors (van der Klink, Kallenberg and Valcke, 2002). The teachers should be given time and support when they participate in an e-learning environment. Education should thus be seen as a process (Plomp, 2006) and a development programme for teachers also needs to be continually evaluated and adjusted where necessary.

Since adaptivity, creativity and learning how to learn are seen as essential competencies for leaders in a fast changing environment (Yukl, 2006; Zaccaro et al, 2006; Hargrove, 2001; Robbins and Coulter, 2003) it appears important to obtain further insight in how those competencies could be developed and what the role of an e-learning environment could be in supporting the development of those competencies. Ausubel (2000) claims in this regard that creativity can only be achieved through continuing attention.

It appears worthwhile to research what kind of information, communication and technological online performance support would be useful to managers and how this could be made available in the digital work environment. This could limit the amount of training time away from the workplace and could provide support at the time that it is required (Rosenberg, 2006; Rosett, 2007).

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Beyond Stereotyping: Understanding Student Readiness for Network Centric Learning

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ABSTRACT

Many commentators and educators credit commencing university students from the 'Net' or 'Y' generation with being well versed in the use of today's wide range of sophisticated information and communication technologies (ICT) such as the latest Web 2.0 applications and services. Yet to date few studies have sought empirical evidence of these students' actual ICT experiences, attitudes, and expectations as they enter higher education. Furthermore we argue that defence academies constitute a special case and warrant such studies given that the characteristics of their student populations may differ considerably from their public university counterparts.

This paper reports the findings of a comprehensive study of pre-entry ICT experiences, skills, and attitudes of first year students at the Australian Defence Force Academy. The aim of the study was to gain an accurate understanding of students' pre-entry use of ICT as an evidence-base for making informed decisions about the educational deployment of, and developmental support for, Technology Enhanced Learning and Teaching (TELT) at the Australian Defence Force Academy (ADFA).

The paper, by providing valuable evidence about students' pre-entry use of ICT, helps to identify barriers to the expanding educational use of ICT and offers valuable insights into opportunities for future developments. We show how defence education and training establishments can make evidence-based decisions on how best to allocate time and resources to meet both rapidly evolving education technologies and the skill requirements of Network-Centric Warfare & Security (NCW/S) environments.

The paper raises the importance of replacing assumptions and anecdotal evidence about Generation 'Y' students with an empirical, evidence-based framework for the design of network-centric learning that takes account of their actual ICT skill levels and the need to build ICT related graduate attributes required for competent operation in digital rich Network-Centric Warfare & Security (NCW/S) environments.

Keywords/phrases: Network-Centric Learning; Network-Centric Warfare& Security; student ICT skills; student engagement; first year experience; faculty/academic development

"Just because kids don't watch the 6 o'clock news and listen to 612 ABC doesn't mean we don't care about issues. Because we spend the majority of our time on computer these days our suburb is Australia, and our neighbourhood the world. We are exposed to so much more information at such a younger age than our parents were that for some people it's scaring having their eyes opened that early. The computer isn't file sharing to us, it's access to our world."

UNSW@ADFA first year student

INTRODUCTION: SETTING THE SCENE

Of late, many commentators credit the 'Net' or 'Y' generation (or 'NetGen'), having grown up in the digital era, with being naturally at home with the wide range of sophisticated information and communication technologies (ICT). The ICT familiarity of these 'digital natives' is juxtaposed against the 'digital immigrants' who haven't (Prensky, 2001). Consequently many educators therefore automatically assume that, as first year university students, these 'digital natives', also known as 'millennials', possess a well, if not highly, developed knowledge and understanding of ICTs such as the latest Web 2.0 applications and services and high level of use. Not only is much of the evidence in support of these claims anecdotal but the same goes for claims to the contrary. To date relatively few empirical research studies have sought to ascertain the actual ICT experiences, attitudes, and expectations of these millennials as they enter higher education. Prominent are the ECAR Studies of U.S. universities and colleges (Salaway, Caruso, & Nelson, 2007, 2008), the JISC research in the UK (Conole, de Laat, Dillon, & Darby, 2006) which drew on Kirkwood & Price (2005), the research-based study of Trinder, Guiller, Margaryan, Littlejohn & Nicol (2008), and in Australia, the survey of first year University of Melbourne students by Kennedy, Krause, Churchward, Judd, & Gray (2006). Even then, and with the notable exception of the Australian study by Kennedy et al. (2006) all have targeted multiple institutions and therefore tend to present broad-brush data. In addition all are one-off snap-shot studies except for the longitudinal ECAR studies.

Yet there is no certainty that the studies that have emerged are necessarily applicable to particular institutions in specific geographic and cultural locations and at different points in time. A case in point are defence related pre-service education establishments. To our knowledge, apart from our study, no Joint Professional Military Education (JPME) establishments have yet published research on their students' pre-entry experiences of established and emerging digital technologies. Moreover, and as explained in more detail below, we argue that studies of students' pre-entry ICT experiences at defence academies and colleges are particularly important given the likelihood that their student profile will possibly differ substantively not only from students entering public universities but also compared to students from defence academies elsewhere. At any rate, while we can draw ideas from these surveys and learn from them they, like our own study, remain, in terms of their particularities, largely context specific. Therefore although the specific results of this study apply to ADFA, our experiences with the survey process in a joint military-civilian education establishment does point to the value of this method, to lessons learned, and to a set of pertinent points to consider in education design, student scaffolding needs and staff development strategies.

OUR CONTEXT

The University of New South Wales at the Australian Defence Force Academy (UNSW@ADFA) in Canberra is a centre for higher education for the Australian Defence Force. It is a sub-campus of The University of New South Wales, one of the largest Australian universities, having a student population of more than 35,000 and a full-time staff of some 5000, of whom more than 2000 are teaching and research staff. UNSW@ADFA offers undergraduate programs leading to UNSW bachelor degrees in Arts, Business, Engineering, Science, and Technology. Additionally we offer opportunities for graduate study and research leading to higher degrees, diplomas, and certificates. UNSW@ADFA undergraduate students are mid shipmen of the Royal Australian Navy and officer cadets of the Australian Army and Royal Australian Air Force, who are in residence at the Academy, as well as other members of the Australian Defence Force who enter as mature-age students. Although registration for higher degrees is available to both military and civilian applicants entry to undergraduate programs at the Academy is only possible through a military selection process. Because of this selection process, these students are a specific group and warrant special analysis. The survey about their pre-entry ICT experiences provides us with an opportunity to develop a detailed profile of our students. This in turn will give us an evidence-based point of departure for effectively tailoring and scaffolding our e-learning environments to reflect and build on their ICT skill strengths as well as address any gaps. While this is of particular importance in giving them a successful first year transition experience it also provides a baseline for devising strategies to achieve ICT related graduate competences and provide for appropriate faculty/academic development. Hence the survey results provide a perspective on both their entry as well as exit level digital proficiency development needs.

ICT AND THE FIRST YEAR EXPERIENCE

There are at least two important reasons for focusing our attention on first year students and both are about building our capacity to develop and adopt more strategic approaches to technology enhanced learning and teaching (TELT) in our context specific JPME establishment. First, as Kraus (2006:1) points out, "students, themselves, are highly strategic and universities need to be proactive in shaping novice students' experiences, attitudes, and behaviours". To do that; being proactive in shaping our students' ICT experiences, skill sets, and expectations demands having an accurate evidence-based point of departure on which to build and, as Kraus (2006:1) notes, "being responsive to the [constantly and sometimes rapidly] changing environment in which students live, study and work". Second, the first year is a critical transition year. Whether they are enrolling straight from school or, as in the case of mature age students at ADFA, returning to study and officer training after many years in the ranks, they face a range of challenges adapting to a new environment. Incoming students have to adjust rapidly not only to their learning of disciplinary content but also to a new e-learning environment. Moreover the enculturation into a military culture that is a decisive feature of all military education institutions such as at ADFA further exacerbates the transitionary pressures on our first year students.

Additionally, the increasingly significant role of ICT in learning and teaching means that incorporating appropriate e-learning policies supportive of strategies that scaffold staff and student engagement in TELT is also critical in an already stressful new environment. Hence, at the level of policy and procedure, we apply to the field of TELT Krause's (2006:3-4) dictum that "responsive policy-making is primarily enabled when decision-makers are well informed about who their first year students are (background, learning needs, expectations etc.) and how best to support them before, during and beyond the first year. A key to addressing the latter is a sound knowledge of institutional capacity, curriculum issues, staff development needs, and the like".

In concluding this section we point to a first year experience study conducted at The University of Sydney. Asmar, Brew, McCulloch, Peseta & Barrie (2000:5) reported that "academic staff's expectations of new students' abilities and knowledge are often unrealistic, and some students discontinue as a result of pressures arising from this mismatch". Our research shows that such a mismatch regarding expectations around ICT skill levels may indeed be likely given that incoming students may not exactly be the 'digital natives' that education designers and academic staff might imagine them to be.

ICT AND A SYSTEMIC APPROACH TO BUILDING GRADUATE ICT ATTRIBUTES

It is clear that as officers, our graduates will make increasing use of a broad range of dense and sophisticated ICT interfaces to optimise vertical and horizontal communications in Network Centric Warfare and Security (NCW/S) environments. It is imperative therefore that UNSW@ADFA prepares officer graduates to be comfortable and competent in such highly digitised operational environments that may also, in joint operations, require high level intercultural communication skills.

This calls for the design and scaffolding of appropriately targeted TELT strategies or virtual learning environments (VLE) in our undergraduate programs to ensure that on graduation students have achieved NCW/S related graduate attributes or competences. However designing and supporting such TELT strategies demand an accurate knowledge of baseline entry-level ICT skills and experiences of incoming students as well as desired exit-level ICT competences of graduates.

The necessity for framing VLE design and staff development around evidence-based data of ICT familiarity is further exacerbated by the ongoing revolution in web based ICT such as the introduction and widespread popularity of Web 2.0 social networking applications and services (Eijkman & Clarke, 2007; Eijkman, 2008; Eijkman, 2009a forthcoming; Eijkman, 2009b forthcoming). These developments are driving significant changes in both higher education and in military communication practices. These will place increased pressure on JPME programs to provide their students with VLE that better prepare them, as graduates, to operate effectively in increasingly complex NCW/S environments.

THE LITERATURE

We conducted a broad-based sweep of the literatures around the ICT experiences of higher education students and of Network-Centric Warfare and Security (NCW/S) communication competences.

Much is made in the educational literature of the growing gap between (allegedly) digitally smart 'Gen Y' students and the old guard of 'Gen X' faculty. For example the Horizon Report (2008:7), reflecting conventional wisdom, notes, "the gap between students' perception of technology and that of faculty continues to widen. Students and faculty continue to view and experience technology very differently." Our survey means to question this assumption. We suspected, from anecdotal evidence, that the realities were much more complicated.

Although, as indicated earlier, empirical research is only slowly emerging, the concern about the educational implications of social networking among young people in particular is increasingly evident in the literature. A number of existing reports and papers discuss this issue. For example, Oblingers' (2005) "Educating the Net Generation". Curtis Bonk has, on his Website (http://php.indiana.edu/~cjbonk/) , a wide array of reports and papers which include a focus on student attitudes. Trinder et al (2008) in their report "Learning from Digital Natives: bridging formal and informal learning" also provides valuable insights having included the perspectives of faculty/academics. In addition the Joint Information Systems Committee (JISC – UK) has an extensive resource list of eLearning research including issues relating to students and staff uses (http://www.jisc.ac.uk/publications.aspx).

There is not the scope here for an extended summary of the literature though we will refer to some of their findings in the discussion section below. Suffice to say that the literature certainly has begun to make us more aware of the complexities, dilemmas, and contradictions surrounding the ICT literacy levels of our new generations of students and the various gaps that are likely to exist between these students and some of our more technologically conservative members of faculty. The overall message of the research literature appears to be twofold. First there is the implicit suggestion of the importance of questioning some of the popular assumptions associated with students' familiarity with new emerging social networking media. The second and related message is that given the complexities, there is value in gathering specific, empirical information on which to build learning architectures, staff development programs, and student support initiatives.

As to the NCW/S literature, at present we are not cognisant of any literature that discusses or specifies the expectations of defence establishments in terms of the ICT competences they demand of their new officers as they exit their undergraduate programs.

Similar to our knowledge of entry-point ICT experience levels of incoming first year students, our knowledge of NCW/S competences is also based on anecdotal evidence and is therefore at best equally sketchy. In response we decided to supplement our project on undergraduate students' pre-entry use of ICTs, at a later date, with another project that aims to ascertain and identify graduate NCW/S competences. However, the project to obtain data about our undergraduate students' pre-entry use of ICTs is the focus of this paper.

THE RESEARCH PROJECT

The paper will present our project design, its data collection method, results, and evaluation of the process. The results of the study indicate that a reliance on populist Generation 'Y' stereotyping for deploying VLE is likely to be problematic in terms of effective student engagement and the targeting of staff development. The findings present a salutary lesson in not stereotyping 'Gen Y' students currently entering our military education establishments and points to the value of extending this survey to cover students in other Academies and the academic/instructional staff who role it is to engage them in network-centric learning.

We conclude by suggesting that, contrary to the frequently cited concerns about access or the provision of content, these are not necessarily pivotal to understanding how students can best benefit from the implementation of technology in higher education. Instead, our study demonstrates the value of gaining an accurate understanding of the ways in which students use and experience digital technologies in complex and often contradictory ways according to their social as well as their educational trajectories.

THE PROJECT DESIGN

Given TELT design and staff development pressures, the pre-entry undergraduate ICT study was initiated by Allan Herrmann who, as Manager of UNSW@ADFA's Education Technology Services (ETS), proposed and received permission to adapt and use the survey used in the comprehensive ECAR Study of Undergraduate Students and Information Technology, 2007 (Salaway, Caruso, & Nelson, 2007).

Some studies, such as the *ECAR Study of Undergraduate Students and Information Technology* do provide extensive data but have limited generalisability as it draws only on U.S. institutions and students. To date we have no empirical data on Australian JPME institutions.

This study comprises our first step in beginning to fill this knowledge gap and aims to provide UNSW@ADFA with comprehensive information on pre-entry ICT related experiences, behaviours, preferences, and attitudes of ADFA first year undergraduate students. The results of the study, for which ethics approval was sought and granted, will assist UNSW@ADFA to plan for, resource, and design appropriate e-learning architectures, student support and staff development initiatives.

Popular descriptions of the 'Net Generation' (Gen Y', the 'millennial', etc.) abound, mainly due to their enthusiastic and almost 'natural' uptake of new technologies; in particular ICT based social networking

applications. As a result educators and educational designers, on the basis of anecdotal information, may find themselves consciously or otherwise responding to the imagined demands of stereotypical students. Rather than having stereotypes inform the design of our TELT initiatives we have instigated this research project to clarify the ICT profiles of our students and provide for an evidence-based planning process. Accordingly we designed and developed the survey with three specific outputs in mind:

- Descriptors of student attitudes and skills to inform course development and implementation;
- Baseline information to drive evidence-based changes to meet graduate attributes for ICT literacy; and
- Potential benchmarking against other organisations

Project outcomes also include our ability to engage in comparative research with other defence academies and colleges.

To obtain this pre-entry information our project draws on an adapted version of the ECAR study by using only its survey questionnaire. We decided against the additional use of focus groups as, compared to the ECAR study's survey being used in 98 institutions, our extended survey was deemed sufficient given its use in one relatively small institution of around 1035 UG students. At the time of our survey 409 students were in their first year of study. Of these 83 (21%) were female, and 326 (79%) were male.

This survey is based on the EDUCAUSE Centre for Applied Research (ECAR) survey deployed in 2007. EDUCAUSE (http://www.educause.edu/) implements this survey annually to study the changes in ICT in higher education in the US. The authors altered the 2007 survey with the permission of ECAR to contextualise it for Australian higher education in general and for higher education in the Australian Defence Force Academy in particular. We adapted the ECAR questionnaire by contextualising some of the questions and by including a special focus on student participation in social networking thus pre-empting similar changes made by ECAR in their 2008 survey instrument. Like ECAR we too aim to make this survey the first in a longitudinal study and apply a modified survey every second year. Subsequent First Year survey instruments, rather than covering base information that is not likely to change (such as experience of ICT in school and basic word processing skills etc.) will focus specifically on current developments such as the use of post-Web 1.0 social networking media. We also intend to survey the same cohorts at the completion of their three or four year program to ascertain changes and the development of ICT related graduate attributes during their studies at UNSW@ADFA.

The survey questionnaire (available on request from the authors) is primarily reliant on quantitative data with a small amount of qualitative data being provided by a few open-ended questions. The survey was administered online (via SurveyMonkey – www.surveymonkey.com) and made available to all first year students in the first semester (during July) 2008. Invitations to participate were sent to students via their Divisional Officers.

In addition to asking about student ownership, experience, behaviours, preferences, skills, and perceptions with respect to information technologies, we also included a special focus on their pre-entry participation in Web 2.0 social networking applications and services. Hence the survey asked students about:

- Their background (e.g. gender, age, residence address, their intended major etc.).
- The kinds of information & communication technologies they use and how often.
- Their skill levels in using different information & communication technologies.
- How these technologies might contribute to their undergraduate experience.
- Their previous experiences of ICT in other educational settings.
- Their perception of the value of ICT in learning and teaching in higher education.

The survey was administered online during July 2008 to first year undergraduate students. Out of a cohort of 490, 160 students responded to the survey. The response rate of 39 % was considered acceptable and indeed the demographic breakdown of the respondents, such as the gender, reflected that of the broader first year cohort.

SURVEY RESULTS

We benchmark our results against the 2008 ECAR survey given the overall similarity between these survey instruments. Therefore, when used, the comparison statistics in this paper are from the 2008 ECAR survey. However they should be interpreted with care. While the questions being compared are very similar there were changes made to contextualise the survey for Australian conditions. Also, given our aim to capture pre-entry experiences and skills our survey was undertaken at the beginning of the year. In contrast to our responses which were based on experience prior to entry to UNSW@ADFA, the ECAR survey focuses specifically on the current higher education experience of the respondents.

RESPONDENTS

The respondents were, in the main male (Table 1). The gender balance among respondents reflects the enrolment patterns at UNSW@ADFA. Similarly, the age range from 17 to 21 is the range for most first year undergraduates who arrive directly from school or after a year's work (including as a member of the Defence Force) or time off (Table 2).

Table 1: Gender		
(n=160)	n (160)	Percent
Female	39	24.4
Male	119	74.4
Missing	2	1.2

Table 2: Age		
Age	n (160)	%
17	20	12.5
18	91	56.9
19	33	20.6
21	6	3.7

The percentages identifying the Military Service into which they would enter following graduation also reflected the enrolment patterns (Table 3 below).

Table 3: Service after graduation		
(n=160)	n	%
Air Force	58	36.3
Army	69	43.1
Navy	20	12.5
Missing	13	8.1

LEVEL OF DIGITAL TECHNOLOGIES OWNERSHIP

The level of ownership computers by first year students indicates a clear preference for laptops (Tables 4 & 5). One might speculate that the perceived convenience and mobility (size) with respect to a laptop in the student rooms or moving around campus were two of the reasons for the preference. While the ownership of laptops less than one year old is significantly below that of 'Freshman' in US higher education (46.3% compared with 71.1%), when laptops between one and two years old are added, the percentage is much closer at 69.4%.

Table 4: Ownership of PC		
(n=160)	n	%
Don't own one	98	61.3
less than one year	28	17.5
one year	5	3.1
two years	8	5.0
three years	2	1.3
four years	1	.6
Missing	18	11.3
Total	160	100

Table 5: Age of personal laptop		
(n=160)	n	%
Don't own one	18	11.3
less than one year	74	46.3
one year	37	23.1
two years	18	11.3
three years	4	2.5
More than 5 years	1	.6
Missing	8	4.9
Total	160	100

Unlike the US where two-thirds of (ECAR survey) respondents owned an internet-capable phone, only 7.2% of first year ADFA students owned such a device.

The only statistically different level of ownership related to males having higher levels of ownership than females of digital game devices. Otherwise, broader stereotypes of males having higher device ownership proved to be untrue for this cohort.

Table 6 Ownership of other devices	*Responses*		*Percent of cases*
	n	*%*	
Simple mobile phone (without Web access)	134	40.0	86.5
Personal digital assistant (PDA) (e.g. Palm, etc.)	10	3.0	6.5
Smart phone (combination cell phone & PDA e.g. Black Berry)	24	7.2	15.5
Digital music/video device (e.g. MP3 player; iPod, etc.)	120	35.8	77.4
Digital game device (e.g. Game Boy, Xbox, PlayStation, etc.)	47	14.0	30.3

ONLINE ACTIVITIES

Indeed, neither was there any significant difference between males and females in the average number of hours per week spent online in the past year. With a mean of 23.8 hours, our first years spent more time online than do their US counterparts (average of 19.6 hours per week reported in ECAR 2008). However, the results suggest (using binary logistic regression) that our female students spend significantly less time than males (a) accessing or using wikis and (b) playing computer games on their own or with others online. Conversely, males spend significantly less time than females on library websites, downloading music/videos, blogging, participating in virtual worlds and using spreadsheets/charts. (As an aside, there was no significant gender difference as far as online shopping is concerned!)

Table 7 (a) Total average number of hours per week			
Mean = 23.8	Median = 19.0	Mode = 16.0	Std Deviation = 17.186

Table 7 (b) Hours each week normally spent doing online activities				
Average hrs/week	Formal education	Work	Social interaction	Personal use
Mean	6.67	4.62	7.17	7.15
Median	5.00	3.00	5.00	5.00
Mode	4	2	10	4
Std. Deviation	5.888	4.141	6.766	6.319
Minimum	1	1	1	1
Maximum	32	27	40	35
Valid (n)	152	131	151	155
Missing	8	29	9	5

DIGITAL COMMUNICATION PREFERENCES

Interestingly, our students come through as 'conservative adopters'. Table 8 indicates that less than half of the respondents consider themselves to be 'new adopters' of new technologies. This is a critical piece of evidence given our assertion that, given the background and experience of our intake cohort, we need to proactively work to change attitudes and skills.

Table 8: Which of the following best describes you?	*n (160)*	*%*
I am usually one of the last people I know to use new technologies.	16	10.0
I like new technologies and use them before most people I know.	41	25.6
I love new technologies and am among the first to experiment with and use them.	22	13.8
I usually use new technologies when most people I know do.	68	42.5
Missing	13	8.1

We are often told of the desire to this generation to communicate through text and instant messaging (IM). However, our cohort of entering students prefers to communicate with the university, particularly regarding administrative matters, through the "older" technology of email.

Table 9: university communication preferences - administration								
If UNSW could communicate with you in any form regarding administrative information, what would your preferences be? (maximum of three)								
Total 235	Instant Messaging	E-Mail	Text Messaging	Web Site (Portals)	Paper Mail	Blog	Wiki	No Preference
Frequency	12	140	23	34	18	2	4	2
Percent	5.1	59.6	9.8	14.5	7.7	0.9	1.7	0.9
% cases	8.1	94.6	15.5	23.0	12.2	1.4	2.7	1.4

Similarly, with regard to teaching and learning, students prefer email communication. While personalised portals have more support 'texting' has less. Perhaps one could argue that the 'ephemeral' nature of texting is recognised by students and a more 'substantial' form of communication is preferred. However, the clear preference of email over 'paper mail' for significant 'legal' and administrative communication needs to be noted as well. This preference continues for teaching and learning communications (outside of the Learning Management System) (LMS) (Table 10).

Table 10: university communication preferences - learning and teaching								
If UNSW could communicate with you in any form regarding learning and teaching, what would your preferences be? (maximum of three)								
Total 237	Instant Messaging	E-Mail	Text Messaging	Web Site (Portals)	Paper Mail	Blog	Wiki	No Preference
Frequency	14	131	18	46	16	2	6	4
Percent	5.9	55.3	7.6	19.4	6.8	0.8	2.5	1.7
% cases	9.5	88.5	12.2	31.1	10.8	1.4	4.1	2.7

Social Networking

Significantly, while a very high percentage (22.4%) do not use Social Networking Sites (SNS), overwhelmingly respondents who do use them use them at least once per week, but more than likely much more than that (Table 11). This level of use does not match that reported in ECAR 85.2%. Therefore, it might be presumed that the use of SNS by our students will increase.

Table 11: Participation in online social networks									
(n=160)	Never	Once per year	Once per semester	Monthly	Weekly	Several per week	Once per day	Several per day	Missing
Frequency	35	4	8	14	19	13	26	37	4
Percent	21.9	2.5	5.0	8.8	11.9	8.1	16.3	23.1	2.4

The other key aspect of their use of SNS is they use them for maintaining rather than establishing relationships. The emphasis on activity in SNS is very much social. To a much lesser extent than reported by ECAR they will communicate with classmates about course related topics and with lecturers/teachers hardly at all. Again, our students exhibit a preference for the separation of social and educational life through their use of different 'tools'.

Table 12: Reasons for using social networking websites (SNS) (choose up to 3)	Responses		Percent of cases
	n	%	
Did not use any social networking sites	34	8.7	22.1
To stay in touch with friends	114	29.2	74.0
Make new friends I have not met in person	20	5.1	13.0
Find out more about people (I may or may not have met)	45	11.5	29.2
Find someone to date	5	1.3	3.2
As a forum for expressing my opinions and views	11	2.8	7.1
Share photos, music, videos and/or other work	72	18.4	46.8
For professional activities (job networking etc.)	5	1.3	3.2
Participate in special interest groups	18	4.6	11.7
Communicate with classmates about course-related topics	22	5.6	14.3
Communicate with teachers about course-related topics	2	0.5	1.3
Plan or invite people to events	41	10.5	26.6
Respond to site advertisements	2	0.5	1.3
Total	391	100	253.9%

There were some significant differences found between the genders concerning why they would not have participated in a social networking website. Males said they did not like them more than females, but were less concerned with privacy and security issues less than females (Table 13). Another significant result from a slightly unreliable test (the percentage of expected frequencies less than 5 was 25% rather than the hoped for 20% or less) was that males did not know how to use the networking sites less than expected by chance. This may be related to relative differences between males and females in terms of oral communication rather than any technical artefact.

Table 13: Reasons for not having used social networking websites (choose up to 3)	*Responses*		*Percent of cases*
	n	%	
Don't like them	32	12.3	25.8
Don't know how to use them	14	5.4	11.3
Too much time and effort required	65	25.0	52.4
Not interested	40	15.4	32.3
Little or slow network access	20	7.7	16.1
Access is blocked by my provider or institution	11	4.2	8.9
Privacy concerns (e.g. misuse of information)	48	18.5	38.7
Security concerns (exposure of files to viruses etc.)	30	11.5	24.2
Total	260	100	209.7

So, if the use of SNS in teaching and learning is not a high priority for students, what might be the possibility of using social technology components e.g. tools facilitating more collaborative approaches? Access to and skills with, wikis and blogs were also canvassed in the survey. We have already identified from the survey that female respondents tended to the use of blogs whereas male respondents identified a preference for wikis. In any event, as Tables 14 & 15 show there is a considerable differential of use by respondents. Less than 20% of respondents used wikis (Table 14) more than once per week.

Table 14: Access to or use of wikis									
(n=160)	Never	Once per year	Once per semester	Monthly	Weekly	Several per week	Once per day	Several per day	Missing
Frequency	51	3	12	14	18	28	12	16	6
Percent	31.9	1.9	7.5	8.8	11.3	17.5	7.5	10	3.8

The use of blogs was even less, with fewer than seven percent of respondents using a blog more than once per week. These are important issues in a context where collaborative working skills are a high priority with Defence. Students lacking the skill and motivation to use such tools will hardly motivate lecturing staff to incorporate these more collaborative tools into their digital learning environments.

Table 15: Access to or use of blogs

(n=160)	Never	Once per year	Once per semester	Monthly	Weekly	Several per week	Once per day	Several per day	Missing
Frequency	99	11	15	11	10	1	5	4	4
Percent	61.9	6.9	9.4	6.9	6.3	0.6	3.1	2.5	2.5

Hardly surprisingly, respondents rate their skills with these tools in proportion to their use. Of equal concern is the respondents' low self-perceived skill level of students for LMS (Table 16). This contrasts with their relatively greater confidence 'office type' applications and even maintenance activities. However, with no significant difference in gender in relation to use, skill perception etc. of use of LMS – it could be argued that, in our context at least, the use of a VLE does not 'privilege' one gender group over the other. This ties with the idea that the 'visual' anonymity provided by online environments can be positive in encouraging more open interaction. Hence, interaction in online learning can be more open.

Table 16: Skill level in using technologies and applications

(Scale: 1 = Poor, 4 = Excellent.)	n	Mean	Std Dev
Computer maintenance (downloading updates etc.)	152	2.62	1.035
Word processing (MS word, Word Perfect, etc.)	153	3.08	.799
Spreadsheets (Excel, etc.)	151	2.68	.820
Presentation software (PowerPoint, etc.)	150	2.83	.847
Graphics software (Photoshop, Flash, etc.)	143	2.15	.957
Video/audio software (Director, iMovie, etc.)	138	1.96	.927
Online library catalogues and resources	145	2.23	.788
Online Learning System (e.g. WebCT, Janison, Blackboard, Moodle, Sakai, etc.)	134	2.08	.832
Wikis	130	2.34	1.000
Blogs	113	1.92	1.036
Simulation games etc.	132	2.42	1.159
Second Life	91	1.43	.777

Respondents also appeared to be more positive about the usefulness of the more 'pragmatic' aspects of LMS based online learning. That is to say they saw the 'administrative support' tools in a more positive light (Table 17). Online quizzes and sample exams for learning, and submitting and tracking assignments online rated very highly whereas discussions and collaborative tools rate lower. Given these are incoming students, it may well be that this is their experience from secondary school or previous universities. The issue for us is to not assume high levels of engagement and experience with these collaborative tools. Therefore these is a need to ensure that as well as a content focus, there is an increasing focus on development of meta-cognitive skills in an ICT environment.

Table 17: Usefulness of online learning system features				
(Scale: 1 = Not useful, 5 = Extremely useful)	n	Mean	Mode	Std Dev
Online course outline	134	3.16	3	.972
Online readings and links to other text-based course materials	133	3.45	3	1.011
Online discussion board (posting comments, questions, and responses)	114	2.72	3	1.125
Online access to sample exams and quizzes for learning purposes	136	3.74	5	1.143
Taking exams and quizzes online for grading purposes	114	3.11	3	1.246
Submitting assignments online	128	3.54	5	1.235
Getting assignments back online from teachers with comments & results	125	3.45	3	1.215
Online sharing of materials among students	105	3.26	3	1.225
Creating/recreating knowledge with others e.g. collaboration using blogs	93	2.67	3	1.155
Keeping track of grades on assignments and tests online	134	3.81	5	1.118

In spite of a somewhat ambivalent attitude to collaborative tools in online learning in a face to face environment, (Table 18, first question indicates that the majority of respondents believe that their engagement is not increased by the use of online communication) respondents were still positive about the possible benefits in the use of ICT in their courses. (See the response to the question "I believe that the use of information and communications technology in my courses …." [Table 18], where no respondent strongly disagreed and the most common response was 'Agree'.)

Somewhat paradoxically, the majority do not believe that they need more training (probably in the technical use of the tools). However, as discussed later, in order to meet graduate attributes relating to skills for working in a network centric environment, students need to be 'trained' in higher level skills.

Table 18: Opinion about communication oriented ICT practices in your study						
(Scale: 1 = Strongly Disagree, 5 = Strongly Agree)	n	Mean	Mode	S/D	Min	Max
I am more engaged in courses that require me to communicate online than in courses that do not use them.	147	2.88	3	.824	1	5
Overall, my teachers/lecturers have used online communication technologies well in my courses.	146	3.41	4	.730	1	5
I will need more training on the use of online communication technologies that I am required to use in my studies.	147	2.56	3	.929	1	5
Most people my age would prefer to take courses that use online communication technologies extensively	147	3.29	3	.785	1	5
I believe that the use of ICT in my courses:						
• Could help me better receive course content.	148	3.66	4	.686	2	5
• Could help me better communicate and collaborate with classmates and others.	148	3.49	4	.695	2	5
• Could result in more prompt feedback from my teacher/lecturer.	148	3.73	4	.715	2	5
• Could allow me to take greater control of my learning activities.	147	3.54	4	.787	1	5
• Could help me do better research for my courses.	148	3.67	4	.794	1	5
The greater use of information & communication technologies in my courses can improve my learning at university.	147	3.73	4	.655	2	5

DISCUSSION

It appears that in general, gender differences do not play a significant role regarding attitudes to and use of online environments. For example there was no significant difference between males and females in the average amount of time spent online per week. The survey did pick up on males having higher levels of ownership of digital game devices compared to females. Pointedly, there wasn't any significant gender difference in online shopping. However, the results do indicate that our female students spend significantly less time than males in their use of wikis and on online computer games on their own or with others. At the same time males spend significantly less time than females on library websites, downloading music/videos, blogging, participating in virtual worlds and using spreadsheets/charts. Reflecting the increasingly ubiquitous access to the internet it appears that gender differences in web usage patterns may be diminishing. Consequently there are fewer gender issues to contend with from an educational perspective apart from scaffolding the use of blogs, wikis and online games in formal learning environments, but more on that below from a different perspective.

The research of Kirkwood and Price (Kirkwood and Price 2005) covering five years of data shows that student access to, experience of, and attitude towards digital technologies varies across subject disciplines. Interestingly this is not the case at ADFA. This, we suspect, may well be due to the selected nature of our cohort.

However, our findings do point to a gap between students' proficiency in using social networking in informal and social environments and their readiness to deploy those skills for the purposes of formal learning. It could be argued that they consciously differentiate between those skills and activities which are for their social life and those which are more formal and for education. Whether this is extended to the tools of SNS such as wikis and blogs is yet to be tested. The extension of this could be that before using these tools, we need to contextualise them more in the learning environment, indicating how they apply there. Such scaffolding need not be extensive or time consuming, but may increase appropriate use of and engagement with these tools.

Equally it could support the proposition that we, as educators, may use social networking tools within more conventional learning and teaching approaches and therefore differently to the way used by students.

For us, the major finding of significance is that we cannot assume that our students are Web 2.0 ready when it comes to the use of wikis, blogs and other social networking services and applications when applied to educational purposes.

By and large our students are not early adopters in that regard, certainly not as much as their American counterparts as evident in the ECAR research (Salaway et al. 2007, 2008). This means that if we are to increase the use of more sophisticated online tools geared to greater and more equal and transparent participation in knowledge creation we cannot simply assume digital proficiency from our students – even if they do use FaceBook etc. for hours on end for social purposes. The message is clear; we educational designers, academic developers and faculty and teaching academics must take positive steps to scaffold student learning in the use of social media in formal learning, and especially so when it comes to higher order digital communication tasks and skills. We can not simply take it for granted that direct transfer from one environment to another will occur: that our students have the ICT skills for formal educational purposes even if they do use social networking, and extensively so, for social purposes that may include much informal learning. The differences in formal and informal usages are also identified in the study by Trinder et al. (2008).

In addition, and alluded to in the responses we received to our survey, is that our first year students are not in the habit of using social networking tools or services for formal learning purposes. As shown in Table 12 student's most popular use of SNS were for staying in touch with friends (29.2%) and for sharing photos, music, videos etc. (18.4%). Tables 14, 15 show they use wikis and blogs at very low levels. This strong preference for the recreational use of these spaces may well explain students are beginning to report a resentment of the tendency of some universities and faculty/academics to extend their online learning presence to social networking sites such as Face Book. As Chowkat et al. (2008:39) point out, "It is often suggested that many of the leisure habits of young people – for example playing online strategy games and using online tools for socialising, co-operation and team work – involve skills which are useful for learning and work. However, it is also apparent that learners resist the intrusion of formal education into their leisure and social activities". Hence faculty/academics may need to approach their use of public social networking sites with some care. As always, and reflecting the participatory nature of the post-Web 1.0 world, negotiating such initiatives with students beforehand is highly recommended. Our students, while ambivalent about their engagement in these developing environments, are still positive and can see potential benefits. But more than that, the VLE which are implemented must have the flexibility to meet and develop the range of needs, skills and engagement of this cohort.

So, yet again, there is a need for the embedding of skills development in and already cluttered curriculum and skills development for busy teaching staff. In order to do this without overworking staff and students, we need to be specific regarding the graduate attributes or competencies which are required by Defence and focus on this. As a preliminary classification we could consider:

- Technical skills (including applications)
- Literacy skills (including how to find and evaluate information)
- Meta ICT skills (including those skills and understandings which enable individuals to construct their own competencies for highly proficient action and learning in online worlds)

By providing students with more authentic learning experiences, they can begin to see where and how these tools can be used successfully and critically evaluate them for future work environments. This is particularly important if we believe that the responses from our students indicate that they learn about 'living' in the online environment by doing, perhaps making mistakes, asking for assistance from their peers or from others 'somewhere on the internet'.

IMPLICATIONS FOR NETWORK CENTRIC LEARNING AT UNSW@ADFA

The survey also points to the need to look beyond skills and skill development to helping students (and staff) to adopt different ways of thinking about how to approach social networking applications. The survey suggests that students still tend to be product rather than process oriented when it comes to Web 2.0. The implication for VLE design and course development is to consider how to shift the mindset or mental models of students to include a focus on process; on different ways of learning. At the moment because of their prior experiences students are much more likely to be interested in the 'product' of online learning, that is on its artefacts rather than on interactivity and participation that are the hallmark of Web 2.0 (Eijkman, 2009 forthcoming). This means that if we are to shift in the direction of constructivist or even social constructionist approaches we have a lot of scaffolding to do.

However, Table 18 also clearly indicates that students see considerable value in having effective e-learning environments available to them and therefore appear to have the motivation to shift their mental models and learn the associated skills. Our survey appears to support the surveys administered to first year students at St Lawrence University. These show that regardless of their ICT proficiency levels, students express a strong desire to enhance their ICT skills. For example "55 percent believe that it's very important for faculty to expect students to keep up-to-date with their technology skills, and 72 percent believe that advanced technology skills are very important to their career objectives" Sullivan (2008:11).

However, this points to an increased workload for academic staff as well as students, and this in an already often considerably overloaded curriculum. This is particularly relevant to UNSW@ADFA where nearly 50% of our students are enrolled in engineering programs which are notorious for having higher than average workloads. This is an issue that requires careful attention.

The practical implications are that we need to provide both staff and students with flexible environments that are enriched by multiple approaches. This includes, for example, supporting staff in providing students with social networking tools (blogs, wikis) without having to go to external SNS services to access them.

The survey and consequent development work also points to the imperative to engage in ongoing research both internally and externally. In terms of the former we intend to engage in longitudinal studies to ascertain shifting patterns of use, expectations and development of student and staff approaches to, and skills in, social networking. In terms of the latter we invite other professional military education establishments to engage in comparative research about student and staff experiences of and approaches to social networking.

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Distance Education and e-learning in the South African Military[1]

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INTRODUCTION

When writing about contemporary South African military issues, scholars face some difficulty.

Firstly, very little, if any, scholarly research emanating from within the military is being published in South Africa or elsewhere at present. On the surface it appears as if the military in general do not engage the community at large on a more intellectual level. What is more, the South African National Defence Force (SANDF), like the broader public sector in South Africa, seems to have gone into a mode of self-protection. Very much like the pre-1994 South African military, the self-protection of the SANDF manifests itself, it seems, in an overemphasis of or fixation with military security.

Secondly, media coverage of the military in South Africa is mostly of a sensational nature. Stated differently, there is not much in-depth media interest in and investigative reporting on things military in South Africa. The South African military in general has a difficult relationship with the media to the extent that the SANDF displays a type of lager mentality when interacting with the media. Certain sections of the military, the Navy in particular, seem to have a more proactive approach in dealing with the media. This is the exception, though, rather than the rule.

Lastly, since 1994, scholarly interest in the South African military has also faded with the shift in societal interest away from military security-related issues. As a result, substantiating many of the observations pertaining to contemporary South African military issues is a real problem. **The observations about the SANDF in this paper should therefore be seen as tentative and exploratory in nature.**

The purpose of this paper is to provide some higher order perspective with regards to distance education (DE) and e-Learning against the general background of Education, Training and Development in the SANDF.

The history of education in South Africa in general and in the military is complex. Like militaries the world over, the South African military is dependent on the general educational system in South Africa to provide it with quality products. And, like most other societal matters, education and its influence on the South African military has a long history.

EDUCATION IN THE PRE-1994 SOUTH AFRICAN DEFENCE FORCE AND THE INTEGRATED REVOLUTIONARY ARMIES

The history of education in the South African military is as controversial as the history of education in the country at large.[2] The immediate security situation that confronted the pre-1994 South African Defence Force (SADF) steered it away from a knowledge-based educational approach towards an emphases on training and experience. This was one of the reasons underpinning the very tactically and operationally mindedness of the SADF. An academic education in the SADF was seen as a "nice to have". Academic education was never an integral part of the career paths of the officers. The SADF, in essence, was a warfighting force with an emphasis on operational and tactical matters,[3] or, as Seegers explains, "military experience counted more than intellectual or staff ability" and "the action was in the line".[4] The SADF favoured tactical and operational training and experience and, as a result, did not develop a knowledge-driven institutional culture based on higher education.

The non-statutory forces who[5] were integrated into the SANDF were highly politicised[6] and very "streetwise".[7] Revolutionary wars and revolutionary forces by nature necessitate a political and strategic orientation. Revolutionaries do not become politically and strategically minded through military training and warfighting. World-wide and throughout history, revolutionary armies have been known for their (political) education (indoctrination some would argue). Part of the ingrained culture of the non-statutory forces had been to

2 For a more detailed discussion of the history of education in the South African military see the following article: Esterhuyse, AJ, "Professional Military Education and Training: Challenges Facing the South African Military", *Defence Studies*, Vol 6, No 3, Sep 2006, pp. 1–23.

3 Esterhuyse, AJ, "Management and Command in the SANDF: Changing Priorities", *Strategic Review for Southern Africa*, Vol XXVI, No 1, May 2004, pp. 47-48.

4 Seegers, A, *The Military and the Making of South Africa*, Tauris Academic Studies, London, 1996, p. 141.

5 None of the forces that fought the apartheid state were part of a bureaucratised professional statutory armed force. They were the armed wings of political movements: *Umkhonto we Sizwe* (MK), the armed wing of the ANC; the Azanian People's Liberation Army (APLA), the armed wing of the PAC and the KwaZulu Self-Protection Force (KZSPF), the armed wing of Inkatha. Since 1994, these forces are referred to as the "non-statutory forces".

6 Heinecken, L, "South Africa's Postmodern Military: Adapting to the New Strategic and Political Environment", Paper presented at the First Cranfield University International Conference on Defence Management, Cranfield University, Shrivenham, United Kingdom, 24-25 April 2003, p. 10.

7 Interview with senior SA Army general at the Military Academy, 7 Dec 2004.

resist, defy, test, protest and challenge official authority.[8] This kind of ethos is diametrically the opposite of the traditional disciplined regimentalised military culture found in armed forces the world over. Non-statutory force members were trained and (in some cases) educated in various places in the world.[9] This, at least, provided them with a broader worldview than most of their colleagues from the SADF. There is reason though to question the tactical warfighting training and experience of the majority of the non-statutory force members who were integrated into the SANDF.[10]

Cawthra argues it will be more correct to talk about the absorption of these guerrilla forces into the bureaucratised South African military than to talk about the integration of the different forces into one statutory armed force. These forces had problems accommodating themselves in a conventional (bureaucratised) armed force.[11] There were in reality a very high level of continuity between the SANDF and the SADF. As a consequence, the tradition of education as a "nice to have" was carried over to the SANDF. One analyst pointed out that the SANDF, like the SADF, does not commission officers. Rather, it trains "… functionaries, uniformed civil servants".[12] Education is still not an integral part of the career of an officer in terms of being institutionalised and thus a requirement to become an officer or for promotion to higher rank.

CURRENT EDUCATIONAL "CHALLENGES" IN THE SOUTH AFRICAN MILITARY[13]

It is impossible to outline all the challenges facing ETD in the SANDF at present. As a consequence, the paper focuses on three very obvious problems:

1. Suitably qualified and experienced directing staff.

There is little doubt that the directing staff at most ETD institutions work extremely hard. At the same time, one is often left with the impression that the work of the directing staff at most ETD institutions is – in the words of Foster – more consumptive than productive.[14] Such an approach often leaves little more in its wake than additional work for others. In addition, there is no doubt that at the War and Defence Colleges, the work pace of the directing staff is more in line with the training culture of the military than the educational culture that is required to install a higher order holistic and cognitive understanding of policy, war and strategy that falls within the ambit of these "educational" institutions. There are a number of reasons underpinning this particular problem. The most obvious is the general lack of (civilian) academic faculties that has become the rule at such institutions the world over. Of particular interest is the absence of post-graduate academic qualifications amongst the directing staff. Together with a shortage of any military experience of note in the South African military at present, these institutions face a certain amount of institutional paralysis – a willingness to educate and train, but an inability to do so.

2. The lack of meritocracy

Educational institutions, in general, are discriminatory by nature. The principle that not everybody has the aptitude for higher education and training is generally accepted by universities and other institutions of higher learning. In very much the same way, militaries accept a triangular and hierarchical system of command. In reality, this implies that not all officers have the aptitude for high command and that not all officers should be accepted, as a rule, at the most senior military courses. Militaries normally have a system in place whereby the most competent of their officers are accepted for attendance of the more senior academic programmes and, consequently, promotion to high command and staff positions. Militaries normally apply the principle of "up or out". Yet, it is difficult to find the traces of such a merit-based system in the SANDF. It is politically very incorrect to point out that, because of historical reasons, a lot of dead wood is drifting to the top of the SANDF at present.

8 Heinecken, L, op. cit., p. 10.

9 Twenty-three nations hosted non-statutory force training, from nearby Lesotho to the Soviet Union and Cuba. See Higgs, JA, op. cit., p. 48. Vladimir Shubin's recently published book provides an extensive overview of the Soviet military involvement in South Africa and, in particular, Soviet support to the liberation movements. See Shubin, V, *The Hot 'Cold War': The USSR in Southern Africa*, Pluto Press, London, 2008.

10 A senior officer from one of the armed forces of the former Warsaw Pact pointed out that Warsaw Pact countries very often did not have a clear understanding of what kind of military training to give to the cadres from Africa. The result, he explained, was that they concentrated in most cases on the political indoctrination of these forces. Conversation with Maj Gen (ret.) Dr Mihail E. Ionescu, Director of the Romanian Institute for Political Studies and Defence and Military History, Madrid, Spain, 24 August 2005.

11 Cawthra, G, "Security Governance in South Africa", *African Security Review*, Vol 14, No 3, 2005, p. 98.

12 Engelbrecht, L, "SANDF at 10: An Assessment", *African Armed Forces Journal*, February 2004, pp. 9-10.

13 It is interesting to note how militaries, and the South African military in particular, conceal their real problems by describing it as "challenges"! The title of this section is in line with this special form of political correctness. The "challenges" should therefore be understood as problems.

14 Foster, GD, "Research, Writing, and the Mind of the Strategist", *Joint Forces Quarterly*, No 11, Spring 1996, p. 115.

From an educational perspective it simply means that very often officers who do not have the aptitude for academic studies or high command end up in the educational programmes of the senior ETD programmes in the SANDF. The real problem is the overall impact of their presence in these programmes on the learning experience of the more competent learners.[15]

3. The absence of a proper academic curriculum.

The curriculums of these institutions often reflect more of a foundation in training than education. The approach is to cover as wide a spectrum as possible in the curriculums[16] – a mile wide, an inch deep, to be precise! The intensity of the programmes at these institutions is very high. Students are overburdened with an extensive amount of information. At the same time, though, very little time is spent on rigorous debate, reflection and, eventually, the internalisation of knowledge. As a result, not much learning is taking place in spite of the overload of information students are exposed to. Information is not processed into knowledge, and the focus is not on debate, reading and writing – the critical ingredients of any learning process. The only way to develop the attributes of an educated person is through reading (to gain knowledge and insight), discussing (to appreciate opposing views and subject their own to rigorous debate), investigating (to learn how to ask good questions and find defensible answers), and writing (to structure thoughts and to articulate them clearly and coherently).[17] With the exception of the Military Academy, it is difficult to identify an SANDF ETD institution where such an approach is the order of the day. The absence of a proper academic faculty, the lack of scholarly depth in the curriculum and the student body's lack of a sound academic foundation constitute the most important reasons underpinning the absence of an academic ethos at most SANDF ETD institutions.

THE USE OF DISTANCE EDUCATION AND E-LEARNING IN THE SOUTH AFRICAN MILITARY

Given the educational realities of the South African military, DE and e-Learning should be a very effective means for bringing education to the broad base of soldiers who do not have direct access to military educational institutions. The truth is that until now the SANDF has not used DE and e-Learning on a grand scale in the education of its cadres. One immediately wants to ask the question why DE and e-Learning has not become a central part of the educational system in the SANDF yet. A related question concerns the issue of what the SANDF should do in order to raise the profile and use of DE and e-Learning. A number of factors seem to stand out in the intention of the SANDF to use DE and e-Learning as a general way of educating, training and developing its members.

Firstly, the SANDF views DE as a means to save money, and it is true that DE is a potential money saver. As a prerequisite, though, money needs to be spent to roll-out a proper DE system before money can be saved on the ETD budget. As it is, DE in the SANDF has never received the kind of budgetary support necessary for a full roll-out of a workable DE-system. The big irony is that, working with a limited budget, the SANDF is simultaneously trying to save money on the instrument or process that is supposed to be the money saver in the ETD environment.

A second factor influencing the effectiveness of DE in the SANDF is the decentralised implementation of a proper DE system. Different ETD institutions in the SANDF have at different times tried to implement a system of DE. One of the reasons why DE does not seem to succeed or why it does not proceed beyond the point of an experimental phase in the SANDF is the lack of structural organisational support from the SANDF at large. In fact, the lack of organisational structures responsible for DE in the SANDF is inhibiting the roll-out of a well-developed DE system. Such organisational structures are critical at all levels of the organisation, especially at implementation level.[18] There is no central structure in the SANDF that is principally responsible for the development of a DE system, that budgets for the implementation thereof and that is responsible for the organisation-wide roll-out or implementation of such a system.

15 The paper "The SANDF: Midwifes of Peace in Africa – An Evaluation of the SANDF Involvement in Peace Support Operations" read by Dr Thomas Mandrup at the SA Army Seminar 21, 26-28 February 2009, provides a more detailed exposition of the lack of a meritocratic system in the South African military.

16 A well-educated SA Army member noted that there is a tendency to overload students at training institutions without focusing on the quality of learning. Many theoretical DE assignments are short answers straight from the text books. Such assignments often do not involve effective learning. Tactical courses increasingly contain learning objectives that should be addressed in educational institutions rather training courses (civil education, etc). He noted that the SANDF "… is trying to nurse the symptoms of a poor educational system in the country and unscientific recruitment in the SANDF." (E-mail correspondence with a SA Army major, 16 February 2009.)

17 Foster, GD, op. cit., p. 111.

18 Interview with a SA Army colonel, Saldanha, 29 January 2009.

One of the results of the absence of such a centralised DE system, for example, is the lack of or an inability to learn from the experimental phases of DE in some of the ETD institutions in the SANDF. Consequently, the SANDF does not seem to build up an institutional memory concerning DE. The South African **State Information Technology Agency** (SITA) is testing a Learning Management System designed for the SANDF, which will hopefully be distributed throughout the SANDF as a stepping-stone to a broader basis for DE and e-learning.[19]

A third factor that inhibits the implementation of a DE-system in the SANDF is the lack of specialised DE knowledge. People in uniform are normally well-developed as "managers of violence", to use the Huntingtonian phrase[20], and not as DE and e-Learning specialists. Successful implementation of a DE system requires personnel with special expertise, i.e. people who are well qualified in the educational field in general and who have specialised in DE. Any DE-based university, such as UNISA, is proof of the need to build these special knowledge and skills. This specifically relates to the implementation of the necessary logistical and communication systems. An educational institution cannot expect its lecturing or directing staff to take care of the logistical and communication requirements that underpin a successful DE system as well. As many a lecturer will testify, time is a scarce commodity. How much of their time will remain available for research and community service if lecturers also become responsible for the logistical and other interactions with DE candidates at the Military Academy in particular? The real question is whether the SANDF has appointed the necessary personnel and created the necessary structures at those ETD institutions expected to provide DE. Inertia in the SANDF and, more specifically, a total lack of knowledgeable personnel to implement DE and who understand the benefits of such a system is most probably the most important reason underpinning the inability to implement a DE system of education in the SANDF.[21]

A fourth factor inhibiting the roll-out of a proper DE system is the aversion of the SANDF to technology, or to rephrase, the SANDF's reluctance to become web-connected. The use of a paper-based system for DE is without doubt a possibility. My colleagues at the Military Academy, where we have a combination of a paper and electronic-based DE system, will however agree that the ability to communicate with students via e-mail is the most basic technological requirement for successful DE. It would even be more critical, I believe, in the use of a DE system for training purposes. In many instances at the Military Academy at present, it is easier to communicate with colleagues on the other side of the world than with your own students in the SANDF. One has some appreciation and sympathy for the concerns about operational security in the SANDF if it becomes web-connected. At the same time, though, for any organisation not to be web-connected in the present age is a scary thought. Certainly, there should be a system – such as WebCT – that could facilitate e-based DE without endangering organisational or operational security.

The necessary IT infrastructure and support is not broadly available to facilitate DE or, even more, e-learning. The support systems for IT in the SANDF in general are inflexible, time-consuming and reactive. Some Army students have to travel to other units to submit DE assignments.[22] Computers in the SANDF are not allowed to be connected to both internal networks and the internet. This limits the utility of existing IT infrastructure for broader e-learning. As a minimum, one could argue that the SANDF should consider decentralising the management of certain IT and software in the SANDF, investing in a larger IT infrastructure to facilitate broader access to the internet which will also improve capabilities for computer-based simulation and training, and provide good-quality and user-friendly internet security and anti-virus software to the SANDF as a whole with automatic online updates.[23] Armed forces the world over make use of internet services. What underpins the SANDF's reluctance to afford its members access to computer and web-based services?

A fifth factor affecting the roll-out of DE in the South African military concerns the socio-economic makeup of the student body. In spite of the high emphasis on student-based education at most higher education institutions in South Africa at present, many teachers and lecturers will testify to the growing need for more contact time between students and lecturers. This is, at least, what some of my colleagues at the School for Security and Africa Studies and I experience on a daily basis. There is no need to dwell on the reasons underpinning this phenomenon. However, the problems in our present school system most probably are a definite factor to consider. Underlying this debate, is the general question of whether we have a student body in the SANDF that is conducive for the successful implementation of a DE system. This question has many dimensions of which some may be (politically) controversial. As academics, we have a responsibility to place these issues on the table for debate in spite of their controversy. Consider, for example, the number of enlisted members in the SANDF who are not IT literate. IT is a threat to them.[24] Or, consider the number of SANDF members of junior rank who have access, specifically after hours, to a web-connected computer.

19 E-mail correspondence with a SA Army major, 16 February 2009.
20 Huntington, SP, The Soldier and the State: The Theory and Politics of Civil-Military Relations, Harvard University Press, Cambridge, 1957, p. 11.
21 E-mail correspondence with a senior SA Army colonel, 18 February 2008.
22 E-mail correspondence with a SA Army major, 16 February 2009.
23 Ibid.
24 E-mail correspondence with a senior SA Army colonel, 18 February 2008.

A sixth factor affecting the proper roll-out of a DE system in the SANDF at present is the organisational attitude of the SANDF towards ETD in general. One needs to have empathy with commanders at all levels in the SANDF who have personnel staffed in posts and whom they then cannot employ because these personnel are busy with some form of ETD. At the same time, though, one needs to ask the question whether the SANDF has policies in place, which allow DE students time for ETD whilst they are at their home units. All people who have studied on a part-time basis will testify of the personal sacrifices part-time studies require. Much more is necessary than in the case of full-time studies. This issue has two sides. There is on the one hand the question of the willingness of DE candidates to persevere in order to be successful. On the other hand, though, there is the question of organisational support and the issue of whether the organisation is willing to create the environment – in terms of time, for example – that will facilitate successful pursuance of DE studies. At present, members busy with DE courses have to negotiate with their commanders about the time they can spend on formal DE during working hours. There is no overarching policy to facilitate DE.[25] The money saved by not attending residential learning opportunities must be critically compared against the cost of working time lost during participation in DE. The more senior the learner, the more significant this effect. "Cost" must further be considered in terms of the reduced contribution of the learners to the operational readiness of the unit where they are working.[26]

A last factor to consider, and one that I am pretty sure has not been debated in the SANDF at large, relates to the difference between education and training, and the extent to which DE is an appropriate tool for training. Beside the fact that, as one SA Army colonel recently explained to me, education is a side-issue for the SANDF; DE is after all precisely what it says – distance education. The mere fact that training is a group-oriented activity to developed practical skills raises questions about the suitability of DE in the military regimentalised training environment. Stated differently, DE may be very effective in those ETD institutions in the SANDF that are more educational in their orientation, such as the Military Academy and the National War and Defence Colleges. There is real doubt whether it can be effective at all at institutions that function on the tactical level and that are oriented towards the provision of skills-based development. One can imagine that it can be done; however, it will be techno-intensive. On a more positive note, though, DE will make training opportunities more accessible for reserve force members. At present, a lot of lip serve is being paid to the importance of the reserve forces. In reality, the Defence Force has allowed the disintegration of the reserve forces to a point where there is real doubt whether the SANDF has the capacity to revive the reserve force system in South Africa.

CONCLUSION

The first part of the paper outlines why neither the pre-1994 military nor the revolutionary forces fighting the South African military developed a true tradition of professional military education. The primary expertise of the SADF was rooted in its tactical and operational capabilities. It suited the strategic realities of the time and, as a result, the SADF was relatively effective in what was expected from the South African military at the time. It was, in short, effective as an offensively minded warfighting machine – well-trained and experienced. The preparation of the revolutionary forces fighting the apartheid military machine also reflected the realities that confronted these forces. In particular, it was accepted that it would be difficult to uproot the apartheid state militarily. The revolutionary forces could not expect to take the apartheid military machine head-on and came up on top. Thus, MK and most of the other revolutionary armies prepared their members in a way that is typical of revolutionary armies. The emphasis was on education – or, rather political indoctrination – as a means to mobilise the masses inside the country against the apartheid regime and not against its military might. Even the tactical training of the revolutionary cadres, if one can believe Vladimir Shubin, was orientated towards their preparation to develop, maintain and function within the underground structures. Only towards the late 1980s, when "… it was clear … that the end of the apartheid regime was imminent" did the ANC cadres started training in a more conventional fashion for the different branches of the armed forces.[27]

Although the word "integration" was used to explain the fusion of the old apartheid military with the revolutionary armies, it was rather a matter of absorption of the revolutionary forces into the existing military bureaucracy. The result was a very high level of continuity between the SADF and the SANDF. One of the features that was inherited from the SADF was an aversion to education in general and an overemphasis on training. The challenge, though, is that the environment within which the military functions has changed on all levels. For militaries in the contemporary strategic environment to be well-trained for the warfighting environment is not enough. They also need to prepare themselves for the defence management and peacekeeping environments. These environments require from soldiers, apart from warfighting skills, to be soldier-scholars and soldier-diplomats. The military in the New South Africa finds it difficult though to provide quality education to its members. In particular, the military did not succeed in developing an ETD system based on DE and e-Learning to reach the broad base of members in the SANDF.

25 E-mail correspondence with a SA Army major, 16 February 2009.
26 Interview with a SA Army colonel, Saldanha, 29 January 2009.
27 Shubin, V, op. cit., pp. 252-253.

What should be done to develop an ETD system based on DE and e-Learning? The SANDF will not be able to develop and implement DE and e-Learning as long as it remains an "over and above" assignment for the directing staff at the ETD institutions. The SANDF needs to plan and resource the implementation of DE and e-Learning in the organisation as a whole properly. Penny-pocketing the implementation of DE and e-Learning at different ETD institutions is the surest path to failure. Proper resourcing implies inter alia the appointment of personnel with the appropriate DE and e-Learning skills and knowledge, creation of the necessary structures to roll-out DE and e-Learning at organisational level and the willingness to provide both the electronic systems and the training that is needed to empower people to use these systems to their own benefit. Only if the SANDF follows such a holistic approach will DE and e-Learning grow into the powerful tool that it is for the development of people.

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Reshaping Acquisition and Business Training for the United Kingdom Ministry of Defence

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ABSTRACT

With ongoing efficiency drives throughout defence, the pressures on military and civilian personnel to continue to meet operational demands within financial, resource and time constraints are increasingly prevalent. The delivery and support of military capability for the future requires a well equipped, multi-skilled and professionally qualified UK MOD workforce, who can work together and successfully engage and collaborate with industry to meet the growing needs of our front line commands.

To this end and in response to cross-government initiatives, there is an increasing and urgent requirement to provide quality, timely, flexible and professional training to upskill the workforce. Reduced training budgets; the need to train quickly; the desire to undertake flexible learning and geographical dispersion are all factors driving the need for innovative, high quality, cost effective training solutions.

Faced with this challenge, the Defence Academy's College of Management and Technology (DA-CMT) is charged with taking MOD training into a new era. This high-level paper outlines the approaches adopted, examples of solutions that were delivered, the benefits realised and the challenges ahead.

BACKGROUND

DA-CMT is the leading provider of Acquisition and Business skills training to the UK MOD Civil Service and its Armed Forces. The two divisions within DA-CMT that deliver this training are Defence Acquisition Learning (DaLearning) and Defence Business Learning (dblearning).

DaLearning (a "partnership" between MOD and Logica) provides acquisition skills training to a broad learning community of UK MOD civilian and military personnel, industry and Other Government Departments (OGDs). Its mission is to provide the knowledge and skills needed by the acquisition community to enable it to better deliver business benefits. DaLearning offers a wide range of courses covering the functional skills areas of Programme & Project Management, Commercial Practices, Supply Chain Management, Logistics, Category Management, System Safety, Lean Management, Requirements Management and Quality Management, along with other subject areas.

dblearning is the principal supplier of core skills and finance training. It exists to provide opportunities for people in defence to learn the skills that they need to perform their business tasks effectively. dblearning also plays an important and growing part in the Defence Academy's mission to promote and support excellence across the challenging and increasingly vital fields of business leadership, management and technology.

Collectively DaLearning and dblearning deliver some 180,000 workshop trainee days and 600,000 hours of elearning per year, delivered throughout the UK and overseas including operational theatres.

THE DRIVERS FOR CHANGE

The UK Defence Industrial Strategy (DIS) [1] and the McKane report [2] highlight the importance and necessity of the MOD working closer (and in partnership) with industry. To enable the MOD to become more agile, responsive, flexible and intelligent customers there is a requirement to equip the MOD's workforce with the appropriate level of knowledge, skills, behaviours and qualifications in order to acquire and deliver the right military capability to the UK Armed Forces.

In addition, equipment programmes and resources across the MOD are being targeted with efficiency drives such as those from the Lyons [3] and Gershon [4] reviews. In all, these have impacted funding lines, workforce availability, skill sets, travel and subsistence budgets, culminating in the urgent need to upskill the remaining workforce.

CONSIDERATIONS

In order to the address the drivers, DaLearning and dblearning have been challenged to consider many aspects of the way training is provided to the learning community, impacting the manner in which training is designed and developed. These considerations break down into three broad categories, the business; the learner and technology.

The Business

- With a decreasing MOD workforce, the development of cross-functional knowledge and skills is paramount for the continued acquisition and support of military capability
- The remaining workforce will be expected to take on broader responsibilities requiring specialist skills and professional qualifications
- With decreasing budgets, the delivery of appropriate and timely training interventions to geographically dispersed staff create additional challenges to existing delivery mechanisms
- A demand for more flexible, innovative and cost effective training solutions
- The increased pace of change to policies and practices will require a more responsive approach to the currency of training material

The Learner

- Meeting the learning needs, styles and aspirations of a diverse learner community learners expect to access training at a time and place that meets their needs and their work life balance
- Learners require a flexible and engaging learning experience using a variety of technologies and formats
- Learners expect timely support requiring more interactive trainers skills

- Learners are increasingly aspiring to professional qualifications associated with their roles
- Learners will increasingly expect to have the flexible access to information they expect at home

Technology

- A changing and variable MOD infrastructure
- Issues regarding access and accessibility
- Security and restrictions with variations in local rules
- The variable acceptance of innovation by the learner community (young and old)
- Live updating of content and automated notification of content changes

Whilst not exhaustive, these considerations challenge us to place the learners' experience at the centre of the design and delivery of all future learning and development interventions.

MEETING THE CHALLENGES

In contrasting but complimentary styles, DaLearning and dblearning have faced the challenges with relish, enthusiasm and delivered successful outcomes. These outcomes are highlighted in two separate examples below.

Defence Acquisition Change Upskilling Programme (DACP)

DaLearning was tasked with designing, developing and delivering one of the most ambitious blended learning projects undertaken. In 2007 Ministerial approval was granted for the largest single investment to upskill the workforce in defence acquisition knowledge and skills through the wider introduction of blended learning.

DACP was aimed at addressing upskilling the MOD's defence acquisition community across four workstreams, Through Life Capability Management; Programme & Project Management; Commercial Practice; Integrated Logistic Support. This included the following deliverables:

- 227hrs elearning (700 topics)
- Facilitated workshops to support elearning
- Communities of practice
- Electronic books
- CPD logbooks
- Forums, wikis and other collaborative learner activities
- Online exam practice and preparation
- Accreditation of targeted training interventions (CIPS, APM and ILS)
- Design and development of a bespoke Learning Content Management System (LCMS)
- Significant enhancements to what was an embryonic Learning Management System (LMS).

The timeline for this challenging and intricate blended learning project to its official launch was just ten months and required a blended delivery model of resources drawn from:

- DaLearning's trainers and elearning team
- Logica's UK and Indian (offshore) Training & Learning Services
- MOD workstream Subject Matter Experts
- DA-CMT for the management of the project
- 3rd party specialists in Project Management and Integrated Logistics.

In its first full year (Apr 2008 – Mar 2009), over 6,000 people registered with DaLearning's online portal, with over 100,000 hours of elearning being accessed. The programme continues to evolve and grow, with many positive lessons being learned, particularly from learner feedback, to make the learning experience richer and more rewarding.

Go-le@rn

dblearning has been providing innovative elearning to MOD staff for seven years through the Defence Elearning Learning Centre (DELC) service. This has been focussed on the core skills of the MOD as defined in the Single Skills Framework.

Given that these are more generic people skills, choosing the most appropriate interventions is vital. A delicate balance is required between the need for bespoke solutions or the procurement of Commercial off the Shelf (COTS) products.

As an example, over the last two years dblearning has been trialling the concept of mobile learning (m-learning) among civilian and military personnel by loaning out PDAs pre-loaded with a wide variety of learning material. The purpose was to:

- Gauge the demand for such a service
- Determine whether staff preferred to use personal or loaned devices to access the m-learning
- Determine the preferred learning format for mobile devices
- Determine the target audience for mobile learning.

The service is intended to provide users with the opportunity to learn whilst out of office (e.g. travelling to meetings etc.) and when access to the MOD learning infrastructure is unavailable. The learning modules consist of:

- Commercially sourced e-learning content re-purposed for a mobile devices
- Short videos
- Podcasts
- PDF learning guides
- Commercial audio language packages.

The success of the initial trials led to the development of the Go-le@rn Portal, a website from where registered learners can download nuggets of learning to either loaned PDAs or to personal mobile devices, such as mobile phones, iPods, PSPs etc.

Following its launch in the summer of 2008, several enhancements to the Go-le@rn Portal have been made in response to user feedback. New courseware has been added, including selective learning packages for specific users with limited access to IT, and RSS feeds in the form of weekly podcasts from Harvard ManageMentor.

In summary, DaLearning and dblearning have embraced the drivers and considerations outlined to meet the requirements, needs, styles and aspirations of its diverse learner community. Whilst both strive to exceed learners' needs, the constraints of priorities versus budget will always be a key driver. That said this should not stop the pursuit of innovation.

THE BENEFITS

DaLearning is currently in the "realisation of benefits" phase of the DACP upskilling programme in terms of the business, learner and technical benefits to the MOD. However, drawing on DaLearning's experience of using a blended learning approach on a similar but smaller programme (for MOD Commercial Officer Licence training) realised a significant number of benefits for the MOD, the tax payer and the learner. Through the introduction of a blended learning Commercial Awareness & Practitioner Programme (CAPP), the following benefits were realised:

- Total number of workshop trainee days was reduced days by 57% from 3500 to1500 per annum
- Individual trainee time spent away from home reduced from 10 to 4 days
- Less time spent away from the workplace (the elearning was developed to be completed progressively with a clearly defined timeline and with workplace support)
- Reduction in team and individual costs such as travel, accommodation and loss of productivity
- Significantly less trainer days required to deliver associated workshops (from an average of 500 to 160 trainer days per year)
- Externally acknowledged and recognised by the Chartered Institute of Purchasing & Supply (CIPS) as the

Best People Development Initiative for 2008 and by the National Training Awards (South West Region) for Partnership & Collaboration.

Specifically for the learner, the new blended learning approach provided:

- Actual reductions in learning time through recognition of existing knowledge and experience (through DaLearning's "Setting Your Own Agenda©" methodology)
- Access to learning at a time and place convenient to the learner
- Flexibility to learn at a pace suited to individual circumstances
- Greater consistency in the delivery of training content and to predetermined standards
- Other sources of reference and additional knowledge in the shape of forums, wikis, eBooks etc.
- Access to specialist learner communities of practice
- Open access to all elearning (no business case restrictions)
- Opportunities to gain professional qualifications (CIPS, APM, APMG).

To date the Go-le@rn trials have demonstrated that learning via a mobile device is acceptable to a proportion of MOD staff; especially those deployed away from home, those whose jobs involve a lot of travelling or long commutes to and from work. These shorter courses, audio courses and the learning bites were preferred over their longer versions of elearning courses and workshops. Go-le@rn is also realising other learner benefits:

- The ability to select learning nuggets
- Greater variety in the choice of learning delivery mechanisms
- Budgets such as travel & subsistence significantly lowered
- Reduced time away from home and work and associated cost savings.

Anecdotally users already acknowledge these benefits in feedback. Culturally the change to blended learning is in its infancy for the organisation and it will be some time before the blended approach is universally accepted. The future workforce will increasingly come from an internet aware generation, whose attitude to information handling will be fundamentally different to current generations. Training organisations face the challenge of organically developing their approach to the delivery of training in order to keep abreast with such developments and expectations.

WHERE NEXT?

In the evolving and unstable economic and operational environment the MOD operates in, hard choices and decisions will have to be made. This will ultimately impact on the budgets, resources and working practices of those responsible for delivering the capability required for our UK Armed Forces.

DA-CMT in general, but DaLearning and dblearning in particular, have the responsibility to provide quality, flexible, innovative and engaging training that enables the MOD workforce to deliver that required capability.

DaLearning's approach is its commitment to engage with, listen and respond to its sponsors' needs and aspirations, but also to explore the art of the possible that is realistically within the needs and desires of its learners, whilst balancing cost effectiveness against innovation. DaLearning continues to explore and improve the ways of engaging its learning community through:

- Balancing the needs and demands of different generations of learners using a blended learning approach
- Providing a broad range of training options for the learner to decide on a training intervention that suits their needs and styles
- More personalised workspaces that incorporates knowledge retrieval, access to learning and collaborative working
- Developing more immersive learning where learning is promoted through experiencing the style of thinking of someone in their working environment.

dblearning continues to improve Go-le@rn services through:

- Transitioning from a 'pull' service to a 'push' service, where content and marketing are sent to directly to customers, i.e. automated updates and notification services of updated course content, new versions or new products
- Developing a subscription service using RSS feeds to receive news alerts on catalogue additions or regular feeds of new content such as weekly podcasts
- Establishing a presence on iTunesU. Many academic institutions, such as Oxford, Warwick and the Open University have established their own sites containing freely available open access learning materials (mainly audio and video). Not only would it provide access to Go-le@rn content, it would also provide a valuable worldwide marketing platform for the Defence Academy.

SUMMARY

In a continuously changing operating environment, providing quality, timely and cost effective training to UK MOD military and civilian personnel is a constant and demanding challenge. Balancing increasingly limited resources and budgets against the need for more engaging, focussed and professional training will require DaLearning and dblearning to design, develop and deliver innovative but practical training and is a challenge that both look forward to with relish.

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Content Development for e-Learning: The Challenges

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ABSTRACT

This paper attempts to identify the challenges of content development for e-learning practice at the National Defence University of Malaysia (NDUM). The methodology of this paper will mainly be content analysis of various reports, governmental documents, as well as semi-structured interviews with lecturers at the NDUM. It is found that in the effort to give students the exposure to and experience of e-learning, the first step in the implementation phase, which is to develop content, has alerted the university of the various fundamental challenges that need to be addressed accordingly.

INTRODUCTION

Academic excellence is always difficult to achieve if the perceptions of stakeholders including students, lecturers and industries vary. This seems especially true for a unique learning environment such as the National Defence University of Malaysia (NDUM), which gives equal emphasis between academic excellence and military performance. It is inevitable for students at the NDUM to perceive that their life is tough because they have to undergo both academic and military training concurrently. Nonetheless, as the youngest public university in Malaysia, the management is constantly finding ways to guarantee that students can achieve their optimum potential in both aspects, and thus changing the perceptions of all involved.

One of the strategies used by the university is improving the information communication technologies (ICTs) which cover educational and administrative domains. ICTs refer to networked communication systems and distributed learning technologies including e-learning. This paper is not to discuss the relation between academic achievement and the use of ICT in education. There is much literature and a lot of debates on whether ICT assists in students' academic performance (for example see Jong-Ho Shin et al., 2005; Khine and Fisher, 2003). Rather, this paper attempts to identify the challenges of content development for e-learning practice at the NDUM.

The National Defence University of Malaysia

The NDUM is a unique university; a one of a kind institution in the world. This is because it is the first university that awards undergraduate degrees and confers military rank of Captain or equivalent to its graduates. The university houses selected trainees from the three different services (army, navy and air force) under one roof. The NDUM started with the establishment of the Military Academy of Malaysia in 1995. Programmes at the establishment were based on cooperation between the Ministry of Defence, Malaysia which provided military training programmes and Universiti Teknologi Malaysia (UTM) (a public university) which provided the academic training component. UTM was a 'natural choice' as the academic partner because of its reputation in engineering degrees. This reflected the pressure on the armed forces to ensure that the training of new military manpower included a large number of well-trained engineers. The first cohort of undergraduate cadet officers totalling 172 started their military and tertiary education at the academy in June 1995 (*Expand Your Mind, Go Beyond The Limits*, 2005).

Because of the importance of properly educating future military officers, the government felt that the academy should be upgraded. This will ensure that the focus of the establishment is sharpened, and the teaching and learning processes become more systematic. As such in November 2006, the academy became a university. This upgrade slightly shifts the focus of the university, which is now to pioneer the creation of academically trained military leadership capable of placing the nation's security interests into a broader regional and global framework. Suitable learning programmes, coupled with suitable learning deliveries, are now needed to ensure that the 'future guardians' of Malaysia received the best education so that they could become talented and loyal defenders of the nation.

The Methodology

Data for this paper derived from content analysis of various documents as well as semi structured interviews of academic staff of the university. The analysis of semi structured interviews is done manually based on themes explored during the interviews. Due to the right for privacy of the interviewees, their names will not be used in this paper. Rather, codes will be assigned to all seven interviewees: R1 to R7. Their backgrounds range from engineering to management fields.

Before analysing further, it is important to understand how the paper is developed. This paper is divided into four main sections. Apart from the introduction, the second section discusses e-learning in military organisations. This section gives a crucial overview of the importance of e-learning in today's learning environment. The third section is the analysis and discussion section; this is the heart of the paper where the analysis of data collected will reflect the significance of issues highlighted. The last section concludes the analysis of this paper.

E-LEARNING IN MILITARY ORGANISATIONS

Between the years 1990 to 2005, most organisations including military institutions have come to a realisation that ICT can play a huge role in many facets of today's life. For example, the Malaysian Armed Forces (MAF), Australian Defence Force (ADF) and the U.S. military have grabbed the opportunities by actively engaging in ICT development.

In August 2002, the MAF started its e-learning programme with the first virtual university in Malaysia, Universiti Tun Abdul Razak (UNITAR). This programme caters to in service personnel who are either sent by the MAF or who themselves applied for the programme. Upon completion of their studies, they will be awarded undergraduate degrees by UNITAR. It is critical to mention that the practice of e-learning at UNITAR for part

time personnel is a blended one; they still have to attend face-to-face sessions at least for a few hours per semester depending on the faculties' requirement. By embarking on this programme, the MAF has acknowledged that e-learning can help its personnel to advance their career by improving their academic qualifications. The rest of the MAF's efforts for e-learning go to its educational institutions namely the Royal Military College (RMC) and single service colleges. The RMC, for instance, uses e-learning to support its face-to-face sessions and the single service colleges use e-learning to help military trainees hone their mastery of skills. It is interesting to note that the university, when it was previously known as a military academy, was not given the task to adapt e-learning. There is no opportunity to explore this issue here; rather the decision now is that the NDUM would like to utilise e-learning to enhance the teaching and learning process.

e-Learning programmes have been widely used in Australian military institutions and colleges during the last 11 years. e-Learning initiatives were reinforced when the ADF formed an e-Learning Panel of Providers in 1998 to select the best providers and courseware to be used by the ADF. This panel represented a key component of an initiative that will support one of the largest e-learning systems ever to be implemented in Australia (Catalyst Interactive Helps drive Australian Defence Force's most ambitious e-Learning Initiative to date, 2004) [1]. As part of the initiative, Defence On-line Management and Instructional Network (DOMAIN) will be developed. DOMAIN is expected to reduce the time spent in learning and training and enhance the availability of many learning and training courses in the ADF (Catalyst Interactive Helps drive Australian Defence Force's most ambitious e-Learning Initiative to date, 2004). It has also been suggested that commercially-available war games used by the ADF were growing significantly due to the need for modelling and simulation support and scarce alternative teaching resources (Carpenter and White, 2005). As commercial games are accessible and cheap, they have been frequently used to teach military personnel about the history of military and war tactics. These games also provide a useful supplement to conventional live training in the ADF (Morrison et al., 2005). Therefore, the ADF is continuously trying to find the best Commercial-off-the-Shelf (COTS) computer games by evaluating them for the purposes of using them as tools for the learning and training of its personnel. In this way the ADF seeks to also contain the costs of developing new ICT training materials and also the costs of in-field military exercises.

The story is different for the U.S. military. In the early 1990s, the U.S. military began to transform its educational programmes at all levels through the application of ICT. These technologies [2] were called e-learning (stand-alone multimedia CD-ROMs or networked materials). Before this transformation of learning strategies, the traditional method of face-to-face teaching was used. It was the face-to-face teaching approach that saw the rise of the U.S military power after WWII. Nonetheless, the capacity of e-learning to prepare reservists in a timely manner was a primary motive behind the changes that stressed the need for training to be feasible at any time and anywhere (TRADOC, 2001). In fact, the U.S. military has always been a global trendsetter with most learning initiatives, including e-learning (Rosenberg, 2001). This is hardly a surprising characteristic given the nature of the military-industrial complex that has increasingly defined the U.S. economy in the post-WWII era (Johnson, 2004). Rigorous training had been the hallmark of the U.S. military and it has historically always depended on highly trained personnel. According to a report by Staples (2003), e-learning has proven to be an effective training tool for the U.S. military.

The Underlying Framework and Issues for e-Learning

The enormous investment that military organisations, especially the U.S. military, have made in new educational technologies has allowed military trainees to pursue their own self-motivated studies in a manner that was never possible before (see Juhary, 2007). The earlier, traditional approaches to learning have been described by many as inspired by *behaviourist* approaches. The behaviourist school of thought was first articulated by Thorndike, Pavlov, Watson and Skinner. What they all shared was the belief that similar to animals, human beings were creatures whose behaviour could be conditioned by repetitive learning exercises in which certain types of 'desirable' acts were rewarded and other, 'undesirable' acts, were not rewarded or 'reinforced'. Taking these ideas into human learning, behaviourist educators insisted that students learnt better when they were "drill[ed] and [forced to] practice" (Skinner, 1974). The act of 'learning' was itself defined as something that took place when there was a change in the behaviour of the subject – a change in a manner compliant with the requirements of the instructor (Skinner, 1987). Implicit in these views was the notion that the 'teacher' had superior knowledge and was in control of a finite amount of desirable knowledge that had to be imparted to the subjects.

It would be easy to assume that learning environments within a military context have always been dependent on drill-and-practice techniques [3] (van Ree, 2002). These techniques, in turn, reflect the view that military discipline is best promoted by ensuring that military trainees acquire skills that enable rapid responses to command. Such assumptions appear to conform to behaviourist expectations. In fact, the first courseware, called CAI or Computer Assisted Instruction, which was designed and introduced in the 1970s (Saettler, 1990) applied drill-and-practice [4] techniques to condition students' learning. Nevertheless, as learning theories evolve over time, so does the framework use for courseware design and development. Although the basis of behaviourism is still very much intact at the lower level of courseware development, for higher intellectually challenged activities, constructivism is becoming a critical component. "Constructivism is not a particular approach to teaching, it is a view of how learning occurs that has important implications for teaching and in particular for the student-teacher and student-student discourse that occurs in the classroom" (Mitchell, 2007a; see also Jaworski, 1993). Mitchell's

concise definition provides an important way of moving through the vast quantity of research reports that have been written on constructivism – much of it is misleading because it oversimplifies the implications of the teaching philosophies that emerge from it. Based on 26 years of research on the teaching process in classrooms, Mitchell establishes the key dichotomies between transmissive and interpretative teachers. The latter is 'learner-sensitive' (Mitchell, 2007b). To sum up, constructivists insist that knowledge is never finite but forever evolving into expanded, deeper and more significant meanings. It is the role of the teacher to guide that process of learning.

Many scholars have commented on the different values of new technologies in the learning environment. For Prensky (2001) having fun was less important than the capacity of students to easily absorb new information through digital technologies. When students were given the choices to learn with new technologies, they assumed more responsibility for their learning and thus became more active participants. For Dzuiban et al. (2006), bringing digital technologies into the classrooms reduced boredom for a generation brought up on the internet and video games. These students, known as Net Gen students (or Net Generation), born after about 1981, found other forms of learning, including television and computers. These frequently offered more active intellectual stimulus than lecture-based teaching. Such students may therefore have problems with old-fashioned learning approaches that tended to give a privileged position to the teacher as the source of knowledge and wisdom that had to be imparted to relatively passive students. According to Tastle et al. (2005), digital technologies compelled teachers to keep up with the students' command of technology. All these technological pressures on the classrooms from the outside world were, according to Oblinger and Oblinger (2005), moving the general learning environment into a direction that focussed increasingly on the students' active engagement with learning rather than a fixed quantum of curriculum. Students were also receiving information about the world from outside formal schooling. The older training approaches were increasingly superseded; new technologies, they argued, undermined the authority of 'old-fashioned' teachers.

How does this knowledge of behaviourist and constructivist principles help content developers to design and develop e-learning content? For the NDUM, two aspects are significant. The first one is the presence or absence of teaching and learning philosophy at the university reflects the incomplete process of developing appropriate contents for e-learning. Should the university adopt a blended teaching practice, that is the combination of face-to-face and e-learning, the content development for e-learning must ensure that students can interact with the materials. As beginners, academics at the university must be warned of the difference between 'cutting and pasting' content from printed texts onto e-learning pages on computer screens. Thus selection of words, phrases and sentences are vital since e-learning offers a different learning medium altogether. The second is the process of developing content must take into consideration students' level of studies and level of proficiency. For fundamental courses, mastery of knowledge is crucial. Therefore, the way the content is developed should adapt the behaviourist principles. As the courses progress, so do the students' level of understanding and knowledge. At this point the constructivist principles can be used to guide content development for e-learning. Ideally, the students will be able to understand their own learning process, that is, from being receivers of information to becoming independent thinkers.

This section has argued that e-learning has a long history in military organisations albeit the differences in the level of adoption. It also argues that the use of appropriate learning framework to develop e-learning and its content is crucial in making certain that the institutions can benefit. The question now is how far can the NDUM absorb the processes involved in developing contents for e-learning and transform all challenges into effective learning solutions. This will be explored next.

ANALYSIS & DISCUSSION

This section is divided into two sub-sections namely the challenges of content development for e-learning and the immediate actions for these challenges.

Challenges

It is imperative to provide a background synopsis for the e-learning project at the NDUM. Planning has started in the middle of 2008 to have a full fledged e-learning system. Previously, only one academic programme at the NDUM has used e-learning extensively (see Juhary, 2007). Learning from this internal experience, and because of the pressure by other higher learning institutions in Malaysia, the NDUM finds that e-learning could provide the missing link in complementing students' learning process. Despite the challenges that will be explained later, the university has started to engage on the process of purchasing a Learning Management System from a private company to expedite the e-learning project. Concurrently, an ad-hoc committee has been set up to look into many facets of e-learning including quality contents. In doing so, it is found that five important challenges for e-learning content development at the university have emerged.

The first challenge relates to the non-existence of neither ICT nor e-learning policy at the NDUM. As an institution at its infancy stage, this seems acceptable; however it poses questions on issues such as the guidelines and

validity of developing e-learning contents. Guidelines refer to issues ranging from technical aspects to copyright and security of contents. Validity suggests whether the contents for e-learning are suitable in terms of level of difficulty and the most appropriate contents to be developed. All respondents were not aware of any ICT policy, let alone e-learning policy at the NDUM. R4 suggested that before further attempt is made on engaging academic staff to develop contents for e-learning, the policies involving the practice of e-learning and ICT must be made known. Regardless of the approach taken by the management, these policies are the framework for a successful e-learning implementation. Although the absence of the policies may not affect the initial running of an e-learning operation, it is a reasonable step if other higher learning institutions' e-learning policies are analysed. Besides learning from other institutions that have used e-learning for a longer period of time, the NDUM can identify the local best practice for e-learning, and thus use it as a point of reference.

The second challenge is on the ownership of e-learning initiatives at the NDUM. Prensky (2001) suggested that for any projects involving ICT, there must be a champion in order to guarantee a successful implementation of the new projects. At the university, understanding ownership of e-learning and taking the appropriate measures for e-learning are two different sub-challenges altogether. Because there is no clear policy as analysed in the first challenge, it is difficult to issue an instruction to develop contents for e-learning. The content for the only e-learning practice at the NDUM is not tailor-made; it was purchased from a private company abroad. The problem with this practice is that the content does not have local flavour that the students can relate to. R1 and R2, from the only academic programme that has e-learning at the university, commented that students complain about two things; firstly, the data about shores and weather in the courseware do not represent the reality in Malaysia, and secondly, the depiction of cultures also differ greatly from Malaysia. While the contrast may not influence students' understanding of the lessons, R1 said that it is high time that the university develops its own contents for e-learning. These custom-made contents will need to pay close attention to students' understanding of local issues including the socio-economic background. Gradually, the contents can relate to Malaysia's involvement in international affairs.

The third challenge is on convincing the faculty to understand the roles of e-learning for tertiary education. Without the convictions, content development is a futile attempt. R5 suggested that making people understand the new way of learning is more difficult than developing the content. This argument speaks for itself; nonetheless it is critical that everybody is involved in developing the content. The NDUM offers more than 200 courses and all these must have their own content developers. Besides, the involvement of all academics allows them to claim ownership of the e-learning project since they are directly involved in it. R5 further commented that it will be a challenging first three year to develop the content; after that it is the matter of maintaining and upgrading the content. A different point is brought up by R6 when she said that the roles of e-learning have been quite vague in students' process of learning. She related her experience of using e-learning for a short course where she found that after a while she lost interest in it. While R6 had a point to make, the author summed up that part of the problems lies with the content which is not stimulating and challenging. This means that at some point or the other, appropriate content will help students to understand their lessons better and thus retain their attention.

The fourth challenge is on the awareness level of academic staff about the importance of providing students with alternative or supporting tool for learning, which happens to be very low. Although this is an old time issue, it is remarkable that some academics do not 'appear' to understand the significance of training students with new technologies. Four respondents were very sceptical about e-learning. While these academics may not represent the whole university, their concerns must be addressed carefully. R3 said that while he was not against the use of ICT technologies, he was trained in a conventional environment and yet managed to master the required knowledge. He further stressed that many of the great leaders today were not also trained using e-learning; what is important is the content, not the delivery method. The author would like to argue that this may be caused by the lack of understanding about the learning theories and the concept of how students learn. As much as the arguments of R3 are valid, the other aspect of teaching and learning is not discussed, which is the students themselves. Being exposed to ICT at a young age at home and schools, students would expect that their tertiary education is conducted in such a way that allows them to relate to their previous experience and knowledge. R1 argued that students may not want to step out of their comfort zone, that is, they are afraid to embrace new ways of learning. Given this, it is the task of the educators to encourage students to embark and explore through new learning media including e-learning.

The last challenge is on content development for military related courses, which is bound by confidentiality and security issues, and these have hindered the participation of 'real' people who understand the running of military institution, culture and life to contribute to content development for military related courses. Although the university can always refer to the existing policies prepared by the National Security Council, about security and confidentiality of military learning and teaching materials, miscommunication and misleading of information will occur at one point or the other. R7 concluded that her experience dealing with documents labelled as 'confidential' or 'limited' is challenging. Not only do the documents need to go through various committees before being made public, but also the nature of bureaucracy system makes some experts in the areas reluctant to contribute in developing appropriate content for e-learning. Further, the security of the servers for e-learning is also questioned by two respondents, R4 and R5. One talked about the firewall that must be stable. At present,

the firewall installed has been experiencing a lot of failure. Although this may be temporary, it actually reflects on the capability of the university to provide for and protect its interest. The other talked about the security of the content after being uploaded to the server. Since the firewall itself can be a problem, there is no guarantee that the content will be saved from any malicious attacks and threats.

Immediate Actions

There are various ways to overcome the above mentioned challenges. The immediate and critical actions that can be taken up are twofold. The first action is to set up an e-Learning Unit at the NDUM. The existing ad-hoc committee must be converted to a unit on its own so that the administration and implementation of e-learning will be efficient. Because this unit is an independent unit in the university, it will have its own staff and budgets. This ensures that whatever that the university requires to be done, there will be no issues of lack of manpower or finance. This unit will also be responsible to draw up e-learning policies for the NDUM. The second way is by planning a series of workshops and seminars about content developments for e-learning. To date, only one workshop has been conducted and the participation did not cover all academic staff due to several restrictions. The workshops must be arranged in such a way that allow the participants to understand important issues including the concept of teaching with technology, learning theories, testing and evaluation, the use of ICT in education, and material selections for learning with computers.

CONCLUSION

The NDUM has a long way to go in terms of providing the best e-learning solutions to its students. Despite the restrictions, the management realises that students are learning differently today than 20 years ago. It is the responsibility of the management to make certain that students are given the options in their learning process. Some of the resistance can be put aside when educators realise that e-learning will never replace conventional ways of teaching and learning, face-to-face. The NDUM takes e-learning as *only* a supplementary learning approach. What e-learning offers is an innovative way of assisting students to achieve their potential. This innovative way will only be possible if the content is appropriate and relevant to the students. The university believes that for whatever reasons that e-learning is useful for, the content of e-learning is the most critical facet of enhancing students' learning process, hence ensuring successful implementation of e-learning.

This paper has demonstrated that the challenges for e-learning and content development of it in particular, are mainly because of the lack of understanding of e-learning as a complementary tool in classrooms. The perception that e-learning will take over the learning process from real life teacher is threatening many educators. Coupled with this lack of understanding, the level of awareness of educators in terms of the potential of e-learning is also a contributing factor. Five out of seven respondents of this paper still have a vague impression of e-learning. This is not from lack of exposure to e-learning; rather the author concluded that this is due to the 'could-not-care-less' attitude that some academics have towards new ways of teaching and learning.

In conclusion, the coming years will definitely see a lot of works that need to be accomplished in order to have successful e-learning. It is not a one-day process where everybody will understand and agree; there will be debates and arguments about the best way of educating students at the NDUM. Given the expectations of all stakeholders for the graduates are high, amongst others their ability to compete globally, it is only reasonable that they should be educated and trained with the best combination of teaching and learning approaches and tools, one perhaps being e-learning technologies. These technologies, nevertheless, will not be useful if the content lacks quality and suitability.

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Notes

[1] The ADF also spent a very large amount of money on its e-learning initiatives. Catalyst Interactive of Canberra, for example, was awarded a AUD$1.3 billion project for developing and maintaining e-learning programmes for the ADF (Catalyst Interactive provides e-Learning Solution to Australian Defence Force, 2004, p.1). This programme was an on-line interactive training programme to educate aircrew, ground crew and technicians in the ADF.

[2] Fletcher et al. (1990) confirm that in the military, where emphasis was on short and efficient training time, the use of ICT, especially Computer Assisted Instruction (CAI) can cut training time by one third.

[3] However, Bonk (2005) has suggested that learning theory in a military setting is now moving away from behaviourism towards constructivism. Professor Bonk is a Professor of Educational Psychology as well as Instructional Systems Technology at Indiana University.

[4] Drill-and-practice was the most common application of CAI in elementary education, the military and adult educational settings (Kosakowski, 1998).

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Benefits for DACeL in the Lessons Learned in the Deployment of an LMS at Unisa

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INTRODUCTION

Learning from your own mistakes is an important survival skill. Being able to recognise your own mistakes and acting on them requires wisdom. Learning from others and adapting your actions will leapfrog your organisation into the future. Did the University of South Africa (Unisa) learn anything from the implementation and subsequent use of the Learning Management System (LMS), Course Management System (CMS) or Virtual Learning Environment (VLE)? Could these lessons learnt at Unisa assist others who want to follow suit?

An answer to the question above will have many facets. If we ask different role players at Unisa to evaluate the rollout, different reasons for the failures and successes will be stated. S. Georgia Nugent (2007), asking why so many people believe information technology has not fulfilled its promise, states that it is mostly because everyone has different expectations and anticipates a different solution or outcome. (S Georgia Nugent in Educause review March/April 2007)

Therefore, when all the lessons learnt, sometimes by very diverse constituencies, have been discussed, it is essential to use the vision, mission and objectives of your own organisation in order to translate these lessons into the specifics that will best suit your organisation. Having considered all the different aspects for the implementation of a VLE and decided that this is the best way forward for a particular institution, make sure that the change management is planned and part of the whole deployment. Failing to do this places the whole deployment of a VLE at risk.

ANSWERING THE FREQUENTLY ASKED QUESTIONS

Before mentioning the major lessons learnt, it is important to answer the most basic questions asked by the organisation that is looking for direction and advice during the selection of a VLE.

Why did the University of South Africa implement a VLE?

Three possible, popular answers to the question are:

- The principal decided that Unisa should have it.
- Unisa does it because everyone else is doing it.
- Unisa does it because a clever salesperson sold us one and now we have to use it.

In fact, none of these answers are correct. The growth and implementation of the VLE was mostly an evolutionary process. Prior to the internet, email and the web, the use of technology in instruction was primarily confined to multimedia titles or hypertext systems. In the eighties, multimedia systems like drill and practice, tutorials, games and simulations were used extensively in the fields of training and education. Learning titles, as substitutes for classroom instruction, were content driven and a few exceptional examples did make it to the shelves; these had levels of interactivity built into the total design of the package which had the potential to assist learners. Following from this multimedia explosion, there was a quest for media rich content as this was considered the ultimate experience for learners.

Then the internet and email wave hit the world and changed the way people obtain information and communicate with each other forever. Information was available to everyone and it was thus possible to allow students to view their account details, academic record and other administrative information by using a computer. Students for the first time had a view of their data on an enterprise's database and I consider this to be the birth of a VLE.

Initially this was a way to view the data of the enterprise, but slowly the communication tools and multimedia titles were integrated and came to be used in instruction as well. Distribution of files among students and lecturer became less cumbersome. A gentle merger took place between the administrative system and the teaching system. The birth of the commercial VLE was when commercial vendors saw the potential and started developing customised interfaces for access to these sources of data, making it easier for institutions to make student data available to students and for the academics to upload course content. Adding internet based communication tools further enhanced the VLE.

TSA and Unisa, both distance education institutions, carried a heavy administrative burden. Students often required information, and with the development of the internet and email it became clear that limited access to our data and some additional communication possibilities would make a big difference to the students' lives as well as to the large complement of support staff employed by the two institutions.

Therefore, in view of their need to reduce workload and improve client services, the two institutions started their quest for a VLE. Commercial options were not considered for reasons of expense, so an in-house development started, indeed an evolutionary process. It was never finished. Enhancements were made continuously and we enforced certain cut-off dates to ensure that we would have a specific version that we could archive and work with.

After the merger in 2005 the new Unisa faced a new challenge. Two separate organisations, each with its own enterprise data warehouses and unique VLE, were merged into a new entity. It was decided that the new merged entity will provide the students and lecturers with the same web-based services they were used too. Unisa had the opportunity to rethink prior decisions. Should we buy a VLE, or should we build it from scratch as both organisations did before? We decided to go the open source SAKAI route.

WHY DID UNISA CHOOSE TO GO OPEN SOURCE?

After an initial technical and functional investigation into a VLE (Virtual Learning Environment) for the newly merged Unisa, the usual dilemma of building, buying or borrowing (open source software) had to be addressed. As indicated previously, the new Unisa could reconsider the in-house development option that came with its own unique challenges. Moving away from the homegrown system was indeed very tempting, but purchasing a product off the shelf was still too costly. The biggest motivator away from in-house development was the lack of sufficient sustainable staff. Both organisations learnt painful lessons when external companies scooped up the leading developers after a three-year cycle, making in-house development always very reliant on HR practices that could retain a good workforce.

Universities in general are not famous for this. University HR practices are normally slow, cluttered with red tape and often offer salaries that is way below the norm in the free open market. Open source seemed to be our only choice. Open source provided Unisa with the opportunity to develop staff without being totally reliant on internal staff complement due to the world wide support from the community. Open source also prevented vendor lock-in. Gartner introduced Unisa to Sakai during a systems architecture consultation session. Upon further investigation and discussions with the Sakai board, Unisa decided to choose Sakai. This decision was made early in 2005. Approval was granted approximately 6–7 months prior to the launch of myUnisa (Unisa's brand of Sakai) in January 2006.

During the latter half of 2005, Unisa developed 19 additional customised tools for myUnisa and integrated it into Unisa's legacy backend systems and ERP.

WHY DID UNISA CHOOSE SAKAI – WHAT ALTERNATIVES WERE CONSIDERED?

Once Unisa decided to make use of open source software (commercial products were too expensive for such a large institution), there were not many choices … essentially Moodle and Sakai. Architecturally Sakai was developed as an enterprise system to suit all sizes of organisations, but particularly for large universities. The framework was very flexible to allow integration, adaptation, customisation and additions. Functionality was on par with all the leading commercial systems, as well as Moodle. Although the Sakai toolset fully supports social constructivism, it does not endorse a specific teaching and learning model but rather provides a flexible environment that can support most current and possible future models.

Unlike many open source software products, Sakai has a governing board, elected by the community to look after the sustainability and long term interests of the Sakai community. These issues include quality control, release management, event management, advocacy, security issues, legal matters etc. Unisa encountered unprecedented support from the international Sakai community. In 2006 a South African "Chapter" of Sakai was established and commercial support is being nurtured to augment in-house resources and assist institutions with limited resources and/or knowhow. Other advantages of Sakai are its close ties with OSP (Open Source Portfolios), as portfolios are rapidly becoming an international standard for assessment and skills recognition.

HOW EASY OR DIFFICULT WAS IT TO IMPLEMENT?

Sakai is an enterprise system and should be treated accordingly. It was not designed to function as a desktop application that can be installed by someone with basic computer literacy. With the necessary expertise a "vanilla" installation is simple. Complexities arise with integration with legacy systems and specialised customisations. Commercial VLE, internally developed VLE and Open

SOURCE VLE MUST ALL BE INTEGRATED WITH THE ENTERPRISE SYSTEM.

What has been your experience with Sakai to date: good, bad etc? Have users been happy? Our personal experience with Sakai as a product and as a community has been very positive in terms of technical support, advice on pedagogy (andragogy), moral support and general encouragement. In fact the myUnisa team often contrasts it with the lack of support Unisa receives from several prominent brand commercial companies, despite tens of millions of rands of investments and top level service contracts.

It is impossible to please all users, but very few complaints are received considering the number of people using the system. myUnisa depends on databases, networks (internal and external) and ageing legacy systems, etc. Malfunctions of any of these systems, local power outages and damage to physical property have in the past led to negative perceptions by myUnisa portal users. The

myUnisa/Sakai platform itself is very stable, with high levels of hardware and software redundancy.

WHAT SORT OF USER VOLUMES DOES UNISA HAVE ON SAKAI?

- January 2006 Sakai v2.1 - Registered active students by end 2006: 120 765
- May 2007 Sakai v2.3 - Registered active students by end 2007: 159 538
- December 2008 Sakai v2.5.x (Currently continuous small incremental upgrade)
    - Registered active students: 200 176
    - 8 379 912 million transactions have been processed via myUnisa.

LESSONS LEARNT AND THINGS THAT SHOULD HAVE BEEN DONE DIFFERENTLY

After answering most of the popular questions, we can now consider the major lessons learnt during the deployment of a VLE. When an organisation is in flux and looking at the different lessons learnt, it should never forget the very first rule: What are the vision, mission and objectives of this institution and what artefacts will be bearers of evidence that prove it is becoming more of what it wanted to be?

A popular saying "Hindsight is perfect vision" expresses somewhat of the experience users might feel.

Several aspects could be dealt with differently, and looking at Fred Nickols's (2004 http://ww.itstime.com/aug96.htm) unfreeze, change and refreeze theory, we see that a precondition for efficient change is stability prior to change. Implementing a new VLE during the merger, and the short time span Unisa had for implementation of a new VLE, meant that Unisa was anything but stable. It often felt as if the wheels had been changed while the train was already speeding on. In Nickols's terms, Unisa was unfrozen and not ideal for any change. Therefore, the first of the lessons learnt could be loosely categorised as change management. Did we steamroller this change at Unisa, or is this an example of how change should be managed?

CHANGE MANAGEMENT

Continuing with business as usual as a result of having students in the system, and knowing that a new Unisa was about to take shape, placed us in a precarious position. The debate at that point was not about whether a VLE should be implemented. Both organisations had VLEs already. Our choices as mentioned earlier were about buy, borrow or build. Why Unisa went the borrow route was explained above. However, looking at the different change management theories in the context of Unisa, the one aspect that was not done well enough was the building of a joint vision among the academic users and the provision of opportunities for joint creation: joint creation not of the choice of VLE but of the development of a teaching strategy that can launch Unisa into a leading role as far as its tuition practice is concerned. It speaks of a willingness to change the way Unisa reaches its objectives. This could be the single most important factor missing in managing change: the buy-in from the top management at an early stage that could force academics to rethink their teaching practice, away from correspondence to a more interactive learning practice. To a large extent, the implementation went well. The students bought into the concept of e-learning hHowever the movement among academics was a classical example of tinkering, (2001, Eric Abrahamson) and this did not have the desired effects because academic users were not ready for the new way of doing things. This realisation must bring us back to rule number one. What are the vision, mission and objectives of the organisation?

If one assumes that, the vision, mission and objectives are clear and in place, the next phase is to determine exactly how the organisation is going to achieve them. In order to do this, the organisation must consider who the users are – both students and academics; the nature of the curriculum and teaching outcomes; and the role technology must play to improve the results.

Therefore it is clear that the single most important aspect missing from a successful roll-out was the buy-in from academics. This could have been prevented if the top management had realised sooner that the state of tuition at Unisa still focuses largely on the correspondence model. This implies a revisit of pedagogy as part of change management.

PEDAGOGY

Educators should be grappling with possible solutions that will improve retention and throughput. Learning theories and paradigms such as behaviourism, cognitivism, constructivism, connectivism and humanism provides clues. However, at the heart of all this research lie the questions everyone is trying to answer: How can we get students to learn, and how can educators teach better? Educators in search for these answers tend to study how children play, and base several learning designs on mimicking the real world by recreating the learner's environment in the learning environment. With the arrival of electronic technology and the internet, behavioural changes among the youth became evident. It is not surprising that educators then started looking at technology for answers. In the eighties, multimedia techniques like drill and practice, tutorials, games and simulations were used extensively in the fields of training and education. Currently the use of media rich and authentic learning environments forms the core of learning activities, and it is safe to assume that media and authenticity could make a difference. However, considering the pace at which technology is changing, educators must constantly try to stay abreast of the latest technology and try out new and better ways to capture the attention of their students.

Programmed learning, multimedia, hypertext and the internet are being placed under the education researchers' magnifying glass. What have they found? I believe that if we look closely at all the research, we can only identify one general truth, namely that the design of the teaching and learning intervention is the only thing that can really make a difference. How do we take cognisance of the above during the implementation of e-learning? During the roll-out of myUnisa and subsequent change management, it became very clear to role players how important proper instructional design is for any endeavour of this kind.

CONCLUSION

Having scrutinised change management theory and realised how important instructional design is, we can see that a change model for the implementation of a VLE should be formulated for any organisation planning to embark on this journey.

It is important to note that the debate is not centred around deciding whether a VLE is required or not.

This is an assumption which we have made. Technology will impact your organisation.

Different factors informs the buying, borrowing or building decission and these does not threaten the successful roll-out.

The art is to constantly harness the power of this technology to suit your vision, mission and outcomes. An organisation that believes it can hide away from technology and its effects will become redundant, and its graduates will be unable to operate in the new world.

Since the vision, mission and outcomes of the organisation are clearly stated and entrenched, they should now be translated into action during the instructional design of each course, course outcome and cross field outcome. During this design process, the needs of each user constituency must be considered and planned for. Special plans must be made to support the stragglers and get them up to speed. It is important to put these plans in place because in the end the early adopters will drag you forward but it is the stragglers who will slow you down to the extent that all your energy will be taken up convincing them to stay with the programme.

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In 1992 Johann was offered a managerial position at University of Pretoria (UP) where he participated in the implementation of Computer Based Testing and the development of other multimedia learning material. He obtained his M.Ed (CBT) degree in 1989 and was headhunted by Technikon SA (TSA) to fill the position of Manager of the Multimedia and Online Learning Unit within a newly established centre (Integrated Technology Centre). The ITC was tasked to lead educational technology initiatives within the institution.

In 2004 TSA and the University of South Africa (Unisa) merged. Johann's extensive experience in educational technologies laid the foundations for his appointment in a consultative role as Deployment Specialist and Change Manager for the Directorate: Portal and Academic Solutions within the ICT department. He is among others, responsible for the role out and academic adoption of myUnisa, a virtual learning environment that served in excess of 200 000 student in 2008.

The Role of an LMS in Improving Learning Effectiveness in a Military Academy

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ABSTRACT

In this paper, the factors that contribute towards learning effectiveness in e-learning courses were explored. A review of previous studies was done to determine those factors that are most applicable to a tertiary teaching environment and to propose a model to assess effectiveness in online courses. The Virtual Learning Environment (VLE) was defined to establish the boundaries for measurement. Constructivism was explored as a teaching approach in tertiary online courses. This model provided the input for a demonstration of an online course measurement and feedback tool using MOODLE. A current student group was used to demonstrate the tool's use and recommendations were made from the findings. Areas for improvement were discussed and recommendations made for future studies.

Keywords: Learning Management System (LMS), *Virtual Learning Environment (VLE), Effectiveness, Blended Learning, E-learning, Constructivism,*

"Advanced knowledge cannot be gained from ghosts and spirits, inferred from phenomena, or projected from the measures of Heaven, but must be gained from men for it is the knowledge of the enemy's true situation". (Sun Tzu)

INTRODUCTION

Background to the problem

In the South African National Defence Force (SANDF), skills are generally gained through well-organized training programs that are focused on specific knowledge areas. The training until recently was largely based on the classroom instructor-led educational model. This system was mainly an objectives- and outcomes-based system with building blocks defined according to military organizational and operational requirements.

A natural progression from this system of training was an alignment with national and international trends in outcomes-based education. This was embraced by the SANDF in the early 90's with increased emphasis on learner-centered training. Strong emphasis on facilitated learning processes ensured operational quality. In the SANDF context this teaching approach implied an increased emphasis on integration of training modules and management of the learner's portfolio of learning in a life-long learning environment. Integration of training and education meant that accurate tracking of individual learner outcomes throughout the learner's career became an imperative. This presented a seemingly insurmountable challenge to the SANDF as the current training systems were not designed to manage this new approach. For example, the old training management system, MILKWAL, was unable to track individual outcomes or capture the individual learner's career-path progress or results. A new system was required which went beyond the traditional Computer Based Training tools and results capturing system, like MILKWAL. A recent solution was realized in a Learning Management System by SITA as an initial feasibility study for the SANDF.

A Learning Management System (LMS) is a computerized system that delivers learning content to learners on a network whilst tracking progress of learners and maps the learners' progress to a set of outcomes (Henderson, 2003). The three main components of a LMS are a content delivery platform, a learning management component and a learner progress tracking and reporting sub-system (Henderson, 2003). LMS systems were born from the concept of e-learning (Henderson, 2003). E-learning was used to describe all computer training since the inception of Computer Based Training (CBT). However, Bonk makes it clear the CBT cannot be anything more than instruction lessons or skills training as it is generally lacking as a learner tracking system (Bonk, 2004). The era of CBT was characterized by a lack of standards to govern universal implementation methodologies that was required to ensure interoperability and the concept of reusability of training content (Bonk, 2004). True inter-operability between e-learning content objects could not be achieved until the definition of the SCORM (Sharable Content Object Reference Model) standard (Ruiz, 2008). SCORM attempts to define a standardized platform for content delivery and learner tracking through a simple model using XML as a definition language. The model describes a system that is platform independent and provides a framework to integrate existing modules into comprehensive learning events. The standard mainly describes data formats for capturing data and SCORM compliant formats for objects that can be used in the LMS. It is therefore evident that in e-learning standardization is required for technical specifications. However, can a standardized model be implemented to measure learning effectiveness?

When implementing an online course it is important to evaluate the intensions of such an intervention in an attempt to ensure that the required results are achieved. Historically many attempts to implement e-learning systems have failed for various reasons. These reasons include (Henderson, 2003):

- Lack of strategic direction by management and policy makers.
- Unplanned and uncoordinated implementation strategies that are focused on computer based training (CBT) tools.
- Institutional views of e-learning as simply another facilitation tool.
- Inadequate systems design that do not include the educational approach in the design, course design, or learner and facilitator systems design.

Needs analysis

However, the most important motivation to implement an e-learning system and to measure its success should be to improve learning (or learning effectiveness). The learner should be the focus and therefore an important measure of success must be: How much did the system improve learning, compared to the previous approach?

It is against this background that the following research questions were formulated to address the need:

- What is learning effectiveness and what factors influence learning effectiveness in e-learning?
- What factors are significant in measuring e-learning effectiveness at the Military Academy?
- What general high-level framework can be used to develop a measurement instrument for future positivistic studies?

Limitations and boundaries

For the purpose of this study the term e-learning refers to those online teaching and learning technologies that is used in the residential or full-time campus study courses. It excludes distance-learning courses and is limited to tertiary education.

Also, the answers to these questions are limited to teaching and learning methodologies and not management-related aspects such as budget constraints, systems specifications or business investment analysis.

General approach

In this study a literature analysis approach was followed to establish theoretical bases for the practical application of the theory. The objective of the study was to demonstrate a model to measure the effectiveness of an LMS in aiding learner success as the most important success indicator of an e-learning system.

THEORETICAL BACKGROUND (LITERATURE REVIEW)

It is evident from the previous section that various models for measuring learning effectiveness have been proposed by different authors. Chan, et al devised a framework for measuring online course effectiveness based on four major components namely online courses, learning effectiveness, evaluation methods and evaluation results (Chan, 2007). Piccoli, et al however suggested that the measurement of the effectiveness of an online learning course must take into account two main "dimensions" (Piccoli, 2001). The "human dimension" and "design dimension" are seen as major components that must be considered in improving learning effectiveness. The literature applicable to this topic is review in a systematic manner and is categorised according to major concepts.

Definitions

Before embarking it is important to define certain key terminologies relevant to the questions. The first key definition is for "learning effectiveness". Ginns refers to "evaluating the quality" in his study to evaluate "blended learning" courses (Ginns, 2007). Alavi uses more concrete "attributes" of an effective learning intervention, which are focused on the collaborative nature of learning and the construction of knowledge through social interaction, teamwork and problem solving. It is evident from literature that learning effectiveness of e-learning systems is dependent on many factors ((Alavi, 1994); (Ginns, 2007), (Moore, 1991), (Sun, 2007), (Lim, 2007); (Adams, 1992)). These factors include but are not limited to user friendliness, ease of understanding, ease of exchange, sufficient contact, perceived usefulness, image, learner anxiety, course flexibility, course quality, diversity in assessment and organizational support. It is evident from these studies that the model to evaluate effectiveness is dependent on the pedagogical approach that is applicable at the institution. Pedagogical approaches, which are guided by institutional policy, can vary from the "blended learning" approach (Ginns, 2007), to the "constructivist" approach (Alavi, 1994), to the adult based education approach (Stellenbosch University, 2007), to name a few. It is therefore important to first define a relevant approach for the institution relevant to this study and then to define the factors relevant to measuring its effectiveness. These factors can then contribute towards developing a framework for implementation of effective e-learning courses. The next sections define various models and approaches that will culminate in a proposed unified model which can be used at an institution like the Military Academy and which will be used in a demonstration of a technology enabler.

Constructing Knowledge

Knowledge defined by the Oxford English Dictionary as expertise and skills acquired by a person through experience or education, and can be tacit or explicit (Polanyi, 1983). Tacit knowledge is defined as "contextual" or inherent to the learner and he/she may be unaware that he/she possesses such knowledge. Explicit knowledge can be conveyed through conventional mediums like printed media or even traditional teacher-led education. It is however inconceivable that tacit knowledge can be conveyed without dialogue, collaboration and interaction (Harlow, 2006). This is also supported by the fact that tacit knowledge is converted to explicit knowledge through a process of codification or articulation (Polanyi, 1983). Knowledge creation involves a process of interaction between the actors and information that is tested, revised and falsified before acceptance and construction takes place.

Technology in Education

In *Blended Learning: What works* (Bersin, 2004) Bersin makes it clear that e-learning has evolved from the mainframe computer-based training (CBT) systems to a system that incorporates technology, traditional teaching methodologies and new approaches towards student-centered learning which utilizes Learning Management Systems (LMS) as enabling platform. This approach allows for synchronous and asynchronous teaching and attempts to find the best mix of both to facilitate training. This has become an imperative towards the successful presentation of e-learning courses to fully utilize the advantages that technology-based learning provides. The key requirements for good training and education are that "the teacher, professor, or subject matter will always have a role to play" (Bersin, 2004) and that learning "requires a combination of content plus context" (Bersin, 2004). What remains important to remember is that technology-based education has an evolutionary progress and that technology must support education. This approach is discussed further in the next section.

Blended Learning

Bonk and Graham defines blended learning (BL) as follows:

> "Blended learning systems combine face-to-face instruction with computer-mediated instruction" (Bonk, 2004).

They also define the present role of this approach as "unrecognized" for its potential to deliver effective education (Bonk, 2004). This is however slowly changing as more educators realize the importance of "space, time, fidelity and humanness" that is required to make technology-based education successful (Bonk, 2004). These dimensions of modern education can be a potential reference to start the development of a framework. Piccoli, et al expand these dimension to include "time, place, space, technology, interaction and control" (Piccoli, 2001). It will therefore be important to excel in all these dimensions to meet the requirements for effective blended learning. It is suggested that all these dimensions are included in the each of the "antecedents" towards effective learning. What may also be important in measuring the effectiveness of a blended learning course is to gauge the course's position in each of these dimensions before the measurement starts. For example, a course that requires more synchronous training may require less fidelity (richness of content), more human interaction and more virtual enablers, whilst a course that is highly asynchronous may require higher fidelity, less human interaction and less live interactions. The dimensional location of the course is however an institutional prescription and frequently driven by resources. The next section investigates a learning effectiveness model as a starting point in defining a suitable approach.

First Learning Effectiveness Model

Lim, Lee, & Nam (Lim, 2007) point out that training effectiveness has always been difficult to measure, especially in measuring the transference of knowledge to the job. They concluded that the most important factors in measuring learning effectiveness are the intrinsic motivation of learner, computer self-efficacy[1], and the ability of content to mimic the practical task execution, the institutional situation and blending of traditional teaching with online learning (Lim, 2007). Lim identified eight contributors towards learning effectiveness. These were, "Motivation, self-efficacy, contents of training, face-to-face meeting, e-mail exchange, ease of use, senior's support and continuous learning culture" (Lim, 2007). In their analysis only five of these were adopted in the final model namely, learning motivation, computer self-efficacy, task-related content, face-to-face meetings, organization environment and traditional learning culture. The next section expands on the Lim model to include other factors of learning effectiveness.

First Learning Effectiveness Model Expanded

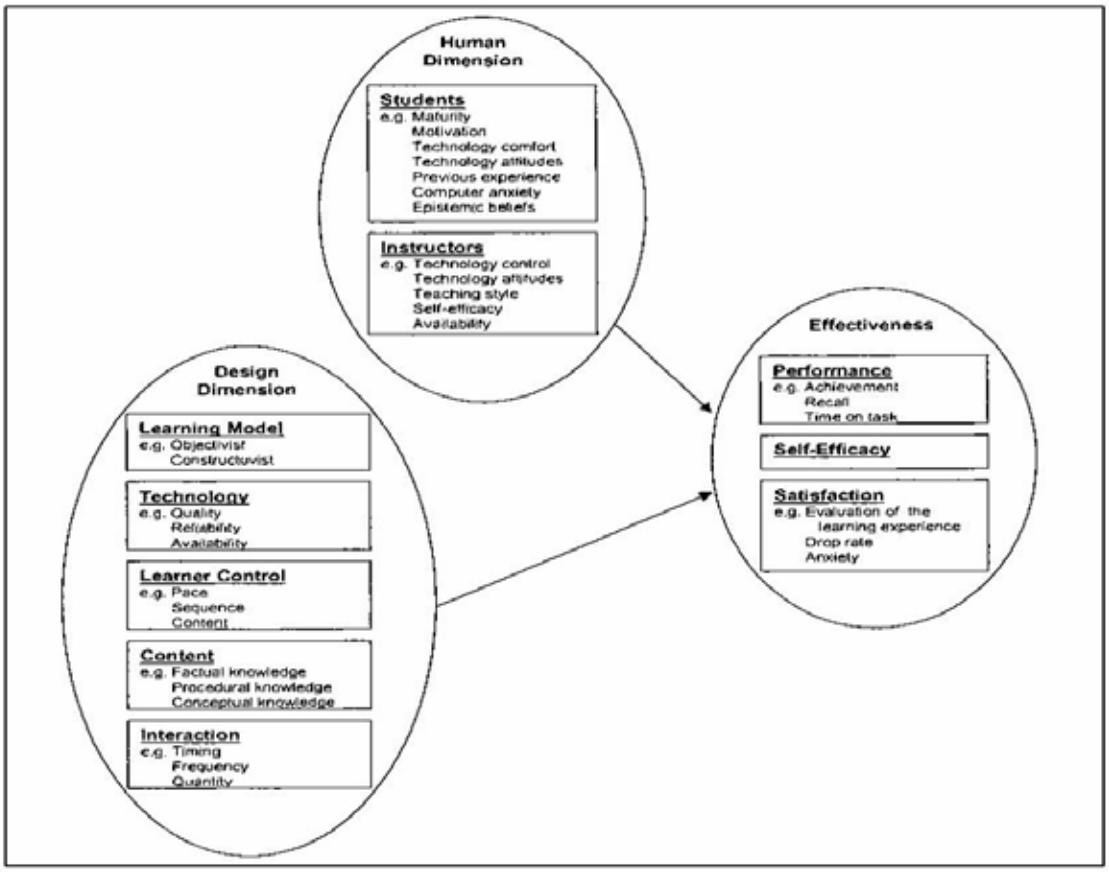
Chan, et al devised a framework for evaluating online course effectiveness based on four major components namely online courses, learning effectiveness, evaluation methods and evaluation results (Chan, 2007). This framework suggests that learning effectiveness need simply to evaluate the constituent online learning resources (that is repositories, progress assessments and knowledge management) to obtain a measure of learning effectiveness. The evaluation process is dependent on course feedback and is primarily based on student perceptions of learning effectiveness.

1 Computer self-efficacy: "The learner's perception of their ability to carry out a series of computer tasks." (Lim p28). "People's judgments of their capabilities to organize and execute courses of action required to attain designated types of performance" (Bandura 1986 as cited in Compeau, 1995).

It is therefore important to map the intended e-learning resources to the applicable learning factor when attempting to design a framework as the framework is influenced by the organizational approach towards blended learning. The next section explores the relevance of the Lim and Chan models to the Piccoli model as basis for incorporation into the Piccoli model.

Relevance of Piccoli Model

Piccoli, et al, highlight various perceived advantages of technology-based learning in the improvement of learning performance but also display various disadvantages. The blended learning approach endeavors to ensure that technology is used as enabler for facilitated learning using various delivery mediums. The Piccoli framework accommodates the interactions of role players in the learning process, technological elements ("design dimension") and their influence on the learning effectiveness. Learner performance in this framework plays an important part in measuring the effectiveness. This Piccoli study showed that the use of e-learning systems did not lead to higher performance. Other factors must be considered in determining the value of such systems and that technology alone cannot achieve learning. The Lim and Chan models are therefore insufficient to measure learning effectiveness and although they can be incorporated, a new model must be defined that will consider more factors than previously discussed.



The Piccoli Model

Piccoli, et al describes the technology-based learning environment as a "virtual learning environment (VLE)" (Piccoli, 2001). In their discussion, the traditional views towards VLEs are discussed as possible enablers towards improving learning effectiveness (Piccoli, 2001). Improvements are brought about in the dimensions as discussed in the previous section and the model is driven by the unique requirements of each course, instead of a generic one-size-fits-all-approach. The "Dimension and Antecedents of VLE Effectiveness" (Piccoli, 2001) suggests an elegant framework to measure learning effectiveness (see Figure 1). Other authors who support this multi-dimensional approach towards effectiveness are (Entwistle, 2002) and (Liaw, 2006) who include "good design" as a determining factor. The next section suggests one approach towards teaching and learning that can be used effectively to support blended learning by tertiary institutions.

The Constructivist Model

Bangert in his "constructivist models of learning and online instruction" also requires "good design" of e-learning courses to be included in any learning effectiveness model (Bangert, 2004). The constructivist model bases the success of instructional design on the learner's ability to internalize the knowledge through their interpretation, form their own meaning and experiences (Bangert, 2004). "Discovery learning", "authentic examples", "judicious feedback", "enhanced self-efficacy" and "collaborative learning" are listed as important factors towards effective e-learning courses (Bangert, 2004). Bangert goes further in defining seven effective teaching practices namely, "(1) student faculty contact, (2) cooperation among students, (3) active learning, (4) prompt feedback, (5) time on task, (6) high expectations, and (7) respect for diverse talents and ways of learning". These principles show correlation between the elements of Piccoli, et al's dimensions and deserve consideration as contributing factors towards effective e-learning. The next section expands the constructivist model towards e-learning effectiveness.

Constructivist Factors Expanded

Sun , Liaw, Huang & Chen, and Ginns & Ellis proved valuable in distilling a list of factors for consideration in e-learning effectiveness (Sun, 2007), (Liaw, 2007), (Ginns, 2007). Ginns, P. & Ellis suggested that "good e-teaching", "good e-resources", "appropriate workload" and "student interaction" must be considered when evaluating face-to-face e-learning. Liaw, Huang & Chen investigated the role of individual autonomy, teacher assistance, multimedia instructional content and e-learning as problem-solving tool as the major contributing factors in an activity theoretical[2] e-learning environments. They conclude that the interactions between e-learning and online learning subsystems create a wealth of knowledge and learning opportunities. Sun investigated the aspect of learner satisfaction but concludes that learner satisfaction forms part of a cyclic process in which learner satisfaction has direct bearing on learner performance.

Alavi investigated one particular blended learning tool (GDSS – Group Decision Support System) to enhance the effectiveness of collaborative learning. Collaborative learning is synonymous with activity theory learning and forms part of the blended learning approach. It utilizes online collaboration tools such as e-mail, forums, notice boards and group assignments to accomplish group learning. An important factor in determining performance is that achievements in collaborative blended learning environments must not only be assessed for the individual but also for the group (Alavi, 1994). Overall achievements for this study showed improved performance for the group and the individual students using collaboration tools. It is therefore important to include measures for individual and group achievements in the framework. The next section suggests a unified approach that is a useful approach towards improving learning effectiveness in a tertiary education institution like the Military Academy.

Introduction to a Unified Theory

A unifying theory is required in this multi-approach towards teaching and learning in the e-learning environment that focuses on both the individual learner and group learning. Various authors have incorporated recent theories of learning in their research. Bangert speaks of the "Seven Principles of Good Practice" which he draws from the constructivist model (Bangert, 2004), Benbunan-Fich of "knowledge construction versus transfer" (Benbunan-Fich, 2006), Almala of "tenets of constructivism" (Almala, 2005) and Dougiamas of "the faces of constructivism" (Dougiamas, 1999). Notably it was Dougiamas who also incorporated constructivism in the design of the OpenSource LMS, Moodle. Andrew defines the constructivist theory of learning as a teaching paradigm where learners "are encouraged to construct their own knowledge through social interaction and meaningful activities" (Andrew, 2007). Dougiamas identified five areas or "faces of constructivist learning which eventually are used to expand the tenets of constructivism. These areas are: trivial constructivism, radical constructivism, social constructivism, cultural constructivism and critical constructivism (Dougiamas, 1999). This progression of constructivism covers the spectrum of separate and connected learning which Belensky, et al, defines as the two distinct learning styles (Belensky, 1986). Almala identifies five major tenets of constructivist learning which he lists as (1) a complex and relevant learning environment, (2) social negotiation and interaction [or collaboration], (3) multiple perspective and multiple modes of learning, (4) ownership in learning and (5) self-awareness and knowledge construction (Almala, 2005). Dougiamas extends this list to include (6) learners filter experiences through their own "world views", and (7) learners learn through the application ("doing") (Dougiamas, 1999).

2 Activity theory: "A system that contains interacting components and is organized to accomplish the activities of the activity subsystems" (Engestrom, 1987 as cited in Liaw, 2006).

In tertiary education it has become increasingly important to incorporate elements of e-learning and collaborative learning. The University of Stellenbosch makes provision that "*e-learning constitutes an integral part of the learning provision*" and a focus on a "*student-centered learning and teaching environment*" (Stellenbosch University , 2007). This indicates a maturing in teaching and learning at this institution towards the constructivist approach in learning and teaching. But how is this relevant to the e-learning environment and therefore also the blended learning environment?

Constructivism in E-Learning

E-learning technologies have become especially focused on delivering learning content in ways that facilitate a constructivist approach. Although not unique to the e-learning environment, these tools are particularly well suited to technology-enabled environments as both tools to aid constructivist interaction and capturing proof of learning. As e-learning implementations of modules have become a prerequisite for quality teaching at institutions like the University of Stellenbosch (Stellenbosch University , 2007) it is evident that the LMS has become the major delivery vehicle of learning content. It is therefore vital that any attempt to measure how effective an e-learning intervention is in facilitating learning must include the constructivist tenets as basis for teaching approach and for effective learning to take place. The next section will highlight the approach that was followed to answer the research question using this theoretical underpinning of effective learning in e-learning.

THE METHODOLOGY

General Approach

Moore and Benbassat describe a method to develop an instrument to measure perceptions in IT. Its value lies in the methodology applied to design the instrument. This methodology can be described in short as (1) identify possible characteristics, (2) review existing instruments to find similarities/ differences and adjust your own, (3) instrument development process (item creation, validity testing, sorting and reliability), (4) instrument testing, (5) instrument reduction and (6) conclusions (Moore, 1991). This approach was used as basis for study in this research although as far as possible existing resources were used and validation of instruments was not conducted.

Research Design

The study is essentially an interpretivistic study and an evaluation research design approach was followed. "It aims to answer the question of whether an intervention has been successful or effective" (Mouton, 2001). The study was theory-driven to determine the perceived factors from literature.

Research Outline

The following general research outline was used during this study:

- Define the key factors from theory that contribute towards improving learning performance in blended learning courses. The major inputs to this phase will be from literature review.
- Propose a general high-level framework for measuring the performance in blended learning courses.
- Demonstrate the implementation of the framework through existing means.

PROPOSED FRAMEWORK

The literature review suggests that some previous models focused on traditional measures such as learner performance comparisons, recall and on-the-job effectiveness. Although these measures remain important it is important to incorporate measures that are less tangible, but important as they can be determinants in improving traditional indicators. Dougiamas reasons that these intangibles are the social and personal interactions that shape our knowledge through "historical, political and economic contingencies" (Dougiamas, 2003). It is therefore important that the e-learning tools that are used must allow the designer to implement specific interventions that enable constructivist knowledge creation. A mapping of the tenets of constructivist learning to LMS tools is therefore required as guideline for designers and this model for evaluation.

The proposed framework to measure learning effectiveness is a combination of the Piccoli model and the tenets of constructivist learning as measuring elements. The Piccoli model provided the boundaries of the framework (that is, which actors are involved) whilst constructivism provided the specific elements to measure. It is important

to note that the effectiveness measurement in this study was limited to the Human Dimension (preferences antecedent), and Effectiveness Dimension (self-efficacy and satisfaction antecedents). The next section will explore an e-learning implementation as demonstration of how existing technology can be used to aid teachers and learners in improving e-learning effectiveness. It is proposed that the model implementation be cyclic in nature as feedback for improvement is vital for good course design.

ILLUSTRATION: CASE STUDY

Mapping The Route

For the purpose of the case study a model is proposed which is based on the constructivist approach towards teaching and learning. The assumption is made that good course design principles were applied and that the blended approach towards e-learning was used. The proposed model for implementation requires a LMS, which supports the tenets of constructivism. It was also necessary to map the existing tools and techniques of an LMS that could contribute towards constructivist learning. A proposed mapping is depicted in Table 1 with the relevant tool/technique and the corresponding constructivist tenet.

Table 1: Constructivist-LMS mapping

Tool/Technique *(Moodle LMS)*	**Tenet, principle or approach** *(Dougiamas, 1999) and (Almala, 2005)*
Blending of online tools, facilitation, collaborative learning and individual learning.	(1) A complex and relevant learning environment
Discussion group, forums, chat and e-mail	(2) Social negotiation and interaction [or collaboration]
Allowance for peer assessments, formative assessments, simulations and reasoning.	(3) Multiple perspective and multiple modes of learning
Creating learning groups, tutorship and peer assessments. Mindmaps and diaries.	(4) Ownership in learning
Scenario based assignments, case studies, status quo reflections, social comments and self-reflection	(5) Self-awareness and knowledge construction
Learner-centered group discussions (anything goes), realworld experiences, and explorations. Hyperlinks and personal notebooks.	(6) Learners filter experiences through their own "world views"
Apprenticeships, workbooks and taskbooks, practicum's	(7) Learners learn through application

LMS Implementation

A testbed was required to illustrate the implementation of the proposed model to improve the quality of an e-learning intervention. Two LMS applications were available for this study as demonstration models, namely Moodle and WebCT Vista. The WebCT platform is provided by the University of Stellenbosch to the Military Academy and Moodle, an opensource LMS, was downloaded from the Moodle site (http://moodle.org). In deciding which LMS to use the following factors were considered:

- Ease of use.
- Accessibility for students and teachers.
- Level of customization.
- LMS suitability for constructivist teaching approach.
- Resources available.

It was decided to use both the LMS systems, mainly because of resource and time constraints. Moodle has a higher level of customization than WebCT and would therefore be more appropriate when problems arouse. WebCT, the LMS in use at the Military Academy, would not be adequate for this, as WebCT cannot be readily manipulated for the purposes of this study. However, it was an institutional requirement that the learning content must be presented on WebCT as the official LMS source and for archiving. For the purposes of this demonstration, the target group was only required to complete the pre- and post-course surveys on Moodle and not all learning content was presented using Moodle.

Moodle was consequently installed on an institutional webserver called Dassen and access was available to any authorized personnel through the local network. The Moodle webserver that was selected was the Apache webserver, which is an Open Source webserver. MySQL server was installed as database server and the PHP language service as a prerequisite for Moodle. Moodle was mapped to the IP address 127.0.0.1 on the network as default, which was used to access the LMS using any web browser software.

A demonstration course was created on the LMS as "Test Surveys" with course code "TS". Users were created on the LMS to allow all students in the target group anonymous access using generic usernames; STUDENT1 … STUDENT18 and students were allocated random usernames from the list.

Constructivist Surveys

Moodle provides the functionality to evaluate various elements of the constructivist model as course surveys. These surveys are known as the ATTLS (Attitudes to Thinking and Learning Survey) and COLLES (Constructivist On-Line Learning Environment Survey) surveys. A version of each of these surveys was created as pre- and post-course evaluation to demonstrate its use as quality assurance tool in the constructivist paradigm of course design. Students were asked to complete the COLLES and ATTLS surveys at the start of the CIS154 course at the Military Academy in an effort to measure student perceptions and preferences in an online course intervention.

The CIS154 module is a Computer Information Systems course presented to first year students at the Military Academy in the Management Studies Program. This course is presented using a blended approach with traditional classroom activities and e-learning activities. Classroom activities included theory presentations, classroom discussions and student presentations, whilst e-learning activities included online resources, formative and summative assessments, chat capabilities, online forums and e-mail. The e-learning resources were provided using the WebCT LMS.

Survey Results

The survey results that were obtained in the previous section are discussed seperately under the headings of ATTLS Survey and COLLES Survey.

ATTLS Surveys

The ATTLS survey is aimed at measuring to what degree a learner is a "connected knower" or separate knower". This survey was originally developed by K.M. Galotti (Dougiamas, 2003).

Items that were measured include question sets for Connected Learning and Separate Learning with a scale of Strongly disagree (1), Somewhat disagree (2), Neither agree nor disagree (3), Somewhat agree (4), and Strongly agree (5).

Table 2 on the next page summarizes the students' responses for the pre-course survey with regards to their attitudes towards learning and learning environment

Table 2: Pre-course ATTLS survey results

ATTLS Pre-course			
Connected Learning		**Separate Learning**	
Make effort to extend	4	Play devil's advocate	2
Insight from empathy	4	Remain objective	4
Put myself in their shoes	4	Focus quality of argument	4
Try to understand	4	Strengthen by argue	4
Think with people	4	Putting on trial	4
Interact with variety	4	Argue with authors	3
Know why people do	4	Use criteria to evaluate	4
Enjoy hearing opinions	5	Point out weaknesses	4
Understand different people	4	I value logic most	4
Where people come from	5	What's wrong?	3
Mean	4.1	Mean	3.7

These results are depicted as summary graphs in Moodle to give visual representation to the student and the facilitator of individual and group results for the survey. Figure 2 below shows the summary of group results, whilst Figure 4 shows the scales of the degree to which the learner is a connected or separate learner, Figure 5 shows the first two responses for specific items (others are not included for brevity) and Figure 6 the individual's responses compared to the group.

Figure 2: Summary of ATTLS Before Results

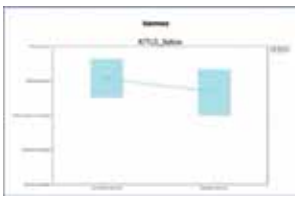


Figure 3: Connected and separate learning

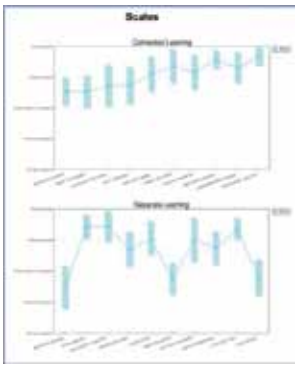


Figure 4: Responses to first two items

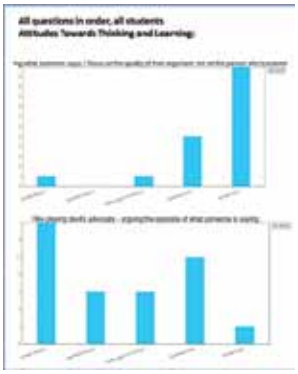


Figure 5: Summary of individual's responses compared to the class

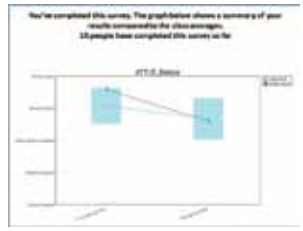


Table 3 below summarizes the students' responses for the post-course survey with regards to their attitudes towards learning and learning environment.

Table 3: Post-course ATTLS survey results

ATTLS Post-course			
Connected Learning		**Separate Learning**	
Make effort to extend	4	Play devil's advocate	3
Insight from empathy	4	Remain objective	4
Put myself in their shoes	4	Focus quality of argument	5
Try to understand	4	Strengthen by argue	4
Think with people	4	Putting on trial	4
Interact with variety	4	Argue with authors	3
Know why people do	4	Use criteria to evaluate	4
Enjoy hearing opinions	4	Point out weaknesses	3
Understand different people	4	I value logic most	4
Where people come from	4	What's wrong?	4
Mean	3.9	Mean	3.8

The summary ATTLS post-course results graphs are included as Appendix A.

COLLES Surveys

The COLLES survey is aimed at measuring how well a course was implemented to suit learners' preferences and perceptions towards a social constructivist teaching approach. This survey was originally developed by P.C. Taylor and D. Maor (Dougiamas, 2003).

Items that are measured include question sets for Relevance, Reflective thinking, Interactivity, Tutor Support, Peer Support and Interpretation with a scale of Almost Never (1), Seldom (2), Sometimes (3), Often (4) and Almost Always (5).

Table 4 below summarizes the students' responses for the pre-course COLLES survey.

Table 4: Pre-course COLLES survey results

COLLES Pre-course	
Relevance	4.3
Reflective thinking	3.7
Interactivity	3.4
Tutor Support	3.7
Peer Support	3.4
Interpretation	3.6

The summary COLLES pre-course results graphs are included as Appendix B.

Table 5 below summarizes the students' responses for the post-course COLLES survey.

Table 5: Post-course COLLES survey results

COLLES Post-course	
Relevance	4.4
Reflective thinking	3.8
Interactivity	3.6
Tutor Support	3.5
Peer Support	3.5
Interpretation	3.7

The summary COLLES pre-course results graphs are included as Appendix C.

ATTLS Interpretation of Results

The pre-course ATTLS survey indicated an overall preference for Connected Learning amongst students with slightly less preference for Separate Learning. Additionally most students do not have preference for the activities involving "playing devil's advocate" and "figuring out what's wrong". This could have been used to implement activities that focus on collaborative learning like group assignments, discussions, student chat, case studies in social perspective, with a high level of objectivity (based on fact and theory), and critical assessments of the current status quo.

The post-course survey indicated that the actual experience of students in the areas of Connected and Separate learning were slightly less than what is preferred, although still within acceptable norms. The students' preferences were not specifically addressed in the course implementation specifically for the purposes of this study, however, such survey results could be used effectively to improve the quality of the course in both the Human and Effectiveness Dimensions of the Piccoli Model through the implementation of specific activities to facilitate the students' preferred method of learning. The post-course surveys are therefore a very simple and accurate measure of the effectiveness of an e-learning course in addition to the traditional measures of effectiveness and quality.

COLLES Interpretation of Results

The pre-course COLLES survey indicated that learners often have a preference for Relevance and sometimes a preference for Reflective Thinking, Interactivity, Tutor Support, Peer Support and Interpretation. This could have been used to implement activities that focus relevance on the learner's interests and current situation (for example, practical application in the work environment). Other activities that could have contributed are activities that require the learner to evaluate and analyse his/her current situation, group learning like student tutoring, peer assessments, message boards, chat and e-mail interactions.

The post-course survey corresponded closely with the pre-course survey results, which imply that the learners' preferences were closely met. The students' preferences were not specifically addressed in the course implementation specifically for the purposes of this study, however, such survey results could be used effectively to improve the quality of the course in both the Human and Effectiveness Dimensions of the Piccoli Model through the implementation of specific activities to facilitate the students' preferred method of learning. The post-course surveys are therefore a very simple and accurate measure of the effectiveness of an e-learning course in addition to the traditional measures of effectiveness and quality.

DISCUSSION AND CONCLUSION

The study suggests that practical means exist to ensure effectiveness of e-learning courses through a cyclic quality assurance approach. This approach is based on the Piccoli model to set the boundaries of the measurements and the tenets of constructivism to determine assessment items. Figure 6 illustrates the process used in this study and suggests a model for future use. The E-learning Quality Cycle also incorporates all the relevant models and factors that are required to ensure learning effectiveness through a quality assurance cycle for e-learning. It is based on a constructivist approach towards learning and involves the design and implementation phases of an e-learning intervention.

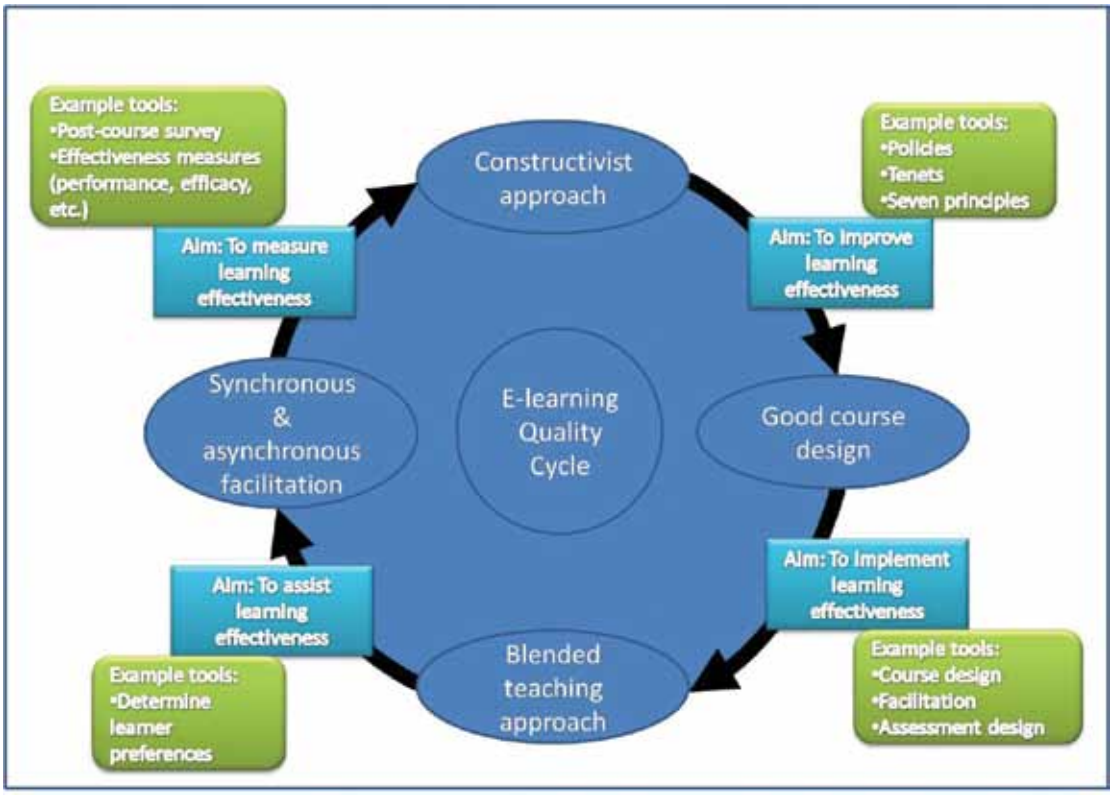


Figure 6: Proposed model

The demonstration of a survey tool in Moodle showed a possible method to determine preferences and measure the extent to which it was achieved in an online course. This can be used as a feedback system for the course but is reliant on the educator to find practical ways to implement suggestions. It is also helpful as a quick reference tool to the educator to determine problem areas. This, in combination with other tangible measurements like student performance and course statistics, can be used as key performance indicators of course success or effectiveness. The tool provides summary representations of the survey results, which are easy to interpret. For quality assurance to be effectively implemented a thorough analysis of available course data is required.

Modern course data can become vast for tertiary institutions and requires extensive human and technological resources to store and manage this data. User requirements for presentation of this data differ at different levels in the institution and complex relations can exist between data sets. Data representation falls within the data warehousing field and is also applicable to the educational environment. Implementations of data warehouses are aimed at data presentation for management decision-making. This approach to decision-making that is based on in-time information ensures a high degree of pro-activity. In online courses this approach can be especially useful to avert learner failure. Designers, teachers and learners can benefit from data warehouse tools like dashboards. Dashboards provide graphic presentations of KPI information that are used as quick references for users. A possible extension of the Moodle survey tool could be to include a dashboard representation of all course data, including constructivist data, learner results and usage statistics. It is also recommended that online courses utilise tools similar to Moodle's constructivist surveys to measure student preferences and experiences to contribute towards the effectiveness of the course. Future studies should include the implementation of data warehousing tools and representations.

This study endeavoured to explore the factors that contribute towards improving learning effectiveness specifically in the e-learning environment. A model was proposed with the teacher, learner and design dimensions in the constructivist approach. The study was therefore limited to a tertiary educational institution that embraces the tenets of constructivism and blended learning. Additionally Moodle was used as demonstration technology of a measure to assess some of the factors of effectiveness in the constructivist paradigm. Future research should focus on institutionalising the constructivist approach with practical guidelines for teachers and designers at other tertiary institutions. Research should also be conducted to measure the maturity of the constructivist and blended learning approaches at the Military Academy.

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APPENDIX A. SUMMARY ATTLS POST-COURSE RESULTS GRAPHS

Figure 7: Summary of ATTLS After Results

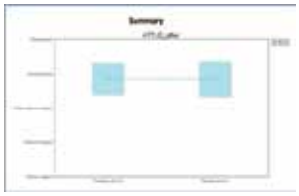


Figure 8: Connected and separate learning

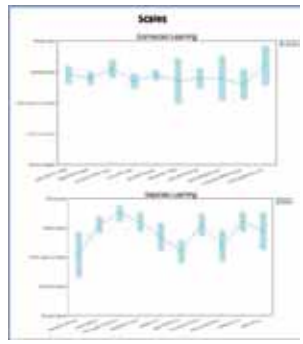


Figure 9: Responses to first two items

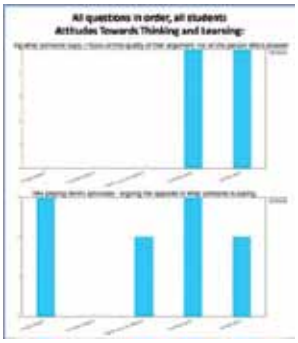
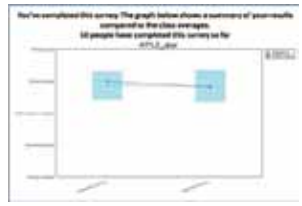


Figure 10: Summary of individual's responses compared to the class



APPENDIX B. SUMMARY COLLES PRE-COURSE RESULTS GRAPHS

Figure 11: Summary of COLLES Before Results

Figure 12: Student preferences

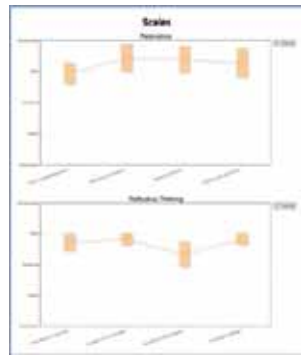


Figure 13: Responses to first two items

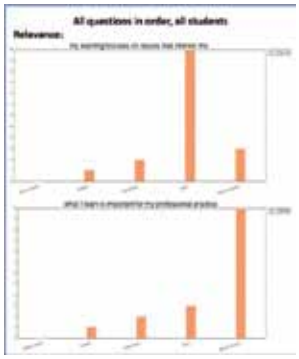
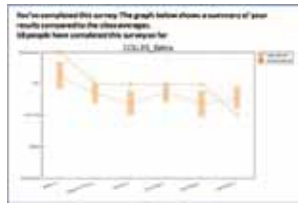


Figure 14: Summary of individual's responses compared to the class



APPENDIX C. SUMMARY COLLES POST-COURSE RESULTS GRAPHS

Figure 15: Summary of COLLES After Results

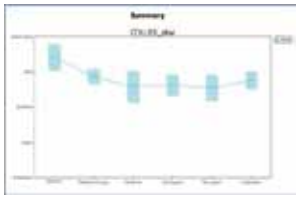


Figure 16: Student preferences

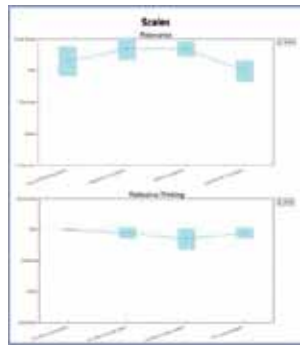


Figure 17: Responses to first two items

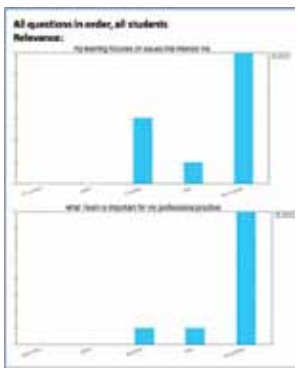
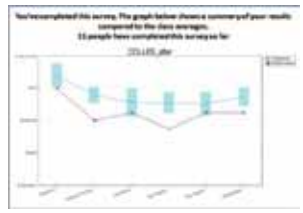


Figure 18: Summary of individual's responses compared to the class



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“Manning the barricades”: Managing Organisational Boundaries for Effective e-Learning

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ABSTRACT

This paper explores how the boundaries within organisations, structural and cultural, impact the take-up of an innovation, such as e-learning in a complex higher education and defence environment. In doing so, the paper examines how structure and environment act as impediments, or facilitators, to newer education and training developments and whether these factors can be mitigated against or managed.

The most apparent barriers are structural. These are sanctioned forms that delineate organisational workgroups and entities. They are inextricably meshed with the policies, processes and practices that scaffold teaching and learning activity.

Structural dimensions can generally be managed or guided towards a common mission, goal or endpoint. The more pervasive elements, however, are cultural and include issues pertaining to role and identity and working within a more ambiguous environment. Many human factors associated with change may be observed as overt behaviour, but often they emerge as more subtle manifestations, which are both difficult to identify and to manage in organisational settings. Strategies that rely on influence, rather than control, can be more appropriate in the latter case.

The most challenging issues often occur at the boundaries of a system. Commonly these complex issues and behaviours are interpreted as problems, and much of the organisational effort is directed towards overcoming such change barriers. This paper will examine various aspects of boundary behaviour, drawing on theories and models of change, as well providing practical examples and strategies to manage these boundary transitions more effectively.

Keywords: organisational change, e-learning, boundary, complex adaptive systems

INTRODUCTION

Contemporary opinion still widely views e-learning as an educational innovation, although it may be contested that in some tertiary education contexts it struggles to exhibit key 'innovative' criteria such as newness, inventiveness, ingenuity or creativity. Notwithstanding this, and the fact that e-learning now has less claim to being a "radical innovation" (Leifer et al. 2000), this paper contends that e-learning, and the associated terms of online, flexible, distributed or blended learning, are innovative in an evolutionary sense of emerging novelty and newness. This is particularly so for many learners and teachers in specific contexts such as defence and related sectors.

INNOVATION AND THE IMPORTANCE OF ORGANISATIONAL STRUCTURE

Successful take-up or embedding of educational innovations such as e-learning, calls for an understanding of organisational context, and the connections and interrelationships of an organisation's constituent parts or elements. Structure has underpinned much of the discourse about organisations and their environment (Hinings 2004) and structural designs, Pfeffer, argues are "important ways of analysing and understanding organizations" (Pfeffer, 1997, p198).

Such views are reflected in a management emphasis which typically frames organisational activity in structural terms, particularly as it impacts efficiency and effectiveness (Hinings, 2003) and, further, as it is seen to bestow legitimacy to emergent activity (Di Maggio and Powell, 1983; Meyer and Rowan, 1977).

Thus notions of control and authority are key structural elements which lie at the heart of organisation (Weber, 1947), providing the scaffolding or the glue to manage multiple dimensions of organisational life. Bureaucratic and formal organisational structures exemplify the high dependency placed on structure, but even more recent forms of organising, such as inter-organisational teams, networks and "learning organisations" (Senge, 2006) are structural forms.

The significance of structure in universities and defence organisations (Dekker, 2002, Reinhart, 2008) is particularly notable, highlighting the criticality of the management of the interface between the two sectors. Despite the fact that both university and defence organisations have had long traditions as institutions (Scott, 1995), traditional universities have evolved to a different structural form, the "professional bureaucracy" (Mintzberg, 1991). Defence establishments, on the other hand, are more akin to Mintzberg's (1991) "machine bureaucracy". An additional configuration, the "adhocracy" Mintzburg (1991), aligns better with think tanks, innovation incubators and entrepreneurial start-up companies, offering an organic management style which exhibits minimal formal processes, rules and structures, and governed by consensus or strong ideological leadership.

Innovations and new projects tend to flourish better within less formal structures, such as the adhocracy. In the initial phases of change or adoption of e-learning in education and training organisations, it has been found that the focus of activity has occurred at the edge or the periphery of the organisation (Rossiter, 2006). Activities can be recognised as pilot projects, sandpits, proof of concept initiatives and test beds. The periphery is where organisations permit maximum freedom and creativity, thus ensuring that the core institutional programmes are intact and less threatened. For example, over recent years a number of different e-learning conceptions, projects and initiatives emerged within the Cranfield University and Defence Academy of the UK context. For example, Cranfield University, a distinctive but postgraduate university with restricted student numbers, has supported numerous LMS platforms including Blackboard, Moodle, Sharepoint and several home-grown solutions. A similar technology mix could also be identified across the various components of the Defence Academy and the wider UK Defence sector. The number of underlying technologies is not necessarily problematic, but the relative segregation of each system and lack of connectivity or interoperability, is symptomatic of an immature take-up model.

Institutional support for such a cottage industry culture tends to be transitory, particularly if senior management forms the view that the e-learning innovation is of strategic importance to their organisation. The pattern is to retire many of the original small projects or innovations, directing the locus of activity towards the 'centre' of the organisation where the control, rules, authority and ownership of the innovation shifts to new stakeholders. This migration can be bumpy and uncomfortable, as the journey involves crossing a number of cultural, processual and structural boundaries. Such boundaries frequently act as barriers to movement and change.

THE BOUNDARY AS A FEATURE OF ORGANISATIONAL ENVIRONMENTS

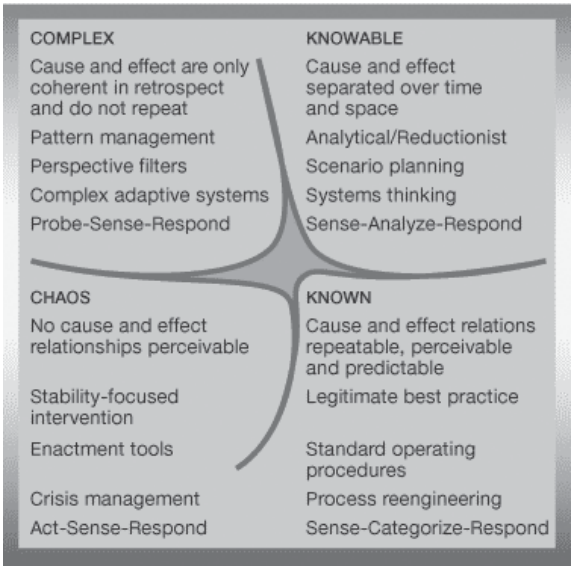
The notion of the "boundary" (Luhmann, 1995), is critical to an understanding of the process of embedding innovations such as e-learning, but to assess the impact of boundaries on organisational life it is important to appreciate the nature of the boundary and its key attributes.

Boundaries are subject to interpretation, depending on context, but commonly are understood as the demarcation line or the edge which divides or delineates two or more spaces, each exhibiting its own particular elements and features. Luhman (1995, p.28) reminds us that boundaries "have the double function of separating and connecting the system environment", but when they are well defined:

> …elements must be attributed either to the system or to the environment. Yet relations between system and environment can exist. Thus a boundary separates elements, but not necessarily relations. It separates events, but lets causal effects pass through (Luhmann, 1995, pp. 28-29)

Kurtz and Snowden's (2003) Cynefin sensemaking framework demonstrates this point, articulating four environments, "known", "knowable", "complex" and "chaotic". These "domains" and key attributes are represented in FIGURE 1.

Figure 1 Cynefin Domains
Kurtz and Snowden, 2003, p. 468



This framework can provide valuable insights to assist decision making with respect to the development and support of educational innovation. Thus, the introduction of e-learning, or a significant adaptation to existing educational practice, could be positioned within a specific domain, based on the responses and behaviours which are native to that domain. For example, a radical innovation, perhaps the introduction of social networking tools in certain contexts, would be less likely to align with an ordered domain such as the "known" (Kurtz and Snowden, 2003), which is populated with attributes such as standardised procedures and process reengineering.

Boundary attributes also vary considerably. A boundary can be sharp and well defined or blurred and fuzzy; rigid and hard or soft and permeable; stable or changeable and so on. The boundary itself may be a narrow or wide space in a physical or cultural sense.

Typically we are more familiar and therefore comfortable with a distinct, relatively narrow boundary. A good example is a fence or wall which clearly establishes the physical limits extended to an individual or group before authority or sanction to proceed is required. In a similar way, the organisational chart offers all stakeholders guidance as to the extent of personal authority or control, and a governing framework covering rules, roles and processes to enable and direct organisational effort. The functional groupings depicted in an organisational chart are useful in a stable known environment where roles are well established and the scope of activities clearly defined. The risk, however, is that such structures create organisational silos and stovepipes, which anchor activities behind rigid and impermeable boundaries. These barriers obstruct or hinder innovation and creativity, especially those which require knowledge, skills and input from beyond a particular organisational group. When transactions need to take place across well defined boundaries they tend to be formal and direct, with the intent of minimising the need for constant interpretation or clarification. Formal contracts or memorandums of understanding are generic examples of such transactions. A specific example is the 22 year contract between Cranfield University and the Ministry of Defence, UK for the provision of courses and academic services, incorporating requirements for e-learning development and modes of flexible and modular course delivery.

The soft boundary is less defined and, therefore, creates a wider space between environments. Typically, such boundary 'zones' are more malleable and changeable and therefore susceptible to unplanned or serendipitous incursions or interventions. An example of this type of transitional environment is the littoral zone around coastlines, where the ebb and flow of the tides makes it difficult to determine the boundary edge and also creates a diverse and changeable ecological milieu for habitation and recreation.

Kurtz and Snowden (2003, p 474) adopt a range of metaphors to further understanding of boundary and boundary crossing attributes. The first is the "shallow river" which can be crossed easily by the majority at any place or time. The second is the "deep chasm" can only be crossed with the help of a structural support, such as a bridge, thus imposing tighter controls on who can cross, the place and time of crossing. The final is the "high plateau" which is deceptive and therefore most dangerous. The danger lies in the fact that individuals can wander unknowingly into a wide open space, loose their sense of direction and may even fall off an unseen

precipice. The plateau, while very disorienting, can be used constructively – for example to promote innovation by disrupting the known behavioural patterns in an organisation which is excessively rigid or set in its ways. Alternatively, it can be quite debilitating, for example, in corporate restructures, where groups wander furtively through the high plateau fog seeking support and advocacy (Kurtz and Snowden, 2003, p. 474).

Such transitional boundary spaces feel unfamiliar and are characterised by uncertainties and complexity. The established rules and conventions of the known boundary space no longer applies, new roles and relationships need to be forged, expectations, goals and outcomes mutually negotiated, all of which require time and new skill sets.

BOUNDARY MOVEMENTS AND BEHAVIOUR

Managing the transition across boundaries is as important to the successful progression or evolution of e-learning as understanding and managing the behaviours which occur within the adjoining organisational environments. Failure to manage these transitions, for example through indecisiveness or stalling tactics, can impact progress in a number of adverse ways producing a stalemate or slow entropy (Luhmann,1995) for an innovation or its key components.

A well defined 'bridge' boundary crossing can facilitate those established or 'known' interactions and transactions which are well understood by all agents and parties. For example, with our Cranfield University and Defence Academy - CMT partnership, standard Prince 2 project change controls are applied to the maintenance programme for the e-learning course, Military Knowledge (MK) I and II (Mackain-Bremner, and Scott, 2006), as that programme has now reached a stable or steady state.

However, if the behaviour patterns and transactions associated with crossing wide and fuzzy boundaries apply, then managing or controlling boundary behaviour becomes more problematic. The interactions and issues surrounding this type of boundary movement are characterised by turbulence, multiple and simultaneous interactions, confusion and lack of consensus. One witnesses the emergence of competing forces and unpredictable behaviour along colliding and intersecting trajectories of activity.

PHASES OF CHANGE AND THE ROLE OF BOUNDARY

It has been argued that boundaries can act as a barrier or catalyst to change, impeding or facilitating the take-up of innovations such as e-learning. In order to understand this better it is useful to consider, even briefly, the role of the boundary with respect to models of change. There are multiple models or frameworks explicating innovation take-up (Rogers, 2003; Kotter, 1995). This paper presents a processual framework (Rossiter, 2007) for embedding e-learning comprising two high level phases; an "innovation" start-up phase and a subsequent "embedding" phase. The phases can be further divided into three domains, a "Product (or Innovation)-centric domain", a "Business domain" and a "Complex domain", each with a different focus or emphasis on activities, processes and interactions. The emphasis of Product-centric domain lays with the nature of the e-learning innovation itself and the enthusiasts who support it, whereas there is a shift of focus in the Business domain, to an institutional perspective where organisational process and policy dominates to enable widespread adoption and implementation of scaleable solutions. The Complex domain is the most mature, characterised by sophisticated and highly iterative interactions to accommodate creative new developments.

All three domains are separated by a boundary or transition space, each of which must be successfully negotiated to embed the e-learning innovation. Embedding does not occur simply by institutionalising e-learning through policy and standardised processes, but requires a more mature understanding and oversight of the complex and creative aspects of educational innovation. Therefore, a key role for institutional executives and leaders is to navigate and successfully manage boundary transitions.

An assessment of the current status of the Cranfield - Defence Academy e-learning is at the end of Phase 1, positioned at the boundary of the Product-centric and the Business domain. The history of multiple projects, perspectives and enthusiasts' activity is typical of the first change phase, but significantly there is further evidence of intent, from the University and Defence Academy, to intervene and move ahead, in order to shape or mould activity in ways which meets better the 'whole of organisation' strategic goals and objectives. Examples of such interventions include recognition of the need for new policies and rules, organisational restructuring, and more directed funding towards sanctioned activity (accompanied by cessation of other isolated or non strategic projects).

If, therefore, organisational leaders seek to direct innovation to achieve more strategic outcomes, developing a capacity to manage effectively the boundary issues and interactions is critical, especially with regard to the sustainability of successful innovation.

NATURE OF BOUNDARY ISSUES

Typically the issues which cluster around the soft boundaries are more problematic as they tend to encroach on functional, jurisdictional and professional spheres of organisational life. The unfamiliarity and unpredictability of these issues spawned such terms as "messy" Trist (1983) or "wicked" (Williams, 2002) because they "defy efforts to delineate their boundaries and to identify their causes, and thus to expose their problematic nature" (Rittel and Webber 1973, p. 167). Added complexity is introduced as these issues are capable of metamorphosis, converging and becoming entangled in a web of other factors (Williams, 2002). Participants in this space can end up as cultural or ideological combatants navigating and negotiating an intricate procedural and policy quagmire.

Examples of "messy" e-learning issues are the competing forces or colliding trajectories which materialise in this space. Examples include the debates which centre on the merits of creativity versus uniformity, equitable access for all versus specialised access for an elite, institutional control versus academic freedom, adoption of scaleable versus customised or flexible solutions.

A familiar and widespread higher education sector "messy" issue relates to course development activities and the content created by staff for online course delivery (Rossiter, 2006). This has arisen at Cranfield, for example, where continuing clarification is required to resolve any potential concerns or disputes about copyright use, IP ownership and management. Furthermore, as requirements for more scaleable, robust or feature-rich e-learning platforms surface, a host of viewpoints and opinions surface from various stakeholder groups about choice of technologies, use, availability, service standards and management.

Dealing with such messy or "wicked issues" requires holistic thinking, skills and a discourse that reflects the relationships and interdependencies, which fall outside the prevailing norms of bureaucracies which champion functionalism, task differentiation, rational and linear thinking (Williams, 2002).

Another characteristic of the problems that occur around boundaries is the breakdown of familiar rules. For example, here the cause and effect rule applies infrequently, causes are difficult to trace back to the source and outcomes are difficult to predict. Williams suggests that , "…responses can be disjointed from causes and a change in the causal agent does not necessarily elicit a proportional change in some variable it affects. It may elicit no response, a dramatic response or a response at certain levels of cause" (Williams, 2002, p104).

Optimal or quick fix solutions rarely suffice in such circumstances as many problems remain intractable and are susceptible to partial solutions or workarounds without a commitment to systemic change. Luke argues that this type of problem does not 'yield readily to single efforts and is beyond the capacity of any one agency or jurisdiction' (Luke 1998, p. 19).

Dilemmas of this nature are largely socially constructed, viewed and interpreted through the unique lens of the individual stakeholders. Individuals build distinctive world views (L-change, 2004) and perceptions based on role, discipline, interests and experience. Human factors therefore feature prominently, as individuals strive to define new and multiple roles in an environment where 'organizational sovereignty loses credibility and conviction' (Clegg 1990, p. 19).

The multiplicity of roles adopted by individuals adds to the complexity of inter-relationships, particularly when familiar or established roles are challenged within the new and unfamiliar context of boundary spaces. Schon (1987, p. 4) argues that we frame problematic situations based on these pre conceived conceptions.

Conventional conceptions of control are less effective in such environments, whereas persuasion, influence and trust are more helpful. All are mechanisms for co-ordinating social interactions (Bachmann 2001), but it is important to note that decision-making, in this context, must incorporate consensus building and trust at both a personal and a system level. Trust, it is widely acknowledged, underpins effective relationships and as such, acts as a mechanism for coping with uncertainty and complexity (Bachmann 2001).

THEORETICAL UNDERPINNINGS

In educational contexts it can be instructive to explore the complex issues and interactions, which occur in and around organisational boundaries, within the framework of systems thinking (Mason, 2008), in particular drawing on non-linear theories such as complexity and chaos (Sterman, 2000). In particular, complex adaptive theories (Stacey, 2000; Lemki and Sabelli, 2008), offer useful insights on self organisation which can be understood as the emergence of order out of a state of disarray and complexity. This conception highlights the dynamic nature of interactions and relationships and the essential role of disorder or mess within systems in generating new order:

> Contrary to some of our most deep-seated beliefs, mess is the material from which life and creativity are built and it seems that they are built, not according to some overall prior design, but through a process of spontaneous self organisation that produces emergent outcomes (Stacey, 2000, p. 294).

Associated with the concept of self organization is the mutually adaptive co-evolutionary process. Ashmos and colleagues (2002) describe the process:

> …systems gradually shed elements or connections of the system that may have been useful in the past, and they adopt new elements and patterns of interrelationships that may be useful in the future… The important point is that the system is not simply trying to adapt to a static environment, but rather the system is learning to adapt to an environment that is itself adapting to the system (Ashmos et al., 2002, p. 192).

CAN TRANSITIONAL ENVIRONMENTS BE MANAGED?

Partnering and collaboration

Effective partnering and collaboration entails the management of difference or divergence. Of particular importance, therefore are skills, processes and attitudes which foster the building of shared understandings, trust and partnerships.

Collaborative environments, however, far from being cohesive, are often characterised by power relationships that are more contested than in traditional bureaucracies where power, authority and control over resources are often exercised by individuals drawing on their position and status in the hierarchy (Williams, 2002, p117).

Collaborative activity is time consuming, involving a great deal of negotiation

over practical issues such as operational priorities and resource allocation. Far from an altruistic exercise, effective partnering also requires one to be realistic and pragmatic, particularly around detailed operational, contractual, financial and delivery considerations as they impact on individual partnering organisations.

The process is even more demanding and complicated in collectives involving a number of partners (Lowndes and Skelcher, 1998), such the Defence Academy of the UK context. The partners engaged in the development and delivery of e-learning on the Shrivenham site of the Defence Academy include Cranfield University, Kings College London, The Open University, UK , and Serco, the commercial service provider of IT services and facilities management.

Within this environment, there are multiple groups and divisions each contributing a specific set of knowledge, skills, services and expertise to the learning programme. Cranfield University, under its academic provider (AP) contract provides postgraduate courses to the DA-CMT, involving academic input from numerous departments and schools across the University, as well as professional support services for learning and teaching from departments such as the Library, Flexible Learning Support Centre, the e-Learning Team, Knowledge Services and Academic Information Systems. E-learning activity also spans a plethora of groups within the Defence Academy colleges, Joint Services Command Staff College and DA-College Management and Technology. Those with a specific e-learning remit include, Technical Division, the DLPO within Defence Capability Centre, DB Learning, DA Learning (in conjunction with its enabling contractor Logica). Other key players in the e-learning 'soup' include the DTR (Defence Training Review), DCTS (Defence Central Training Services) and British Telecom (contracted to support course delivery and services across all services and the MOD through the Defence Learning Portal). The list is by no means exhaustive.

While formal contracts provide the overarching framework to manage these relationships, effective outcomes depend on a range of formal and informal collaborative techniques. In particular, is it crucial to be able to negotiate well, recognise the need to compromise and to make careful judgments about the balance between benefits and risks for one's own and the other organisations.

Therefore, with respect to the MK I and II, while Cranfield and DA-CMT, have relied on formal production processes, course committees and customer boards for delivery and quality, we are also appreciative of the need to employ more 'influence' rather than 'control' mechanisms to evolve and improve the MK learning experience and product.

SENSEMAKING AND ROLE OF THE "BOUNDARY SPANNER"

A key role in making sense of the structure and process of collaboration in e-learning environments is that of the "boundary spanner" (Williams, 2002). Sense making (Weick 2001), therefore, incorporates making connections between the disparate professional skills, conceptual understandings and bodies of technical knowledge that apply to e-learning innovations. In boundary spanning activities, this requires an understanding of interrelationships which emerge in different ways and at different stages of a partnership. The ability to be lateral and creative thinkers is important, particularly, as Williams (2002) argues "where the design of effective solutions to complex problems, the skillful negotiation of sustainable partnership agreements involving a number of different agencies, and the mobilization of resource packages is needed" (Williams (2002, p.119).

Trevillion views boundary spanners as "cultural brokers" who, in bridging the gap to another organisation, makes "a real effort to empathize with, and respect another's values and perspectives" (Trevillion 1991, p. 50) An essential dimension of successful inter-organisational working, therefore, involves building and sustaining effective personal relationships which operate across cultural boundaries.

In order to attain the recognition and legitimacy essential to the role of a "boundary spanner", Williams (2002) posits the essential criteria of inter-organisational experience, trans-disciplinary knowledge and cognitive capability. This promotes the key attributes of "understanding the big picture" and "strategic thinking", required by boundary spanners when operating at both strategic and implementation levels.

CONCLUSION

The impact of the boundary issues and activities on the ability to embed e-learning highlights the importance of leadership and informed decision making in managing boundary environments. Avoiding the natural tendencies for some to 'man the barricades' against the unknown and unwanted change, requires leadership, vision and insight. Reaching the right balance between embracing the positive attributes of complexity and change, but retaining the ability to differentiate and marginalise negative confusion and 'red herrings', demands judgement, sensitivity, perseverance and decisiveness. The ability to discern the difference between promoting agility and flexibility, and from lack of direction in complex organisational settings can appear daunting.

In summary, the organisational focus needs to shift from a preoccupation with intra-organisational activity to the development of inter-organisational capacity, from protecting silos to building networks and joined-up agendas. The traditional benefits accruing from collaboration and networking have included access to new knowledge and greater awareness of leading-edge developments and ideas in other organisations and sectors. In the current economic climate, however, the imperative to co-operate is even stronger. The new return-on-investment may well simply be the capacity to sustain our innovation successes, by working together more effectively across boundaries, sharing both the risks and benefits.

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Generating Agile, Adaptable and Capable Airmen

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ABSTRACT

Professional development has always been a feature of Royal Air Force (RAF) working life. However, our personnel have not always understood the full benefits of education and training nor capitalised fully on the RAF investment. In part this has been due to adherence to a 25-30 year old training strategy which failed to keep pace with the ever increasing complexity of the operating environment that now demands greater agility in both people and supporting processes. This paper provides background information on the RAF's change management project to generate greater agility, adaptability and capability in its personnel.

BACKGROUND

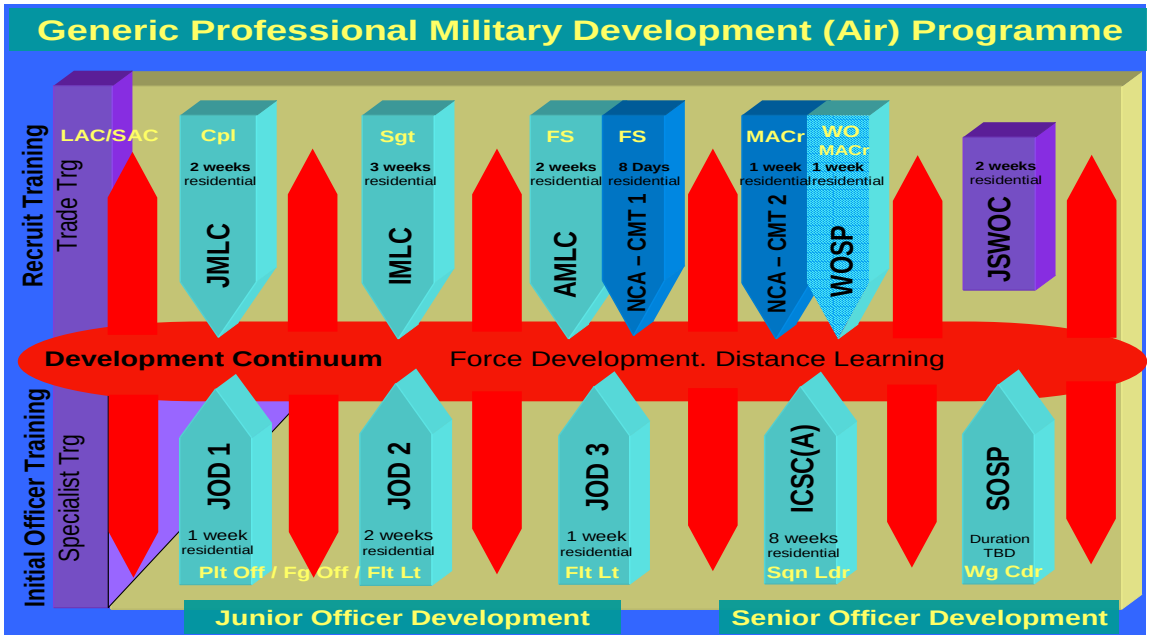
Early into the third millennium various strategies began to be introduced to address a range of perceived shortfalls in the development of RAF personnel but it was not until 2005 that an all encompassing study was initiated to ensure that the strategies were consistent with each other and with the outputs sought, mutually supportive, relevant and appropriately focused. The Review of Officer and Airmen Development (ROAD) examined in depth not only RAF generic training (the knowledge, skills and attitudes common to personnel at each rank, irrespective of their specialisation) but also that of sister-Services. Comparator studies were also conducted into the development models employed by other nations, including the United States Air Force and Canadian Armed Forces. The ROAD reported to the UK's Air Force Board Standing Committee on 2 May 07. At the heart of the findings was the recognition that the existing generic education and training delivered to RAF personnel was broadly appropriate and of high quality; but there were concerns. The training for officers was considered to be too little, too late; issues compounded by the voluntary attendance policy of some key developmental courses. The Report also identified a lack of delivery coordination across all ranks that had led to course overlap, omissions, drift and overheating. It also concluded that there were training gaps for both warrant officers and for those senior officers not selected for Advanced Staff Training (AST).

OUTCOMES

Professional Military Development (AIR)

The response to the findings of the ROAD Study has been the development of a programme of Professional Military Development (Air) (PMD(A)) which for the first time brings a coherent approach to the delivery of generic education and training. PMD(A) builds progressively through a range of core activities, which weaves together residential & face-to-face courses with distance learning (DL) and on-unit Force Development (FD) activities into a through-life continuum of generic education and training for all. The central element of the DL delivery will be a range of engaging and innovative e-learning modules. A schematic of the through-life continuum of the generic PMD(A) programme follows at Figure 1:

Key to Figure 1:	*JMLC: Junior Management & Leadership Course*	*JOD: Junior Officer Development*
LAC/SAC: Leading/ Senior Aircraftsman	IMLC: Intermediate Management & Leadership Course AMLC: Advanced Management & Leadership Course	Plt Off: Pilot Officer Fg Off: Flying Officer
Cpl: Corporal Sgt: Sergeant	NCA: Non-Commissioned Aircrew CMT: Command & Management Training	Flt Lt: Flight Lieutenant Sqn Ldr: Squadron Leader
FS: Flight Sergeant MACr: Master Aircrew	WOSP: Warrant Officer Study Period JSWOC: Joint Services Warrant Officers' Course	Wg Cdr: Wing Commander ICSC(A): Intermediate Command & Staff Course (Air)
WO: Warrant Officer		SOSP: Senior Officer Study Period



Generic Education And Training Centre

Key to the success of PMD(A) is the establishment of a single policy and management organisation responsible for all RAF generic education and training; based at RAF Cranwell the Generic Education and Training Centre (GETC) formed on 1 Oct 07. Central to their work is the creation of a coherent curriculum to identify the breadth, depth, timing and delivery of generic education and training. Known as the Generic Education and Training Requirement (GETR) this potentially colossal database (and this, of course, leads to other issues), which is still under development, is essential to the coordination of PMD(A). Accessible to all, it will detail the competencies for all personnel from aircraftsman to wing commander at any particular point in their careers. This transparency will allow individuals and managers to assess progress through the generic education and training continuum and gain clear direction on future development needs. Furthermore, full oversight of the breadth of PMD(A) will allow RAF accreditation partners to evaluate each of the developmental elements and make academic and vocational awards accordingly; such awards are acknowledged as being beneficial to both recruitment and retention but also provide improved efficiency and effectiveness in the workplace.

LEARNING DELIVERY

A great vision, but what about the detail? Traditionally the RAF has delivered generic education and training through residential courses. For Phase 1 training – initial entry for both officers and airmen - there is little choice but to use the residential course for knowledge, skills and attitude development; the style of delivery should be engaging and include the use of accelerated learning techniques. Beyond that, in Phase 2 – specialist training – generic development takes on a supporting role to the generation of competencies needed to perform well in the chosen branch or trade. Thereafter, in Phase 3 – productive service – further development in command, leadership, management, personal and staff skills is undertaken that builds on the Service and life experiences of RAF personnel. Under PMD(A), these valuable but expensive residential uplifts will be retained but better focused to the analysis and evaluation of experiences, strategies and ideas, rather than being focused on the delivery of knowledge that underpins them. The necessary underpinning knowledge, vital to an intellectual and technologically based force will, for the most part, be generated through on-unit FD and DL activities to a minimum standard as laid out in the GETR. Additionally, elective developmental opportunities will be available for those who choose to enhance their learning.

The residential courses for officers in Phase 3 are delivered by the RAF Division, at the Joint Services Command & Staff College, Shrivenham. The course profile is currently undergoing transformation as a new mandatory Junior Officer Development Programme (JODP) is being introduced. The JODP comprises of 3 residential courses spanning the first 6 years of an officer's career. For squadron leaders a new 8 week Intermediate Command and Staff Course (ICSC(A)) has been developed which has, again, been made mandatory and set to be undertaken at or close to the point of promotion. The new course doubles the contact time of its predecessor and through rich exercising manages to cover the equivalent content of a 10 week course. Consideration is also being given to the development needs of the 82% of squadron leaders who do not go on to AST. For those and the wing commander cadre, a Senior Officer Development Programme is being devised, the first element of which will be the Senior Officer Study Period.

For airmen the residential Phase 3 courses are delivered by the Airmen's Command Squadron (ACS) at RAF Halton where the Junior, Intermediate and Advanced Management and Leadership Courses are undertaken to secure substantive promotion to corporal, sergeant and flight sergeant respectively. These courses have now been reinforced with the introduction of a Warrant Officer Study Period for warrant officers and master aircrew within their first year in rank. Separate Non-Commissioned Aircrew Command and Management Courses are also run at the ACS.

Distance Learning

To create a true continuum of through-life learning, all of the residential uplifts will be supported by interactive DL. In addition to interactive CD based e-learning and the more traditional directed reading, a Virtual Learning Environment (VLE) with a supporting Course Management Service (CMS) is being developed and hosted on the World-Wide-Web. Based on the MOODLE system, the VLE, although just a few months old, already has students interacting with learning content that includes background and joining instructions for residential events and effective communications packages. Importantly, as well as being an exciting and engaging e-learning delivery platform, the VLE's embedded CMS will allow the management, tracking and recording of learning. Intimately linked to the VLE is the need for tutor support which attracts a high resource bill and is currently an area of weakness in the implementation of the ROAD project. In order to spread the load, it is intended to conduct on-unit tutoring in the first instance by utilising the staff resource of the FD organisation, Station Training & Development Officers and selected mentors. The next tier of tutor support will be from DL cells within the residential schools and colleges to ensure the linkage to the next formal development piece is maintained. The governance of DL will be conducted by GETC staff who will, as resources and needs dictate, also organise regional seminars.

BENEFITS

The commitment to a coordinated and blended continuum of education and through-life learning gives the RAF many benefits. By providing the right generic education and training at the right time RAF personnel will be better prepared to operate effectively in all spheres of military life and better equipped to deal with the demands of current operations. While the content of PMD(A) is focused on generating increased personal agility, adaptability and capability of RAF personnel, the management structure being introduced will provide organisational agility. The close linkage between all deliverers and requirement managers will ensure that the necessary PMD(A) activities are achieved in an effective and efficient manner and that any changes can quickly be introduced. A properly crafted through-life generic PMD(A) construct will give the RAF a unique opportunity to seek a greater and more flexible range of accreditation options. Such accreditation options will provide personnel with a tangible and transferable reward for undertaking PMD(A) while demonstrating a true commitment towards continual personal development.

On E-Assessment

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ABSTRACT

Assessment is an integral part of learning, and yet very little attention is paid to e-assessment when it comes to e-learning. A significant effort has been directed towards developing high quality question items that take advantage of the new medium, and yet there appears to be some resistance to embrace this new medium. There have been interesting developments in the field of e-assessment. Symbolic systems such as Maple T.A. have matured sufficiently and provide a range of question items. Another significant development is in the area of short answer question items that are assessed that are tolerant to spelling and grammatical mistakes. The advent of digital pens that capture audio and written content opens new possibilities. We can now begin to address diagrammatic reasoning more elegantly.

In this paper, we make an attempt to review the state-of-play in e-assessment discussing its pros and cons. Starting with a review of technology landscape, we move on to a discussion of some of the perceived concerns for embracing e-assessment both as a diagnostic, formative and summative assessment tool. The paper concludes with a discussion on timely intelligent feedback which still remains a big challenge and the opportunities that exists to mediate this issue.

e-Assessment has come a long way from simple multiple choice and drag-and-drop items to more sophisticated items such as short-answer free text input, symbolic assessment of mathematical questions and diagrammatic input and reasoning. New technologies and techniques in AI are constantly reshaping the landscape. Digital pens that record not only what is spoken, but also digitally store what is written is set to challenge the very perception of assessment. These technologies bring in a plethora of opportunities that can be exploited. They provide a unique opportunity to rethink our approach to our assessment from one of *attaining a set grade* to more rudimentary level of comprehensive understanding of the relevant subject. Adaptive or informative assessment offer further opportunities to tease out student's strengths and weaknesses. And thereby provide a more holistic approach at identifying conceptual weaknesses with a view to providing a more targeted approach for remedial action.

The paper is organised as follows. First, we provide a brief background and context in Section 2. In the next Section 3, we provide a simple example to motivate the use of symbolic system for developing question items. Two examples from a recent diagnostic assessment are included in Section 4 to illustrate the challenges posed by the mathematical input, and some of the advantages of this approach. Some of the opportunities provided by systems that are under active development are briefly mentioned in Section 5. The paper concludes with a short summary.

BACKGROUND CONTEXT

The student cohort at the Defence Academy is unique in that the audience are drawn from all the services – army, navy and air force. Most of the courses are at post-graduate level, and some are non-degree bearing. The courses are designed as a mid-career technological update. The students come with varying degrees of numerate skills, and generally weak in basic mathematics. They all require a quick refresher. It is important to diagnose their weaknesses fairly early on with a view to providing remedial lessons. Many of the observations reported in this article are based on experiences in designing the diagnostic assessment and providing the remedial lessons.

WHY SYMBOLIC SYSTEMS?

While developing question items in Mathematics, it is often convenient and imperative to use a symbolic engine to assess students' responses. Consider a question in algebra that asks the student to expand the brackets in the expression

$(2x - 1)(6 + x)$. The correct answer can be entered in many equivalent ways. Few of the choices are listed below:

1. 2x^2 + 11 x – 6
2. 2*x^2 + 11*x – 6
3. -6 + 11 x +2x^2
4. 11*x -6 + 2x^2

And there are many such combinations, all correct. This is where symbolic systems come useful. They check for the algebraic equivalence of the student's response and the pre-defined answer, and declare a mark. While this is useful, it does not allow for any partial marking. For example, a teacher assessing the input $2x^2 + 11x + 6$, can easily spot the sign error. Partial marking in symbolic systems is facilitated when the question can easily be broken down into several steps. There is very little to support detection of cognitive errors. More sophisticated questions can be designed involving differentiation, integration and graphs.

EXAMPLES

In this Section, two examples are presented from a recent online assessment. The level mathematics involved is fairly elementary and is readily accessible to many students with satisfactory education in mathematics. The examples illustrate some of the fundamental problems faced by the students both on the technical level as well as challenges posed by entering mathematical text into online systems.

Example 1. Formula manipulation. A vehicle starting with an initial velocity u m/s is travelling with an acceleration a m/s/s. Its velocity at any subsequent is given by the expression

$$v = u + a \cdot t$$

Make t the subject of the above expression.

The correct response is

$t =$ **(v-u)/a** .

The question is rendered on screen as shown in Figure 1.

A vehicle starting with an initial velocity u m/s is travelling with an acceleration a m/s/s. Its velocity at any subsequent is given by the expression

$$v = u + a \cdot t$$

Make t the subject of the above expression.

$t =$ [ ]

Figure 1 A question on formula manipulation.

Responses to the question in Example 2 are shown in Table 1 Responses to the question in Example 2. It is interesting to note that a number of students (4%) are not using the parenthesis. Even though the students are asked to supply the relevant expression only without the assignment, there is always one who does not follow the instructions.

Count	*Percentage*	*Responses*	*Remarks*
62	38.75 %	no_answer	
58	36.25 %	(v-u)/a	Correct response.
7	4.375 %	v-u/a	Potentially correct, except for the missing parenthesis I the numerator.
3	1.875 %	v/(u+a)	
2	1.25 %	(u+a)/v	
2	1.25 %	u+a/v	
1	0.625 %	((v)-(u))/(a)	Redundant parenthesis.
1	0.625 %	(V-U)/A	All upper case.
1	0.625 %	(u-v)a	
1	0.625 %	(v+u)a	
1	0.625 %	(v-u)/a=t	Potentially correct, except for assignment.
1	0.625 %	(v-u)a	
1	0.625 %	(v/(u+a)=t	
1	0.625 %	a.(v-u)	
1	0.625 %	u-v/a	Sign error and lack of parenthesis
1	0.625 %	v(u+a)	
			Other responses omitted for brevity

Table 1 Responses to the question in Example 2.

Example 2. Algebraic manipulation. For two resistors connected in parallel, the combined resistance is given by the formula

$$\frac{1}{R} = \frac{1}{R1} + \frac{1}{R2}$$

Make *R* the subject of the formula**.**

The correct answer is

$R = \boldsymbol{(R1R2)/(R1+R2)}$.

Apart from the knowledge required to perform the required algebra, students found entering their answer a challenge. Table 1 shows typical responses received from a cohort of 160 students. Only 19 % got the answer right, while a significant proportion 14% reciprocated the individual fractions. The table also highlights indiscriminate (mis)use of parenthesis.

Count	Percentage	Responses	Remarks
75	46.87 %	no_answer	
18	11.25 %	R1+R2	Common misconception.
6	3.75 %	(R1R2)/(R1+R2)	Correct response.
4	2.50 %	1/((1/R1)+(1/R2))	
4	2.50 %	R1R2/(R1+R2)	
3	1.87 %	1/(1/R1+1/R2)	
	1.87 %	3	Perhaps adding the suffixes.
	1.87 %	r1+r2	
2	1.25 %	(R1R2)/(R2+R1)	
	1.25 %	1/(1/(R1)+1/(R2))	
1	0.62 %	((1/(R1))+(1/(R2)))/1	
...	0.62 %	(1/R1)+(1/R2)	
...	0.62 %	(R1)+(R2)	
...	0.62 %	(R1*R2)/(R1+R2)	Use of asterix for multiplication.
...	0.62 %	(R1*R2)/(R2+R1)	
...	0.62 %	(R1+R2)/2	
...	0.62 %	(R1R2)/((R1)+(R2))	Redundant parenthesis.
...	0.62 %	(R1xR2)/2	
...	0.62 %	(r1-r2)	
...	0.62 %	(r1r2)/r2+r1	Potentially correct, except for the missing brackets for the denominator
...	0.62 %	(r1xr2)/(r2+r1)	Use of x for multiplication and lower case
...	0.62 %	1/((1/r1)+(1/r2))	
...	0.62 %	1/((R1^-1)+(R2^-1))	Negative exponentials
...	0.62 %	1/(1/R1)+(1/R2)	Need brackets for the denominator
...	0.62 %	R(1/(R1))+R(1/(R2))	
...	0.62 %	R1(R2)/(R1+R2)	Redundant brackets around R2
...	0.62 %	R1*R2/(R1+R2)	Algebraically equivalent to correct response.
...	0.62 %	R1-R2	
...	0.62 %	R1R2/(R2+R1)	Algebraically equivalent to correct response.
...	0.62 %	R1R2/R2+R1	Denominator requires parenthesis
			Other responses

Table 2 Responses to the question in Example 1. Total number of students is 160. Note the wide variation in the input for the correct response. One of the most popular misconceptions of reciprocating individual fractions stands out.

The above two examples highlight several advantages and disadvantages.

- Symbolic input provides much richer content to analyse. The input need to be entered precisely and accurately. Systems such as Maple T.A. (Maplesoft, 2008) provide opportunities for the student to verify his/her expression (not assess) before submitting his response. Part of the problem is that the students are weak on the very concepts which the input systems demand.
- The responses collected from a cohort provide a rich repository which can then be further analyzed for providing more precise and targeted feedback and design remedial measures. Some of these errors are conceptual, as in the case of reciprocating the individual fractions (see Example 2).

OPPORTUNITIES

In a technology driven world and with emphasis on Information Communication and Technology (ICT) in the curriculum, there have been many developments. These are listed below which have strong potential to reshape e-Assessment.

- Digital pens. This technology is pioneered by Swedish company Anoto (*Anoto group AB. digital pen and paper based technology.*) with the invention of their system for digitising handwritten text on paper printed with micro dots. The Smart Pen developed by LiveScribe (van Schaack, 2008) have taken one step further by providing a computing platform embedded in the pen. These technologies combined with recognition of hand written mathematics (Tapia & Rojas, 2005) will ease the burden of mathematical input significantly. They also ease the burden of diagrammatic input, and open up new possibilities for designing questions with mixed modalities.
- Intelligent Feedback. Feedback is normally provided either at an item level or collectively for a group of items (Driouech., Park, & Jun, 2008). A group of question items are related to some concepts. Using the evidence of performance on these items, the authors use Bayesian belief networks to update the probabilities on the nodes to related concepts. There have been some attempts at providing incremental feedback as the student steps through solving a problem (Integre Inc., 2004). Analysis of errors on parametrized problems offer a powerful means to identify common misconceptions (Muller, Bescherer, Kortenkamp, & Spannagel, 2006), and there by construct more pertinent feedback.
- Maths input. Mathematical input using a keyboard has many challenges. This is traditionally approached using the standard set of characters or symbol mode (WYSWYG). Many of the students still struggle to enter $\sqrt{x}$ using the keyboard. With the advent of digital pens, we can address not only mathematical input, but also diagrammatic input. Currently, recognition of hand-written mathematics is only available for Tablet PC (with somewhat limited character set). SmartPens currently do not expose position and time data to the end users (van Schaack, 2008). By combining hand-written mathematical text (Tapia & Rojas, 2005) with the digital pens, we can begin to address user interface issues in an elegant way.
- Free text input. (Mitchel, November 2006; Mitchell, Russell, Broomhead, & Aldridge, 2002) Assessment of short-answer questions using natural language is pioneered by Intelligent Assessment. There is great potential to combine this with digital pens to move to uniform user interface.

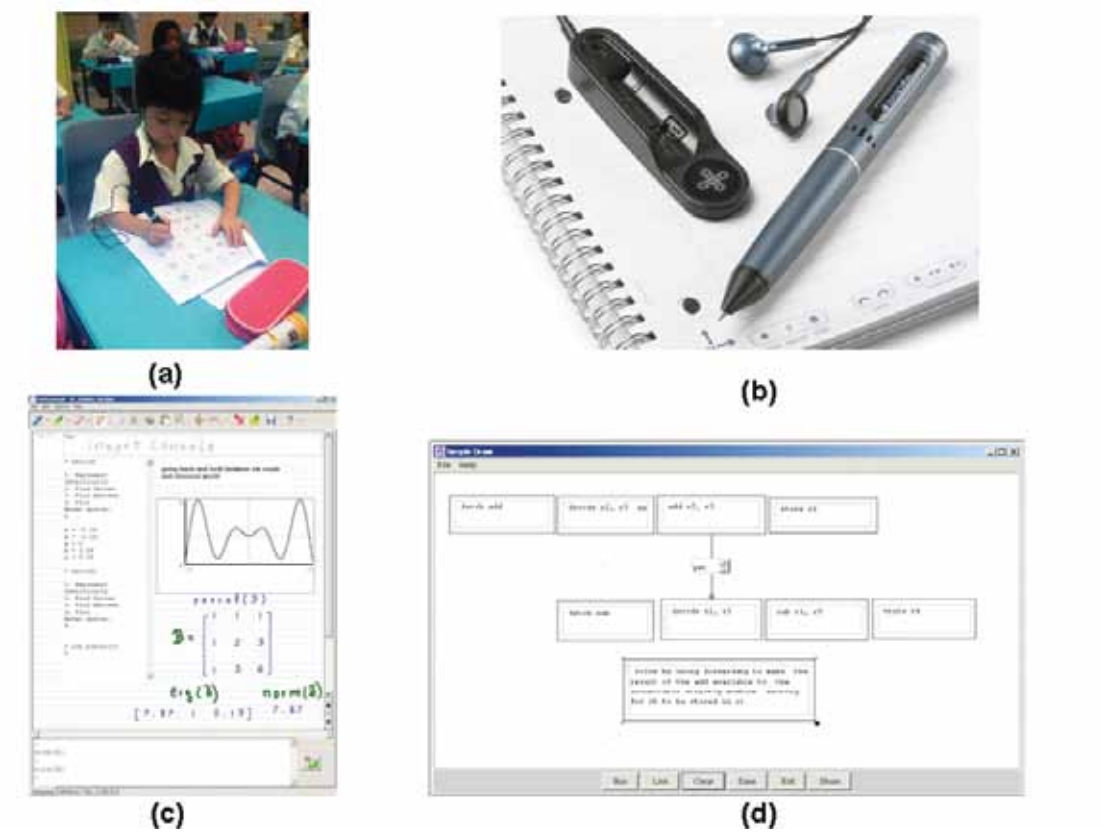

Figure 2 New opportunities. Student using a smart pen in a class room (a) (Van Schaack, 2008), smartpen from LiveScribe (b) (LiveScribe, 2008)**, hand-written maths on a Tablet PC (c)** (Wenzel & Dillner, 2008) **and assessment of imprecise diagrams (d)** (Waugh, Thomas, & Smith, 2004)**.**

SUMMARY

In this paper, we have briefly reviewed some of the current technologies that offer greater potential to alleviate some of the challenges faced both by the students and the teaching staff. Mathematical input remains a major hurdle for the students. Digital pens offer potentially a neat solution that will also address the problem of diagrammatic or graphical input. Further research is still needed to address the human interface issues related to pen and paper-based systems. One major advantage of these systems is that there is a natural backup i.e. the paper.

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Electronic Management of Training at the United Kingdom's Joint Services' Command and Staff College

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INTRODUCTION

With ever-constraining budgets, military forces are continuously seeking mechanisms to make the most effective and efficient use of their financial resources. eLearning provides an attractive media to many Forces; enabling Service personnel to undergo learning within their unit at their own pace and reducing the requirement for residential learning. However, it is unrealistic to expect eLearning to replace all forms of residential learning.

When delivering residential learning, a mechanism is required to ensure that all learning events directly feed an operational requirement. Using such a mechanism enables the shortest practicable courses to be delivered, while still achieving the desired operational outcomes, which ensures an optimised benefit-to-cost for all delivered learning events.

The UK MoD's Defence Systems Approach to Training[1] (DSAT) provides a well established, robust and efficient means of monitoring and developing learning, based on the Operational requirement. Traditional application of the DSAT requires multiple paper-based documents to audit the progression from operational capability to learning events and their associated assessments and validation.

The UK's Joint Services' Command and Staff College (JSCSC) in conjunction with its Private Finance Initiative partner, Serco, is in the process of developing and implementing a bespoke Managed Learning Environment (MLE). The MLE incorporates an innovative application, Curriculum Manager, which ensures all learning events are directly based on an operational requirement; thus feeding military capability. This linkage to operational requirement is assured by series of inbuilt validation and audit functions, based on the DSAT construct, providing easily visible course development and publication signposting to all levels of management.

1 Joint Services Publication 822 – The Defence Manual of Training Management.

AIM

The aim of this paper is to highlight how learning events are assured to connect to operational requirement from the outset of learning design. By examining JSCSC design and implementation, as a case study, this paper will further highlight how once fully-implemented the position of Curriculum Manager will enable JSCSC to advise single Services how proposed changes to learning may impact upon the operational environment and facilitate accurate and timely responses to Requests for Information and Parliamentary Questions. It will also indicate how programming of learning events and courses can be semi-automated, reducing the workload to course programmers and enable the most effective use of resources.

Whilst **the position of** Curriculum Manager has been developed for a military-learning environment there are broader applications for this system in the business environment; especially where employees are required to display defined skill sets to accomplish their duties. This is of particular relevance to regulated environments such as the pharmaceutical and engineering industries.

JSCSC CONTEXT IN DEFENCE TRAINING AND EDUCATION

The Defence Academy was formed under the UK's Defence Training Review[2] on 1 April 2002 with the explicit aim of providing 'Intellectual Excellence in Defence[3]', predominantly at the postgraduate level. JSCSC is one of the component colleges within the Defence Academy, and opened on 7 August 2000 with the aim 'Provide world class Command and Staff education and training, in order to enhance operational capability, thereby advancing the Defence and Security interests of the United Kingdom[4]'.

Delivering all command and staff training for the UK armed forces, the JSCSC concentrates on developing officers' analytical skills and decision making within a defence framework. Unlike the majority of UK Defence Training Establishments, the outputs of the JSCSC are not easily identifiable by recording a change in the performance of a student (given the educational nature of the majority of serials within the college). Therefore it is essential to correlate educational activities taking place within JSCSC's courses to operational capability on order to evaluate commitment of financial resources devoted to command and staff training.

Defence Systems Approach to Training (DSAT) Overview

The DSAT mandates all Defence training, delivery and evaluation follows a cyclical, iterative process to ensure its relevance to current military application. The cycle follows the four-step process as shown in diagram 1.

It is of note that while the DSAT makes continued reference to training, it is equally applicable to education. Indeed, the DSAT cites within its governance section that:

Training

> 'Individual training is required to equip our personnel with the knowledge, skills, attitudes and attributes needed by modern battle-winning forces in the harshest environment, the high tempo battlespace, and for the range of other Defence tasks in which our personnel may be required to participate. Individual training makes a vital contribution to operational and business effectiveness, the fighting spirit, and the professional and personal development of our personnel[5].'

2 Commenced in 1999.

3 Defence Academy's mission statement.

4 JSCSC's mission statement.

5 JSP 822, part 3 Chapter 2, Para 2.

Education

'Education is designed: firstly, to provide knowledge and understanding that underpins individual training and fosters the development of ethos; secondly, to expand the cognitive skills of our personnel that are vital to more effective performance as they progress through their careers; and, thirdly, to promote a learning culture that will enhance a modern battle-winning force.[6]'

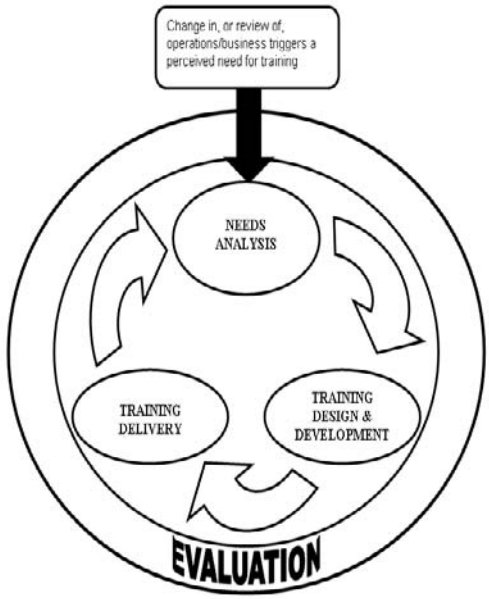

Diagram 1 – The DSAT Cycle[7]

Needs Analysis

Conducted by the customer[8] or its designated agent. A detailed investigation is conducted to determine what service personnel are required to do in the operational environment, expressed by a hierarchical job scalar consisting of Duties, Tasks, Sub-Tasks and Sub-Task Elements. Each element of the job scalar is then supplemented with the standards to which these job elements are to be performed to and the conditions under which the serviceperson is expected to perform. Once the job scalar is complete a Difficulty, Importance, Frequency analysis is conducted against all elements. This is used to develop the training priority of each element of the scalar. For elements where the Difficulty and Importance are high, but the frequency is low (eg Fire-fighting in the Maritime Environment) a high training priority is assigned; as it is imperative that the serviceperson is capable of performing that task first time to the correct standard. Should the Difficulty and Importance be low and the Frequency high (eg preparing uniform) a low training priority is assigned as this can easily be trained in the operational environment with little or no impact to operational capability. The results of this investigation are presented to the supplier[9] in the form of an Operational Performance Statement (OPS) or Competency Framework (CF)

Training Design and Development

Conducted in partnership between the customer and supplier. The OPS or CF is examined by Training Management to determine what is practicably deliverable within a Defence Training or Educational Establishment (DTEE); given the availability or existence of training equipment, time to train away from operational unit and ability to emulate operational conditions. This results in the development of a Formal Training Statement (FTS); which consists of three distinct parts:

6 JSP 822, part 3 Chapter 2, Para 3.

7 Joint Service Publication 822, The Defence Manual of Training Management, Part 4, Para 4.1.

8 The individual single Service or employing body.

9 Defence Training or Educational Establishment.

- **Training Performance Statement (TPS).** A list of Training Objectives (TO) detailing what a student will be capable of achieving at the end of training, along with the standard to which the TO is to be performed to and under what conditions.
- **Workplace Training Statement (WTS).** A list of Training Objectives that are most practicably trained in the operational environment.
- **Residual Training Gap Statement (RTGS).** A list of elements which cannot be trained in a DTEE or in the workplace. These normally consist of elements where training is conducted, but the true conditions of performance can not be emulated in a training environment.

All elements of the FTS, although developed in partnership between the customer and supplier, remain the property of the customer.

On acceptance of the FTS by the customer the supplier subdivides the TOs into Enabling Objectives (EO) (themes to be covered in the learning environments) and Key Learning Points (KLP) (specific details of what will be incorporated in learning events).

Training Delivery

Conducted by the supplier and can employ any feasible media. Should a form of face-to-face delivery be required, KLPs are collated into a logical order and used to form the basis of an Instructional Specification (ISpec). The ISpec also detail the type of location required for that learning event, any resources required and an outline of how the learning event is to be conducted; often including teaching notes.

Evaluation

Conducted using multiple varieties of methodologies. Assessments, whether formative, summative, theoretical or practical, are designed and conducted by the supplier to determine whether the student has achieved all TOs at the end of training. The supplier will also conduct Internal Validation (InVal) to gain students' views of how effectively the learning events were with regard to the TO. The customer also conducts External Validation once students have completed training to see how effectively they can perform in the operational environment. This enables the customer to see if the OPS is functional and whether further development of the TOs are required to enhance operational capability.

JSCSC's Initial Managed Learning Environment Project

Having first developed a requirement document for a Managed Learning Environment (MLE), the JSCSC's business partner, Serco, initially proposed a solution combining two of its Commercial Off-The-Shelf (COTS) applications. These COTS applications are the Faculty College Management Information System (CMIS) and the Skillspace Learning Platform (LP)

- **Faculty CMIS.** Faculty CMIS is an integrated approach to timetabling, course management, resource use and student attendance; designed to manage both physical and academic resources for the broadest range of academic institutions. It includes fully integrated online web tools, room booking, equipment booking, examination scheduling, registers and student allocation facilities. It is designed to increase the efficiency of an institution's use of human and physical resources. It is already used by vast array of respected higher education faculties including, but not limited to, Oxford University, London School of Economics and University College London to manage both complex timetabling and resource management issues.
- **Skillspace LP.** Skillspace Learning Platform is a web-based virtual learning environment that allows learning content to be delivered to students in an engaging format that can be monitored and reported on by the tutor. Online assessments can be included in a formal portfolio that can contain evidence of access to learning material, results on online tests to check understanding and a repository for file storage showing evidence of course work. LP integrates with the timetable section in Facility CMIS to provide staff with a means of attaching lesson plans, learning materials and online assessments to timetabled events. Student interaction is stimulated through communication tools which allow them to debate the provided learning either in a moderated or un-moderated format, manage shared projects by signing documents in and out or share understanding through discussion groups. It is currently being used to deliver learning to the UK's National Health Service.

Whilst preparing to launch the LP to a representative course, it became clear to both parties[10] there was no mechanism to directly link hosted learning materials to course documentation as mandated by the DSAT. Indeed there was no mechanism to ensure the learning materials were the most current version, or directly associated to the course required.

This represented a significant delta between JSCSC Requirement document and the services the COTS products could deliver; most significantly because the Requirement stipulated the MLE would be DSAT compliant.

Once identified, the requirement for a DSAT-compliant interface between CMIS and LP was developed.

CURRICULUM MANAGER FUNCTIONALITY

Training Authorisation

To ensure DSAT compliance, Curriculum Manager creates a new course by asking for essential data which will form part of the Training Authorisation Document (TAD). The TAD is a formal record documenting the commitment between the customer and supplier to develop and deliver a course. It details the maximum and minimum number of learners required for a successful course and binds the customer to resource the course; financially and by the provision of staff and subject matter experts.

A repository for the OPS is then created for the newly created course, relating the course to the specified Duty of that OPS.

Formal Training Statement

Once a course has been created, the training designer is presented with the opportunity to enter the TOs for the course which, if the DSAT cycle has been followed be provided by the customer.

A useful validation tool at this stage is the use of mandatory fields; whereby a TO can only be marked as complete when the TO has been populated with its associated conditions and standards. It also presents the opportunity to record whether the TO is included within a course for Core, Legislative or Accreditation purposes. Core requirements are there to ensure operational capability; legislative to ensure adherence to law (eg Health and Safety); and accreditation to ensure recognised qualification is valid for award on successful completion of the course (eg chartered engineer status). Once all details regarding the TO have been inserted, training management can then determine whether the objective should reside in the TPS, WTS or RTGS.

At this point of data entry the specific Task articulated in the OPS which relates to the TO being populated can be recorded as a drop down from the OPS repository. It is at this point the TO directly relates to the desired operational outcome.

Although all TOs can be entered at this stage, they can only be saved in draft format. Additional validation protocols of the application ensure that each TO can only be marked as complete when it is supported by at least one EO. Equally each EO can only be marked as complete provided is supported by at least one KLP.

While the conditions and standards fields are not mandated for EOs or KLPs under the DSAT, provision is made in the data input interface to enable training management to enter such information at these levels. The more information entered at the EO and KLP level will enable more detailed analysis when researching a Request for Information. As such, the opportunity also exists at these levels to record if the EO or KLP is a core, legislative or accreditation requirement (or a combination of the three).

Once each TO is supported by an EO and each EO is supported by a KLP, all elements can now be marked as complete. Should any supporting element not be marked as complete, or lack a supporting EO or KLP, the application displays a warning of where the error lies.

10 JSCSC and Serco.

Again, when EOs and KLPs are being populated, links can be forged from a drop down menu to the OPS held in the repository. In so doing the EOs and KLPs can be directly connected to the Sub Tasks and Sub Task Elements respectively; deriving a link to operational requirement.

At this point, the application can now generate a DSAT-compliant FTS as a PDF file; Training Management is safe in the knowledge that all elements of the FTS can be now be delivered as learning events at the KLP level.

Learning Events

Once a fully-populated FTS has been created, training management can develop the learning events which will enable the students to achieve the KLPs, EOs and TOs. Learning events can be face-to-face encounters, eLearning Objects, research time or a combination thereof.

Multiple learning events should drive toward a common theme. As such, Curriculum Manager provides the ability to form a module of learning events. Once a module has been created, numerous learning events can be associated to it.

On creating a learning event, the user is requested to determine the type of event, the maximum number of learners that can complete that event at one time, the learning event duration and what resources are required. The resources are derived from pulling the appropriate data from CMIS, which is populated against the college in question.

The KLPs to be delivered in the learning event can now be connected; automatically indicating the associated TOs and EOs. Curriculum Manager will not enable the creation of a learning event without at least one KLP being associated; thereby ensuring learning events directly feed the operational requirement.

Should eLearning materials be required to support learning, Curriculum Manager interfaces with LP to make the association. A facility is available at this point to assign a time-release function to the learning materials. Should pre-reading or confirmation of prior learning be required to support the specified learning event, the desired timeframe can be set at this point. Hence if learning materials need to be forwarded to the students three days before the learning event, this relationship can be set at this point. Indeed, should an eLearning examination be required a set period after the learning event, this can also be assigned.

At this stage prerequisites to the learning event can be allocated; this takes the form of defining other learning events which must to be completed before this learning event can take place. This enables Curriculum Manager to develop a product flow description for the course. This will in due course influence the manner in which learning events are transferred to the CMIS application.

For each KLP, provision is made for training management to insert teaching notes to advise the learning deliverers how to transfer learning to the student. Given all this information, the system can then produce a DSAT-compliant ISpec.

To enable senior management to view an executive summary of the ISpecs that form a module, Curriculum Manager includes functionality above the mandated requirements of the DSAT, whereby it can create a Stage Specification (SSpec) that lists all the learning events that form the module and the associated KLPs, EOs and TOs along with the manner of learning event used to transfer learning.

Assessment Events

In the final timetable for the course, assessments (be they practical, examination or online testing) are required to be recorded. As such, similarly to how learning events are populated, assessment events can be created. This then links the assessment to the KLPs, EOs and TOs associated.

Curriculum Manager Assurance

Prior to the publication of a course, Curriculum Manager can validate whether all KLPs, EOs and TOs have been cited in the created learning events. Should any element be missed, training management is informed to enable learning events to be modified or new events created; providing the key benefit to training management.

Curriculum Manager will also at this stage ensure that students' achievement of KLPs have undergone some form of assessment and training management is informed of any discrepancy.

Course Transfer to CMIS

As the learning events have been allocated with prerequisites and learning event durations, Curriculum Manager

now holds a product-flow description of a 'perfect' course. This can then be exported from Curriculum Manager into CMIS, dropping a course into a course programme. Historically, this was one of the most time consuming activities for course programmers; attempting to determine which learning events had to occur at what time.

As the maximum number of learners for each learning event is also recorded in the learning event, CMIS can book multiple learning locations should a course be required to break out into syndicates.

Course Programmers can now apply the 'real world' to this 'perfect' course, adjusting timelines to fit around bank holidays, leave periods and non-availability of lecturers.

Viability of Application of Curriculum Manager to Business or Other Nation's Armed Forces

Provided that the workplace performance of individuals can be captured in a format such as an OPS or CF, Curriculum Manager can be employed to assure the most effective and efficient delivery of learning and ensure that it is directly linked to the business requirement.

CURRICULUM MANAGER ADDED BENEFITS

Learning Event Operational Relevance

Validation procedures at both the FTS and course-publishing levels ensure that no learning event can be transferred to the timetable (via CMIS) unless it directly feeds an operation requirement, as stipulated in the OPS or CF. This will minimise the degree of drift, or superfluous inclusion or omission, of learning materials within courses recorded within Curriculum Manager.

Operational Capability Assurance

It is commonplace for efficiencies to be demanded from training programmes. It is also often the case that additional requirements are placed upon courses, without the flexibility to extend courses. This results in the requirement to prioritise and possibly remove items from the course programme. With the implementation of Curriculum Manager, suppliers will be capable of informing customers of the events they will have to remove to achieve the required goal; along with detailed information of the EOs and TOs that will be compromised by their removal and what aspect of operational requirement will be affected. Furthermore, the supplier will be capable of advising the customer of any degradation to core, legislative and accreditation requirements if learning events are removed.

This will in turn enable customers make an informed decision as to what training events can be removed.

Training Documentation Visibility

Traditionally, for a learning deliverer to know what they are required to teach at a given time, under a functioning DSAT system, they would first consult the timetable to see what subject they are delivering and at what time. They would then refer to the relevant ISpec to determine how the learning event should be conducted. With the advent of Curriculum Manager, all events on the timetable relate to a learning event held within the system. By selecting the event on the electronic timetable, learning deliverers will be directed to the relevant ISpec. Additionally they will be shown:

- Prerequisite learning events for that session – thereby reminded of the path students have taken to get to this event
- The associated TOs, EOs, Task and Sub-Tasks – indicating the link to operational requirement
- Any associated eLearning materials
- Any associated assessment events relating to the KLPs covered in that learning event

Releasing of Administration Staff from Minor Tasks

When course readers or associated supporting documentation is delivered to current courses, administration staffs are required to ensure sufficient copies are printed prior to the learning event and distributed at set dates. The facility to set a time relation to eLearning objects at the learning event level of Curriculum Manager means that much of this routine activity can be foregone.

While the MLE will never replace paper releases of documentation, it does provide students with the facility to have all required learning materials available to them via their computers, rather than having to carry reams of paper with them between learning locations.

MANAGEMENT BENEFIT

Senior Management

The predominant benefit delivered to Senior management is the direct and identifiable link between learning events and operational requirement. In the context of the JSCSC, this enables justification of educational activities taking place within the college against the military need. It also greatly enhances Command's ability to respond to Requests for Information and Parliamentary Questions as all course documentation and materials are hosted within a single, hierarchical system.

Moreover, it enables Command to advise single-Service and Joint Customers on the potential impacts that changes to course events may have on operational capability.

Learning Deliverers

Given the hierarchical nature of training documentation and the product flow development of learning events, learning deliverers are provided greater context to the sessions they are required to facilitate. The ability to see the learning journey students have to undertake, where this learning will take them and the assessments they will undertaking enables greater focus on the objectives of each learning event.

The linkage to operational requirement also enables the learning deliverer to emphasise the need for learning activities to the student body; reinforcing the benefit of learning activities to the students' activities in the operational workplace.

Auditors

Under the DSAT, DTEEs are required to undertake a training audit every two years. This incorporates an examination of a representative sample of training documentation and delivery throughout that DTEE.

With the introduction of Curriculum Manager, auditors will no longer be swamped with excessive paperwork; they will be capable of tracing all training outcomes (all the way back to operational requirement) and documentation by linking directly from the electronic timetable for any course delivered.

Course Programmers

Given the product-flow description held by Curriculum Manager from the development of learning events, Course Programmers will be able to concentrate their efforts on scheduling of visiting lectures and the practicalities of running courses within an academic environment; rather than scheduling events to effect the greatest learning benefit. Indeed, by developing courses in this manner it minimises the need to redesign courses for each iteration. This will free time to enable Course Programmers, Learning Deliverers and Training Management to devote time to developing enhanced learning events to meet the operational requirement by the most effective and efficient means.

GLOSSARY

CF	Competency Framework
CMIS	College Management Information System
COTS	Commercial Off-The-Shelf
DSAT	Defence Systems Approach to Training
DTEE	Defence Training or Educational Establishment
EO	Enabling Objective
FTS	Formal Training Statement
ISpec	Instructional Specification
JSCSC	Joint Services' Command and Staff College
KLP	Key Learning Point
LP	Learning Platform
MLE	Managed Learning Environment
MoD	Ministry of Defence
OPS	Operational Performance Statement
RTGS	Residual Training Gap Statement
SSpec	Stage Specification
TAD	Training Authorisation Document
TO	Training Objective
TPS	Training Performance Statement
WTS	Workplace Training Statement

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Concrete Blogs

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ABSTRACT

The increasing use of social technologies in learning and teaching begs the question of their appropriateness and the manner in which they are deployed. This case study outlines a specific use of blogs and wikis in a fourth-year Civil Engineering course on Durable and Sustainable Concrete Structures at the University of New South Wales at the Australian Defence Force Academy (UNSW@ADFA). As the students were in their final year of study, academic staff sought to encourage a student-centred, authentic learning environment for the course. Students were given a design brief and divided into two teams; each researching suitable concrete mixes and design details to be found for disparate and harsh environments. Despite the class being face-to-face, online tools were included since much communication in the field is online even if team members' offices are in close proximity.

Blogs and wikis, as well as other communicative tools, were used in order that students share their research findings and subsequent conclusions. These were read by the lecturer, and formative assessment and feedback were provided promptly. The other team also read and commented on each entry, providing peer feedback. Discussions occurred regarding the suitability of various proposed mixes and designs. Emphasis was placed on communication and collaboration within and between teams. Final assessment was provided in the form of a presentation.

Changes in teaching approaches are discussed, together with difficulties experienced in using tools new to both students and staff and the tension between pedagogy and university policy requirements. Responses by both staff and students are examined, along with proposed changes for the next offering of the course. Implications for expanding this methodology throughout the program are also explored.

CONTEXT

The focus of this case study is students in a fourth-year Civil Engineering course on the Durability of Concrete and Concrete Structures. Recognising that these students were in their final year of study, the lecturer looked to provide a context for the course which would most closely reflect the environment into which they would enter upon graduating. This environment would require them to design a durable and sustainable concrete structure as if they were graduate engineers, operating as part of a community of practice, receiving guidance and mentoring from a senior engineer.

The use of a blended learning scenario was designed to simulate post-graduation Network Centric Work conditions, where team members may not be located in one place, and where use of online communications tools would be a primary method of communication.

A further aim was to:

- allow students to have increased ownership of their learning; and
- be active participants in the learning process rather than passive recipients of knowledge.

PREVIOUS SITUATION

Previous iterations of the course had been didactic. Lectures were supplemented by online components which were basically 'this week's PowerPoints', containing only summarised content, with assessment being by individual assignments. The lecturer felt that while feedback had been consistently positive, the students would benefit from having increased control over their learning, together with an experience more closely aligned with that which they might experience in the work place.

CHANGES

Students were now divided into two groups: one 'building' a durable concrete structure in the Persian Gulf, the other a concrete structure in Basra. These disparate and harsh environments were chosen as realistic locations where Australian Defence Force (ADF) personnel could be required to build structures as part of their deployment. The particular challenges of researching the local requirements, and the availability and appropriateness of potential materials were also authentic issues which inform the choices engineers make when creating concrete structures; and ones which were often not taken into account in text-book based classes.

Assessment also changed markedly. Rather than three summative assignments, weekly formative assessment was provided through lecturer (as consultant) responses on the blogs and wikis. The lecturer read the entries at least two or three times a week and commented as would a senior engineer within the team providing feedback to junior engineers online.

ASSESSMENT

Participation was given a 20% weighting throughout the course with initially, the remainder reserved for individual and group marks. This was later changed at the students' request to be completely based on the final group presentation.

Students were permitted to see other group's online blog and wiki entries. Further than simple discussion, active peer review and constructive criticism were encouraged. This again provided a more authentic environment as work mates would be expected to provide feedback throughout a project.

Students used blogs and wikis to communicate within and between teams. This reflects the nature of modern life within the ADF and business, where electronic communication can often be the primary mode of communication between staff members who may be travelling or deployed in various locations. The use of wikis was planned to provide evidence of the evolution of individual as well as corporate findings/research/work. Initially it was believed that students would insist on some portion of marks being allocated to individual work. This belief arose from anecdotal evidence and staff experiences at other institutions where there were often complaints that a particular team member did not contribute adequately to the project. It was therefore surprising to staff that students in this case study insisted that this component of assessment was unnecessary: they preferred being marked as a group. When questioned, the response was that any engineering project would succeed or fail as a group effort. A particularly telling comment was that as these were all ADF members, who and been together as part of their divisions, they knew each other well and were content that 'all the slackers were gone". Accordingly, the wikis were abandoned, and only blogs were used throughout the remainder of the semester. As an aside, it would be interesting to test whether this is a response unique to UNSW@ADFA, any Military/Defence Academy or, indeed more broadly across cohorts in final year courses who previously participated jointly in other courses.

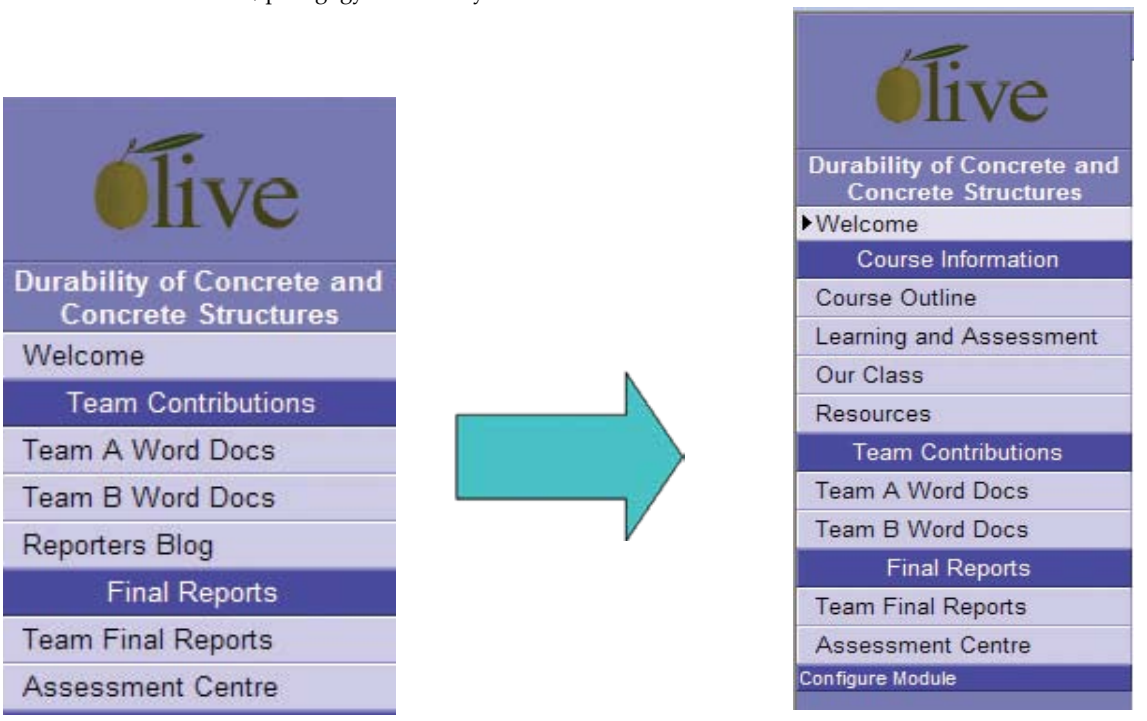
CHALLENGES

A number of challenges presented throughout the course. Both blogs and wikis were new to all staff and many of the students. Interestingly this aligns with Eijkman and Herrmann (2009) findings that while students appear to be more generally 'social technology' savvy, they may not 'recognise' some of theses tools which they use in other forms. This is clearly an area for further investigation – how much does the physical appearance of an online tool impact the response of the student (and staff) to its deployment?

Wikis and blogs were originally planned as online communications tools. The use of wikis was intended to make clear individual contributions to the ongoing discussion and development of the project. These proved to be difficult and time-consuming to format appropriately for their intended use. Blogs were easier to use in our specific online environment, as an HTML editor was incorporated in the design, but technical difficulties lay in getting a separate blog for each group to work at the same time. This technical issue was resolved approximately three weeks into the course, in discussions with students who appeared less concerned than staff about technical changes needed. Indeed, this greater student flexibility and adaptability in an online environment was an ongoing feature of this case study and also would benefit from further study.

TENSIONS BETWEEN PEDAGOGICAL IDEALS AND UNIVERSITY ADMINISTRATIVE REQUIREMENTS

The staff in this course particularly wanted students to focus on the communicative aspects of the course, and originally placed informative documents such as the Course Outline as child items to an 'Information' button. (See figure 1 for a view of the course front page and navigation). This was in keeping with the assumption that the visual interface of such online environments is one factor influencing the understanding which students develop regarding course structure, function and procedural importance. However, during the implementation of Online LIVE - OLIVE (the Learning Management System (LMS) used at UNSW@ADFA), to an apparent effort to keep develop visual course consistency, Heads of Schools made several stipulations, one of which was that Course Outlines were to be placed at the navigational top level of all courses. As links placed higher on a list may be perceived as being of greater importance than ones further down the list, this was undesirable, but the compromise was made in order to meet all requirements. Worryingly, this caused other items of a similar nature also to be placed at that higher level, thereby visually implying that these items could be more important than the communications tools. The tensions arising from such policy compliance will continue as long as there is a perceived 'administration/pedagogy' dichotomy.



Initial Visual Structure

Subsequent Visual Structure

Figure 1 Changes in visual structure

Content and documents such as Course Outlines are designed to comply with these demands, as well as sound pedagogical processes and student demands. The making of these documents available online with limited contextualisation (such as might be provided in a face to face presentation of these documents, is a continuing issues for online courses such as these.

OUTCOMES AND OBSERVATIONS

A number of outcomes and issues were identified in this case study. Three of these will be addressed here.

Potential for 'authentic' learning experiences

The move from a traditional didactic approach to this course to one more closely reflecting the potential work environment of the students was demonstrated to work without needing to take the 'simulation' too far. One of the oft quoted reasons for not trying to make the students' experiences more authentic is that if the actual work context cannot be totally simulated there is no benefit. This case study demonstrates that if the specific features of the work context are identified, e.g. team work, student initiated research, peer review and staff as consultant, it is sufficient for these to be used to give a demonstrated positive outcome to the student.

Confusion between technical and pedagogical problems

Many university lecturers overestimate their centrality to student learning and underestimate student resilience. They become very concerned if anything technical goes 'wrong', even for a short period, fearing that students will become alienated or critical of the delivery of the course. Emails from students indicating that an item is not 'working' are often seen as critical of the lecturer or the system, rather than simply informational in nature. In this course, it was particularly noticeable that students coped well with the technical difficulties within this course, and offered active solutions to some of these challenges. When presented with alternative solutions, they thoughtfully considered and debated the pros and cons, then indicated their preferred solution.

Students who are:

- kept apprised of the situation,
- given the opportunity to voice their opinion, and
- actively involved in resolving the issues, rather than being passive, and critical, observers,

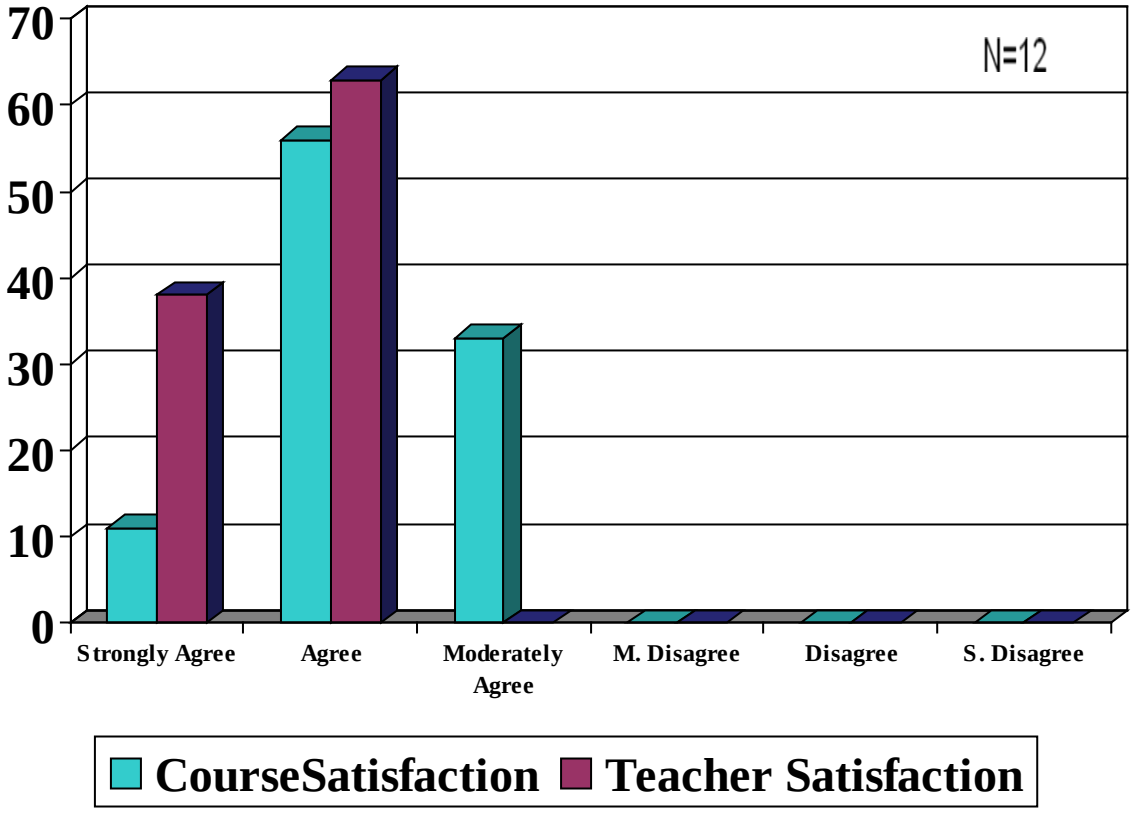
provide significantly more positive responses to evaluations. (see figure 2)

Anecdotally, this ability to provide feedback also took a surprising turn when the students asked the lecturer if the Monday face-to-face class could be 'dropped' so that they could "get on with it"; i.e. to spend the time researching the required information and then to post their outcomes online. This was not wasted time, as evidenced by the content placed online, but was indicative of their engagement and the confidence they had in the promptness and appropriateness of the lecturer's feedback.

Student feedback indicated that student satisfaction with the course was even more positive than previous course offerings. Comments included statements such as "any learning done was valuable and job specific" and that the lecturer had provided a "productive learning environment".

The response from staff was that they felt that the students had benefited from being treated as professionals-in-waiting, and that the level of engagement was higher than in previous offerings. While initial workloads seemed higher than usual with a new course, mainly due to the need for staff technical up-skilling, the marking loads were distributed evenly throughout the course, and it was felt that overall this was less burdensome.

Figure 2



Although the numbers for this course were small (n=12), the division into teams is easily scalable. The distributed nature of the marking eased end-of-semester marking loads.

Tension between institutional policies and procedures and effective online teaching and learning

Good online design does not occur in a vacuum. Institutional administrative requirement, while often typified as hindrances, are equally as often important in maintaining standards and accountabilities. So the tension of the two is a constant 'juggling act'. The tensions can be seen as negative and hence disruptive to good design and having a negative impact on outcomes, or positive and managed and integrated to provide enhanced outcomes. This case study demonstrates that, while the ideal visual implementation might not have been achieved, the one that was proved to be eminently positively received by the students who, in the long run need to understand the art of compromise.

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Evaluating Course Design Principles for Multimedia Learning Materials

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Abstract

This paper reports on evaluation studies of principles of course design for interactive multimedia learning materials. At the Defence Academy of the UK, Cranfield University has worked with military colleague to produce multimedia learning materials for courses on 'Military Knowledge'. The courses are part of Officer Career Development training for junior officers in the army. The courses were developed following clearly defined course design principles believed to best suited for the delivery of resource based learning materials. The overall findings suggest that the course design principles are indeed regarded by students as supportive of effective learning.

INTRODUCTION

This paper reports on evaluation studies of principles of course design for interactive multimedia learning materials. The evaluation studies included interviews, observation studies and the use of online questionnaires. At the Defence Academy of the UK, Cranfield University has worked with military colleagues to produce multimedia learning materials for courses on 'Military Knowledge' (MK). The courses are part of Officer Career Development (OCD) training for junior officers in the army. The courses constitute more than 200 hours of stand-alone learning materials. The courses were developed following clearly defined course design principles and a pedagogic model believed to best suited for the delivery of resource based learning materials. Key features of the model include: clearly stated aims and learning outcomes, knowledge maps to support flexible navigation and a wealth of activities to support effective learning. The lead author was responsible for formulating the course design principles and for specifying the pedagogic model. The principles draw on several sources in the literature for what is considered as good practice. The paper reports in-depth evaluation studies concerned with validating the pedagogic model and associated course design principles. The authors believe this is the first time that such a large scale set of studies has been carried out. The overall findings suggest that, in general, the course design principles are indeed regarded by students as useful for effective learning. However, there are also interesting individual differences in the learning strategies adopted, with some students making more use of some of the course design features than other students. Some conclusions are drawn about what does indeed constitute good course design, together with suggestions for further research.

Section 2 briefly sets the scene concerning the MK courses.

Section 3 overviews the course design and development model and key features of the learning designs used for the MK.

Section 4 describes the research methods used, with information about research designs, sampling and data gathering.

Section 5 presents summaries of the main findings of the research. Section 6 has some concluding comments, together with descriptions about how the research programme, of which the reported studies are a part, is being taken forward at the Defence Academy – College of Management and Technology.

ABOUT THE MK COURSES

Cranfield University supports military colleagues at the UK Defence Academy in the delivery of a wide range of educational courses. We have been engaged in developing quality web-delivered distance learning courses for junior officers in the British Army. The courses are known as Military Knowledge 1 and Military Knowledge 2 (MK1 and MK2)[1] and provide in total some 200 hours of self-directed learning. The courses are self-contained and designed to be worked through by learners working individually. Informal support groups do exist and, as noted in the evaluation findings below, many students would welcome more opportunity to interact with peers and tutors. For more about the background to the MK courses, see Mackain-Bremner and Scott (2006) and Potts (2009).

The MK courses are divided into parts, modules, sections and lessons. Each lesson is further divided into as many as five topics, which may in turn have subtopics. The MK courses are structured in such a way as to give total freedom to the student in terms of the order in which each lesson, and indeed each topic or subtopic is accessed. To this end, students are provided with a "Knowledge Map", a visual representation of the course with a mechanism for browsing and launching lessons. Students are permitted to browse lesson content or to go directly to any given topic within the lesson via the lesson's topic menu internal navigation. Students are also provided with a "Lesson Map" which allows them to navigate to a given topic or subtopic. The learning design used for lessons follows the principle that for each topic there is (i) a clearly defined learning outcome (ii) expository text supported by multimedia resources (graphics, animations, video clips) (iii) one or more interactive learning activities with formative feedback (iv) self-assessment activities with formative feedback (iv) summaries that can be downloaded for review purposes. Summative assessments are delivered online using a dedicated assessment engine.

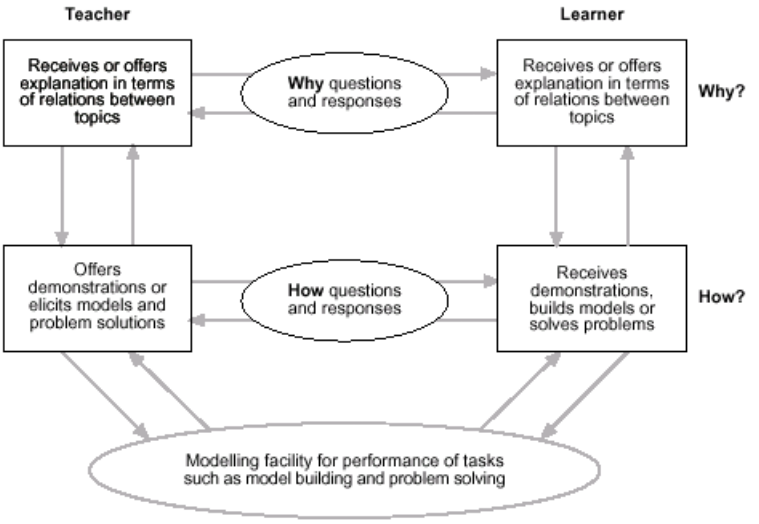
1 Over time the MK courses have evolved with different versions, revised structures, revised summative assessment criteria and, inevitably, revised content. What has not changed is the pedagogic model. The paper refers to the MK courses as they were at the time the research was carried out.

THE COURSE DESIGN AND DEVELOPMENT MODEL

This section briefly describes a principled approach to course design for interactive multimedia learning environments. (See also Scott and Cong, 2006.) The principled approach is based on conversation theory (CT), a theory of learning and teaching.

CT originated in the 1960s from a cybernetics approach to explaining learning in both living organisms and machines (Pask and Scott, 1973; Pask, 1975, 1976; Scott, 2001). The fundamental idea of CT is that humans are dynamic self-organising systems with a need to learn and that learning is mediated by external and internal conversations about a topic or subject matter. In an external learning conversation very often one participant has the role of teacher and subject matter expert. The teacher aims to develop a learner's understandings. Part of this process requires the learner to externalise his/her understandings as explanations and models for purposes of formative assessment. In CT, this process is referred to as 'teachback'. When engaged in a productive learning conversation, the participants typically share access to external representations of the subject matter in the form of texts, diagrams, concept maps, models, examples and so on. Figure 1 shows the form of a learning conversation.

Figure 1: The 'skeleton of a conversation'



(Source: Scott, 2001)

Pask (1975) refers to this model as the 'skeleton of a conversation'. It shows a 'snapshot' view of two participants (learner and teacher) in conversation about a topic. All such exchanges have, as a minimum, two logical levels ('how' and 'why'). The 'how' level is concerned with how to 'do' a topic: how to recognise it, construct it, maintain it and so on; the 'why' level is concerned with explaining or justifying what a topic means in terms of other topics. External representations mediate these conversations and assist the participants to negotiate agreements, including agreements to disagree. Apart from these external conversations, each participant has a continual internal conversation or 'inner dialogue' where concepts are constructed and assessed for logical coherence and consistency of naming with other concepts within a participant's conceptual system. Pask (ibid) also defines a generic term, 'modelling facility', to describe the resources that enable the teacher to demonstrate and exemplify the topic. Here, the teacher can use non-verbal demonstrations. Modelling facilities can be laboratories, computer based micro-worlds and simulations or parts of the real world.

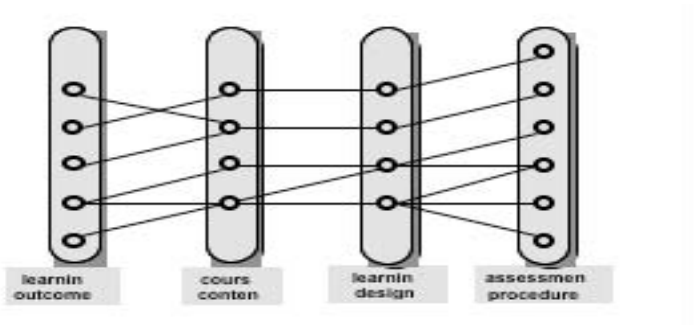
To support conversational learning as characterised by CT, we believe a multimedia learning environment should have four major components, as exemplified in Pask and Scott's (1973) seminal Course Assembly System and Tutorial Environment (CASTE). The four components are:

- Learning outcomes that are clearly specified. These may be conceptual, procedural or attitudinal.
- Course content should be analysed in terms of knowledge and tasks to ensure logical coherence and consistency of terminology.

- Learning designs (also referred to as 'tutorial strategies') need to be specified to ensure effective learning takes place.
- Assessment procedures need to be specified, both formative and, where relevant, summative. Formative assessments play a key role in eliciting 'teachback' activities within a learning design.

A key principle to be followed is that all items of each the four components should map onto corresponding items of the other components. This is illustrated in Figure 2.

Figure 2: A framework for course design (Source: Scott, 2001)



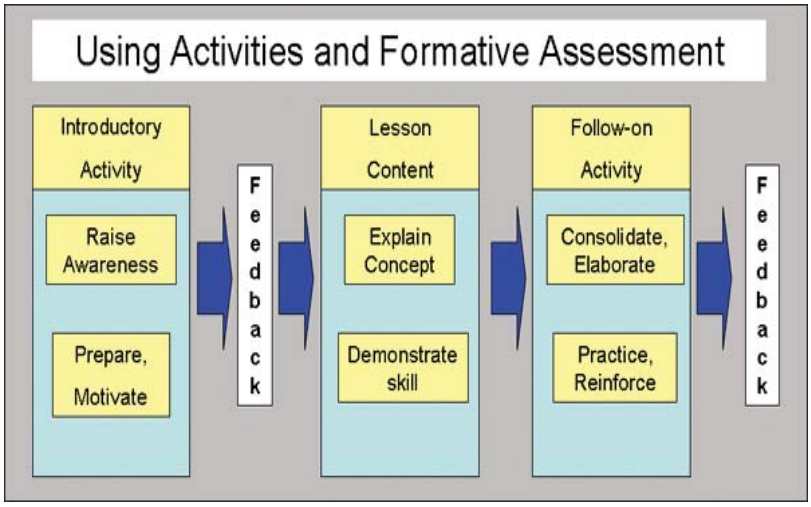
In similar spirit, John Biggs (1999) has coined the term "constructive alignment" for the idea that course components should work together coherently and consistently.

A key contribution from CT is that learning designs should be viewed as ways of conversing with the learner to support effective learning. Rowntree (1990) refers to this approach to learning design as providing a 'tutorial in print'. The conversations that occur should encourage the learner to:

- Reflect on his/her current knowledge, skills and attitudes
- Carry out tasks that ensure effective learning takes place.
- Engage in 'teachback' of knowledge, skills and attitudes and apply these to novel problems.

These ideas are summarised in Figure 3.

Figure 3. A template for learning designs that are conceived as conversations with the learner.



We will now look at the whole process of course design, development and delivery.

To help ensure that the fundamental principles of course design are followed when designing, developing and delivering courses, a ten step process model has been developed (Ryan et al, 2001; Scott, 2002). The steps in the model are summarised in Figure 4.

Figure 4: Processes involved in course design, development and delivery

Although the model follows a particular sequence to ensure that all the components are designed to fit with each other, it is understood that they interact with each other. This means that the decisions of later steps may influence the earlier steps that may then need to be revised. This is indicated by anti-clockwise arrows at the centre of the diagram in Figure 4.

There are some features of this model of course design which contribute to and account for its effectiveness in the design of interactive multimedia learning environments. They are:

- All components are designed to work together.
- Components are analysed and developed in a planned sequence; although each is reviewed again as new components are specified.
- The entire design process is orderly but flexible. There is both "feedback" and "feed forward" in iterative cycles of work.
- The key step of knowledge and task analysis is supported in CT by a well defined methodology (Scott and Cong, 2007).
- The design process includes formative evaluation using pilot studies and technical testing.

Summative evaluation of a course once it has been delivered is seen as a key step in the design, development and delivery process. This step is one which is, in practice, often skimped on or even omitted. Summative evaluation may use summative assessments to provide data on how well the course as a whole is doing its job of helping learners achieve learning outcomes. As below, it may also look to see how relevant and effective are the various components built into the course design.

RESEARCH METHODS

To elicit in-depth information about students' perceptions of the course design methods, semi-standardized, open-ended oral interviews were conducted, together with deployment of an online questionnaire. Four students thus far have served as interviewees. Each student was interviewed by the researchers for about one and half hours. After the student interview, the dialogues between students and researcher were transcribed into texts. The "constant comparative method" of grounded theory (Bogdan & Biklen, 1992) was then used to analyse all the written scripts and recorded transcripts in order to ascertain the similarities and differences in perceptions among these participants.

The student's responses were useful in developing an online questionnaire. The questionnaire contains Likert scale questions and four open-ended short essay questions. Table 1 shows the major components within the framework of questions used in the interviews and questionnaire.

Table 1: Major Components within the Framework of Exploratory Questions

EXPLORATORY QUESTIONS	
What variables affected the perspectives of learners in the courses?	• Learners' e-learning experience background • Learners' IT skills • The situations of learners' study • Access to an internet connection • Learners' learning style preferences • Learners' study time • Learners' motivation to learn
What are learners' perceptions of the features of the learning designs used?	• Learning outcome statements • Knowledge Map and Lesson Maps • Learning activities • Lesson assessments • Summaries • Summative assessments • Animated graphics • Embedded hypertext items (i) • Menus (study guides, faqs, assessment policy and download of summaries) • The topic navigation bar
Learners' overall satisfaction with aspects of the course	• Structure • Content • Navigation • Assessments

The survey lasted for four month starting from October 2008 to February 2009. Data was collected from 162 respondents.

SUMMARIES OF THE MAIN FINDINGS OF THE RESEARCH

For each question, the respondents indicated their level of opinion using four point Likert scales. Four points were chosen, rather than three or five, in order to 'force' a choice so it would be clearly positive or negative. The means of the responses to each Likert scale question were calculated. The results are presented below with brief commentaries and with samples of the comments made by respondents as free text entries. Here we present data per question only. Further analysis, not yet carried out, will look for correlations amongst the responses, for example, to see if a student's preferred way of working correlates with their use of the several available navigation aids.

Respondents' Perceptions of Expected Study Time, Introductions and Desired Learning Outcomes.

The first section of the questionnaire examined the respondents' perceptions of the usefulness of statements of expected study time, introductions and desired learning outcomes. The results are presented in Table 2.

The means were calculated according to the scores of each selection coded (very useful = 4, useful = 3, a little useful = 2, not useful = 1 and always = 4, frequently = 3, sometimes = 2, rarely = 1).

Table 2: Items concerning the content of learning outcomes

Item Number	*Items*	*Mean*
1	How useful were the statements of study time?	1.78
2	How useful were the Module Introductions?	2.47
3	How useful were the statements of Learning Outcomes at Module level?	2.17
4	How useful were the statements of Learning Outcomes at Lesson level?	2.31
5	How frequently did you read through the Learning Outcomes before studying a Lesson?	2.34

As can be seen from Table 2, Item 1, about the usefulness of the statements of study time, with a mean of 1.78 (out of a maximum of 4.00), it seems that most respondents did not agree the statements of study time were useful. The comments of the respondents about this question, shows that most thought the statements of study time were not accurate. Here are some comments:

> *"The statements of study time are woefully inaccurate. I may take that long to read the material once but not to learn sufficient to pass the assessments."*
>
> *"Always wrong - too short. Generally not proportional to actual study time."*
>
> *"Some subjects take far less time & others far more"*
>
> *"On the early version of MK2, the study time statements were exceedingly inaccurate. (For Module A it took me over 7 hours pure study, against a predicted 6, and with note-making and revision, this went up to 21 hours.) Since Nov 07 it seems to be more on track, but I haven't revised (or been assessed) on any of the modules yet."*

It seems that most respondents agreed that Module Introductions were useful (mean = 2.47) but there were some who thought they were not useful. Here are a couple of comments from the respondents who had negative opinions about the Module Introductions.

> *"I always skipped them"*
>
> *"Had so much to do that I didn't bother reading them."*

It also seems that most respondents agreed that the learning outcomes at Module level (Item 3) and Lesson level (Item 4) had been useful before they started lessons (mean = 2.17 and mean = 2.31). One of respondents commented that "*Good summary to use as a checklist for learning.*"

Item 5, concerning the usage of learning outcomes by students (mean = 2.34), indicates that students quite often use the learning outcomes before studying a lesson. Some respondents gave very positive feedback:.

"It was a good indication of what was to be studied and where the information could be found."

"Sets the tone for the learning package"

Respondents' Perceptions of the Knowledge Map, Lesson Maps and Navigation Bar

The results of specific questions (items 3 to 8) in the questionnaire concern the usefulness of the navigation aids. They are presented in Tables 3 and 4. As before, the mean was calculated according to the score of each selection coded (very useful = 4, useful = 3, a little useful = 2 and not useful at all = 1).

Table 3: Items concerning the content of knowledge and task analysis

Item number	*Items*	*Mean*
1	How useful was the knowledge map for helping you understand the structure of the course?	1.86
2	How useful was the knowledge map for helping you navigate through the course?	1.89
3	How useful was the lesson map for helping you understand the structure of a lesson?	2.03
4	How useful the lesson maps for helping you navigate through a lesson?	2.08
5	How useful was the topic navigation bar at the top of the screen?	2.63

As can be seen from Table 3, Items 1 and 2 about the usefulness of the knowledge map got the means of 1.86 and 1.89. It seems that almost half the respondents did not agree that the knowledge map had been useful for helping them understand the structure of the course and helping them navigate through the course. After analysing the respondents' comments about these two questions, we found two main reasons that deterred the respondents from using the Knowledge Map. One was that the size of the Knowledge Map made it difficult to use on-screen. The other was that many respondents preferred to study step by step, which means that they did not need to use the Knowledge Map to help them understand the structure of the course and to navigate around it. Here are some comments from those respondents.

"Useful to get a scale of it but useless as it will not fit on one screen or print on one page."

"It is too big a document unless you print it off at A3."

"Never used it. I just went through lesson by lesson and module by module."

"I did not refer to the Knowledge Map"

"I simply went through the course in chronological order."

Items 3 and 4 concern the usefulness of the Lesson Maps for understanding the structure of a lesson (mean = 2.03) and for helping navigate through a lesson (mean = 2.08), which suggests that just above half of the respondents had positive opinions about them. The main reason for those respondents who thought the lesson map was not useful is that they did not notice that the Lesson Maps were available, this despite the fact that they are described in the course Study Guide and exemplified in an interactive sample lesson.

Item 5 is about the usefulness of the topic navigation bar. The mean is 2.63 which suggests that most respondents regarded the topic navigation bar was useful. Here are some positive comments.

"Good for switching back and forth if required."

"Excellent for revision before completion"

"Acted like a book mark for me."

"The easiest way to navigate through."

Some respondents did not think it was useful, the chief reason being that they did not notice it.

The items of Table 4 concern the learning styles of the respondents. Following the seminal work of Pask and Scott (1972), we wished to establish if we could distinguish between serialist learners and holist learners. Serialist learners like to learn step by step. Holist learners prefer a more holistic approach, based on wishing to know how a course is organised as a whole before embarking on detailed learning.

Table 4 and 5: Items concerning the respondents' learning styles

Item 1 Which descriptions best fit how you navigated through the course? (Tick one or more)	
Answers	Percentage of Total No
I worked through the lesson via sequential orders.	84.3%
I worked on lessons in which I was interested and filled in gap lessons.	5.9%
I first worked a lesson where I was unsure of the content.	3.3%
I first worked the lessons where I already know something	11.1%
Item 2 Which description best fits how you worked through the lessons? (Tick one or more)	
Answers	Percentage of Total No
1. I worked sequentially through the topics.	87.5%
2. I moved between topics to check my understanding.	15.1%

As can be seen from the above Table, most respondents were serialist leaners who worked through the lessons and topics via sequential orders. This result may explain why many respondents did not use the knowledge map and the Lesson Map. Further analysis will explore this possibility in more detail.

Respondents Perceptions of Lesson Summaries, Activities, Self-Assessment Quizzes and Other Learning Design Features

Specific questions about the above are shown in Table 6. Items 1 and 2 are about the online summaries (mean = 2.64) and the printed summaries (mean = 2.90). It seems that the respondents mostly used both summaries to check their understanding. One respondent commented that "*The lesson summaries are the best part of the MK2 package and assist the most with learning.*"

In particular, the respondents preferred to use printed off rather than on-screen summaries. Here are some comments from the respondents about the printed summaries.

> *"The printed lesson summaries also make a good revision tool, alongside my own notes."*
>
> *"I find the printed word easier to read and learn from so made use of this aspect of the course"*
>
> *"The lesson summaries are the best part of the MK2 package and assist the most with learning."*

Item 3 concerns the lesson activities (mean = 3.24), indicating that respondents almost always worked through them. The following are some comments from the respondents.

> *"Very useful in pulling together information."*
>
> *"These generally led to the questions in the lesson assessments"*
>
> *"Keen to use all tools to ensure understanding of topic"*
>
> *"Often seeking the answer so that could move on to the other topics."*

Item 4 is about the lesson self-assessment questions (mean = 2.89), suggesting that most respondents thought they were useful. Here are some comments from the respondents.

"These let me know if I needed to revise something again"

"They gave a clear focus on the key element of the subject."

"Made full use and they ultimately assisted in the learning process."

Item 5 and 6 concern other multimedia aspects course. More than half of the respondents liked to use the animated graphics (mean = 2.53) and the embedded hypertext items with icon 'i' (mean = 2.54). They used them to aid their understanding of the course. Here are a couple of comments.

"The animation helped put the text into context, it certainly helped me to understand the processes better. A picture paints a thousand words"

"Made the process much more 'human' especially when studying alone."

Table 6: Items concerning lesson summaries, activities, self-assessment quizzes and other learning design features

Item number	*Items*	*Mean*
1	How frequently did you use the online summaries to check your understanding?	2.64
2	How frequently did you use the printed lesson summaries to check your understanding?	2.90
3	How frequently did you work through the lesson activities	3.24
4	How useful were the lesson assessment questions?	2.89
5	How useful were the animated graphics as aids to understanding?	2.53
6	How useful were the embedded hypertext items with icon 'i' as aids to understanding?	2.54

Respondents perceptions of the summative assessments of course design.

The results of specific questions in the questionnaire concern the summative assessments of course design. They are presented in Table 7. As above, all the questions of this part are Likert scale questions. In this case, the mean was calculated according to the score of each selection coded (Very easy = 4, easy = 3, difficult = 2, very difficult = 1 and very good = 4, good = 3, poor = 2, very poor = 1).

Table 7: Items concerning the summative assessments

Item number	*Items*	*Mean*
1	How easy to follow were the module assessment procedures	3.09
2	How would you rate the quality of the questions in the module assessments?	2.81

The data for Item1, about how easy to follow were the summative assessment procedures (mean = 3.09), suggests that respondents mostly felt they were easy to follow. Item 2 concerns the quality of assessments questions (mean = 2.81), indicating that the quality of the questions was generally perceived as being good. Earlier iterations of the MK courses were criticised for the poor quality of the summative assessment items, so this is good news for the course developers.

CONCLUDING COMMENTS

This paper has reviewed a principled approach to the design of multimedia interactive learning materials based on conversation theory and deployed in the form of a ten step model for course design, development and delivery. A case study was described using courses on Military Knowledge as the context for ongoing detailed evaluation studies aimed at validating the principled approach to course design. We are not aware of any other large scale evaluations of course design practice and so consider our work to be a valuable contribution to the research literature.

With respect to the evaluation of the course design model, the questionnaire data show that a large majority of respondents consider the courses to have been well designed. By way of summary, we have carried out a SWOTS analysis to illustrate and interpret the data. (See Table 8.) A SWOT analysis is a common method of strategic analysis for strengths (S), weaknesses (W), opportunities (O), and threats (T). We have added a fifth component of "strategies" (S) to capture suggestions for how the MK courses could be improved.

Table 8: A SWOTS analysis of the MK courses

Elements	*Related dimension of the MK courses*
Strengths	1. Learner oriented 2. Flexible access to the courses 3. Students decide individually about the sequence and pacing of learning 4. Students like to use learning outcomes to preview their knowledge 5. Good structure 6. Good navigation 7. Good learning activities 8. Students appreciate checking their knowledge using lesson summaries. 9. Students appreciate testing their knowledge using self-assessment quizzes 10. Visualization (graphics, animation)
Weaknesses	1. Lack of opportunities for collaborative learning 2. Study times often underestimate what is required 3. Screen-handling is exhausting 4. Quality of summative assessment questions could be better 5. Students need to be quite well motivated 6. A 'self-management' culture is difficult for some students 7. Some students would prefer blended approaches that include off-line study 8. Loss of face-to-face richness
Opportunities	1. More flexible access to learning 2. Can reach more students over a range of times and locations
Threats	1. Influence of traditional teaching approaches 2. Lower motivation 3. Drawbacks of using technology (need for training, access, accessibility)
Strategies	1. To update the content 2. To further improve the quality of summative assessment questions 3. To provide opportunities for collaborative learning 4. To employ intelligent tutoring /adaptive teaching 5. To develop more sophisticated ways of assessing understanding, e.g., games and tasks based on scenarios

Data from the evaluation studies show that:

1. Overall, learners find the course design satisfactory and do make use of the many features built into the course with the aim of making it pedagogically effective. More specifically, the learning design features employed (statements of learning outcomes, use of multimedia assets and interactive activities, use of self-assessment questions, use of a course knowledge map and lesson maps and so on) are all seen to be working together constructively and effectively.
2. There are many, still to be explored, interesting individual differences amongst the learner population.
3. Many learners' would value more opportunities to work collaboratively with peers.

We are feeding back our findings to our MOD colleagues with the view to discussing how the course might be improved. Topics being addressed include (i) how to ensure all learners make best advantage of the course features (ii) how to implement and manage elements of collaborative learning (iii) how to best support a range of different learning styles and (iv) to investigate a possible role for adaptive teaching where access to lessons and topics within lessons is made contingent on successful completion of lessons and topics at subordinate levels within the Knowledge Map and Lesson Maps.

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Developing a Web-based Resource to Support eLearning Practitioners

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ABSTRACT

This paper reports on wALTer, an ongoing project that aims to provide a high-quality web-based resource to stimulate and support e-learning professional development in the UK HE sector. It is of relevance to all teachers and e-learning professionals who are involved in the design, development and delivery of e-learning and is designed to support professional accreditation in the field. As such, it is also intended to be a useful resource for staff in other education and training sectors. The output from the project will be a single web service incorporating a digital repository of taxonomically organised support materials together with a wiki style interface. Much of the thinking that has informed the project has come from the authors' experience of supporting Defence Academy - College of Management and Technology staff in the production of sophisticated multimedia interactive learning materials and the delivery of online courses. .

INTRODUCTION

This paper reports on wALTer, an ongoing project that aims to provide a high-quality web-based resource to stimulate and support e-learning professional development in the UK HE sector. The wALTer project is a direct response to the UK Higher Education Funding Council for England (HEFCE) and Joint Information Systems Committee (JISC)1 Strategy for e-Learning (2005) that has in Section 4.4 an action for "The Academy and JISC to support the work of the Association for Learning Technology (ALT) and the Staff and Educational Development Association in developing and implementing a professional framework for learning technologists" (Higher Education Funding Council for England et al, 2005, p.14). The project was funded as part of the JISC Capital Programme: Repositories and Preservation Programme. The initial project partners were Cranfield University (CU), ALT and Manchester University (MU). Due to restructuring of their departments, the MU partners were obliged to withdraw from the project at an early stage. Before doing so, the MU team shared with the CU team a draft of MU's e-Learning Best Practice framework which was under development. As below, this framework has helped informed our project activities.

The project is at a 'proof of concept' stage. It builds on an existing web-based resource at CU, The Online Learning Knowledge Garden (OLKG). The OLKG has been designed to be an elegant and accessible resource that encapsulates a well thought principled approach to course design that has proved particularly useful for a number of online courses developed and delivered at the UK Defence- Academy – College of Management and Technology (DA-CMT). The OLKG is being developed and extended by means of a set of linked technologies. An enterprise web portal application, wiki2 and content management applications ensure that the resource can be searched and accessed in multiple ways.

The project also builds on other research activities concerned with the professional development of e-learning practitioners. Cranfield University, in association with the UK University for Industry and the British Institute for Learning Development, has carried out a comparative survey of the education and training needs of learning designers, together with a survey of what education and training opportunities are available (see MacLean, 2007). A key aspect of the project is the involvement and support of ALT which has also expressed an interest in the research. ALT currently offers the CMALT (Certified Member of ALT) professional qualification for individuals using learning technologies within their work. This involvement provides a focus for professional development and therefore a rationale for the design and use of the wALTer resource. It provides a motivation for use and a vehicle for dissemination and guarantees, as much as any situation can, sustained demand and therefore support and growth.

First, we give some background to the development of the project, including: i) what we mean by the term learning design, ii) an overview of our previous research investigating learning designer competencies and iii) a process model for our principled approach to the design, development and delivery of quality e-learning. We then report on project activities and progress to date, including: i) the development of an ontology for the subject domain of e-learning practice on which to base a well-defined taxonomy and controlled vocabulary for the website resource ii) metadata schema, version control and work flow procedures for managing the content of the resource and iii) the choice of technology. We also comment on possible future directions for developing the resource

LEARNING DESIGN: REQUIREMENTS, PRACTICE, PROSPECTS

We use the term 'learning design' with theoretical justification (MacLean & Scott, 2007) to refer to the process of designing effective learning experiences for a variety of contexts: in the classroom or laboratory, in the field, online and via standalone packages using a range of media. Learning design practice involves a wide set of knowledge, skills and competencies, including: learning theory and its applications, course design principles and procedures, use of media, use of different technologies, relevant business processes and so on. In this section we describe our investigations of the professional role of 'learning designer'. As this work progressed we came to appreciate more and more that the set of competencies we were identifying apply also to all teaching and support staff in educational institutions tasked with delivering electronically-enhanced learning. This broadening of scope motivated Cranfield University's desire to be part of the wALTer project.

In the belief that there is a clear disparity between the UK and North America in terms of how learning designers are trained and supported as professionals, we conducted a research project to find out the state of the profession in the UK and to examine the differences with North America in order to inform UK practice and make recommendations (MacLean, 2007).

A multi-method survey was carried out to establish the requirements, practice and prospects for learning design. The research methods used were focus groups within the UK, an international online survey, surveys of higher education and commercial professional training, a survey of competency frameworks, and interviews with learning design professionals in the UK, North America, Australia and New Zealand.

RESEARCH FINDINGS

With respect to the requirements for good learning design practice, the focus groups, questionnaire data, international data, and survey of competency frameworks showed a high degree of consensus about what are the components that make up good learning design practice.

A survey of current practices with respect to the education, training and deployment of learning designers showed that, compared to the U.S.A, the UK is lacking in relevant education and training opportunities. With respect to future prospects for an increased professionalisation of learning designers, there was a clear aspiration for there to be more relevant education and training opportunities and the desire for a national accreditation framework supported by one or more professional bodies.

With respect to the UK, one of the research questions asked if there are aspirations amongst learning designers within the UK for the field to become more professionalised and for there to be greater opportunities for education and training.

The review of the literature, particularly a UK Department for Education and Employment (DfEE) (2000) report, drew attention to the existence of the need for better training and preparation of learning designers in the UK. The ways in which professionalisation of learning design and the setting of professional standards, including an ethically founded code of conduct, were considered and a comparison made between existing learning design competency frameworks.

Case studies presented by focus group members and open discussion about training and assessment issues which should be understood by learning designers added to the already rich picture developing as to what it is to be a professional learning designer in terms of knowledge and competence.

Questionnaire data revealed a common thread among UK learning designers, i.e., a desire for improvement in the training and continued professional development opportunities currently available to them. Their views on what form this might take varied but the general opinion appears to be there is a need for more and varied training that addresses both the theoretical and applied aspects required in the field. This should be improved by practical experience with training and development occurring in the workplace or at other institutions. It was felt by some that current commercially available courses are too superficial while others considered that higher education courses could be too academic. However, although practical experience was seen as important to professional learning, theory was also required. The point was made that theory must be linked more clearly to practice. There is also a requirement for more knowledge of how to link learning design to performance improvement.

Themes were identified which indicated an aspiration for training not only in learning design but also in understanding the business or institutional environments where it is likely to be applied. This might be addressed by learning business skills such as those required by consultants and project managers.

Standards, professional recognition, and the setting up of a central professional body for learning designers are aspirations which many learning designers feel should be realised. A professional body might sit at the centre of a professional community that respondents felt was necessary. It could help meet other aspirations that were expressed such as mechanisms for the exchange of ideas, mentoring schemes, and repositories of resources for learning designers. It was remarked that an online community or wiki would help with the sharing of ideas and provide a place for individuals to seek advice. If such a means of learning collaboratively were to be employed and used by learning design practitioners to learn and develop aspects of professional knowledge for themselves, the practitioners might also benefit from being able to employ the principles that they should be instilling in learners as suggested in the literature review, i.e., those of becoming a self-organised learners (Harri-Augstein and Thomas, 1991).

A professional body is also needed, it was suggested, to provide a 'recognised industry qualification or kite-mark'. Such an organisation could be linked to a university-based body to better promote the profession and the services it offers. But any organisation or association seeking to provide such a standard would be well advised to heed Eraut's (1994, p.167) cautionary advice about the problems likely to be encountered in mapping 'a system of professional qualifications onto a group of learning professionals who are continually expanding the scope of their competence and developing the quality of their work'.

Interviewees were unanimous in supporting the need for professionalisation of the field. In various ways and to varying degrees, they explained how this might be done. They all agreed that professional standards based on competencies are needed to provide the necessary foundation. There were also aspirations among learning designers who have worked for many years in the field that any professional body supporting standards should give recognition to the experience and knowledge of people like themselves.

COMPETENCIES FOR LEARNING DESIGN

Between March and July 2007, we worked on a collaborative project with the British Institute for Learning and Development (BILD) funded by the University for Industry/LearnDirect to set out a proposed competency framework for learning design that can be used as the basis for a national accreditation scheme for the UK. Drawing on the review of the literature and upon BS's in-depth knowledge of the field (and drawing directly on the DfEE report's main headings) a set of high-level competencies was distinguished (see TABLE 1).

The research data and findings were analysed to enhance the framework. For each of the high-level competencies, a more detailed set of sub-competencies was defined. This more detailed version of the proposed learning design competency framework can be seen at Appendix A of MacLean (2007). The collaborative project between CU and BILD is ongoing at the time of writing.

It is hoped that the framework can serve as a more practical and acceptable alternative for the UK than that afforded by the standards of International Board of Standards for Training, Performance and Instruction laid down in Richey et al (2001). Responses thus far from BILD members indicate that the proposed framework is likely to be acceptable to the profession as the basis for a national accreditation scheme in the UK.

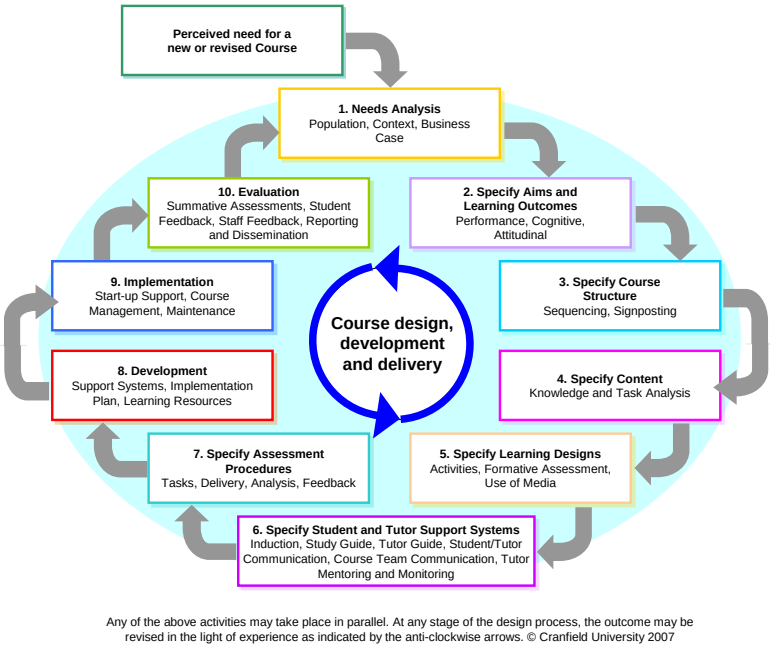
Table 1 - A Learning Design Competency Framework (source MacLean, 2007)

Skill areas	*Competencies and performance*
Generic skills	Project management
	Client management
	Planning
	Leadership
	Communication skills
	Team working
	Budgeting and costing
	Contract management
Learning design skills	Apply understanding of how people learn to create a range of pedagogic solutions
	Perform needs analysis
	Perform knowledge and task analysis
	Write aims and learning outcomes
	Develop pedagogic model/instructional design strategy
	Create a detailed learning design for each learning outcome
	Select from and apply a wide range of e-learning technologies for particular pedagogical purposes
	Describe course production processes
	Use research skills to investigate subject
	Interpret and write technical specifications
	Apply human-computer interaction (HCI) principles to interactive screen design
	Engage effectively with subject matter experts (SMEs), technical authors, media developers and other project staff
	Write style guides for SMEs and technical authors
	Design study guides for learners
	Design tutor guides
	Design support systems for learners, tutors and course managers
	Apply editorial skills
	Develop assessment strategies
	Select from and apply a range of assessment techniques
	Carry out pilot studies
	Design and carry out evaluation studies
	Design and apply quality assurance procedures including:
	Know and implement relevant legislation for accessibility, plagiarism, copyright and IPR issues, security and confidentiality
	Know and apply relevant ethical principles and codes of practice
	Understand and apply relevant standards and specifications
	Carry out staff development and training activities
	Develop professional knowledge and skills as a reflective practitioner

COURSE DESIGN, DEVELOPMENT AND DELIVERY

Here, we will briefly overview, what it is that learning designers do. FIGURE 1 shows the various processes that a learning designer must understand and be able to apply throughout the design, development and delivery of a programme of learning.3

Figure 1 - Course design, development and delivery



(Source: Scott 2006)

It can be seen from the above diagram that learning design requires knowledge and skills in a variety of areas. These are not restricted to online learning but are broadly applicable in any learning design context. This is only a diagrammatic representation of one particular model and, naturally, each of the steps shown has many more layers of detail about what is involved. These layers are not shown here but the model is used to illustrate the point that where this or similarly rigorous models are applied to the design of learning materials and experiences in a range of situations, there is an increased likelihood of the learning materials and experiences achieving their desired outcomes.

This process model was developed at the DA-CMT where one of CU's schools (Cranfield Defence and Security) is the academic provider of defence related short courses and programmes of study. The model has been successfully applied to the development of a number of online courses. In particular, it was used to guide the development of courses on Military Knowledge. Mackain-Bremner and Scott (2006) describe the background to these courses. Scott and Cong (2009) describe in-depth evaluation studies of the learning design features of the courses. iv

Continued use of the model has repeatedly justified Allen's (2006) advice:

"As you contemplate any e-learning development project, it's important to prepare for the complexity of the undertaking. Using a tried-and-true process will arm you well for both the expected and unexpected challenges, and bolster your confidence. And help you maintain your enthusiastic commitment to excellence." (Allen, 2006, p.14)

With respect to Allen's point about commitment to excellence, the final phase of the ten-step model is evaluation, a key aspect of which is the application of quality assurance procedures. Each online course developed using the model is open to assessment against quality assurance checks which have been derived from the process model. An experienced learning designer carries out separate checks at both the programme and module levels. Using module or programme level quality assurance documents as a guideline the learning designer examines every aspect of the online learning materials. Each section of these documents has checklists drawn from the additional layers of detail referred to above. Using these, the learning designer rates the various aspects on a scale of 1

(poor) to 5 (excellent) or N/A (not applicable). In each section of the documents and a report on the front page the learning designer will also provide course owners with constructive feedback and advice on how the course design might be improved. The example in Figure 2 captures how the learning design aspects of a module have been assessed and feedback given.

The checklists may also be used by the designers and developers of courses (teachers and support staff of different kinds) to serve as 'advance organisers', tools that support 'pedagogic planning'.4

Figure 2 - Extract from a document used for module level quality assurance checks

3. Learning Design

	N/A	1	2	3	4	5
Do module parts such as units and lessons have a clear indication of learning outcomes?	☐	☒	☐	☐	☐	☐
Do lessons use activities and formative assessment to support effective learning?	☐	☐	☐	☐	☒	☐
Are activities:						
Relevant?	☒	☐	☐	☐	☐	☐
Timed?	☐	☒	☐	☐	☐	☐
Interesting?	☐	☐	☐	☐	☒	☐
Elaborating?	☐	☐	☐	☐	☒	☐
Reinforcing?	☐	☐	☐	☐	☒	☐
Accompanied by formative feedback?	☐	☐	☐	☐	☒	☐
Supportive of self-assessment?	☐	☐	☐	☐	☒	☐
Are different media used appropriately and effectively to:						
Explain?	☐	☐	☐	☒	☐	☐
Enrich?	☐	☐	☐	☒	☐	☐
Motivate?	☐	☐	☒	☐	☐	☐
Enable access for learners with special needs?	☒	☐	☐	☐	☐	☐
Using resources:						
Is there an effective and appropriate use of resources?	☒	☐	☐	☐	☐	☐
Are they clearly referenced?	☒	☐	☐	☐	☐	☐
Do links work with no problems?	☒	☐	☐	☐	☐	☐
Using collaborative learning:						
Are discussion fora used effectively?	☒	☐	☐	☐	☐	☐
Are there clear instructions?	☒	☐	☐	☐	☐	☐
Is tutor support adequate and appropriate?	☒	☐	☐	☐	☐	☐
Using social networking applications (eg wikis and blogs):						
Are they used effectively?	☒	☐	☐	☐	☐	☐
Are there clear instructions?	☒	☐	☐	☐	☐	☐
Is tutor support adequate and appropriate?	☒	☐	☐	☐	☐	☐

Please Comment on the Above

The module aims and learning outcomes should be included online for students to refer to and ensure they can achieve them.

Media is used effectively within the ppts. It is good practice to include a reference slide at the end of each ppt presentation to enable students to conduct further research into a subject.

More use could be made of activities to provide formative feedback to students.

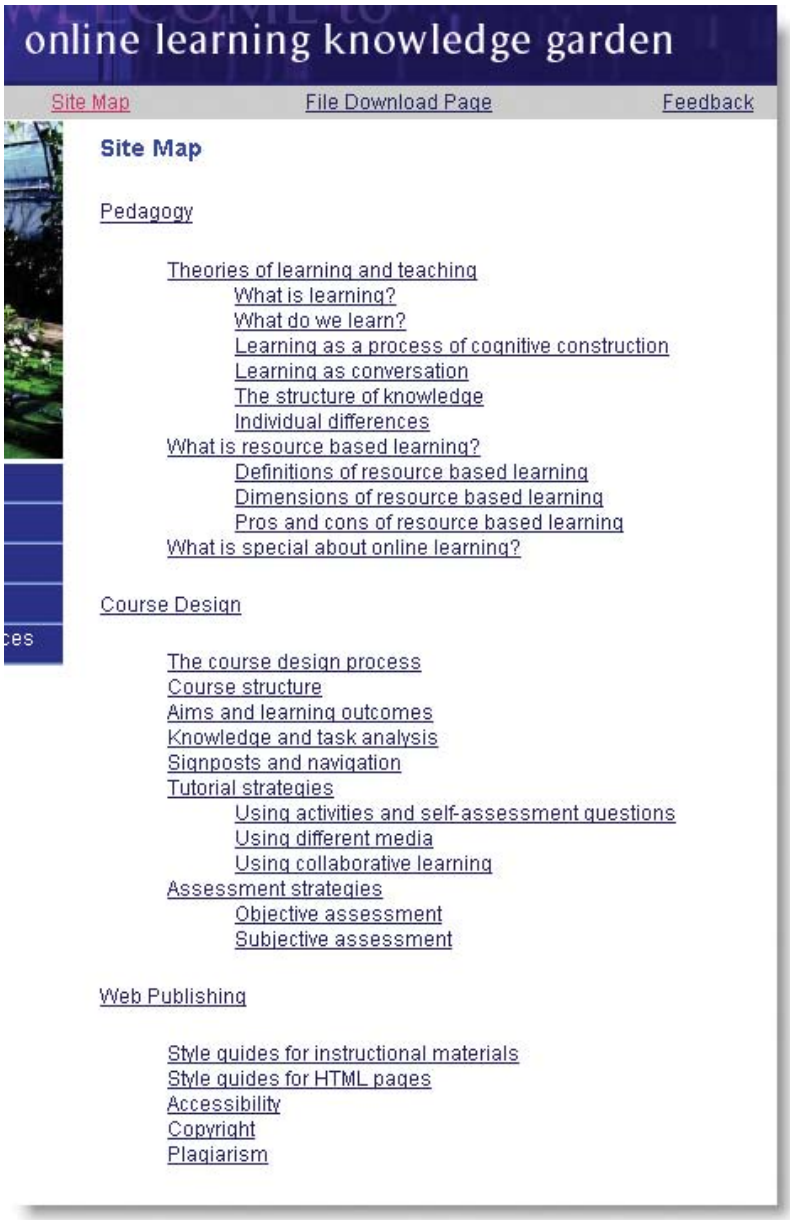
The use of discussion forums and social networking applications could improve peer to peer learning. FLSC can provide training on the use of discussion boards.

Quality Evaluation Checklist - module level Page 4

THE ONLINE LEARNING KNOWLEDGE GARDEN

The online learning quality evaluation checklists were developed to be used in conjunction with the Online Learning Knowledge Garden (OLKG) a web-based resource for a pedagogic planning.5 The structure of the original OLKG is shown in FIGURE 3.

Figure 3 - The original Online Learning Knowledge Garden site map



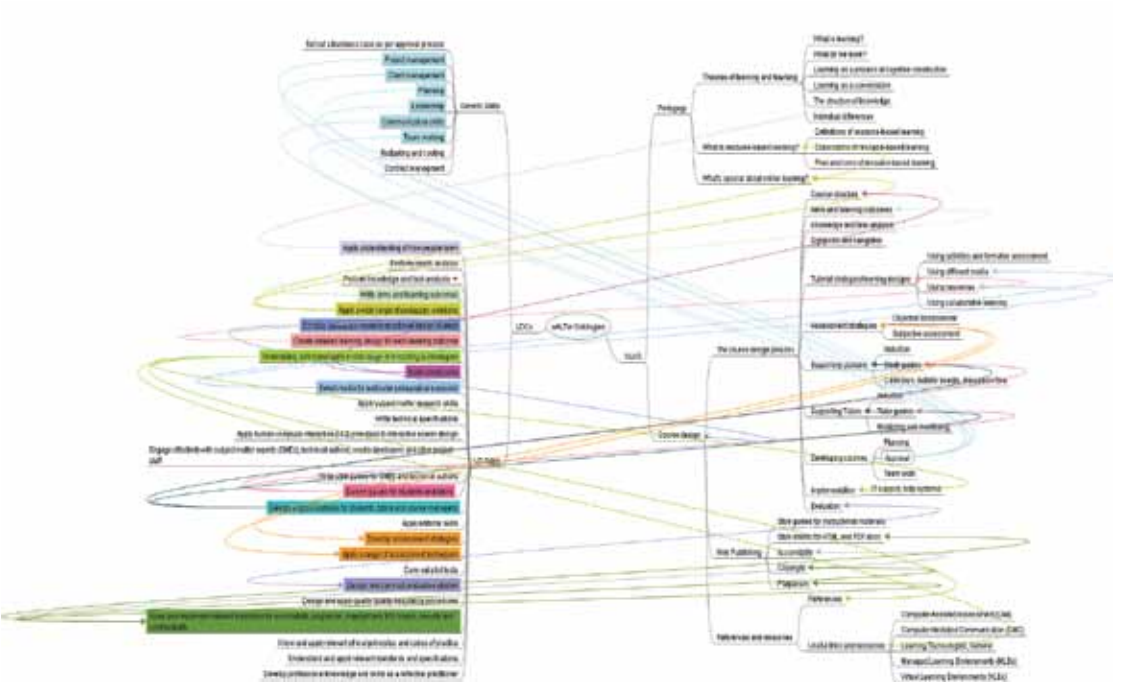
(Source: Scott, 2006)

AUGMENTING THE OLKG

The wALTer project is concerned with augmenting the OLKG in the following ways: i) develop the structure of the OLKG as a comprehensive and coherent taxonomy of learning design related resources ii) embed the content in a digital repository with a web portal interface iii) develop metadata schema, version control and workflow processes to support the continued development of the content of the OLKG.

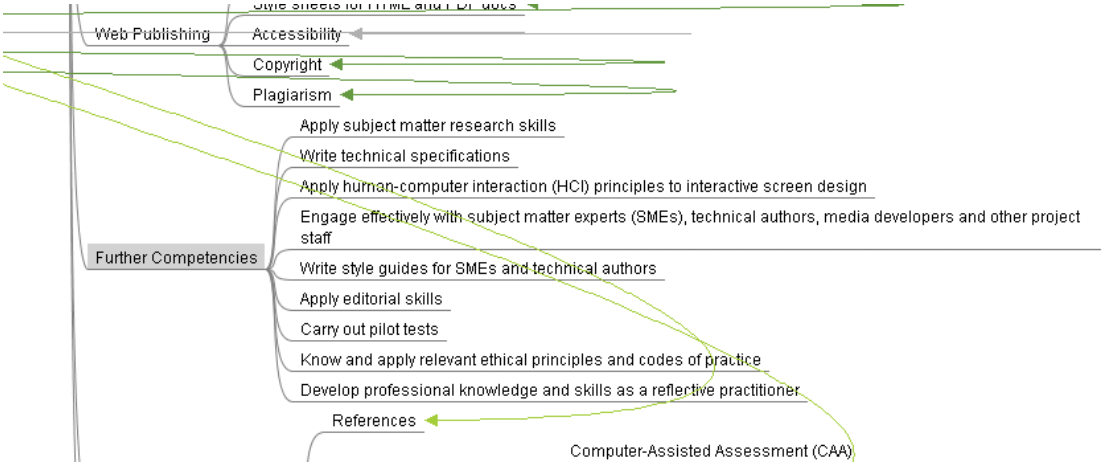
The OLKG structure was taken as the basis for constructing a knowledge domain ontology6. It was then mapped to the CU Learning Design Competencies. The mappings between the OLKG and Learning Design Competencies are shown in FIGURE 4. The mappings identified a number of items in the Learning Design Competencies not included in the OLKG ontology.

Figure 4 - Mapping between Learning Design Competencies and OLKG



The OLKG ontology was then augmented with the additional Learning Design competencies. (See FIGURE 5.)

Figure 5 – Addition of further Learning Design competencies not included in the original OLKG ontology



The next step was to map MU's Best Practice in e-Learning framework to the new version of the OLKG ontology. (The MU framework is shown in FIGURE 6.) The first step was to reorganise the framework's format under a set of high level categories that corresponded to those in the augmented OLKG ontology (See FIGURE 7). After detailed consideration of the contents of the Manchester University framework, it was agreed that, apart from some differences in terminology, all was subsumed within the augmented OLKG ontology, apart from reference to approval processes, which in Higher Education and Further Education are formal means of planning and developing a new course. As a result, 'Approval' is now included as part of the augmented OLKG ontology under the main category 'Planning'. FIGURE 8 show the final version of the augmented ontology.7

Taking the augmented OLKG ontology as a starting point, a well-defined taxonomy with hierarchical sub-headings is being created. In this context, a 'well-defined' taxonomy refers to the organisation of a knowledge domain such that:

- It is comprehensive;
- It is logically coherent (in the sense that the domain contains no contradictions or isolated fragments);
- It is consistent in its use of terms for labelling topics within the domain;
- For each topic there is a canonical definition that asserts unambiguously what the topic is about. (We refer to this as the 'why' or conceptual knowledge associated with a topic.)
- For each topic there is a task structure defining the 'how' or procedural knowledge associated with a topic.8

An interesting example of a web-based resource to support e-learning professionals is the Open University's Cloudworks site9. The chief difference between Cloudworks and the wALTer/OLKG approach is that the ontology of the former is not well-defined in the sense used here. Rather, it is a loose collection of terms and concepts used by educational practitioners.

Figure 6 – Manchester University e-Learning Best Practice (draft)

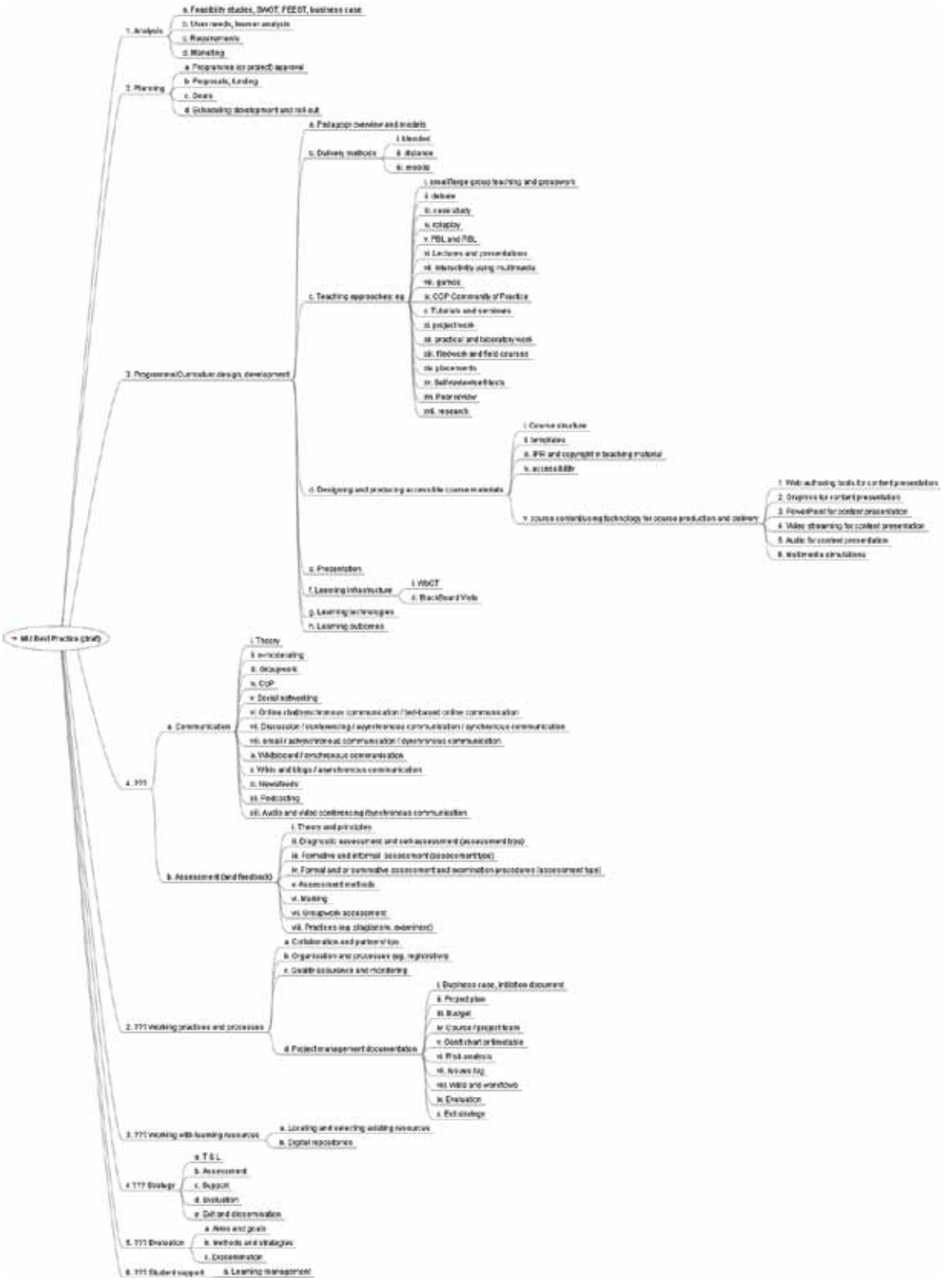


Figure 7 - High level categories corresponding to augmented OLKG ontology

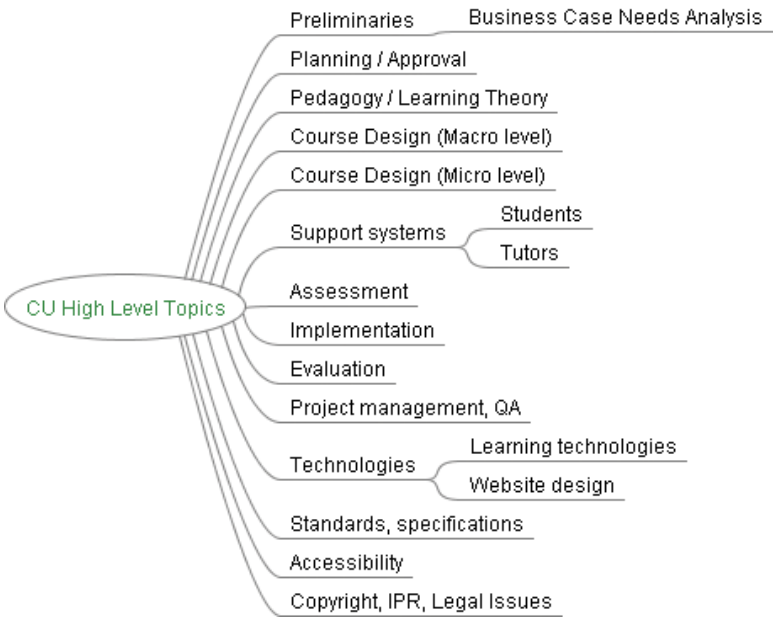
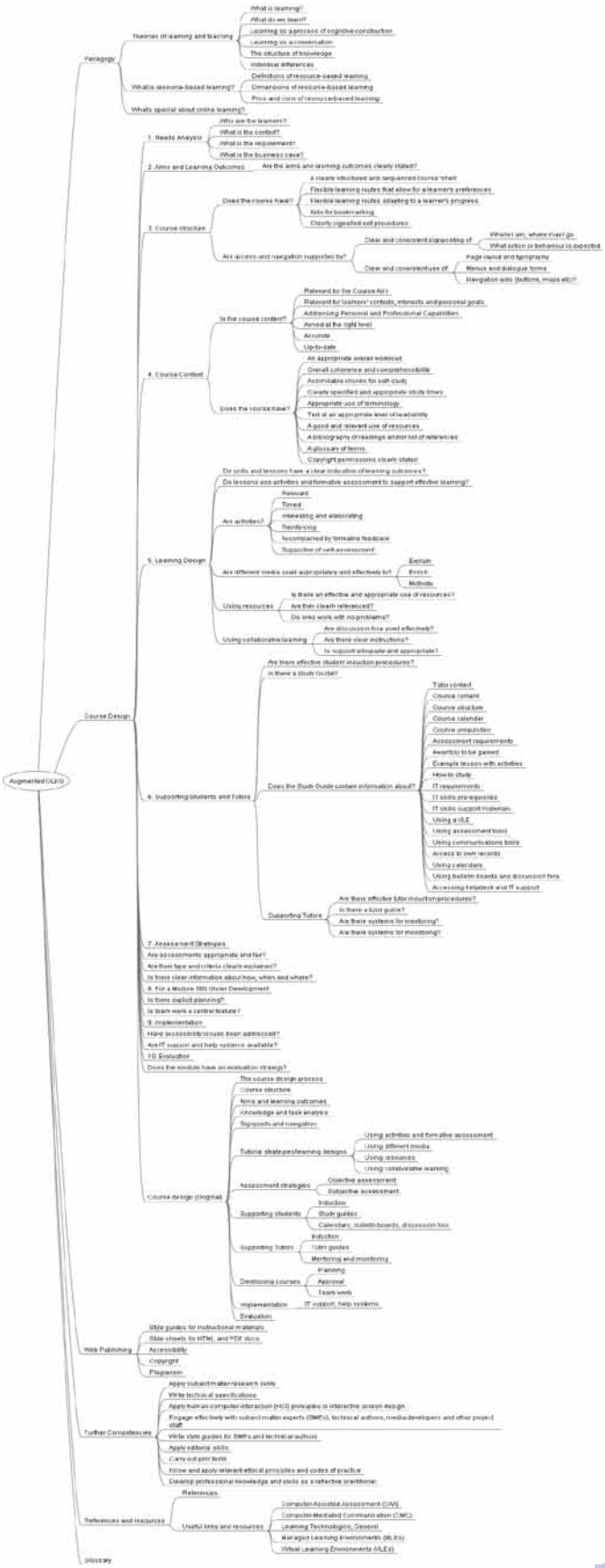


Figure 8 – Augmented OLKG Ontology



IMPLEMENTING THE NEW RESOURCE

After evaluation of several technological solutions, it was decided to implement the web service using the Liferay10 open source enterprise portal platform. Liferay itself has undergone several stages of development since it was first evaluated for use in the wALTer project. A drawback of the platform is that system developers require an excellent knowledge of Java programming and the JSR 286 Java Portlet specification. However, the platform can be configured such that non-technical users who have had some training are able to set up and administrate many of the platform's features including deployment of portlets (interface components within a web portal). The most recent release of the software contains many new features which will allow organisations to readily develop an enterprise portal. Importantly for the future of the wALTer project, the portlets available in Liferay are designed to support social networking, collaboration, online communities, online management of content.

CONCLUDING COMMENTS: WORK IN PROGRESS AND FUTURE DIRECTIONS

The purpose of the wALTer project output is to demonstrate the feasibility of setting up a high-quality resource to stimulate and support e-learning professional development in the UK HE sector and beyond. To this end, the development of a single web service to support e-learning professionals is nearing completion. Work currently in progress includes:

- Using the augmented OLKG ontology as the basis for creating a well-defined taxonomy for the knowledge domain
- Creation of a metadata schema based on a subset of the Dublin Core elements11
- Development of a controlled vocabulary that identifies usage where the same term is used with different meanings or where two or more terms are used for the same concept
- Content 'tagging'12 mechanism
- Workflows with version control for content submission and management
- Tools for collecting user feedback
- Resource quality assurance procedures
- Wiki
- Search tools
- RSS feeds13

Thus far, the project implementation indicates that it would be feasible to develop the project beyond the 'proof of concept' stage. To do so would require additional funding of resources. In February 2009 JISC declared that it would be announcing a new funding call under its Digitisation programme one theme of which is the enhancement of existing online digital collections (JISC, 2009). Successful application for a funding grant under the Digitisation programme would meet the goals of this theme by supporting us in increasing the use of the resource, enhancing the user interface, enriching existing metadata and improving resource discovery mechanisms. Given the capabilities of portal software such as Liferay it should be possible to achieve these aims by making use of its Web2.0 social networking features to support relevant research and teaching communities and suitability as an online resource to be embedded into teaching and learning.

(Endnotes)

1 The Higher Education Funding Council for England (HEFCE) promotes and funds higher education teaching and research. The Joint Information Systems Committee supports education and research by promoting innovation in new technologies providing central support to Information and Communication Technology services. See http://www.hefce.ac.uk/ and http://www.jisc.ac.uk/ .

2 A wiki is a collection of web pages produced using the simple wiki mark-up language and forming a collaborative website which can be edited by anyone with access.

3 The 10-step process model maps directly on to the stages of course design, development, delivery and assessment procedures that are captured in the UK Ministry of Defence's Defence Systems Approach to Training (DSAT).

4 [iv] Acknowledgement: Personnel of the DA-CMT Distance Learning Programme Office assisted in the data collection for these studies.

4 The term 'pedagogic planning' has come into vogue in the UK thanks to a number of JISC funded initiatives. It is used rather elastically to refer both to the design of whole courses and to the design of particular learning activities within individual units or lessons.

5 The first version of the OLKG was developed as a collaboration between the University of the Highlands and Islands Millennium Institute, Salford University and De Montfort University.

6 Following common usage, we use the term 'ontology' to refer in general terms to any attempt to characteris a knowledge domain as a structure of related concepts or topics. As explained later in the paper we use the term 'taxonomy' for descriptions of ontologies that satisfy a number of formal criteria. More on these distinctions and different terminological usages can be found in Lambe (2007), Rowley and Hartley (2008), Orbst and Liu (2003) and McGuiness (2003).

7 For a more legible version of this large figure, please see the online version at http://www.mindmeister.com/16601845 .

8 The detailed methodology for carrying out the knowledge and task analysis necessary for the construction of a well-defined taxonomy for a knowledge domain is described elsewhere (Pask, Kallikourdis and Scott, 1975; Scott and Cong, 2008).

9 http://www.cloudworks.ac.uk/ , accessed February 26th, 2009.

10 The Liferay software can be downloaded from http://www.liferay.com .

11 Dublin Core Metadata Initiative. (2008). **Dublin Core Metadata Element Set, tVersion 1.1**.

Retrieved November 12 2008 from http://dublincore.org/documents/dces .

12 Tags are keywords or terms which may be assigned to a piece of content. These keywords can form a means of classifying information.

13 Really Simple Syndication (RSS) is a format for publishing feeds or summaries of content from one website within another.

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Education in and with Defence Modelling and Simulation – Experiences and Challenges

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ABSTRACT

The Simulation and Synthetic Environment Laboratory (SSEL) is a facility operated by Cranfield University to support Modelling and Simulation (M&S) at the Defence Academy of the UK at Shrivenham. This paper will discuss the facilities and capabilities of the SSEL, as it has evolved since 1995 to support specific teaching of Defence M&S. The range of educational activity encompassed will be described, together with the challenges presented by this very same broad range of activity. The important role of both Government organisations and Defence Industry in supporting the facility will also be highlighted.

INTRODUCTION

In 1994, what was then the Royal Military College of Science at Shrivenham (now one part of the Defence Academy of the United Kingdom) conducted a review of education in Defence Modelling and Simulation (M&S) which led to the institution of a number of new courses. These courses were to address not only the needs of service personnel, but also those of defence civilians, both inside and outside public service. Actual provision and delivery of academic courses such as these are then the responsibility of a dedicated School of Cranfield University (Cranfield Defence and Security) located at the Defence Academy campus at Shrivenham, which has been under contract with MoD for this purpose since initial privatisation of the academic function in 1984.

At the Postgraduate Masters level, a new MSc in Defence Simulation and Modelling (DSM MSc) commenced in 1996, which was made available in both a full-time, 12-month residential format and also as a part-time course to be taken over a maximum of 5 years. At the same time, a depth module in M&S was included in the new Defence Technology MSc course, which at that time was taken by Army Majors in the technical stream as part of their Army Command and Staff Course.

A short one-week introductory or overview course addressing M&S in Defence was also created, which would run several times a year and cater primarily for non-specialists. Alongside these new courses was also an existing overview course looking at Military Operational Analysis (Operational Analysis (OA) is the UK term used to refer to the defence application of Operational Research within the Ministry of Defence (MoD)). In addition, a deliberately increased emphasis on M&S was also given to a number of modules in various other existing postgraduate programmes – for example in courses in Guided Weapons and in Systems Engineering.

To underpin and enable this significant increase in M&S education, a new laboratory facility was therefore established, known as the Simulation and Synthetic Environment Laboratory (SSEL), to provide for the necessary hands-on, demonstration and practical components of these programmes. The SSEL is owned and operated by the Operational Analysis, Modelling and Simulation Group (OAMSG) of Cranfield Defence and Security at Shrivenham.

In 1994 that initial incarnation of the SSEL hosted seven Silicon Graphics workstations (an Onyx Reality Engine and six Indigo2 Maximum Impacts), a single ex-SIMNET GT110 Image Generator, three Sun Sparc Stations and ten PCs. These had all been purchased with end-of-year financial underspend provided from the central MoD, as the level of expenditure necessary was significantly beyond that which either the local MoD or university budget could afford.

Since that time, the SSEL has relocated twice, tripling in physical size and as of 2009 has now grown to comprise approximately 100 standard PC systems which run various (and often multiple) versions of both Windows and Linux operating systems. Although MoD have certainly supported the SSEL by providing applications for it to use (as discussed later), there has been relatively little further MoD investment in terms of the core computing capability. Hence responsibility for maintaining, developing and operating the facility thus now rests almost entirely with the resources of the Cranfield University organisation at the Defence Academy.

This paper will describe the major challenges and issues faced in establishing, operating and maintaining the SSEL as it has developed and evolved over the fifteen years since it was created. The aim is to highlight lessons in the creation and use of such a facility, which might be of value to other educational organisations seeking to develop a similar capability.

Additionally, in recently relocating the SSEL to the new Defence Capability Centre (DCC) at Shrivenham, a new aspiration raised by the Defence Academy is for the laboratory to also provide a service through use of M&S to support education in other (i.e. non-M&S) areas and subjects. This requirement poses a number of new challenges, some technical, some of organisation and resources and still others that are more concerned with attitudes and teaching practices. These will also be discussed.

SSEL EDUCATIONAL ROLE

The main role for the SSEL was always conceived to be that of supporting a broad range of education, specifically 'in' Defence M&S. This will be contrasted later in the paper with discussion of the emerging requirement to support teaching in other subjects 'with' M&S – where the M&S are merely a means to some other academic end.

While many of the students who pass through the SSEL, especially those in uniform, are of course often already familiar with various applications of M&S in military training, the SSEL itself does not exist to provide facilities for such training. Therefore rather than being involved in the training of gunners, drivers, commanders, pilots, operators or decision-makers, the SSEL was designed to provide facilities to help educate those who would be involved in specifying, developing, selecting, acquiring, managing and operating such simulation systems.

The role of M&S in supporting military training is however by no means the only application domain the SSEL addresses. It must be equally able to demonstrate the role of M&S across the remaining range of potential defence applications in areas such as analysis, planning, acquisition, experimentation and prototyping. In particular the SSEL seeks to support academic programmes in M&S which create the 'educated customer'. Thus it is more common for students to be users, managers or customers of simulations and/or their outputs, than to be actual developers of them.

The range of the students themselves is equally as broad. They vary from officer cadets, through to Colonels (or equivalent), coming from any of the three services, together with their MoD and industrial equivalents. Their primary interests in simulation may come from any of the application domains mentioned above. Their exposure to the SSEL may range from as little as a single 30-minute demonstration, through to a series of practicals of one to five hours duration and on up to academic exercises and case studies lasting one to five days. An example of one of these is presented later.

For some students (the 'specialists'), M&S will be the dominant day-to-day element of their job, while for others (the 'generalists') simulation may be just an occasional part. This variety reflects the fact that M&S is an increasingly widespread enabler which is pervasive throughout defence. Education in the SSEL must be sensitive to this range.

For M&S specialists at the postgraduate or MSc level, they will then typically also make extensive and intensive use of the SSEL in their dissertation/project phase, which can last up to 15 weeks.

SSEL FACILITIES

One could certainly characterise the SSEL as a form of 'battlelab', albeit one whose mission is specifically to support the range of education that has been described. Providing facilities to support this range of activity might well pose a challenge even if the SSEL had a significant annual budget. In fact however, it does not have a regular dedicated budget line at all, although this certainly does not mean that it has no requirement to spend money each year. Rather it is simply not a discrete cost-centre, so that SSEL purchases are made and justified on a case-by-case basis against the larger academic departmental budget to which the SSEL belongs. The disadvantages of this approach lie in the difficulty of forward planning and in the need to make those separate justifications each time. The advantage however is that the SSEL currently does not have to balance a separate budget or to explicitly demonstrate a local return-on-investment. Thus it is able to readily support all users of the academic department without charging considerations having to be the first point of discussion. As will be discussed later however, this does not address the outstanding issue of providing support to users outside the department.

PROVISION OF M&S APPLICATIONS

Given both the method of academic funding and its limited nature, the provision of the necessary models, simulations and other supporting tools cannot be achieved by simple purchase. In passing, it should also be noted that in some cases (eg government developed software) suitable solutions could not necessarily be commercially procured. Hence the SSEL relies heavily on non-commercial provision of suitable teaching aids from a variety of sources, basically though a process of partnering and collaboration. These sources include MoD, DoD and other coalition and alliance partners, together with defence industry, both in the UK and elsewhere. It is no exaggeration to say that without the active support of all these organisations, for which the SSEL is extremely grateful, the facility would simply not be able to exist, at least in its current form.

In return for SSEL access to their applications and tools, the external providing organisations gain value which can range from simple showcase exposure and visibility of their products or capabilities (especially to the MoD customer community), to formal or informal testing and evaluation in a trusted independent sandbox or nursery environment and through to integration in larger scale Defence Academy activities and exercises.

Many applications are provided to the SSEL 'as-is' and 'at-risk' and on the clear understanding that support either cannot be provided at all (as the SSEL is a foreign and demanding environment which is not under the direct control of the tool provider) or else, in the absence of formal support funding, can only be on an occasional, low-key, goodwill basis. Rarely however has this aspect been cause for serious concern over the years.

More traditional academic software arrangements and licences are certainly also employed, in areas such as operating systems, compilers and other utilities. But as the main focus of the SSEL is on mainstream defence applications, it is the defence sector itself which is still the primary source of relevant applications. An important factor here is that even where the best-of-breed software applications for the defence sector are commercially available (a situation which is growing all the time) they are still often fairly niche products, commanding considerable price premiums, in comparison with mass-market products like office suites or other tools.

BREADTH OF M&S APPLICATIONS

The educational focus of the SSEL may be contrasted with that of a battlelab of the more traditional sort, which would typically be engaged in supporting defence programmes, studies and concepts. Such a battlelab is often established and tasked to support one particular domain of activity. This narrower focus therefore allows it to conduct a selection process to identify the most appropriate best-of-breed simulation or tool needed to carry out any specific task. By contrast, the SSEL has, as has been described, a very wide target audience and domain and also the requirement to demonstrate a range of potential solutions in the same niche.

A topical example of this challenge is in the debate between use of traditional Government developed or provided applications (so called GFI : Government Furnished Information or GOTS : Government Off The Shelf) compared with the growing use of their emerging Commercial Off The Shelf (COTS) equivalents. While it is not within the SSEL's remit to offer any specific direction in terms of the mix or choice between these two strategies, it must nevertheless certainly have sufficient of both to be able to expose students to the relevant issues concerned – recall the requirement to generate 'educated customers'.

A visitor to the SSEL was once surprised to discover that the facility actively uses more than six different Computer Generated Forces (CGF) applications in the land domain alone, some being GOTS and some COTS. He questioned why the SSEL did not simply choose the most appropriate one for its needs and then concentrate on that one system alone. The rationale is that the very same range of systems and solutions are employed by the defence community which comprises the SSEL's primary customer base. Thus students are likely to encounter the same range of alternatives when back in posts in that real world. Hence in order to act as an educated M&S customer they will need to understand that range and why it exists and then be able to select or specify appropriate tools intelligently, according to their needs in any one particular situation.

While the SSEL does not aspire to own (and certainly could not sustain) literally one copy of every M&S application used in a particular niche, it nevertheless therefore may well have to employ and support more than just a single representative or best-of-breed product. Side-by-side demonstration of different systems, be they varying in level of detail, or in internal construction or simply from different providers, is an important part of the educational experience.

This provision of multiple systems for comparison purposes is however an aspect that has developed and evolved over time, in response to student and customer comment. It was not a deliberate or explicit component in the initial SSEL design. Indeed back at the outset in 1994, even given the relatively small number of systems and applications available at that time, the original single full-time academic staff member found it a fairly challenging task to single-handedly understand, support and run the applications, not to mention also planning and conducting the actual academic activity with them.

SSEL OPERATIONAL COMPLEXITY

By 2009 in contrast, the SSEL has grown to not only three times the size and approximately five times the number of computers, but also now utilises some 30 different major simulation systems, to say nothing of supporting and related tools like terrain database generation systems, 3D modelling tools and Geographical Information Systems (GIS). While it is true that not every simulation application is necessarily used to the same extent throughout an academic year, all systems are functional and all are used in support of various specific teaching objectives.

There is however a negative consequence of trying to run so many different simulations systems on the one network and set of computers in the SSEL. This manifests in various problems which arise because some of the simulations, especially the more traditional ones, have seemingly been written with the implicit assumption that they will be run on a bespoke network, dedicated to that one purpose alone. In this they are in contrast with mass-market IT applications which may tend to conform better to implementation guidelines allowing them to co-exist more harmoniously alongside other applications installed on the same platform.

Such simulations often make specific demands in aspects such as particular versions of operating systems required, IP addressing schemes, machine naming conventions, disabling of some or all security and access restrictions and controls, configuration of firewalls and use of particular folder/directory structures. All of which can then easily cause conflicts with other systems which have their own particular set of expectations and requirements in these respects.

It is also the case that many of the simulation applications, especially the traditional ones again, do not utilise modern software installers, but rather require a complex manual installation process of gradual customising and cajoling onto a system. Documentation and help files may well also be sparse or non-existent.

IT AND SYSTEMS SUPPORT

These issues can make it very difficult for a traditional outsourced IT provision to support the demands of an M&S facility such as the SSEL, especially where the facility is dynamic and is changing continually to meet the demands of different student groups and different educational activities. Hence why the SSEL deliberately chooses to undertake these tasks from within its own resource pool, in spite of the effort this requires. In addition to its own local experience, SSEL staff have encountered these same issues many times in the facilities of its external partner organisations and in the broader defence community.

Typically in such cases, the M&S staff will have had interaction with non-M&S IT support staff who may ask questions such as: "why can't we just get it ported to XXXXX operating system/version" or "why isn't there a proper installer?", usually followed shortly afterwards by: "can't you just get the developer to make one for us then?".

IT staff typically do not have any background in M&S, or even sometimes in defence as a whole and hence require detailed explanation of the realities of Defence M&S as a niche domain. These realities include that the application in question has probably been provided free-of-charge and 'as-is' and hence that local M&S staff may therefore have no contact with, leverage with, or even recourse to, the original developer. In any case, the simulation may often have been developed to be directly used and supported in-house by that providing organisation and in a very different context and target environment.

Granted, with the increased use of COTS applications, this situation is improving, but in establishing an M&S lab it is currently still desirable to have dedicated staff available, who can understand not only the simulation applications themselves and their usage and context, but also the underlying technology, hardware and systems to some extent as well. This aspect also represents another important issue that the 'educated customer' in M&S should be aware of.

As a result of this desire the SSEL is now directly supported by 3 dedicated academic staff, with another shared between the SSEL and the Computer Aided Design Centre. Another 4-5 academic staff are also regularly involved, although not based full-time in the SSEL itself. In addition to both conducting the teaching and understanding and supporting the simulation applications themselves, the same core team of academic staff is also responsible for IT, network and systems support in the SSEL. However, the SSEL still has difficulty in acquiring the services of a fulltime skilled programmer who is both technically competent and also willing to take an interest (or have an understanding) in the specific needs of a defence based community. With the loss of the input of Masters level student projects (discussed later) which were often programming based, this need for a dedicated programmer has become even more acute.

Given that most of the systems have been provided to the SSEL explicitly for academic use by their respective owners or developers, an important element in the relationship with those providers is that they trust the SSEL to then make appropriate and relevant use and representation of their systems. This relationship cannot be established overnight, but takes time to evolve to the point where the SSEL is now generally perceived to be an independent and impartial educator, worthy of partnering and collaborating in terms of the provision of simulations and tools for its use.

It should be noted that, many of these 'relationships' and 'trust' issues are of course formed through personal contacts over many years and that the SSEL and therefore Cranfield University, the Defence Academy and the wider MOD community all benefit in a very real, albeit intangible, way from these relationships. It has therefore become vital that new academic staff joining the SSEL learn not only about the many and varied models and simulations operated within the facility but that they also quickly establish themselves within the wider defence community, forming their own relationships.

EXERCISE LONGHAUL - AN EXAMPLE OF EDUCATIONAL ACTIVITY IN THE SSEL

The following example of a specific educational activity in the SSEL is presented to illustrate how the various strands already discussed all come together.

Exercise Longhaul is a vehicle for groups of specialist M&S students to make use of the SSEL and its facilities for a week long practical academic exercise in the design, creation and use of an advanced distributed simulation local and wide area network based Synthetic Environment (SE). The exercise has typically run twice a year since the founding of the SSEL in 1996. It forms the culmination of the Networked and Distributed Simulation (NDS) module, where students are taught about the fundamentals of networking technology, the principles of simulation interoperability, simulation network architectures and applications and about standards such as Distributed Interactive Simulation (DIS) and High Level Architecture (HLA).

As a guiding vehicle for the exercise, the student group is given a very short description of a fictional, but relevant and topical, concept-stage capability problem. They are then tasked with designing, building and operating a distributed simulation experiment to study the topic, using a set of simulations connected using both Local Area Network (LAN) and Wide Area Network (WAN) links across multiple geographic sites with the SSEL as the central network hub. Over recent years, the range of remote sites involved have included not only various industry locations all over the UK but also overseas military warfare centres (e.g. in Australia and New Zealand).

Participants at these remote sites provide both manpower and simulation applications and tools free-of-charge in support of the exercises academic aims. As discussed previously, there is value to these participants in terms of exposure to the M&S specialists undergoing education in the SSEL, plus the opportunity for organisations to use the event for training and development of their own staff. The exercise also provides the chance to test new applications and simulations in a relatively benign and non-threatening environment.

In the early years, ISDN communications were used to create the network infrastructure, but more recently these have tended to give way to use of the internet, although there are still some participants who prefer the point-to-point links. As the exercise is academic in nature and runs at a completely unclassified level (being fictional) this does not present a problem.

The structure of the exercise is deliberately very freeform, with the students initially being given relatively little information on what to do or how to do it. They must therefore make decisions for themselves on both the conceptual issues and the practical ones, including:

- What sort of experiment they wish to conduct.
- What scenarios they wish to develop and use.
- What data they must collect to provide appropriate measures of effectiveness.
- What collection of simulations and other tools they require.
- What roles the remote sites will each play.
- How they will task-organise their own manpower
- How the timetable for the week will develop.
- How they will test their Synthetic Environment and determine its firmness for their purpose.

The student group themselves must make contact with the remote sites to establish their initial availability of people, simulations, tools and databases. With the SSEL staff in a mainly reactive rather than proactive role, the students will then take the lead in designing, building and testing the experiment, during which they will spend increasing time liaising and coordinating with the remote sites over email, instant messenger, phone and video conference links as well as exchanging live simulation data.

Finally they will conduct a number of actual live experimental runs, during which they will record appropriate data for use in the subsequent post-exercise analysis phase. After this they will present their findings, both in terms of the academic learning objectives and in terms of the fictional study problem.

Very little, if anything, of the exercise will have been pre-built or pre-tested beforehand. The students really do have to start from scratch and have only the five days to complete the whole activity.

The collection of simulations and other tools employed in these experiments typically comprises:

- Low fidelity, reconfigurable human-in-the-loop virtual simulations.
- Generic Command and Battlespace Management systems.
- Simulated combat net voice radio.
- Computer Generated Forces.
- Civilian 'pattern-of-life' generators.
- Network control and monitoring systems.
- Exercise control and monitoring systems (e.g. 2D and 3D viewers)
- Data loggers and analysis tools.
- Weapon servers.
- Simple sensor view simulations.
- COTS simulation tools.

The role of the external sites has been proven to be a vitally important one in these exercises, as the students are faced with addressing the human and organisational processes and complexity involved in creating and using these distributed simulation methods, as well as the technical simulation interoperability challenges. Student post-exercise feedback and evaluation comment always highlights this learning aspect as one of the most valuable.

Examples of some of the topics addressed in recent exercises include:

- Low-level ISTAR systems for urban operations.
- Utility of a mast-mounted sight for improved survivability in medium vehicles.
- Value of Augmented Reality style overlays for improved situational awareness.
- Comparison of vehicle-based fire support with artillery and air delivered options.
- Investigation of improved Sensor-to-shooter communications.
- The value of providing low-level UAV feeds to forward manoeuvre vehicles.
- Quantifying the impact of blue-force tracking situational awareness systems.

EDUCATION 'WITH' MODELLING AND SIMULATION

In 2007 the existing SSEL was relocated, at MoD's request, to the newly-built Defence Capability Centre (DCC) at Shrivenham. This new centre seeks to create an integrated and more holistic focus for teaching across all the UK's technology strands and capability areas and across all Defence Lines of Development (DLODs). M&S is thus but one part of this capability. While the relocated SSEL continues to have all its previous roles and responsibilities, MoD placed a clear additional expectation on the facility, which was that it should now also seek to employ its capabilities not just for education of M&S specialists alone (i.e. education 'in' M&S) but also to support and enable a broader range of other Defence Academy education programmes (i.e. education 'with' M&S). Thus it should evolve to be better able to provide effectively a M&S-based service to other military and academic staff which can be used to visualise and bring alive their concepts through a process of hands-on experimentation.

The SSEL has in fact always conducted such enabling activities, albeit on a smaller and more ad-hoc basis, typically in connection with case-studies, group work and projects for students on courses in other areas of the Defence Academy (i.e. not M&S students). It has not been unusual for a small group of students to appear at very short notice, asking for support to 'do some simulation' - perhaps to provide a practical experimental chapter as one part of their project report. In many cases their broader project will often have been to explore a particular technology or design a new capability, which they then wish to examine in a broader battlespace context, using M&S in the SSEL, thus moving from examination of system performance issues, to system effectiveness issues. In some cases this is almost a microcosm of Simulation-Based Acquisition (or, to use the UK term, Synthetic Environment Based Acquisition: SeBA) on a small scale, albeit here in an educational context of course. Examples of this have included:

- Utility of a barrel mounted camera to increase tank survivability in urban areas.
- Future digitised vehicle crew workload experiment : 3 vs 4 man crews.
- Vehicle drive automated navigation aids.
- Mast height optimisation.
- Ground-based sensor array position optimisation.
- Control and operation of a COTS model aircraft as an urban micro UAV.

However, coming back to MoD's new aspiration for more structured, planned and formalised provision of M&S to enable academic learning, thus far there has been relatively little take-up of this vision, in part perhaps because there are no new resources available to underpin the change – either from the perspective of the SSEL team in providing them, or on the part of other users who might wish to put the effort into making use of them. Some initial limited ventures have however been successful – for example in practical demonstration and examination of the principles and concepts of Collective Survivability though OA-style Wargaming by classes.

As with the adoption of any new medium, such a change in educational practices may see a slow take-up unless it is adequately resourced, given the time pressures staff, both military and academic, currently experience. There may well be parallels here with the adoption of other new instructional aids, means and technologies under the banners of e-learning and distance learning.

While there is awareness of the benefits of more active forms of experiential learning such as M&S may provide, some staff still fear the perceived loss of control over the learning process compared with more traditional instructional methods. Given current timetable and course pressures (i.e. to make courses shorter, as described above) it is also not clear how the time necessary to convert material, prepare sessions and brief staff, never mind to go through the actual experiential processes themselves can easily be accommodated.

A final note of caution relates to the facilities of the SSEL itself. While every effort has been made to provide educational tools which support its original aims of teaching 'in' M&S, it is no means assured that these will also be suitable for teaching 'with' M&S. A simple example might be validity of data – to teach about the conceptual role of wargaming in OA and the design of good experiments, does not necessarily require realistic or classified data, thus all SSEL systems currently operate at the unclassified level. But to use that same wargame in support of a study on a specific concept, platform, system or capability might well require more validated and sensitive data which would then typically be subject to a higher level of classification. Given the broad range of students of differing backgrounds and nationalities passing through the SSEL, the potential difficulties here are clear.

At the same time however, it must be said that there is a very active interest within the SSEL itself in pursuing this initiative as it offers an opportunity for staff to increase their experience and apply their expertise, while also diversifying activity, thus maintaining job interest. In all likelihood however, this will place an additional burden on the M&S staff in the SSEL who must then also understand not only their own subject area, but also enough of their colleagues needs and subjects to act meaningfully as an 'educated provider' in those areas!

CONCLUSION

As ever, if the M&S team at Shrivenham had known in 1994 how the UK and global defence environments would evolve, different decisions about the form of the new SSEL might well have been taken at the outset. Even simple decisions such as the use of academic software licences (thus reducing startup costs at the time) then make it difficult or impossible in many (or even most) cases to then use those same systems later for funded commercial work, which might thus have helped to generate revenue. Yet funding is typically not available to reverse that decision downstream.

The appetite for technical education in subjects such as M&S has changed (i.e. reduced) significantly in recent years, in the UK at least. It is still not clear what the future holds in this regard. Certainly it would seem to further increase the rationale to look at making increased use of the SSEL and its facilities for learning 'with' M&S. The extent to which other academic departments and military users would be willing to pay for such facilities has not yet been established however.

The contractual mechanisms under which one particular department of Cranfield University operates the SSEL for the broader University, for the DCC and for the Defence Academy might benefit from some revision to facilitate this new role for the facility. But there is then a challenge to be faced in such a revision. On the one hand, one approach to contracting prefers detailed, precise and unambiguous statements of future academic tasks and requirements against which contractual performance monitoring may be conducted. While on the other hand the need for a broader enabling provision would provide the flexibility and agility to allow the SSEL to respond to its various customers' emerging and developing requirements.

There is also a difficult path to be continually navigated between on the one side the SSEL's reliance on external providers and its need for external funding for R&D and on the other side the need to maintain academic independence, objectivity and impartiality.

Nevertheless there should be a sense of significant accomplishment as the SSEL has established itself and gained both recognition and appreciation for its independent role and position among its alumni and the Defence M&S circles they operate in. Furthermore it has managed to achieve, develop and maintain this with relatively modest resources. Whether making any different initial decisions in 1994 could have resulted in a better or more agile facility at this point is of course hard to predict.

The feeling within the M&S team is thus to very consciously maintain the current balance between the various different types of SSEL activities, while trying to guide and assist higher authorities to formulate a more appropriate set of enabling mechanisms.

At the same time the SSEL must maintain its important relationships with partner and supplier organisations. Indeed this aspect will become ever more important as M&S students spend less and less time on residential courses and thus develop less of a sense of working community both among themselves and also with the SSEL itself, which might lead to a decline in the level and commitment of alumni involvement and support on which the SSEL currently depends.

Finally, further efforts must be made to respond to colleagues desires to make use of the SSEL for learning 'with' simulation and to develop capabilities better suited to that task. There is however a clear tension between the resources and facilities necessary for learning 'in' M&S compared with those needed for learning 'with' M&S. It should certainly not be assumed that both can be carried out with equal facility using the same applications, data and resources. Nor is it simple and straightforward to switch from one role to the other – even given the availability of dedicated M&S staff. Experience to date also indicates that as most academic and military staff are fully engaged with their own existing commitments, the development of further activity in this aspect may require the M&S team to more actively look for new opportunities to seek and stimulate such dialogue and interaction.

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Blended Learning – What's In It For Me?

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ABSTRACT

There is increasing interest in the use of blended and e-learning for training and education in the defence and security sectors. In this paper, we consider the business advantages and disadvantages that may be incurred by the various stakeholders- providers, purchasers and students. We review some of the recent literature on the success of blended learning from outwith the defence sector, particularly in healthcare.

Blended and e-learning may provide the potential for cost benefits for both providers and purchasers and flexibility for learners. These benefits, of course, must be traded against possible disbenefits. These may be cultural, diplomatic and personal.

There are several advantages for such an approach, over traditional delivery methods:

- Increasing the geographic limits of participation, as by their very nature, the defence and security sectors markets are global.
- Reduced costs or higher profit margin, as there is a reduced requirement for face-to-face contact.
- Increased flexibility for participants, as they can fit training around their operational commitments.
- Attracting participants to undertake further study, for example Masters programmes, by providing 'tasters' of course content.
- Allowing purchasers to assess the operational benefits of particular training programmes, before committing to longer duration courses for their staff.

INTRODUCTION

Relevant training, in both military and commercial environments, can act to increase motivation of staff, provide a sense of personal satisfaction and improve skills. These factors may lead to improved performance of the employee (Mullins, 2005). With rapid growth in technological innovations, there is also the continual need for staff to be trained in the use of emergent technologies and techniques. Distributed learning (distance, e-learning, blended learning) may provide organisations with a mechanism for their staff to undertake training and development without geographical constraints. Organisations may incur lower costs and increased staff productivity, as training can be fitted around operational or other work commitments.

Blended learning is a rapidly-growing method of providing distance learning by using web-based resources, supplemented by face-to-face contact with an instructor. Although several definitions of what constitutes 'blended learning', Williams, Bland, and Christie (2008) suggest that in essence it is the use of both face-to-face and distributed teaching. This approach to teaching and learning is not entirely new; in the United Kingdom, the Open University was founded by Royal Charter during 1969 and accepted its first students during 1971. Its mission was to provide access to degrees via a combination of printed and televisual resources coupled with face-to-face provision of tutorials and summer schools.

The potential of blended learning is to offer increased flexibility for learners, by providing continual access to resources, enabling learning to fit around work or operational commitments. It also allows delivery to any location with access to the internet, hence a provider may potentially access global markets with ease. With the decreasing cost of portable computing hardware, (as demonstrated by the MIT $100 laptop project and the commercial release of netbooks, retailing for less than $300) opportunities for e-delivery are becoming increasingly less capital-intensive.

Whilst there is scant literature on the experiences of provision in the defence and security sectors, the medical profession can show some advantages of the approach. In many ways, the organisational demands placed on clinicians might be regarded as similar to those in the defence community. First, with seniority there may be increases in the specificity of education required. Second, working patterns may prevent traditional (e.g. day release) face-to-face training, indeed, Dent, Weiland and Paltridge (2008) identified time pressures as the key factor in deterring medical professionals from undertaking Continuing Profession Development training. Finally, clinicians worldwide may have similar training needs, which may not be satisfied in their specific location and blended learning may provide reusable training content, transcending geographic boundaries (Choules, 2008). Blended learning has been shown to contribute to rapid response to training needs imposed by emergencies, for example, Moore, Perlow, Judge and Koh (2006) argue that blended learning allowed the rapid dissemination of learning materials across a diverse end-user base. Within the medical profession, the advantages of blended learning have also been argued to contribute high-quality education, whilst providing this at lower cost (Pahanis, Stokes, Walsh and Cannavina, 2007).

In this review, we consider the financial, academic and motivational benefits and disbenefits for the key stakeholders involved; purchasers, providers and participants. We discuss how blended learning may contribute to the wider goals of education in the security and defence sector.

WHAT'S IN IT FOR ME?

One can propose that there are three classes of stakeholders in the provision of training and education to defence and security personnel. The first group, 'purchasers' are those stakeholders responsible for training budgets who commission a provider to develop course offerings to address operational needs. The 'purchaser' may be a defence ministry or administrative sub-unit. The second group is the provider. Providers may include academia, defence colleges or even private contractors. Their role lies in providing technical expertise to develop teaching and learning materials. The final group are the participants, the individuals undertaking the learning activity. The student does not pay and is frequently mandated to undertake specified training and education. Their employer will commission this provision.

Of course, the critical considerations of training provision and procurement will include the financial cost (for both procurers and suppliers), value for money (does the offering lead to the intended up-skilling outcomes sought by the procurer) and the motivation of the learner to complete the activity. For blended learning to succeed, all of the stakeholder groups need to see benefits, when compared with traditional, face-to-face, teaching and learning activities.

PURCHASERS

Expenditure on military training in the US exceeds $17bn (Artino, 2008) of which $4-5bn is for specialist skills. Introduction of computer assisted instruction (CAI) in the US may be decreasing training time by around 30%, which may save $1bn per annum (Fletcher, 2009), although this equates to around 0.1% savings on the current US defence budget. Cost reduction with a highly dispersed workforce (Maglogiannis, 2003) is a clear driver for the adoption of both blended and e-learning in the defence sector. With increasing needs for advanced, specialised training, the cost of providing the tailored instruction that is so imperative to all soldiers was considered prohibitive. It is expected that with falling IT costs, future computer technology will make this affordable (Fletcher, 2009). In addition to the financial advantages, it is also likely that a substantial benefit is in the ability to rapidly up-skill personnel, without the need to remove them from their existing duties. As previously discussed, in the medical profession this benefit has been acknowledged, particularly in the potential to deliver "just in time" training, in response to crises.

A further benefit of using the combination of e-learning with simulation allows students increased access to scenarios that would be prohibitively expensive, and potentially too dangerous, in the real world (Gredler, 1996). Although, as Mihal (2002) reminds us (in the context of US law enforcement training), "Proficiency with firearms cannot be taught solely online".

The implementation of blended learning can also assist the development of partnerships with new providers. The involvement of university-based academics in the provision of technical education for the military is increasingly sought, particularly where it relates to science and engineering (Juhary, 2008). Blended learning offers the purchaser the opportunity to remove reliance on a limited number of specialist providers. The increased competition among providers may act to decrease supplier power and hence increase buyer power. The introduction of competition may act to benefit purchasers by reducing price. Further research is required to determine the price elasticity of supply.

PROVIDERS

Since the foundation of European universities in the middle ages, methods of instruction have generally remained conservative, consisting of face-to-face teaching. In recent years, there has been a rapid increase in the use of electronic delivery means to supplement traditional teaching methods. One of the key benefits in using blended and e-learning is substantial profitability for academic institutions. In the UK, The Open University posted a surplus of £12.1m (representing a 3.2% return) on a turnover of £376m during the financial year, ending 31st July 2007 (The Open University, 2007). Another pioneer of distance learning in the UK is the College of Estate Management, which posted a similarly impressive surplus of £2.8m on a turnover of £9.5m representing a 30% return (College of Estate Management, 2007). To put these figures in context, the Higher Education Statistics Agency (HESA) income and expenditure statistics for 2006-7 indicate that the total surplus across the sector amounts to less than 0.9% of turnover. In the United States, a number of online-only private higher education institutions have been founded (Gannon-Cook et al., 2009); some of these are showing impressive operating profits, for example, University of Phoenix (Apollo Group Inc.) posted an operating profit of $477m on a turnover of $3.1bn (15%) for the year ending 31st August, 2008 (Apollo Group Inc., 2008). The University of Phoenix uses a combination of face-to-face, online and blended learning (via its FlexNet® product).

It is interesting to speculate as to the factors leading to the financial performance observed in training organisations using blended learning. The first economy is simply the lack of a requirement for extensive estate, when compared with the 'traditional' university. There is no need for large lecture theatres, student accommodation or, indeed, permanent teachers. This, however, is offset by the costs associated with information technology, dedicated specialist technical support (Davis and Fill, 2007) and the extensive preparation of modules. Wall and Ahmed (2008) suggest that the cost of the most sophisticated delivery for distance learning is over 300 times greater than the cost of one hour of a traditional lecture, and these are sunk costs. Interestingly, the start-up costs of blended learning may be lower than for traditional delivery as IT infrastructure could be outsourced, thus reducing barriers to entry. It must be remembered, however, that occupancy of a traditional lecture is limited by its physical dimensions- in the case of blended learning, there are no physical constraints on the number of participants in the distance elements. Recruitment to programmes is not limited by capital-intensive estate, so whilst the maximum cost of the most sophisticated forms of delivery may be higher, course occupancy may be potentially unlimited.

Whilst profitability may be improved by adoption of a blended-learning approach, customer satisfaction and learning outcomes must be maintained. For blended and e-learning to be successful, the practitioners delivering the courses need to be sufficiently motivated to do so. Gannon-Cook, Ley, Crawford and Warner (2009) reviewed earlier work on the desire of academics in the US to develop distance-learning material. Early adopters were principally motivated by the desire to help students. Gannon-Cook et al.'s (2009) analysis of four US universities found that the principal motivation (20%) to develop e-learning was the desire to provide good service to learners, however, 27% of motivation was provided by monetary reward.

LEARNERS

In the US military, possession of a postgraduate degree has been suggested to improve promotion prospects by 10-15% (Bowman & Mehay, 1999), although it remains uncertain whether there is a causal link or simply that those personnel engaging in further education are more motivated to succeed professionally. There are therefore considerable incentives to undertake postgraduate education while in post. Facilitating access to education, providing transferable skills, may assist in the ability to obtain employment when their service contract ends.

Blended learning has been argued to provide improved learning outcomes, but this depends, to a very high degree on the personal attributes of the instructor (Derntl and Motschnig-Pitrik, 2005). To satisfy learners, there is a clear need for the educators to be educated to satisfy the expectations of learners.

BLENDED LEARNING IN SUPPORT OF SECURITY SECTOR MANAGEMENT EDUCATION

In searching beyond professional areas such as medicine which require significant intermittent on-the-job training and practical work, it is useful to examine the educational and training requirements of wider security sector practitioners and policymakers; many of whom become committed to operational interventions or senior policymaking activity and thus place great value on a system of flexible delivery.

Security Sector Management (SSM) has evolved as a concept since the late 1990s, when terms including Security Sector Reform, Security Sector Transformation, and Security Sector Governance started dominating the policy headlines of government departments involved in the security, diplomatic and development arenas (DFID, 2002). This trend gained further momentum and support once bilateral and multilateral donors evolved and promoted what has become known as "Whole of Government Approaches" (WGA) (OECD-DAC, 2004) which called for all security-related Government departments to integrate efforts to generate more coherent operational and policy responses to the global security environment.

From a UK Government perspective, in practice this has led to the development of cross-Whitehall strategy groups comprising Foreign & Commonwealth Office (FCO), Ministry of Defence (MOD) and Department of International Development (DFID) representatives. Such groups are divided based on priority country (i.e. Afghanistan), region (i.e. Middle East and North Africa) and thematic areas (Security Sector Reform). All strategic areas fall under the broader theme of 'Conflict Prevention' (Global Conflict Prevention Pool, 2002); a policy platform which has been included as a UK's Foreign Policy priority for the past 10 years (International Priorities Paper 2001, FCO White Paper 2008) and which serves as an accepted common denominator across the cultures of all three security-relevant Departments. More specifically, based on the DFID strategic remit of 'poverty eradication', the FCO focus on peace agreements and state legitimacy and the MOD's objective to be a 'force for good', 'conflict prevention' offers some common ground and a common language as a foundation for better policy coherence.

This 'joined-up' approach to understanding and implementing wider security policy and addressing what some have referred to as the 'security and development nexus' (Luckham, Cawthra, 2004) has demanded a new form of education and training schemes. Whereas professionals across the diplomatic, security and development portfolios would have traditionally developed their careers based on first degrees and post-graduate education in areas such as international relations, conflict studies, international security, development/diplomacy studies, it is now recognised that the complexities and challenges involved in viewing issues through a whole-of-government 'lens' require sound management skill-sets, particularly with institutional objectives of developing leaders in the field. At the same time, the individuals tasked with dealing with such complexity are often key change agents aspiring to middle and senior management positions, or fast-track civil servants or members from wider civil society who already come with extensive knowledge based on a combination of academic background and practical experience.

Blended learning is proving to be an effective vehicle for the delivery of education in the area of Security Sector Management. Due to the lead role played internationally by a small group of bilateral donors in the SSM field (including the United Kingdom, the Netherlands and Canada), extensive educational 'outreach' programmes become important, particularly in catering to priority countries. It is interesting to note that education and training in the SSM field enjoy great demand in both the northern and southern hemispheres, as vulnerabilities across a security sector can be felt in all types of transitioning societies.

The point outlined above highlights the importance of broad geographical participation of SSM as a global marketplace of practitioners and policymakers. The issue of recognising a 'global marketplace' is further reinforced by the strategic policy remit of leading donors to offer education and training on wider security programmes to their global partners. Perhaps the most valuable part of the educational experience – and a consideration for those partaking in such initiatives – is the wide international participation within the group

which facilitates the shared experiences across a range of transitional contexts. This aspect enhances the post-graduate educational experience and creates valuable personal networks on which the middle and senior managers will depend in the future, be it from a diplomatic, defence or development perspective.

Whilst the need for periodic face-to-face contact directly supports network-building and the sharing of experiences and knowledge, candidates who aspire to develop in the field of SSM often cannot allocate the required time for full-time, or even part-time post-graduate education. Arguably, from an outreach perspective, those international participants who can afford one full year – or even a significant part-time commitment - out of their professional environment to complete post-graduate studies are not the most appropriate future leaders and change agents whose full-time presence in-country is often demanded. Moreover, the traditional full-time and part-time post-graduate models would pose enormous difficulties for many policymakers and practitioners deployed operationally to remote parts of the world. In reality, it is those individuals that bring a combined wealth of different practical and policy experience whom the institutions would wish to develop as future leaders. This requires a careful approach which prioritises shared experiences and network development, yet minimises face-to-face contact.

In the face of the current global economic crisis, and as organisations strive for greater efficiency, there is also a desire to minimise the logistical costs of a post-graduate educational experience. In most universities, consistency must be achieved in the pricing of post-graduate certificates, diplomas and Masters degrees notwithstanding the mode of delivery, however, cost disparities go exist, especially in executive education. A brief search of prospectuses reveals that, within the UK, the price of an MBA programme may differ three-fold between the least and most expensive. This disparity perhaps indicates the perceived reputational variation between institutions offering equal awards. For the purchaser therefore, one area where cost savings may be realised is in the logistics supporting classroom attendance. Some universities are even now developing 8-week international post-graduate certificate programmes during which all taught components are completed but which allows for assessed work to be submitted over a minimum 6-month time horizon. This also respects the requirement for most Post-Graduate Certificates to be completed over no less than 6 months.

As more flexible blended learning approaches often call for a more concentrated and continuous – as opposed to disjointed and interspersed – module delivery, it becomes possible to invite potential students to sample the content of a post-graduate course by way of offering a module as a short course. Beyond serving as an 'appetite whetter' for the student with a limited commitment which does not exceed the single module, this course trialling and sampling also allows purchasers to assess the potential operational benefits before committing to courses of longer duration for their staff. Moreover, for those servicing operational commitments who infrequently become restricted from attending the odd module, the regular delivery of condensed modules provides options to take certain modules at later dates.

A blended approach taken to post-graduate education in SSM must therefore cater to the purchaser, provider and consumer. The purchaser must feel reasonably assured that the experience will facilitate his/her needs which include the development of future leaders and indigenous change agents, the nurturing of 'friends in court' across a range of priority partner countries, and the option to evaluate the extent to which the experience will contribute to the operational requirements of the strategic environments into which their employees deploy.

CONCLUSIONS

This paper has discussed a number of developments in the area of blended learning, and has argued for the increasing importance and utility of blended learning education across a number of particular sectors. The current policy debate on wider security issues across the UK Government – and the skillsets required to take forward a more coherent national and international approach to security- demands training and education which goes beyond the knowledge gained in mainstream social science disciplines including politics, international relations, conflict studies and international security. This combination of skillsets and knowledge strengthens the capacity of policymakers and practitioners to apply strategic vision and operational aptitude in order to promote and manager national and regional stability and growth. Security Sector Management is therefore highlighted as a key area which blended learning techniques support for a number of reasons, including flexibility required for those students who receive operational deployments; the benefits of shared international experience of senior policymakers and practitioners which this type of post-graduate degree attracts; the cost-effectiveness of delivery to an international audience; the ability to attract international 'change agents' who, under normal circumstances, could not be released for one year of full-time education or an extensive part-time residential commitment; and a reduced logistical cost and burden supporting a better balance between classroom-based and virtual learning.

As well as highlighting a number of disbenefits which may become outputs and unintended consequences of blended learning approaches, the paper also underscores the importance of an 'expanded' stakeholder base in areas like the security sector, which includes the purchaser, the consumer and the provider. Due to the complex characteristics of this marketplace, innovative blended learning techniques must be applied which combine winning elements of 'flexible' and 'part-time' learning and cater to students in a way which does not compromise delivery.

There are also a number of disbenefits that can influence the outcomes of this approach and which – if not managed effectively – could potentially undermine the delivery of blended learning. For busy practitioners and policymakers, one could argue that enhanced flexibility surrounding the completion of modules and assignments may unnecessarily prolong the post-graduate experience. On-line discussions and debates which are not sufficiently balanced with face-to-face contact may prevent students from capitalising on as rich an experience as one could realise. The on-line support of a well-resourced 'digi-library' and a knowledge base which provides information sufficient to submit an average piece of course assessment could result in a lack of very good and excellent pieces of assessed work. This latter point may have a negative impact on the levels of innovation applied to organisational challenges and areas which the 'purchasers' may wish to see the students undertake some in-depth analyses.

Blended learning appears to offer significant benefits to all stakeholders; to suppliers, purchasers and learners, due to its inherent flexibility and economic advantages. It also offers demonstrable potential to contribute significantly to 'outreach' from providing countries, to the global challenges faced within the security sector. As evidenced by the knowledge transfer potential, as demonstrated in the health sector, blended learning might be considered as offering an attractive, cost-effective, alternative to face-to-face delivery that can work as a force for good in the global challenges facing the world. As our review demonstrates, due to the paucity of quantitative data on the relationship between SSM blended learning and its outcomes, further research is required to establish the true cost-benefit relationship between blended learning and face-to-face teaching.

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A Distance Learning Model for Optimising Individualised Training in a Department of Defence

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ABSTRACT

In a transforming South African society the emphasis is on realizing the potential of individuals and accrediting competencies against a National Qualifications Framework. The South African National Defence Force's diverse human resources also demand training in order to effectively protect South Africa and its inhabitants. Competency development is needed by both the Permanent and Reserve Force. This training requirement and the shrinking budget compel the Defence Force to apply cost-effective human resource development strategies. Interactive distance learning, of which e-learning is one delivery platform, is a viable strategy. The distance learning model was developed as guide to the designers.

The South African National Defence Force (SANDF) as part of the revised Department of Defence (DOD) has used distance learning as a didactical delivery mechanism since the 1980s. The delivery was mainly paper-based and a blended approach of contact sessions and self-study applied. It was uncoordinated within the department and succumbed to many pitfalls. In-depth research was initiated to address the needs of the department.

NEEDS OF A TRANSFORMING DEPARTMENT OF DEFENCE

In a transforming society where the emphasis is on realizing the potential of the individual and accrediting all competencies against a National Qualifications Framework (NQF) overseen by the South African Qualifications Authority (SAQA), the SANDF, is also transforming to its new role and place in a new dispensation. The diverse human resource, comprising of a number of cultures, and grouped into three main groupings, namely civilians, a Permanent (uniformed) Force, and a large Reserve Force (also in uniform) demand training in order to effectively protect South Africa and its inhabitants. They all need competency development to fulfil their respective roles.

The Department is responsible for most of the education, training and development of its human resources which is needed to provide an effective Defence Force. It therefore designs, develops, presents and evaluates most of the learning opportunities in-house. This training requirement and the shrinking budget compel the Department to apply cost-effective human resource development strategies. Distance learning, especially with its new interactive nature that enhances learning and forms an effective didactical learning transfer system, can potentially be a viable strategy.

SEARCH FOR AN INDIVIDUALISED, DISTANCE LEARNING SYSTEM

The Department's need for a cost-effective Education, Training and Development (ETD) system and the demand for individualised learning, formed the drivers of two research projects, the first for an overall individualised system and the second (Viljoen, 1999) for an interactive distance learning system. A variety of media technologies are presently utilized in the macro-distance learning environment. Analysis of the media technologies, led to the conclusion that computer-based training, and e-learning can be applied in the Department. Printed materials will form the basis of learning material. The utilisation of electronic delivery platforms will be developed to improve the interaction between the instructor and learner and between learners.

Selecting the media technologies constitutes an essential part of the entire distance education, training and development system (from here on referred to as the distance learning system). Given the realities of access to computers and the bandwidth required for full interactive learning programmes, the implementation of e-learning require intensive planning, budgeting, procurement and training. To provide guidelines for developing an effective distance learning system, a model was designed that provides the backdrop against which such a system function.

A DISTANCE LEARNING SYSTEM MODEL

The model (as illustrated) is build around the three central components of any learning situation, namely

- the learner,
- the instructor (facilitator of learning) and
- the content that represents the outcomes and the way it is to be accomplished.

They are placed in the context of the Department that function as a system where the learner is employed at a unit and the learning opportunity is provided by designated facilitators from a training unit (ETD provider). Being a system, there are various factors influencing it such as learning theories, global ETD trends, legal ETD prescripts (SAQA and NQF), education training quality authorities (ETQAs), accreditation of learning, budget, selection factors, and policy structures.

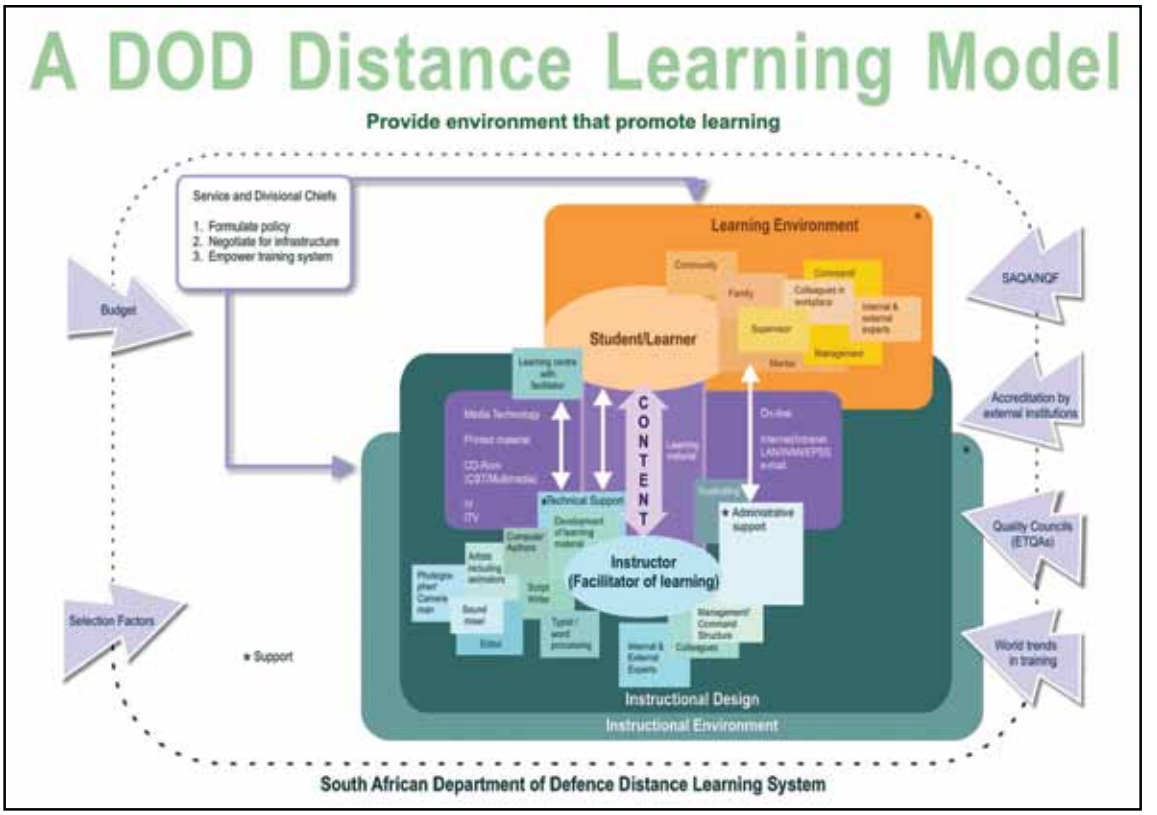
It was found that the distance learning systems of the past failed due to, amongst other reasons, the lack of commitment from superiors and policy makers. For this reason the policy making component has been incorporated as an integral sub-component of the distance learning system and not only as a factor on the system border.

POLICY MAKERS

The Service and Divisional Chiefs delegate to Chief Human Resources Development and the Services' ETD directors the policy making functions to determine aspects such as budget allocations, infrastructure provision, study leave structures and awards. Through the promulgation of policy, the facilitators and the learners are

empowered to optimally use time, to minimize discriminatory practices and to provide equal opportunities for development.

The provision of the necessary information technology infrastructure enables the facilitators and learners to establish and utilise interactive distance learning platforms, such as e-learning, that enhance learning. At present the development of the essential information and communications technology infrastructure that will support e-learning in the Department is in the design phase with the process to specify the user requirement.



INSTRUCTOR / FACILITATOR OF LEARNING ENVIRONMENT

The facilitator of learning in a distance learning system is responsible for ensuring that the learner receives the learning material, that the learner receives learning facilitation as required and to assess the learning outcomes. He does this by means of sound instructional system design and the subsequent development of learning material. The facilitator regularly participates in the design project, often as project coordinator, and therefore directly involved with a project team who comprise of people doing the following:

- being subject matter experts;
- being practitioners in the field ("shop floor workers and supervisors" – competent members who know what the expected performance is);
- managing on all levels – policy makers, learner officers commanding, own officers commanding;
- being prospective learners;
- being media specialist;
- word processing and page layout;
- art work;
- animation;
- script writing;
- photography;

- video recording;
- sound mixing and voice-overs;
- editing and producing; and
- authoring e-learning packages.

Integrating all the design and development tasks are two integral aspects of this environment.

Delivering the distance learning has additional needs such as:

- administrative support of the system,
- technical support for the infrastructure that is utilized and
- emotional support for the facilitator who often works long hours and who could be easily isolated from the rest of the training unit.

The content that is delivered is a central responsibility of the facilitator since it forms the link between him and the learner.

THE LEARNING CONTENT AND DELIVERY MECHANISMS

The learning content encompasses all the aspects and processes to be learned in order to achieve the learning outcomes. In the distance learning situation the learning packages not only forms the source of learning but also represents the facilitator. It therefore has to be presented in a way that will enhance learning through stimulating intra-personal communication/ interaction in the learner. This is why even the printed materials have to be developed with many interactive features that involve the learner maximally.

The platforms to deliver distance learning involve an integration of information and communication technologies and methodology in an interactive learning environment. Interactivity is enhanced through computer based packages and e-learning that provides additional learning motivation through movement, colour, sound and immediate reaction of the programme on choices made by the learner. The ultimate forms of these media are games and simulators with virtual reality components. Another powerful mechanism is interactive television that can be accessed through specialised centres or electronic systems.

The specific outcomes and related content together with the means will determine the blend of delivery platforms that will be implemented in any give learning situation.

LEARNER ENVIRONMENT

The learner's function is to make optimum use of the learning opportunity, but this is often very difficult due to factors in his environment such as a lack of technological and emotional support. This is in many instances caused by a lack of understanding on the part of colleagues, supervisors and the command element of the unit in which the learner is employed. The distance learning model therefore advises that the learner's work environment is consulted early in the design process and drawn into the learning process. Having the co-workers involved in especially the needs analysis phase, allow for establishing the real training need – making sure that the learning opportunity will address the essential competencies. Having co-workers, especially the command line, involved in the learning process by serving as mentors and first line assessors of the learning success, enhances involvement and spreads the responsibility of the learning programme to the people who reap the benefits of the learning outcomes. Through this involvement the work place becomes an environment that enhances learning and is also conducive in establishing a learning organization culture.

IMPLEMENTING THE DISTANCE LEARNING MODEL

Implementing such a model needs a concerted, integrated strategy that involves all ETD practitioners from the top to the most junior instructor. Since interactive distance learning is fairly new for the Department as a delivery platform, all role-players probably need development in utilising such a form of training. Policy-makers have to be educated in empowering the system, instructional designers have to be trained in designing and developing the components involved, facilitators have to be trained in delivering training in this form, learners have to learn how to study in this mode and support personnel have to develop the skills and attitudes that will enable the optimizing of the distance learning system.

The establishment of e-learning as delivery platform for distance learning is in its infancy in the Department. It will require special consideration to accommodate access, bandwidth and computer literacy levels.

It is therefore imperative to follow a distance learning implementation strategy starting with awareness and ending with practice.

CURRENT SITUATION

Since the development of the distance learning model it has been utilised by some of the training units who implemented a distance learning or blended approach to certain programmes, notably the Military Academy.

In order to enable the development of distance learning methodology a distance learning policy has been formulated and the user requirement specification for a learning management system that will support e-learning developed. The latter has been derived from both academic research and piloting of a system in two defence training units as presented by Venter and Meter.

CONCLUSION

The distance learning model for the Department implies the integrated effort of a multi-disciplinary team who each have their responsibilities that are merged in a system ensuring the filling of performance gaps through optimal learning in an environment conducive to performance excellence.

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Annémarie van der Walt (neé Viljoen) studied at the University of Pretoria and obtained the degree BScEd majoring in Zoology, Botany and Pedagogy in 1980. Presented environmental education from 1981 to 1989 while obtaining part time the BEd (1983) and MEd (1987) degrees from the University of Pretoria. Joined the SANDF in 1989 as officer instructor of staff and command courses via distance learning. Transferred to the Research and Development department of COLET in 1992 and continued research on individualised training in the SANDF with specific focus on distance learning in the organisation. A doctorate in Education was awarded in 1999/2000 by the University of South Africa for this research.

The SITA / SANDF Learning Management System: An Evaluation of its Longevity in the SANDF

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ABSTRACT

This presentation provides background information relevant to the initial start of the learning management system (LMS) pilot project. All the reporting information regarding the LMS in operation refers to the South African Army College, the primary pilot unit. The history and approach of the College are mentioned. Thereafter the success factors, lessons learnt, LMS attributes and learner feedback are discussed. Challenges within the South African National Defence Force (SANDF) as well as pilot evaluation feedback are discussed. The envisaged future is briefly explained.

FUNDAMENTAL BACKGROUND INFORMATION

NOTE: This presentation supports the "Distance Learning Model as form of individualized training for optimizing training in a Department of Defence", as presented by Col Annemarie van der Walt.

Project REVELATION originated in 2003 with the specific purpose of developing guidelines for distance learning practice in the SANDF. E-Learning was identified as an integral part of distance learning and a Learning Management System (LMS) as a crucial requirement for effective delivery and administration of all learning within the Department of Defence (DOD).

Since 2003 the State Information Technology Agency (SITA) has been jointly involved with training within the DOD, as part of Project REVELATION. Investigation and research were conducted for possible LMS solutions, which would suit the primary requirements of the DOD. During the course of 2005 SITA procured a 500 "seat" LMS license for piloting purposes. In order to allow for a proper, detailed and structured evaluation of the functionality of the LMS within a live, dynamic environment, SITA requested the assistance of the DOD in evaluating the product to capacity. Authorization for such an evaluation was granted.

The LMS was installed on the DOD Intranet Server. South African National Defence College and South African Army College were appointed as the primary pilot units. The South African Army College presented the Distance Learning Phase of the Junior Command and Staff Duties programme (JCSD), where most of the functionalities of the LMS were used, while the South African A National Defence College (SANDC) presented the Executive National Security Programme (ENSP), using mostly the collaboration tools for communication and the portfolio of evidence for the uploading of summative assignments during residential training.

During the same time period, while the piloting of the LMS was in process, a requirement for an Education, Training & Development Management Information System was submitted by Directorate HR Service Systems. The Navy has developed a Management Information System module in their internal management system (.NAVY), which with closer investigation could satisfy the needs of the wider DOD. The aforementioned system has the capability of replacing the current MILQUAL subsystem within PERSOL in order to comply with requirements laid down by Department of Labour in terms of the Skills Development Act and the South African Qualifications Authority Act (SAQA).

The integration between the management of learning (LMS) and the management of learner data (ETD MIS) remained a matter of concern. In 2006 Project @LAST was established to manage the porting of Learner data between the current ETD MIS (running off .NAVY) and the pilot LMS in order to facilitate the data exchange between the two systems. The integration testing between the LMS and the ETD MIS were successfully conducted. Subsequently a prototype description for an integrated solution was documented.

PILOT FEEDBACK AS EXPERIENCED BY THE SOUTH AFRICAN ARMY COLLEGE

Detailed feedback regarding the LMS experience from the perspective of one of the primary pilot units, the South African Army College, is provided. The College took a leap of faith when deciding to make the paradigm shift to e-learning and optimal use of the LMS. Although the pilot study officially concluded in December 2006, the LMS remains operational and has become an integral part of their day to day operation.

Even though the College represents a small percentage of the total training fraternity in the SANDF, the pilot feedback provides a sound argument to substantiate the longevity of a LMS in the environment.

APPROACH TO LEARNING

The South African Army College emphasizes the development of the military learner's intellectual and analytical capability and the capacity to formulate sound decisions within the parameters of current doctrine and establishment of staff procedures. All learners are therefore educated on how to think, rather than what to think. Therefore a blended learning approach is embraced.

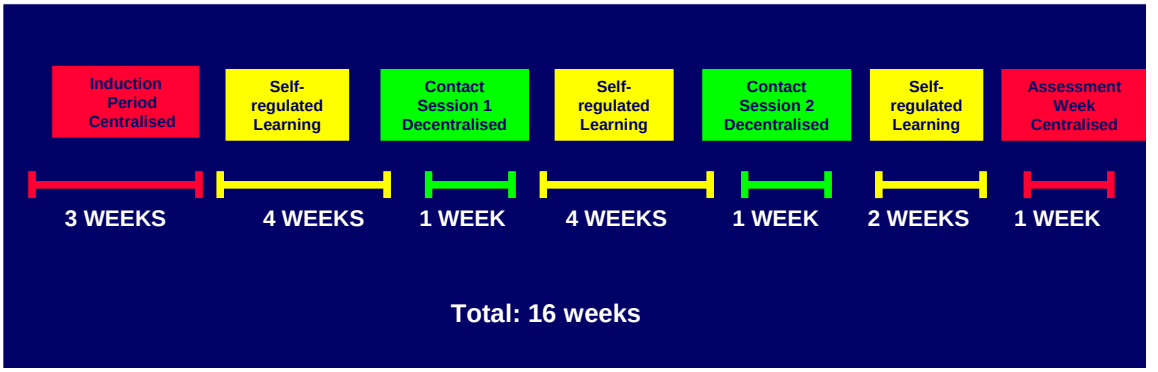
A combination of instructional methodologies must be used to facilitate learning. These methodologies may vary from classroom-based facilitation during contact sessions, syndicate group discussions and induction periods to collaboration using e-mail and discussion forums or online learning content, assessments and/or assignments.

Even though a mentorship program is used to ensure that individual progress is monitored and improvements are implemented where and when needed, it is vital that learners embrace the adult learning approach The building block principle is maintained and the design is in accordance with a self-directed learning approach in order to contribute to meaningful learning.

HISTORY

The JCSD programme consists of 2 modules, the Distance Education Module (DEM) and Residential Education Module (REM). Until 2004 the DEM received only printed learning material as well as a CD containing Battle Handling information. A Work Book had to be completed and served as formative assessment. During the latter half of 2005 the JCSD Branch was informed by Project REVELATION that they have been appointed as one of two primary units to take part in the piloting and evaluation of a LMS system. Fortunately, at that stage the College had a well established Distance Learning (DL) model for the JCSD Theory course, which could be used as the foundation for the implementation of the LMS.

Fig 1: JCSD Distance Education Module – Programme Plan



This was a total paradigm shift to all involved. The decision was made to embark on a blended learning approach. Learners would still attend class room sessions during the contact weeks and would work on the LMS during the self-regulated learning periods.

In a matter of three months the Directing Staff (DS) had to familiarize themselves with e-learning, e-buzz words and they had to act as subject matter experts (sme's) in the redesign of their paper-based learning material into e-learning "friendly" content as well as online formative assessments. Above all, they had to be trained on all the functionalities of the LMS (learner interface as well as facilitator interface) and they had to test and check their individual modules on the LMS. On 16 January 2006 the College was prepared for the 100 learners that reported for the course. Instruction-led modules with online formative assessments were uploaded onto the LMS.

CURRENT STATUS

The College implemented the LMS as pathway for learning during the Distance Education Module (DEM) of the JCSD (T) course. The paradigm shift was made with no option of turning back. The LMS principle is here to stay. From January 2006 until December 2008 600 learners were trained via the LMS; another 100 learners is currently using the LMS. Daily operation of the system currently results in more requests for optimization of functionalities. These requests, if not hampering the operation of the system, are included into the user specification.

One of the LMS modules, Phases of War, has already been redesigned to allow for more interactivity. The possibility of a third redesign is in the pipeline. The Warrant Officers Development Course (DEM) is in the process of being transformed from printed learning material to functional interactive e-learning modules. Four of the six modules are currently on the LMS for final review. During the next financial year other instruction-led subjects and exercises of the JCSD course, already on the LMS, will again be redesigned into proper interactive e-learning packages.

LESSONS LEARNT

Lessons learnt during a pilot generally provide the most significant information for the drafting of requirements and also serve as valuable pilot evaluation feedback. According to the feedback provided training units should:

- provide measures for down times (power failures and system failure)
- select the right person for the job (Committed facilitators)

- take into account that such a system is administrative intensive
- take cognizance of the fact that initial implementing of the e-learning/ LMS principle is labour intensive
- be selective with content, activities and information as an overload defeats the objective
- take high resolution media into consideration as it slows the system down
- ensure that content and question techniques are professionally designed and developed, as well as educationally correct
- use appropriate methodologies as e-learning is not always the answer
- ensure that e-learning instructions are clear, concise and descriptive
- ensure that they have the structure to support a LMS-driven course. In this regard the following aspects are important:
    - Distance Learning sections must be fully staffed as the system is administration intensive
    - IT/LANA support must be in place
    - The training facility should have a fully operational computer laboratory / CBT centre
    - The Research and Development section must be active and effective
    - Instructor/learner ratio should ideally be 1 to 10 and definitely not more than 1 to 15
- make sure that the content, assessments, assignments and additional information such as library documents are reviewed continuously as learners are creative
- provide the initial LMS training during the Induction Period as it is key
- be selective with the content and other information that is displayed on the LMS
- outsource design and development until capacity within the unit has been developed
- ideally allocate a dedicated e-learning team the design and development
- align the content with current doctrine
- remember that learners are busy with distance learning and that they must still be able to continue with their daily responsibilities
- determine beforehand what needs to be done – do a proper needs analysis
- initially plan well to ensure less problems afterwards
- stick to simplicity and consistency with regard to e-learning packages

SUCCESS FACTORS

In order to ensure the longevity and success of e-learning as well as a fully functional and operational LMS it is imperative to take cognizance of some critical success factors such as the following:

- Ensure active involvement, support and buy in on formation - as well as policy - and decision makers' levels
- Have or obtain an approved distance education structure
- Establish an approved budget
- Insist on a dedicated IT specialist / knowledgeable LAN Administrator (LANA)
- Finalise unit standards
- Obtain the approval of curricula by respective role players
- Ensure close liaison with reputable, allocated service providers
- Ensure internal and external quality control
- Receive commitment to excellence by all role players
- Receive the continuous support by SITA
- Plan effectively and manage time efficiently

- Establish a model and/or framework
- Keep design simple but functional
- Build own e-learning team capacity (story board, design, develop)

ATTRIBUTES OF THE LMS

Delivering the content of the JCSD Distance Education Module in this manner enhances the learning experience and improves generally improves knowledge transfer. These facts clearly illustrate the feasibility of implementing a LMS as a tool for optimising training in the DOD. The following attributes were documented:

- Progress of learners are monitored effectively.
- Excellent/timely communication between the learner and facilitator by means of e-mail, forum and announcements.
- Recording capability of assessments is a key functionality.
- Uploads to Portfolio of Evidence provides proof of activities completed.
- The Portfolio of Evidence is an indispensable feature.
- Results during the Residential Module improved, which indicates greater knowledge retention during DEM.
- Understanding of the learners were enhanced.
- Computer literacy of many learners improved during the course.
- Directing Staff (DS) have a clear record of time when assignments and assessments are uploaded on the LMS.
- Late submissions/non-submission can be traced and followed up. It is thus a handy tool to monitor and control progress for both learners and Directing Staff.
- Learners and Directing Staff have records of communications.
- Meetings between Directing Staff can be reduced as alternative means of communication is available to exchange essential information in a timely manner.
- The LMS enhances the learning experience, especially within the context of outcomes based education.
- The investment made in the LMS is a means to empower the members of the DOD with knowledge contributing to effective training and education.
- Learners were eager to use the mail functionality.
- The announcement function providing direct communication with the learners, was extensively used.
- The JCSD learners benefited from the more credible course content and constructive and progressive feedback and the majority was also exposed to basic computer literacy which they can plough back into their work environment.
- The most remarkable impact of the LMS was visible in those learners who thought they would not be able to conquer the LMS. This served as a morale and self-esteem booster.
- The reference repository as part of exercises on the LMS is very helpful.
- In cases where a learner did not have access to the Intranet and LMS an OFFLINE CD was provided. All the completed assignments and assessments were uploaded to the LMS during the next visit to the College.
- The LMS provide a tool to bridge the limitation of time that is required to master complex content.
- The LMS supported the intended outcomes of the learning programme and provided the learners with a better understanding of the application in practice during the Residential Module.
- For the first time in history the JCSD Branch could implement a successful mentorship system accepted by all learners due to the effectiveness of the collaboration functionalities.
- The learner bio data batch upload functionality could decrease production time from 3 days to approximately 2 hours.

- Learner feedback was very positive. The following remarks were made:
    - Learners did not perceive learning in isolation.
    - Members available to their home units.
    - Mentorship platform was created.
    - The online assessments were interesting and fun.

LIMITATIONS

The following limitations were experienced during the pilot period. It has to be seen within the context of the specific LMS, the current status of the DOD Intranet and networks as well as the nature of the programmes managed during the pilot period.

- Infrastructure, network traffic and bandwidth capacity are currently insufficient and unreliable.
- The local area network administrator (LANA) at unit level does not have any knowledge of the functionalities of the LMS.
- The information organization capability of the current LMS as well as the navigation compilation place limits on the access of information.
- Insufficient HELP facility available.
- The mail facility is not user friendly and has insufficient functionalities.
- Stability in the LMS was hampered by technical errors.
- No collaboration can be done from the administrator end (back end).
- Partitioning functionality which was added as an interim solution, is insufficient

CHALLENGES

The implementation of a "new service" are usually subjected to a number of challenges that has to be side-stepped or compensated for. Some of these documented challenges are LMS specific and will be addressed in the user specification, while the others have to be dealt with in the most effective and efficient manner. The following are examples of challenges documented:

LMS specific

- Mail facility is insufficient.
- Management reporting is not flexible at all, does not cover all areas and is extremely user unfriendly.
- A scheduling tool does not exist.
- Batch uploads cause too many problems.
- Insufficient instruction with regard to general operation of the LMS.
- The assessment instruments are insufficient and boring.

General

- Infrastructure, networks and bandwidth issues need to be addressed on higher level throughout the DOD
- Change management measures have to be documented and implemented.
- Buy in, commitment and involvement from management and policy makers are crucial.
- Dedicated personnel to administer the system are imperative.
- The development of E-learning Centers of Excellence within the DOD.
- There is currently no communication facility available for non-DOD members and international fellows to access the LMS as it runs from the DOD Intranet.
- No Internet access is currently allowed.
- The computer literacy level of the learners is not always up to standard.

CONCLUSION

The successful LMS pilot is a milestone for the distance learning model as well as a breakthrough for ETD in the DOD.

The pilot evaluation clearly indicates the need for a learner - as well as a learning management system in the SANDF. The User Requirement Specification (URS) is currently in the second version draft format and describes the envisaged system as an integrated, automated, electronic system that can manage the learner data according to SAQA prescripts as well as the learning process with tools for communication, assessment management, portfolio of evidence building, scheduling of learning events, curriculum building, access to references, costing together with a capability to link with learning content delivery systems specific to the various training providers.

The integrated system, Education, Training and Development System, must make provision for seamless integration with external institutions such as the ETQA's as well as internal departments amongst others the Human Resources, Financial Management and Data warehouse.

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Key Policy Issues Around e-Learning at a Defence Academy:
An Australian Case Study

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ABSTRACT

This paper addresses a range of issues and practical matters, both current and future, regarding the nature and scope of online learning available at the University of New South Wales campus at the Australian Defence Force Academy. Online learning, or e-Learning, already has a significant presence in both undergraduate and postgraduate education at ADFA through the availability of an integrated learning management system and the development of strategies to promote the use of the virtual environment. Much is presently made in military circles of the reality of network centric warfare and the challenge in military education is to foster these same conditions in academic programs such that students can experience working in a media-rich, virtual environment. Getting the balance right with e-Learning in a Military Academy where on the one had students are engaged fulltime in a regimen of training while on the other are undertaking academic studies, is the real challenge. Within the framework of the circumstances of ADFA and the university's commitment to foster e-Learning at ADFA, some approaches to achieving this goal are outlined.

INTRODUCTION

The Australian Defence Force Academy (ADFA) is a unique and challenging environment. It operates as a partnership between the Australian Defence Force (ADF) and the University of NSW (UNSW) in providing a balanced and liberal education within a tri-service military environment (UNSW@ADFA). All undergraduate students at ADFA are serving Defence personnel, primarily Officer Cadets and Midshipmen in training though with a mix of some mature age (advanced) students with temporary or existing Officer rank. The provision of undergraduate degrees across a range of academic disciplines in Arts, Business, Science, Engineering and Technology is the primary function of ADFA and the UNSW engagement. [1]

ADFA provides training and education for the future leaders of the Australian Navy, Army and Air Force. Approximately 800 Navy Midshipmen and Army and Air Force Officer Cadets are currently enrolled in the three year training program at ADFA in parallel with their academic studies. Another 300 are currently completing a fourth year of academic study in engineering or at Honours level in other degree programs through UNSW.

Midshipmen and Officer Cadets at ADFA begin a career in the ADF, receiving a full time salary while they undertake a program of military and leadership training and university studies from a highly regarded civilian university that is recognised throughout Australia and overseas. The university education and military training they undertake will prepare them with the knowledge, skills, professional abilities and qualities of character appropriate to Officers in the ADF and other Defence Forces.

ADFA is unusual in the community of Defence Academies. As far as is known, no other military academy operates exactly in this way with a separate and independent civilian university provider and with both a Military Commandant and University Rector (read Dean) neither of which has seniority over the other. Within this framework, the university and military components of ADFA work in a cooperative partnership. There are, of course, clear domains of separate activity and responsibility, but in all areas where there is an overlapping responsibility for management of the students in their academic programs, significant interaction and interchange of information between the university and the military is the norm. Procedures and protocols for the exchange of such information, which all sponsored students must agree to on entry, have been in place since the opening of ADFA in January 1986.

On the military side, the Deputy Commandant (DCOMDT), of Colonel equivalent rank, is responsible for the military education and training of the Midshipmen and Officer Cadets. The Executive Officer Cadets is responsible for the day to day administration, discipline and command of the Midshipmen and Officer Cadets and other military personnel undertaking full-time tertiary study at the Academy.

For the university, the Associate Dean (Education)[2] and the Manager Student Administrative Services, have oversight of the academic programs and all student administration. A significant amount of student management, especially within the different degree programs, disciplines and academic courses, is devolved to the academic schools. Governance of the academic programs is through either the undergraduate or postgraduate coursework education committee reporting to the faculty Academic Board as a point of referral to the University Academic Board and Council. Full details of these arrangements are available in the ADFA Handbook[3].

UNSW@ADFA

UNSW has provided educational services to the ADF since 1967. Over the period to 1985, this was based at both the Royal Australian Naval College at Jervis Bay and the Royal Military College of Australia in Canberra. Separate education services were provided to the Royal Australian Air Force through the University of Melbourne. In the late-1970s, The Federal Government took the decision to consolidate these educational services into a tri-service establishment ultimately to be known as the Australian Defence Force Academy. In the early years of concept development, there was discussion that a new Defence University might be established to cater for this need. This idea was subsequently rejected in favour of the creation of the University College of the University of New South Wales within the Academy. The University College is now formally known as UNSW@ADFA.

1 Refer ADFA website: http://www.unsw.adfa.edu.au/

2 http://www.unsw.adfa.edu.au/learning_teaching/assocdn.html

3 2009 ADFA Handbook: http://www.unsw.adfa.edu.au/student/handbook/

As one of the Group of Eight (Go8) Australian universities, UNSW is a research intensive university with an impressive 60 year history of multi-disciplinary scholarship in both research and teaching. At the present time, UNSW is the highest ranked of all Australian universities as far as learning and teaching performance is concerned. It is also highly ranked both nationally and internationally for its research performance. In recent years ADFA, as one of the nine faculties of the university, has been at the highest levels of teaching performance in UNSW. It thus contributes significantly to the university's overall teaching profile and national ranking and has attracted significant internal funding for learning and teaching development through the Federal Government's Learning and Teaching Fund allocations to UNSW.

ADFA draws undergraduate students from across the full range of the Australian secondary schooling system. ADFA also hosts a number of international cadets and midshipmen from affiliated Defence Forces. At the present time some nine other countries have undergraduate students studying at ADFA. Most Australian universities, especially so the larger metropolitan universities, typically draw the bulk of enrolments from their local secondary schools. The special challenge this creates for UNSW@ADFA is that the academic programs and the admission processes need to cater not only for the full range of national secondary school systems but also differing tertiary ranking systems from both across Australia and elsewhere. While not unique to ADFA this situation is the norm for student admissions, not the exception.

At the postgraduate level, UNSW@ADFA operates much like a traditional university campus offering both full-time and part-time coursework and research programs to a wide range of local and international Defence personnel, both serving and civilian, and also to the general community. There are also a significant number of international civilian research students undertaking higher degree studies under the supervision of UNSW staff. It is to be noted that most of the postgraduate coursework programs are available in the distance mode with a high content of online teaching and learning undertaken. In recent years, the largest growth postgraduate coursework student numbers has been in the distance arena and this has been identified as an important (and strategic) area for future development.

THE DEFENCE TRAINING AND EDUCATION CONTINUUM

Most Defence Forces, especially those from modern developed countries, value the contribution that a high quality education makes to the professional development of serving Officers and other personnel. As in the ADF, a significant amount of Officer development commences with an undergraduate degree which may be taken across a range of both professional or generalist programs either subsequent to or simultaneous with basic Officer training and commissioning. This may then be followed with higher level study leading to Graduate Certificates or Diplomas, Masters or Doctoral qualifications. The trend being observed is that Officer career development and even promotion is now more than ever linked to the successful completion of postgraduate study in one form or another.

The training-education continuum identifies the shift in focus during the career of the military Officer between periods of intense educational endeavour and the ongoing training which is so vital to develop and maintain the specific skills required to properly perform one's military duties. At various times in the career path, it is likely that there will be intense periods of education and training undertaken. While these activities might appear to serve differing requirements, what is apparent is that engagement in educational activity is in itself a form of self-training and good quality training has a significant educational benefit as well.

While at ADFA, the Cadets and Midshipmen move between these two activities - training and education - at various times during the year. The academic program runs over two semesters of 13 weeks each (March-June, July-October) plus a three week study recess and examination period after each semester. Military training continues through the entire year though is concentrated into blocks outside the academic program. During teaching periods, but not the study or examination weeks, a reduced military training load of about 15 hours per week is undertaken. Considering that ADFA undergraduate students are fulltime employees of the ADF and do not undertake part-time work to support themselves – as is the case for most civilian university students – this modest commitment to military training in parallel with their academic studies is not a significant burden on their time.

On the completion of an undergraduate degree, which may be from any local or international tertiary institution, the timing of postgraduate study is often dictated by the competing demands of military posting cycles and service-related career development (Staff College etc), and the directions and pressures of personal and family life. Postgraduate coursework, especially in the distance mode, is the most common program of study for serving personnel though there are growing numbers undertaking hybrid coursework/research degrees or full research degrees.

THE EDUCATIONAL ENVIRONMENT OF ADFA

ADFA is unique in the organisational structure of the ADF. Officially, ADFA is considered to be a training institution and, as such, all Cadets, Midshipmen and Advanced Students posted to ADFA and enrolled in UNSW programs are required to attend all classes in which they are enrolled – they are effectively in training. The university's requirement in this regard is more flexible and places the onus on the student to be regular and punctual in attendance at class. The university view is that UNSW@ADFA is an adult learning environment and students need to take responsibility for their own actions including, amongst a range of other student and academic conduct issues, attendance at classes and engagement with their studies. The university does however have a fall-back position in that if a student attends less than 80% of their scheduled classes they may be refused final assessment in the course concerned. Though this might seem to be a contradiction – full attendance on the one hand and a minimum of 80% on the other – this has never been an issue in the military or academic management of our students since the intent of both these requirements are clearly understood.

At the present time at AFDA, a significant amount of undergraduate teaching is undertaken in traditional classroom settings. This is not meant to say that a range of other flexible, informal and virtual learning is not part of the academic curriculum – for indeed it is. Though lectures are the common form of delivery, in the vast majority of courses students are engaged in small group activities such as tutorials, laboratories and studio work. There is also significant emphasis student-centred learning in group work and project-based activities as well as formal and Informal collaborative learning. There is also a significant engagement with e-Learning though not to the extent that this could be considered as online teaching as will be discussed below.

THE ROLE OF E-LEARNING

Online or e-Learning is an integral component of the learning and teaching strategy at UNSW@ADFA and a centralised learning management tool has been available since 2001. WebCT Campus Edition was the initial system but this was progressively phased out by end-2007. OLIVE (OnlineLIVE) is the present UNSW@ADFA implementation of the Janison Learning Management System platform[4]. This Australian platform, developed as a generic learning management tool, was initially taken up by the TAFE (Technical and Further Education) sector and across K-12 in schools, but has since been adapted to the tertiary sector in a number of Australian universities and Colleges, including UNSW@ADFA. OLIVE was trialled as a pilot in the first teaching semester of 2007 and was fully implemented in the second semester that year as WebCT was being phased out.

OLIVE is available to teaching staff in all academic courses and is used to various extents in both the undergraduate and postgraduate coursework arenas, and especially so for Distance Education postgraduates. In the early years, a significant use of both WebCT and OLIVE, particularly at the undergraduate level, was more for content management than learning management. What has been observed in recent years however is a clear trend away from this as more staff are discovering and utilising the various inter-active learning and assessment functionalities of the system. This perhaps reflects the overall shift occurring in learning theory and practice generally from the early information-rich environments to the social networking and media-rich environments of the post Web 1.0 world.

Historical data shows that in WebCT approximately 40% of undergraduate courses had an LMS presence, while about 50% of postgraduate courses had a similar presence. In first semester 2009, 60% of undergraduate offerings had an OLIVE presence while all postgraduate distance delivery courses had an OLIVE presence though 20% of these held only course manuals/outlines and links to websites etc. Of the remainder (some 80%) all would had an active LMS presence. Functionality use has also increased in OLIVE with the new function of announcements being most popular, and the fact that email has been integrated into the UNSW@ADFA emails. Blogs, wikis and the ability for students to upload website URLs and share files has also become more popular.

THE CURRENT SITUATION

For the military undergraduate students, ADFA is a training institution with a requirement, as previously mentioned, for attendance at all scheduled classes. A heavy reliance is thus placed on face-to-face teaching and, at first glance, there would seem to be less opportunity to fully engage with e-Learning. The dilemma this creates is that this style of teaching does not appropriately expose undergraduate students to working regularly and constructively in the on-line environment, an environment they will surely engage with in their future service and later civilian careers. To the incoming undergraduates, many of whom are highly computer literate and who routinely socialise and communicate through virtual social networks, a heavy emphasis on classroom teaching must seem somewhat traditional, perhaps even archaic.

4 http://www.unsw.adfa.edu.au/learning_teaching/onlinelive.html

In developing these approaches, it has become apparent that there must be a clear understanding of the "tensions" that sometimes arise in an environment where educational endeavour is superimposed on a military training regime. In navigating this, a mature understanding of the different cultures of the two partners, the university and the military, is crucial and open and constructive two-way communication between senior staff on both sides is absolutely necessary. Without all this, misunderstanding and misrepresentation can quickly get in the way of good intentions and pedagogically sound educational development.

What is clear though is that both the military and university staff at ADFA share a common goal - to provide the best education for whole-of-life learning and the best preparation for service within the Defence Force. What has been the challenge as far as e-Learning is concerned is how best to engage the undergraduates (at least to some reasonable extent) in a rich and virtual network centric environment in both their academic studies and military training, for this is the environment where they will most likely work - that is, network centric warfare.

The primary questions for academic staff at ADFA are thus: what roles can e-Learning play; how best can this be built into the academic curriculum within the constraints of a traditional face-to-face teaching environment; and can this be incorporated into the training regime as an adjunct activity?

To an extent, these challenges are reflected in the present (though soon to be updated) UNSW@ADFA Learning and Teaching Plan 2006-2008[5]. The core elements of this plan deals with issues including student learning enhancement, the research-teaching nexus, embedding graduate attributes, integrated online learning, the learning and teaching feedback Loop, the recognition of teaching staff and learning and teaching support for staff. Considerable progress has been made across this range of issues over the period of the plan, particularly so in the area of the development of student learning spaces and the provision of learning and teaching staff development.

This work has been the primary responsibility of the Associate Dean (Education) with support from the Faculty Learning and Teaching Fellow and the Faculty Teaching and Learning Committee[6]. Though 2008-9, a significant amount of work has been done to develop both the virtual learning environment by the extension of online learning and its incorporation into more courses/programs, and also physical learning spaces via the creation of new and flexible learning spaces for formal and informal student learning.

One of these spaces, known as The Learning Hub and located within the Academy Library, has been specifically created to provide a flexible and media-rich environment where students may engage in individual, group and project-based learning. Equally, staff have been encouraged to use the Hub to trial new approaches to teaching and learning in their courses, especially where this has a mixed mode of delivery involving small group contact, syndicate activities and IT-related activities. The flow-on effect of the availability of this space will be in identification of the university's needs and requirements in the development of new flexible teaching spaces in the forthcoming ADFA Redevelopment Process.

One interesting challenge at ADFA is that while there significant stability of employment of academic staff, many with long-term careers and thus substantial educational experience and institutional knowledge, the military staff are all on two-year postings and few have any previous experience of tertiary education. This does mean that it is necessary to regularly engage with new military staff (about a 60% turn-over each year) and this is done via a range of annual retreats, regular meetings and formal briefings to ensure a reasonable continuity of approach by and activity within the changing military cohort.

THE CHALLENGE FOR ADFA

Experience over the 23+ years of the operation of ADFA has clearly shown that there are "tensions" between the training and educational demands on the undergraduate students. While being deployed in one environment (military training) the students are expected to apply themselves and work independently in their academic studies.

As mentioned, staff briefings are a key strategy to expose military staff to the university way of thinking and our operating procedures. On item of recent interest has been the issue of on-line engagement and the e-Learning potential and it is expected that this discussion will continue.

5 http://www.unsw.adfa.edu.au/learning_teaching/downloads/9208_learnteachplan_0607.pdf

6 http://www.unsw.adfa.edu.au/learning_teaching/tlc/index.html

The students also are given a number of academic briefings, in essence about their rights and responsibilities and the importance of appropriate academic conduct. It is also made very clear to them that their conduct within the academic environment is governed by overall UNSW policy and that this is integral with the development of their Officer Qualities. The university, and also UNSW@ADFA, has in place a range of policies and procedures dealing with issues such as student misconduct, academic misconduct and academic progression.

At the postgraduate level, distance education and the use of e-Learning present a specific opportunity for UNSW. It is well recognised that in pursuing this however, that the whole matter - from educational design to administration, delivery and assessment - needs to be well managed and administered. For external students, there have been some difficulties in communication across the Defence firewall and many have acquired a private network account for their studies.

What then is the way forward for e-Learning at ADFA? At the outset, it is important that both parties – UNSW and the military – accept the possible tensions or clash points relating to a change in teaching mode and work to achieve the best outcome for the student body as preparation for their future Defence careers. Working in the virtual environment is a key and undisputed part of this development. This is best achieved through the development and implementation of sound, focussed and flexible policy and procedures. Much of this already exists with the UNSW environment and significant work has been done over the years at ADFA to tailor a set of operating conditions appropriate to the ADFA environment and goals.

While an e-Learning policy, per se, does not formally exist there is acknowledgement of the need to develop the on-line environment further so that the undergraduate students – the Officers in training - receive the most appropriate and rewarding educational experience. What is clear is that e-Learning is a long term priority and goal for UNSW@ADFA and work will steadily continue to develop this more within our courses and programs in concert with our military colleagues.

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In 1994 he was the recipient of a Teaching Excellence Award from the University College, UNSW. He was awarded an Australian Learning and Teaching Council Citation in 2008 for his sustained, energetic and innovative leadership that cultivates excellence in learning and teaching.