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Evaluating empowerment and control of HE e-learning technologies in a secure environment

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ABSTRACT

With the increased spread of HE distance learning into a wide variety of contexts it is important for us to understand the factors involved in its successful deployment for students. E-learning has a great potential to support effective and empowering HE distance learning (Wilson, 2007; Adams, 2005; Hughes, 2005). However, within two secure environments, prisons and health service, the factors involved are complex. This paper reviews HE e-learning technology perceptions within these two contrasting contexts from 225 students' and stakeholders' perspectives. Previous research has detailed literature limitations on obtaining students' perspectives of e-learning (Conole et al, 2006). These limitations are compounded when other stakeholder perceptions are not integrated (Sun et al, 2007; Adams et al, 2005; Millen et al, 2002). This paper developed and applied an e-learning framework for student and stakeholder perceptions. This social psychological framework, is based on previous practice based e-learning studies and is used here to synthesise two large-scale case studies. The framework focuses on three concepts learner Access (e.g. learning design, technology design, physical access), Awareness (e.g. of resources, their usage and support for e-learning tasks) and Acceptability (e.g. trust, privacy, aesthetics, engagement). Students' and stakeholders' perceptions identified high levels of students' empowerment through e-learning whilst still requiring a further pedagogical tailoring and an awareness of support. However, serious problems within these contexts have identified blocks to e-learning through stakeholders perceptions and fears of acceptability (i.e. issues of risk and trust). Ultimately, through understanding competing perceptions and needs within these complex environments we can support the effective technological development, pedagogical design and deployment of e-learning systems.

INTRODUCTION

The importance of identifying students' perceptions of e-learning applications although complex is paramount to their success (Conole et al., 2006). Previous research, however, has concentrated on students within traditional HE situations. Work-based and informal distance learning has increased factors impacting on student satisfaction. Recent health service studies identified the potential of work-based e-learning to increase student perceptions of professional empowerment (Adams, 2005). Wilson (2007) identified motivational aspects of e-learning in prison education. Hughes (2005) found that distance and higher education prison students were empowered by their ability to take more control of their lives. As well as being more qualified, their ability to overcome study barriers provided them with life skills for their release.

Ultimately, however, we do not learn in isolation but as part of and within a social context. We learn to develop ourselves as part of a community whether that be work, home or leisure communities. Social practices and structures can shape how we learn and, in turn, who we become (Lave & Wenger, 1991; Wenger, 1998). Technology in the form of e-learning systems traverse distances, organisational and social structures (Star & Griesemer, 1989). However, it is the social, economic and governance systems in which technology are embedded, which is of growing importance, not the technical artefact itself. Ultimately this means that we need to understand e-learning within the contexts that our students are learning. Within the e-learning domain there is an ever growing grey line between what students learn as individuals and the impact of this on related communities. For practice based e-learning context the balance between individual and organisational learning is blurred further. Within a prison setting an individuals learning can impact in varied ways on both the prison system and society. The impact of elearning on organisations and communities has produced a growing need to understand and control these developments.

Internationally there is a growing tension between centralised and local governance of e-learning systems. This paper presents two large-scale studies of contrasting e-learning programmes within the Health and the Prison domain. Within the health domain despite having a national centralised structure e-learning systems are frequently governed by local health 'trusts'. This is also true within the prison service that although governed by national centralised polices, e-learning systems are effectively managed in a very de-

centralised manner. Centralised initiatives seek equal opportunities for learning, evidence based medicine and rehabilitation through learning. However, local security imperatives frequently clash with e-learning initiatives. It has been unclear, however, if these clashes are always due to security issues or emotive responses to poor awareness from those locally governing e-learning deployment. We review the tensions in these two developing e-learning programmes and discuss potential solutions to these problems.

BACKGROUND

Within the e-learning context the Vygotsky theories of development (Vygotsky, 1978) have been used to merge social and cognitive theories of learning in technology design (Crawford, 1996). Understanding both cognitive and affective responses to games have also been useful in the design of games for immersion, engagement and presence (Laurel, 1990). Ultimately student e-learning satisfaction relies on a complex interaction of different socio-psychological factors. Sun et al (2007) argued that students' e-learning satisfaction related to multiple contributing factors (e.g. computer anxiety, instructor attitude, course design). According to Lave & Wenger (1991) 'situated learning' theories learning within any domain is more than a formal acquisition of knowledge or information: it has a social element which is often ignored. They emphasise that learning should be about the whole person, which involves the situation and activity. Ultimately, to understand and support learning we need to understand it within the situation within which it is embedded.

However, within the health domain students' e-learning can be impeded by poor management understanding, deployment and support (Adams et al, 2005). Understanding different interacting stakeholders' perceptions can help identify the impact of competing community issues on the learner (Millen et al, 2002). Within the healthcare and prison services e-learning is embedded within the organisational structures of these institutions. This could be beneficial as a motivator for students if the organisation had a positive approach to e-learning. However, if we look back to the physical and architectural development of these two domains we can see a common thread of 'control' of learning for health and safety reasons which remains a governing ethos within both organisational cultures. Identifying these powerful governing drivers, requires us to view the emotive side to e-learning decision making both for the individual student and others within organisations. Jones et al (2004) discusses the notion of bringing passions back into the study of organizations to remove the idea of knowledge being thought of as an 'objective representation' or 'social construction'. Many organizational initiatives and teaching practices have a history of evoking emotive responses as the balance between creativity and standardization are maintained.

Finally, it has been argued that technology is situated within a culture which determines aspects of its use (Harrison & Dourish, 1996). Certain technologies may apply well in an environment of trust but fail in an atmosphere of distrust. Many e-learning programmes relying on educational principles of trust and sharing, which online developments have sought to mirror. Web2 technologies such as wiki's, blogs and forums seek to support the e-learning ideals of co-construction and sharing. However, we must understand how these clash with organisational cultures of control.

Linking the cognitive, contextual and emotive aspects of student e-learning perceptions in technology interactions is complex and therefore poorly researched. Relating these different dimensions directly into design also requires guidance. One way to model these could be through a set of design issues previously identified in isolation but not as design guides for engagement: Awareness (of elearning resources their application and support), Access (to the e-learning both pedagogically through design and scaffolding of the learning etc. and practically through location of the technology, usability of interface etc.) and Acceptability (from privacy and trust to aesthetics). *For example:* contextual issues (e.g. poor awareness of how an online course relates to a students own career goals), poor elearning design (e.g. low e-learning access through poor interface usability) and negative emotive responses (e.g. poor perceived aesthetic quality and engagement with the e-learning application) may impact negatively upon students willingness to continue with an online course.

METHODS

Both studies sought to review different aspects of e-learning programmes in contrasting secure environments. Within the healthcare domain the focus was on the use of technology to support information provision (e.g. digital library provision) for practice based learning. Within the prison domain the focus was on technology to support all aspects distance learning (e.g. coursework, information provision, collaboration, assessment). Within both domains students were studying at a variety of levels (e.g. from introductory to post-graduate) and there had been a growing need for online elements to distance learning to support timely and effective education.

The two contrasting domains meant different data collection and analysis procedures were taken. Within the healthcare domain recording devices, focus groups and observational studies, once ethically reviewed, were relatively easy to complete. Within the prison system using devices for data collection were more complicated and field notes were the main data source. The different data sources also impacted on the different levels of analysis. The healthcare case-study was analysed using the grounded theory method whilst the prison case-study was thematically analysed to obtain abstract concepts which could synthesis findings across the two case-studies.

A detailed set of ethical procedures (e.g. anonymised data, withdrawal procedures, consent forms) were undergone both through healthcare, prison and academic routes. The qualitative data, from both studies, was analysed using either a thematic or Grounded Theory approach (Strauss & Corbin, 1990) Study reference numbers are included for reference in quotes used in the paper.

The research questions for each case-study although concentrating on some domain specific e-learning issues had an exploratory focus:

1. The ability of e-learning technology to empower or exclude its users; and
2. The interplay between social structures, communities of practice, and e-learning technologies within secure contexts.

Healthcare Studies

In-depth interviews, focus groups and observational studies were conducted with 134 nurses, doctors, consultants, surgeons, allied health professionals, managers, library and IT employers. (see Table 1). The data was collected within the health service over a 3 year period within a rural and city hospital (and associated medical education centres), two primary care trusts and a health information provider. Computer ability, the location of computers to access e-learning information resources and the type of support (e.g. outreach librarians) ranged from ward based to library & office based..

Across all the settings four issues guided the focus of questions:

- Perceptions of the clinicians' role within the organisation, and their e-learning information requirements (for themselves or the people they supported).
- Perceptions of health service current e-learning information practices, social structures and organisational norms.
- The impact of current practices, structures and norms on e-learning information resource awareness, acceptance and use.
- Technology perceptions and how these affected the other issues already identified.

All of the interviews and focus groups (were recorded and transcribed into an anonymous format for analysis procedures to proceed.

Group	Ref .	Status & Role	No.
Provincial Hospital	St1	Nurses, Consultants, Managers, Library & IT	20
Inner City Hospital	St2a	Pre-Registration to Registered	36
	St2b	Doctors, Consultants, Surgeons, Allied Health Professional, managers & IT	37
Outer London Hospital & Primary Care Trust	St3	Nurses, Doctors / Consultants, Psychologists, Social Workers.	26
Patient Call Centre & Patient grps	St4	Health information, nursing call handlers & managers	24

Table 1: Participant descriptive data (Healthcare)

Prison Studies

In-depth & informal interviews, observational studies, questionnaires and longitudinal studies were conducted with 91 prison learners and staff (tutors, co-ordinators, education managers, heads of learning and skills and librarians). This research was conducted across 15 prisons with different structures, education providers & security levels (i.e. ranging security category, gender, public/private and computer access) across the UK (see Table 2).

The three main themes of the study were:-

- Situated Learning – What effect does their prison life have on learning and what effect does learning have on prison life.

- Support - who or what has affected their ability to study e-learning in prison
- Access - how does security and access to technology, or the lack of it, affect their learning

It was decided that a recording machine would not be acceptable in a prison setting, so field notes were taken instead.

Group	Ref	Status and Role	No
Prison OU students	St5	Prisoners doing OU distance learning courses	35
Prison Education staff	St6	OU Coordinators, tutors, education managers, librarians	29
Prison managers	St7	Heads of Learning and Skills and Resettlement staff	4
Open University Staff	St8	Associate lecturers, staff tutors, support managers	16
Government & Non-Government Organisations	St9	Managers	7

Table 2: Participant descriptive data (Prison)

RESULTS

This paper aimed to evaluate e-learning programmes within these two contexts (i.e. health and prison domain) through linking the cognitive, contextual and emotive aspects of student and stakeholder e-learning perceptions. The authors also endeavoured to relate these different dimensions directly into e-learning design and implementation issues. To do this a three tiered framework (i.e. awareness, access and acceptability) was developed using this data and previous data.

It is important to understand students' and stakeholders' **awareness** of e-learning availability, applicability for different situations, work-practices, time-limitations and how others (i.e. within their community, organisation and discipline) use different e-learning resources. Awareness can seriously impact upon users' uptake of resources in obvious (e.g. someone unaware of an application won't use it) and unclear (e.g. someone unaware of the potential benefits and time involved in learning and utilising an application may not be motivated to use it) ways.

It is essential that students are able to **access** e-learning systems i.e. that they find it easy to approach, enter or use an elearning system and the learning within. This concept is often related to traditional pedagogical elearning design, usability issues and accessibility by disadvantaged groups. However, at different levels of abstraction, accessibility can impact upon students' usage by relating to issues of technology location, authentication, system design and usability, information parameters (e.g. amount, and portability) and training.

Finally it is imperative that students and stakeholders feel that an e-learning system is worth accepting as adequate or valid; **acceptability** is often governed by social norms and relates to issues such as information and technology trustworthiness, repute, quality, aesthetics, fun and ownership, as well as social structures, perceived expertise, ethics and privacy. However, there is potential for discourse between the different levels of abstraction and over time. This can temper or inflame users' emotive strategies and thus willingness to overcome access, awareness and further acceptability issues. Redesign requires pinpointing if these are aesthetic, social norm or trust related issues.

The e-learning framework detailed above (i.e. access, awareness and acceptability) supported an evaluation of the case-studies that identified high levels of students' perceived empowerment through e-learning whilst issues of pedagogical tailoring & support were key. However, the analysis also highlighted blocks to e-learning through stakeholders perceptions of acceptability (i.e. issues of risk and trust). Initially perceived threats to information control introduced barriers to e-learning system development and deployment. Student clinicians see resources and e-learning within the workplace as an empowering tool but have serious needs with regard to support and tailored pedagogy. Senior consultants' poor e-learning system awareness results in a need to control student clinicians' information access with the web, in particular, seen as a threat to this control. Offender learners see access to e-learning as a source of identity reinvention and aid to rehabilitation. There are, however, issues of how support and e-learning pedagogy meet offenders' specific needs. Prison managements' over-riding e-learning perceptions are of security risks though lack of control. Unfortunately poor awareness of e-learning systems leads to negative over-reactions. Even a graphics calculator can be seen as a security risk.

In summary the analysis identified a central concept, relating to e-learning empowering students, across both sets of studies. However, negative perceptions of information security and control were identified as

impeding the deployment of e-learning programmes. Further analysis identified three thematic issues, detailed below, impacting on this central concept; Access: e-learning technology infrastructure and deployment, Awareness: e-learning support and Acceptability: stakeholder misconceptions.

Situational descriptive data

A comparison was made between the usage of e-learning resources by those in the health service (clinicians) with educational librarians and lecturers (see Adams & Blandford, 2005). Clinicians use markedly more off-line than on-line resources than those in academia where increasingly the web was growing in preference.

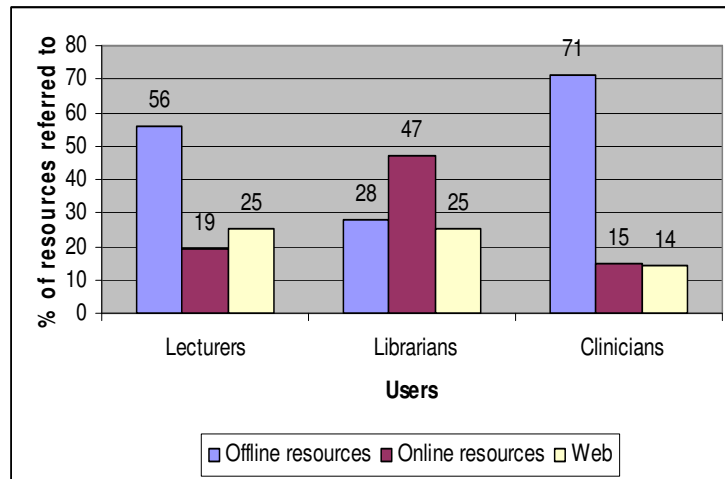


Figure 1: Percentage of distance learning resource usage by different user groups

Descriptive data was gathered regarding the reduction in access to increasingly on-line e-learning courses by prison students (see figure 2).

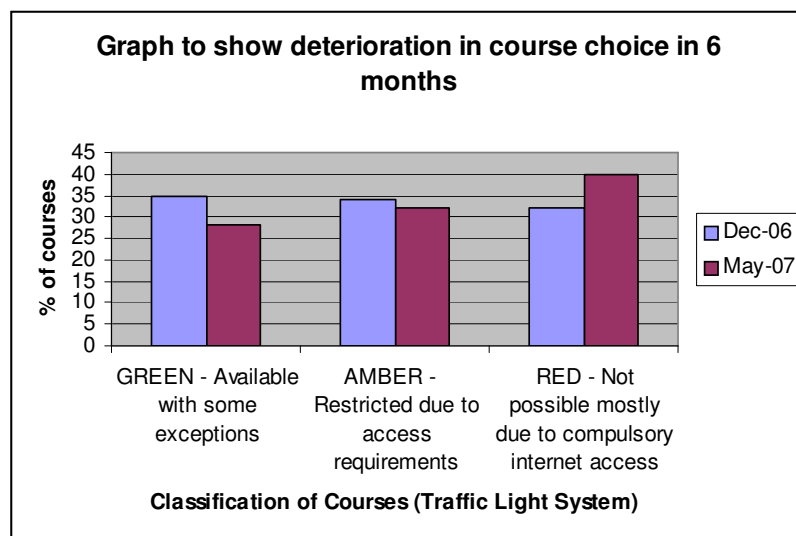


Figure 2: Percentage of e-learning courses accessible by prison students

Access: E-learning technology infrastructure & deployment

The power of e-learning programmes to transform learning and thus working practices in work based learning has had a powerful impact on many within the health profession. Junior members of staff in particular saw e-learning resource, in particular, as a route to empowerment in their learning.

‘We should be given the opportunity to learn as much as we can, be as much, be as effective as we can be for the sake of the patients’ (Pre-reg student nurse: St2a)

Prison e-learning systems also empowered students to rise above their prisoner status, develop confidence in their own ability to be a 'real' student, use their time usefully and remove themselves from the 'bad' elements around them.

'When you do have a laptop it's wonderful ... It makes you feel like you're really a student – there's no point in rehabilitating if you don't know modern technology' **(Prison student: St5)**
'I think these years will have been something that I can have done to do something good.'
(Prison student: St5)

There are, however, barriers to this empowerment and realization within prisons and the health service that these changes will take time.

'I might have to tread water for a while. I know it's coming – just mark time until it does.' **(Prison student: St5)**

'They reach for a book ... or they go and ask somebody, they don't reach for a digital resource ... it's not yet a natural part of their everyday clinical lives. And that's one of the main hurdles to be got across' **(Consultant: St 1)**

Within prisons many barriers related to security imperatives and a poor regard for education. One prison had been provided with a brand new computer room but the computers would not accept CDs due to security protocols. . Security protocols resulted in insufficient internet access limiting course choice and reducing students' ability to complete a chosen degree (< 10% of students had internet access). Prison education staff also often had inferior computing facilities to their prison staff colleagues. Prison officers were also seen to question the need of prisoners to gain degrees and even seen to resent or envy their studies. Prison Service managers and students also commented that many prison officers lacked education themselves.

'They [Prison Officers] don't like you doing OU. Some of these officers are sun newspaper readers. Do you know what I mean?' **(Prison student:St5)**

Within the health service access to the internet was theoretically higher but in practice was just as low. Although technology placed in communal work places (e.g. 'on the wards') raised users' awareness of e-learning it clashed with organizational norms (e.g. 'the workplace is a place to learn practical things not theoretical knowledge') causing some stakeholders to feel organizational structures and practices were being threatened. Senior clinicians were frequently referred to as information gate-keeper for junior clinicians. For example, some senior clinicians would rather access digital libraries on behalf of junior staff. These approaches to controlling information access were perceived as simply means of exclusion by those of lower status:

'Why shouldn't we have anything that they are hiding from us?' **(Post-reg nurse: St2a)**

Awareness: E-learning support

The healthcare studies identified that poorly designed systems, deployed to individuals with inadequate support produced a lack of awareness of technology potential. Users therefore perceived many health e-learning systems as complex and inappropriate for their needs.

'It's like being given a Rolls Royce and only knowing how to sound the horn.' **(Surgeon: St2b)**

Within the prison domain there was a low priority given to e-learning resourcing resulting in many education staff facing a dilemma of how to continue supporting students. Some prisons allowing e-learning students to be accommodated within the better funded standard education class, but not without compromise; one tutor combined Digital music and Desk-top Publishing.

'I give headphones to the DTP students so they can continue to work in a noisy environment.'
(OU Coordinator: St6)

Within one healthcare study, e-learning support (i.e. outreach librarians) implemented within the community adapting to group and individual needs, was identified as empowering to both the community and the individual. Relationships built by the clinician librarian, through technology usage and work practice development dramatically improved motivation towards online learning.

'It increases the sense that you think, I can find out the answer to this question'

(Consultant: St3)

The prison studies identified some exceptional support from dedicated e-learning staff within the university and the prison:

'They [the OU tutors] were enthusiastic and fired my imagination....It was very interesting to see the 'the real thing' in pictures instead of books. It made the subject come alive.'

(Prison student: St5)

However, many students expressed their concerns that staff were being asked to bend the rules. Copying DVDs onto CD, offering personal laptops to work on, were just a few examples. The tensions in resourcing for peer support and interactive tutor support resulted in students feeling isolated:

'No internet so I can't chat with my tutor or other students ... I'm the only one doing science in this prison' **Prison student: St5**

Acceptability: Stakeholder misconceptions

Within both domains e-learning students considered the Internet as an important aid in accessing reputable up-to-date information sources (e.g. digital libraries, academic sites). However, there were often serious Internet fears and misconceptions amongst those governing e-learning access.

Within the health domain there was a strong distinction made between Internet and Intranet resources. There was an increased perceived control of intranet resource than the Internet which threatened status by providing open access to varied information sources and the potential for abuse. In addition, senior clinicians expressed the view that junior staff members would not be able to interpret the quality of all the information available to them on web sites and in digital libraries.

'... there may be stuff in this country that is of a reasonable quality but it requires some skill to some extent to be able to discriminate. I don't have difficulty with this. I don't know how much the nurses or the junior doctors would be able to discriminate.'

(Consultant: St2b)

Within the prison service the Internet was perceived to reduce control and be a security risk:

'The prison service is terrified of Internet access for prisoners' **(Contracted education manager: St6)**

Negative perceptions about technology, however, extended beyond the Internet. In one prison an advanced graphics calculator was seen as a security threat because it was not recognized by the security officers.

Ultimately, however, within both domains as awareness and understanding increases so do peoples acceptance of the technologies

'I've seen the advantages as technology has grown but we are still growing with it aren't we'
(Specialist nurse: St1).

'Prison service and governors are becoming much more aware that on-line can now happen.'
(Manager: St9)

DISCUSSION

Within both domains the research has identified a high degree of motivation amongst students to attend and complete e-learning programmes. Many students within both domains saw e-learning as a route to their empowerment and positive re-definition of their identity whether through promotion or rehabilitation. We argue that these factors alone should motivate e-learning providers to continue to overcome the organisational barriers to developing these programmes. There are, however, many barriers to be overcome within these domains. This research identified many e-learning issues related to technology infrastructure, deployment, support and stakeholder misconceptions. Negative perceptions of information security and control were identified as impeding the deployment of e-learning programmes.

Edleson and Gordin (1996) highlighted that technology had increased the availability of information but that poor access (i.e. due to poor searching and information literacy skills) was a strong disincentive to utilise it. Adams and Sasse (1999, 2005) identified that both online and physical access restrictions impacted on end-users' security strategies (e.g. poor feedback of risk demotivated users secure strategies). Technology located within an end-user's office, and with password access provided, may allow location and authentication access but exclude further access because of its poor usability. Modelling the relative importance of access issues (e.g. usability) in relation to student engagement can provide e-learning designers with arguments for investing in usable designs.

The current study also identified problems with awareness by students of support both that of the lecturer and peers. Some technical solutions to these problems are organisational awareness applications, online alerting or support mechanisms (e.g. Adams & Blandford, 2002; Schaefer et al, 2005). However, unless designers understand the complexities of engagement these may become novel yet unused mechanisms. Schaefer et al. (2005) recently identified that end-users' poor awareness of their cognitive need for help in query formulation demotivated their use of an online DL support application. In contrast, recently research (Adams & Blandford, 2002) has identified that a clinical organisational awareness application (i.e. a corporate roll-over screen saver application) increased uptake of this resource (i.e. end-users designing their own corporate screen savers) and other applications (e.g. the use of health digital libraries and the intranet). However, the security implications of these applications have been poorly reviewed.

Previous research (Adams and Blandford, 2005) has identified that end-users (including students) cognitively trade-off privacy against other issues based on assumptions: but, when users become aware that their assumptions are inaccurate they emotively rejection the technology. If a specific e-learning application has a high acceptability (e.g. engaging and aesthetically pleasing) we may increase acceptance of poor usability, complex authentication procedures, hidden information and the likelihood of incurring privacy risks (Norman, 2004). Conversely low acceptability (e.g. for time and safety critical tasks such as patient diagnosis) may reduce willingness to deal with these issues (Schaefer, 2005). A major barrier, however, to effective e-learning deployment lies in stakeholders acceptability levels. Stakeholder fears were found to be driven by poor perceived control of the technology and what they saw as potential threats to organisational security and current practices. Many of these fears resided in inaccurate technology knowledge and potential security risks. This, in turn, highlights several problems with the importance attached by governing bodies to e-learning programme. Within the health service higher status clinicians' perceived that learning was embedded in day-to-day practical problem solving, not in e-learning programmes. Prison stakeholders were similarly sceptical about HE e-learning programmes contribution to the prisoners and their rehabilitation.

There are contrasting arguments around technology solutions for effective e-learning programmes. Meyrowitz (1985) argued that developing electronic media decreased prisoners complete segregation from society, but Jewkes (2007a), argues that even relatively 'media-rich' institutions are still isolated from the wider society. The Internet and Web2 technologies (e.g. Wikipedia, facebook) are seen by many as online e-learning programmes engaging isolated communities within wider learning societies. However, Internet security risks and practice threats (e.g. hackers, paedophiles) have led to Intranet solutions that increase stakeholders perceived control yet allow student involvement in larger learning communities.

In the internet world, physical space no longer has the same meaning. People can be whoever they want to be, wherever they are. However, in prison there is a distorted perception of space and time (Wilson & Logan, 2007) and the resulting isolation was accentuated by the lack of internet access. Within the health domain space and time is highlighted as an important learning and resource usage factor (Reddy and Dourish, 2002). However, here the vital importance of locally situated community building and learning support mechanisms are emphasised.

Conclusion

Distance learning and e-learning has a history of empowering those who are excluded from learning. However, the education and technology that supports that learning can be thought of as a threat to the status quo. Organisations respond with actions to repress and control e-learning programmes, evoking emotive responses as the tensions between organisational control and freedom of expression are revealed. We need to understand the contexts within which e-learning are embedded, to identify these problems and find appropriate solutions

for all. This paper has identified that through understanding competing perceptions and needs within these contrasting complex environments we can support the effective technological development, pedagogical design and deployment of e-learning systems.

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