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## **‘How can you learn to drive a dozer online?’ Moving to Online Learning in the Mining Industry**

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### **Abstract**

The implementation of effective online learning in workplaces can challenge corporate priorities, organisational culture, organisational structures and employees. Although there has been great interest in the potential for the use of online learning in workplaces there is limited research into an effective implementation process in Australian industries. This study identified those factors that might influence the effective implementation of online learning approaches in the Australian mining industry. This industry is geographically dispersed comprising competitive companies that have a commitment to training staff in practical skill based competencies in an often physically hazardous environment.

Using Grounded Theory as a methodological framework, interviews were conducted with a variety of stakeholders likely to be involved in online learning in the future. The principal factors identified as playing a major role in the future implementation of online learning in the mining industry were: competency standards compliance, corporate priorities, organisational culture, organisational structures, learning opportunities, learner needs and online learning environment. The study demonstrated quite clearly the need to plan the implementation of online learning before the event and the importance of aligning the expectations of all stakeholders.

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### **Introduction**

Since 1983 training in Australia has been defined by an economic and political agenda that has sought to make industry globally competitive. Governments sought to place a new importance on by whom, how and where training would be conducted through what became

known as the training reform agenda. The underlying aim of this agenda was to increase Australia's skill base and broaden the responsibility for training beyond the post-compulsory education system. In accord with this trend the present Federal Government has coined the term 'the knowledge-based economy' while the Opposition recently released the notion of the 'knowledge nation' (Australian Labor Party 2001). It is within this context that vocational education in Australia is being shaped in terms of access and flexibility, and where '...the meaning of the word "learning" is in a state of transition'. Thus, in terms of the 'information economy', learners in the vocational and education training sector should be able to access the training '...on-the-job, off-the-job or anything in between, provided any time of the day or night, over 365 days of the year, on-line and off-line, self-paced or classroom' (Australian National Training Authority 2000, p.6). Given these influences it is not surprising that there has been considerable interest in using technology, particularly the Internet, to increase the boundaries and definition of training and education, through what has become known as online learning:

As we enter the next millennium...training as something provided for employees will be replaced by learning that employees initiate themselves. Training for the masses will be replaced by highly customized, just-for-me learning. (Garger 1999)

One industry that has demonstrated considerable interest in the potential of online methods to increase training effort has been the mining industry. The National Mining Industry Training Advisory Board's (NMITAB 1998) training priorities reflect the need for flexibility and change: 'a flexible and relevant industry-driven system; recognised credentials to optimise recruitment and selection; improved minesite skills through a more efficient training delivery system; relevant, industry driven, flexible, recognised credentials; more efficient training delivery systems and highly productive employees; developing for future technologies; cost-effectiveness and portable skills. The dispersed nature of the mining industry also influences online learning implementation: 'Because of its geographical characteristics, mining should be one of the main target industries for development of new remote technologies for training delivery' (National Centre for Vocational Education Research 1998).

The actual implementation of online learning in industry settings is poorly researched (Garger 1999). Thus, this research project was designed to investigate those factors that might contribute or impede the effective implementation of online learning in an organisation using the Queensland mining industry as a case study.

## **Background to the Study**

An initial meeting with the Queensland Mining Industry Training Authority Body (QMITAB) revealed an interest in researching the issues perceived by the industry as relevant to the implementation of online learning. The QMITAB wanted to know the perceptions of opportunities and benefits of online learning and factors that may influence the successful implementation of online learning in the mining industry.

The QMITAB was aware that the push for online learning is part of the general sense that 'everyone is doing it' and that there could be some cost savings for training. Members were also motivated by the lifelong learning objectives of the 'University for Industry' project in the U.K. This project reflects Stephenson's (1998) ideas of providing for the need for individuals to have opportunities 'to develop their capabilities continually throughout their lives, to maximise their

potential to keep themselves in employment, and to contribute to the [nation's] economic success' (Hillman 1997). Providing the opportunity for learners to access relevant online resources, to identify learning needs and negotiate learning online could assist in workers' control or empowerment of their learning to develop their capabilities (Hase & Kenyon 2000).

The QMITAB was aware that there have been isolated attempts at implementing training using multimedia CD-ROMs provided by commercial companies (e.g. Caterpillar equipment) and some private providers. They were also aware of many problems experienced with this type of computer-based learning, for example, irrelevant content, high expense of course development and maintenance, difficulty in updating CD-ROM based information, and the lack of familiarity of workers using computers for learning. However, there was also a view at the QMITAB that online learning could save training costs and encourage more inclusive workplace processes for workers in isolated areas who work long shifts with little time for training.

This study aims to determine the factors important to the effective implementation of online learning in a dispersed industry, using the Queensland mining industry as a case study of a dispersed industry dependent on practical knowledge and skill development. 'Online learning' is best defined in terms of learning activities presented through Internet technologies that encourage learning experiences rather than as just a way to deliver information (Alexander & Boud 2001). However, 'online learning' was defined for the participant (if they asked) as 'learning using computers, including the Internet', as it was anticipated that this would encourage them to reflect on their experiences with any computer based training and learning, particularly as it was known that this was largely a 'greenfield' site for Internet based learning.

Perceived constraints and opportunities for implementation of online learning discussed by industry stakeholders and the recommendations they made for effective implementation of online learning are provided in this paper. These factors contribute to a model of effective implementation of online learning in the mining industry.

## **Methodology**

Grounded Theory (Glaser and Strauss 1967) was used for this study as it is a well-established inductive process for developing a theoretical model from the concepts emerging from the field data. Constant comparison of concepts emerging from the data, looking for convergence of ideas and interviewing people who could provide possible divergence or explanations for divergence, and theoretical saturation are the essential components of the Grounded Theory approach. Convergent interviewing (Dick 1998) was used to support this approach. Further model development will be based on a comparison of concepts emerging from interviews and case studies of online learning implementation in workplaces.

## **Interviews with Stakeholders**

Mining personnel across a range of stakeholder groups were approached inviting their participation in a combined Southern Cross University and QMITAB project investigating online learning implementation. Initial interviews were used to identify other possible interviewees on the basis of the data obtained with the guiding principle of seeking possible disconfirmation. Saturation was reached when no new data was being obtained despite having sought out very different sources. Interviews were undertaken in person and on the phone. Extensive notes recording the main ideas were made at the interviews.

Thirty-two mining personnel were interviewed across two Queensland mining sectors (coal and metalliferous) including mine workers, supervisory staff and managers, industry based trainers, Technical and Further Education and Training (TAFE) teachers, private training providers, online material suppliers, QMITAB and government departments. Online learning is not established in the Queensland mining industry. Most of the sites surveyed have had limited past experience with multimedia CD-ROMs (usually only 1 or 2 packages) and only one site is using Internet based training. Another Australian mining company site using multimedia CD-ROMs extensively in Indonesia and a N.S.W. TAFE teacher using online learning for mining staff were also included for comparison.

The interviews included representatives from the Australian Qualifications Framework (AQF) for the mining industry:

- AQF2 Operators
- AQF3 Senior Operators
- AQF4 Deputies
- AQF5 Managers
- AQF6-8 Senior Managers

Using convergent interviewing the initial probe question was: 'The mining ITABs are considering the implementation of online learning in the mining industry. What do you think of this idea?' A further question was asked if the respondent needed some further prompting: 'What could be some of the opportunities or problems of online implementation in the mining industry?' Later interviews asked these opening questions but additional more focussed questions based on the emerging ideas were also asked as part of the comparative analysis. The interviews were coded as soon as possible after interviewing in 'QSR\*Nudist' (QSR International Pty Ltd) with associated memos.

## **Main Factors for Implementing Online Learning**

Following analysis of the interview data seven main factors emerged as important to the respondents for implementing online learning in the mining industry. These were:

- External Factors-Competency Standard Compliance
- Corporate Priorities
- Organisational Structures
- Organisational Culture
- Learning Opportunities
- Learners' Needs
- Online Learning Environment

Furthermore, 87 concepts were identified under these main factors. Collectively these factors and concepts contribute to the developing model of effective online implementation. Figure 1 illustrates a model developed from these main factors and the relationships proposed between them and online learning. The relationships between these factors and concepts will be further developed as more data is compared from the literature and if more interviews are required to clarify emerging issues. In this paper, the main issues described under these factors and recommendations from the respondents will be discussed. The particular opportunities and barriers for online learning implementation described under these main factors reveal the

issues that are relevant within the context of this industry. Some of the differences in expectations within the industry are also described, which reveal the need for planning before implementation and the need to have a process in place to align these expectations during the planning stages (Hase & Ellis 2001). Further papers will discuss the relationships between these factors and the main issues emerging from this study that will contribute to an understanding on online implementation in the mining industry.

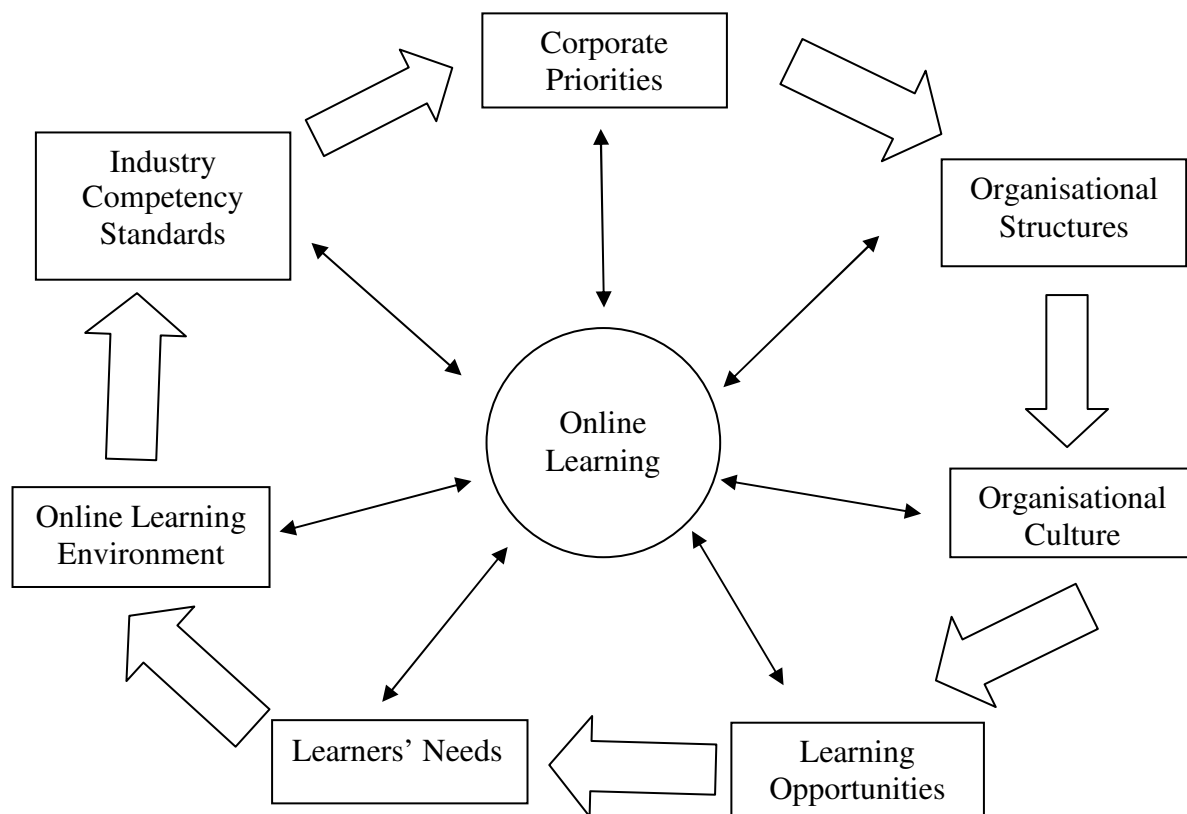


Fig. 1: Factors Important for Implementing Online Learning in Queensland Mining Companies

### External Factors: Competency Standards Compliance

Respondents confirmed that online learning would have to be compliant with industry competency standards. However, there were different perceptions of the role of online learning implementation in the competency compliance process. With the move to workplace training and assessment and the economic downturn in some mining sectors, training staff had been reduced and training material production had declined or not necessarily mapped to training package competencies. Some respondents did not view implementing online learning as an immediate priority for the industry except to use the Internet for distributing information about training packages, changes in legislation and maintaining administration of these competencies. Others viewed that online learning could be a part of the compliance process for knowledge competencies, particularly for supervisors and managers.

### ***Opportunity for Standardising Materials***

The high volume of staff movements within and across sites, across shifts and changing procedures require centralised operation methods to be communicated and updated. There was confirmation across respondents that online learning offers the opportunity to standardise procedures across the industry, adding consistency, maintaining quality and reducing communication of unsafe procedures.

### ***Relevance of Online Learning to Learning Practical Skills***

Respondents grappled with the different competency needs of supervisors and mine workers. As competency based training involves ‘demonstrating that you can do something’ (NMITAB interview), some respondents viewed online learning as irrelevant for learning Levels 2-3 operator skills. Although there was divergence in opinion whether operator knowledge could be learnt online, it was agreed that skills would have to be practiced and assessed in the workplace. Some plant and equipment operator jobs involve the use of computer controls and operators and trainers with some experience of CD-ROM training expressed support for initial (or revision) online operator training. The ‘high cost of failure’ in the industry in terms of injury and equipment costs, underpin this view. There was general agreement that Levels 4-6 knowledge based competencies could be learnt online, although some workplace learning and assessment would be required.

### ***Online Assessment of Knowledge and Skills***

Concern about online assessment of competencies focussed on the need for practical demonstrations of skills on-the-job and the security of assessment online. Viewing online learning as a part of the training process with formative online assessment and workplace summative assessment of competencies was the ‘experienced’ online site model and proposed by some trainers and managers.

Assessment security, in terms of cheating was a concern for managers in particular. They are legally responsible for competency compliance and accidents occurring due to workers’ inadequate competencies. Cheating occurs in face-face assessments, particularly for apprentices, as there is a ‘high fear of failure’ (Trainer interview). Any final online knowledge assessments would have to be supervised by an Registered Training Organisation or supervisor. The threat of sacking, using passwords or video recognition were also suggested as remedies.

Assessing Generic Induction (OH&S) competencies online is being currently trialed, particularly for the retesting process every two years. All mine workers have to do this testing and the industry is looking at reducing costs. Except for practical First Aid and Fire Fighting skills the General Induction test is based on ‘intellectual competencies’ (Private Provider interview). Assessment security was also an issue for Generic Inductions as workers have to achieve 100% to pass and a password system was used.

*Recommendations* included the need for:

- Using Internet programmes to map and administer competency compliancy, link with online and other courses/training information
- Co-ordinating online learning implementation on an industry or sector basis (e.g.QMITAB): content consistency and quality, minimize duplication of development effort particularly for generic knowledge and management competencies
- Encouraging communication between sectors about online development (e.g demonstrations on ITAB Websites)

- Structuring courses based on competency standards
- Meeting computer literacy competencies in training packages
- Integrating online learning activities with online formative assessment and workplace practice and assessment to achieve competencies.

## ***Corporate Priorities - Organisational Culture***

### ***'The Bottom Line'***

Most of the respondents mentioned that effective online implementation depends on management's priorities for training, the needs and costs of training and relating these to online implementation. Workers and trainers were critical of management viewing training as a legislative requirement rather than valuing training for the employee's learning needs. Some trainers expressed disappointment that a 'life-long learning culture' was not promoted by management. In particular, insufficient support or commitment for training programs was described as a barrier to implementing online learning.

Employees perceived mining management as primarily concerned with productivity, training costs and cost effectiveness. Employees and trainers questioned management's evaluations of the real costs of current training methods, in particular, 'hidden costs' of taking experienced workers off the job to do workplace training and assessments and flying staff to main centres for training. They confirmed that online learning would need to show an increased return on investment to be implemented by managers.

In contrast, managers provided a positive profile of their training programmes, and described various roles for online learning, particularly for Levels 4-6. Managers expressed an awareness of the limited time available for training and mentioned the need for cost efficiency as a priority for decisions about online implementation. Maintaining production was considered vital with training time not coming before production priorities.

### ***Strategic Planning for Online Learning***

It was reported that previous implementation of CD-ROM based training was usually dependent on the motivation of an individual and was not often part of the company training strategy. Although there were reports of some success with these programmes, most were discontinued when the person responsible for implementing the program left or the content became out-of-date and management considered it too expensive to update.

As employees also reported that mining industry strategic plans are very linear, structured and focussed on measuring training in terms of productivity, they were described as unlikely to be changed for online learning unless it complements existing goals or is perceived as providing a solution to a corporate objective.

*Recommendations* included the need for:

- Company strategic plans to include online learning as part of the training process
- Evaluating existing training methods effectively, including 'hidden costs' (e.g. one-one workplace training, classroom, writing training manuals)
- Evaluating short and long term costs and benefits of online learning (e.g. hardware costs, computer literacy benefits, more independent learning).



## **Organisational Structures**

### ***Work Environment: Computer Access***

Physical conditions at mine sites were described as dirty and hazardous, with computers not part of the workers' main job and access to computers limited at some sites. Workers work 12 hour shifts (4 days on, 4 days off) and could be too tired to learn after work and often live in temporary housing without computers. However, this movement of workers also means that the computers at the site are accessible on a shift basis.

Sites (within and between companies) varied in the access to computers and the Internet relating to the type of work carried out and management priorities for the supply of computers and the Internet. Access to computers was also determined by jobs with Levels 4 and up being supplied computers for administration work, plant operators using computers for their job and equipment operators using non-interactive computer controls on the vehicles. Most administrative tasks, for example, ordering stores, clocking on-off, entering daily production statistics have to be done by most workers through computers in the central offices. Computers and the Internet were also available for administration work in special dust controlled underground offices at one site surveyed.

### ***Policies and Procedures to Support Online Learning***

Managers using online learning emphasised the need for strategic planning that provides for support of online learning as an integral part of the training process. For example, providing access to computers, networks and the Internet, providing rostered time for training (including online learning) with mentor support and developing online packages relevant to employees learning goals and expectations. In particular, the value given to training and the training time made available were seen as relevant to online learning given the need to remove workers from their work.

### ***Need for Awareness of Online Learning***

A lack of awareness by mining managers of what online learning involves was confirmed by trainers and managers using online learning. Trainers suggested a 'roadshow' or a sample online unit be provided by the QMITAB to demonstrate to managers the types of resources available and benefits that may be relevant for the industry.

*Recommendations* included the need for:

- Technology resourcing plans to be developed (e.g. availability of new computers, software and Internet)
- Worker training plans to be provided that include computer literacy skill development, if relevant
- A greater awareness of online learning resources available and being developed (e.g. talk with those who are doing it)
- Determining a balance of appropriate learning delivery to achieve training goals (e.g. providing access to online learning with workplace learning and assessment).

## **Learning Opportunities**

### ***Different Learning Context***

Advantages of online learning were expressed mostly in terms of it potentially offering a different learning environment and how this could benefit workers. Middle managers

confirmed that online learning could challenge and improve existing training. It challenges classroom based delivery models by offering more self-paced learning alternatives for learning and provides a richer interactive learning environment compared with learning from text. Trainers also described how online learning and formative assessment could complement existing one-one workplace instruction.

### ***Time to Train: Independent Learning***

Current training practice usually involves a more experienced worker demonstrating skills and supervising a worker until they can do their job unsupervised and are assessed as competent. Training times also depend on the availability of the experienced person or the availability of a group for off the job training. Online learning was confirmed by trainers and managers as enabling people to do at least some of their training without constant supervision.

### ***Flexibility: Just-in-Time Training***

Workers, trainers and managers confirmed that providing immediate physical access to online learning as needs arise in the workplace, could offer a convenient and efficient training opportunity. For example, if a worker needs to revise a procedure on-the-job, goes on holidays and misses scheduled training, breaks a rule, or when they need to learn to do something new on-the-job. As equipment needs to be assembled underground and workers are trained underground, supervisors described how workers could look at procedures online near the equipment and be more confident before they use the equipment or to revise a procedure on-the-job. Currently training manuals must be carried underground which are heavy and cumbersome and often difficult to read.

### ***Flexibility: Off-the-Job***

With the move to workplace learning and a change to longer shifts there has been a decrease in formal time allocated to learning. While managers discussed the company's training plans and rostered time for training, they only mentioned Levels 4 and up accessing learning in their own time. The two sites with online learning also have set times allocated for training but employees can learn online in downtime at work or at home. However, workers are given explicit incentives to do this such as being provided 'time off in lieu' or overtime for undertaking online learning on their rostered day off or recognition for training through the pay or promotion systems for competencies achieved.

### ***Responsiveness to Job and Procedure Changes***

Respondents suggested that industry and job requirements are changing with competency compliance, use of contract workers and procedure changes. Being able to make changes to information and distribute relevant training quickly throughout the industry online was suggested by a wide range of respondents. Maintaining currency of training materials as jobs change has been a problem in the past that has been overcome at a site using online learning.

### ***Online Content Opportunities***

Many respondents provided suggestions for online content implementation based on their past experience of computer based training, demonstrations of online or perceptions of need for training. For example, generic inductions, reading literacy, computer skills, communication skills, operation procedure theory, administrative systems and safety management. Some of these suggestions were for providing information online rather than structured online learning. However, a link was provided by respondents between workers accessing information through the Internet (or Intranet) and developing computer literacy skills that would assist with online learning.

### ***Online Learning Tools Opportunities***

For example:

#### **Simulators**

Some workplace situations require use of remote controls and it was suggested that these controls could be attached to computers for simulation learning in preparation for the field. Standardising procedures, reducing the 'high risk of failure' in the field and providing just-in-time learning were described. The success of simulations depended on quality of the product, how well it simulates controls, provides feedback and emulates real working environments.

#### **Virtual Reality-Scenario Testing**

There is an awareness of virtual reality being used in other industries with high risk factors (e.g. pilots) and the high cost of developing these programmes. The novelty value of these programs were seen as potentially encouraging workers with no computer experience to try out the programmes. As videos of hazardous conditions are used successfully for scenario testing in OH&S classroom training, online scenarios with online interactive feedback were suggested.

### ***Trainers Skill Development***

Private providers were often described as the motivators for introducing CD-ROM-ROM based training. Concerns with quality of online training providers, the need for providers to work closely with industry and to be responsive to requested changes were stated. With development of Internet based administration systems, many sites have IT people who can assist with online course development or support. Some trainers and supervisors expressed a desire to develop their own online courses that will be relevant to workers' needs, contain site specific information and can be easily updated. They wanted to learn basic Web authoring skills and would study in their own time if there was support from management for online delivery.

*Recommendations* included the need for:

- Considering alternative learning environments
- Providing computers on site (or in training rooms nearby)
- Providing scheduled training times, including online learning
- Allowing just-in-time training times with online learning
- Providing incentives for self-directed learning out of work-time (promote life-long learning concepts)
- Providing computer literacy training, (e.g. mentoring on-the-job, compulsory and as requested)
- Involving trainers, computer technical staff and workers in planning for online implementation ('sense of ownership')
- Providing Web skill training for trainers or developers.

### **Learners' Needs**

The barriers to online learning implementation were mostly described in terms of learners' needs for computer literacy and their readiness for more self-directed learning.

### ***Computer Literacy-Reading Literacy***

Computer literacy issues and related reading literacy issues were mentioned by most respondents. There is a general perception that computer literacy is low for operators, with age and work experience being factors. Older workers were less likely to have computers at home and felt intimidated by the younger workers' computer experience. However, older workers reported feeling frustrated that they can't use computers and would like the time to learn how to use them. Computer illiteracy is also impacting on the day-to-day use of computer based administration systems with some staff waiting for an experienced person to do it for them. Levels 4-5 were perceived as being computer literate, although skill levels could vary.

There was an expressed need for learning computer skills and computer competencies are a part of the Black Coal Training Package (not Metalliferous or Extractive) but there were few training processes in place. Some managers and trainers reported doing TAFE computer classes in their own time and trainers have tried mentoring programmes successfully. However, few courses are available in regional centres and online learning was considered a possibility.

A wide range of reading and numeracy skills was reported with some very low levels (Year 2). Three sites (all using online or CD-ROM based training) reported doing pre-employment basic reading skills testing. There was concern that online assessment would discriminate against those with lower computer or reading literacy levels, as in face-face assessment scribes and readers can be used and the assessor can ask for clarification. Others considered that online assessment has the potential of overcoming literacy problems by using visual stimuli and interaction.

Despite computer illiteracy problems there were reports of successful use of multimedia CD-ROM training, particularly at the overseas site where reading literacy was also a large issue. The novelty value of these packages, use of visuals and drag and drop navigation contributed to their usability. The site using online learning has many apprentices or tradesmen who are computer literate but they also aim to make the program simple to use with pictures, diagrams and simple text.

### ***Self-Directed Learning***

Using online learning just-in-time during work-time when a worker has downtime or at home requires workers to be directed to work unsupervised or to be sufficiently motivated to work unsupervised. There were concerns that workers may not have this motivation to learn unsupervised. It was considered that Levels 4-6 would have this motivation for promotions and for operators it would depend on their just-in-time needs for a job or promotions. Apprentices and tradesmen at the site using online were very keen to do the online learning in their own time for pay advancements and promotions. Trainers described an implicit aspect of motivation with workers being reluctant to admit they don't know something, particularly in front of their work mates. Online learning was seen as possibly assisting with this workplace culture by providing an environment where it is 'safe' to make mistakes and become more confident through online assessment tasks as formative learning before going into the workplace.

Providing a 'sense of ownership' of the courses and computers was considered important as a motivator. Including relevant and site specific information and visuals (including of workers at the site) has encouraged workers to use online courses. There has to be a sense that 'I need

to know this.’ Developing this attitude is important if computers are to be unsupervised as there was concern that workers could wreck them if they were not considered important to them.

*Recommendations* included a need for:

- Access to computer infrastructure
- Awareness of individual training needs
- Awareness of company incentives to train ‘What’s in this for me?’
- Awareness of alternatives for learning
- Access to relevant training, ‘Need to do this’
- Consider reading literacy levels (e.g. course design)
- Provision of a ‘safe’ learning environment
- Access to mentor during online learning (face-face or virtual support)
- Staff involvement in course design and content, ‘sense of ownership’

## **Online Learning Environment**

The educational design and navigational features of an online course were described by most respondents as relating to motivation, development costs and the effectiveness of the course.

### ***Simple Relevant Structure***

Developers and providers of online courses promoted simplicity in layout and a structure relevant to workers’ needs. The two online courses examined used the training package competencies to structure and access the course content making it immediately relevant. Using site or industry specific visuals and examples encourages this relevance. Both courses were designed for the Web using HTML in simple templates that were not expensive to develop, easily edited and updated.

### ***Valid Content***

Content must be correct and relevant to industry and workers’ requirements. This requires industry involvement in the development of the course and checks on the correct content and procedures.

### ***Levels of Understanding: Self-Paced Learning***

The amount of content and concepts being taught must be appropriate for target workers. An advantage of online learning was described as being able to select the content on a needs basis; more experienced workers could select relevant content, less experienced could use a more structured step-step approach. Providing small blocks of relevant text was also considered important due to the pressures on training time and the abilities of some workers to focus on learning. Providing formative assessment for each unit was valued.

### ***Limit Text, Use Visuals***

Due to the general lower reading levels, past problems with reading large amounts of text on screen and the need to demonstrate practical tasks, there were recommendations to minimise text and to use relevant visuals. Using voice-overs has been successful in some packages providing interest and assisting with reading problems. A ‘drag and drop’ system for navigation rather than text based instructions was recommended as there is experience with these in the industry with reports of ease of use, including those with computer illiteracy.

### ***Learning Styles***

Being able to cater for different learning styles in training was considered important by trainers. Providing a mixture of text and visuals and being able to cater for individual workers needs was described. Some people not being able to read or learn from a computer screen was also suggested as a problem that needs consideration.

### ***Interaction: Mentoring***

Providers and trainers mentioned online discussion as a learning tool. Workers using the Level 4 online package are using asynchronous online discussion to discuss workplace issues with other students and to ask the teacher questions. Interactivity was not mentioned by other managers and workers probably as most respondents have experience of CD-ROM training where interaction is not possible. There were reports of operators regularly using email to communicate with supervisors' offsite and supervisors and managers regularly using email in their job. As there is a perceived need for learners to have support from workplace experts, either in person or virtually, interactive discussion should be built into the design of online courses.

*Recommendations* included the need for:

- Valid content (correct content and procedures, quality checks)
- Site specific content (or related site) is included (relevance)
- Content must be easily updated or edited
- Relevant course structure (based on competency standards)
- Short, relevant blocks of information
- Relevant use of visuals aids
- Reading literacy levels (use of language, jargon) to be considered
- Material designed for use on the Web (not uploading of text resources)
- Allow self-paced learning (user can select information they need)
- Include interactive discussion, mentoring support (face-face or virtual).

## **Conclusions**

This case study has identified a number of factors that appear to be important for implementing online learning in the mining industry in Queensland. Most importantly it indicates the complexity of views and issues that relate to online learning by researching the views of a wide variety of stakeholders. There are individual differences in expectations and motivations within and between sites and there are areas of convergence and divergence about the possible opportunities and barriers to online learning implementation within the industry. It reveals that implementing online learning in a dispersed industry is not a simple process of introducing an online package; it involves an understanding of existing corporate goals, organisational culture and structures, training goals and practices, learners' needs, different learning opportunities and the support processes required. Understanding the dynamics between these factors and the priorities within an industry contribute to the decision making processes about the relevance and possible role of online learning.

The awareness of the features of online learning varied throughout the industry and there is a need for dissemination of accurate information about what is available so that effective decisions can be made. 'Online learning' was defined by the respondents mostly in terms of

online content being delivered through the Internet and Intranets with some reference to virtual reality and simulation. However, the range of potential online learning activities described was limited with the focus mostly on content delivery and formal assessment. There was diversity in the expectations of employees, management and trainers which also raises the need for a process to discuss these expectations within the industry for effective implementation. The process of recognising these expectations and encouraging communication during the planning and implementation stages seems crucial if online learning is to become established as part of an organisation's learning strategy. The implementation process needs to involve all stakeholder groups to develop a relevant online learning strategy and ensuring alignment of expectations and needs prior to implementation (Hase and Ellis 2001). The ways online learning activities can be used for learning in different contexts within the industry also needs exploring.

Understanding the relevance of online learning to the practical outcomes focus of competency based assessment has also been raised in these interviews. In particular, the need to be able to demonstrate skills and knowledge in the workplace challenges the implementation of online learning and assessment. In particular there seems to be uncertainty that online learning will prepare mine workers for the practical skills they need on-the-job. However, online learning was also viewed as potentially providing a 'safe' environment to learn from experience (Alexander & Boud 2001) by learning knowledge and practicing skills that can be hazardous or involve very expensive equipment on-the-job. It was also viewed as a safe 'socio-emotional context' (Alexander & Boud, p. 8) to practice knowledge and skills independently without 'looking like you don't know what you are doing in front of your mates'. These factors are described as important for implementing online learning but online learning can also be viewed as a way to influence the learning culture in the organisation.

Many of the barriers described for implementing online were part of a larger problem described in terms of the organisation's culture not valuing learning (particularly the time needed) or not being flexible enough to change to include new innovations in corporate planning or training strategies. Many of the opportunities of online learning were seen to encourage a different learning context with a greater focus on learner needs. There is a need to examine the possible role of online learning implementation in relation to developing a 'learning culture' as discussed by Rosenberg (2001). It seems important to ask, 'Do organisations need to be prepared for online (Smith 2000) or can effective online learning be implemented that encourages new learning contexts for organisations?'

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