

A Learning Framework for facilitating Organisational Change and Continuous Improvement Programmes – Programme Design Implications

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Abstract

A strategic framework is proposed to investigate how Technology Enhanced Learning (eLearning) can be deployed as an effective mechanism to facilitate and support continuous improvement and change management programmes within organisations. The framework supports the current drive in education to move from tutor centred approaches to learner centred approaches. The framework also takes the relevant pedagogical and technological considerations into account and implications for the design of future programmes are posited based on feedback from the current programmes.

Initially a comprehensive survey was conducted with in excess of 100 European Small and Medium sized Enterprises (SMEs) on their attitudes towards and take up of eLearning. A comparative study was conducted with Irish sites of a number high technology large multinational companies. This was followed by the development and deployment of a suite of SCORM compliant interactive standalone eLearning courses in the continuous improvement arena, more specifically in “Lean Thinking” Tools and techniques. Course development and implementation was conducted in conjunction with a selected number of high-technology large multinational corporations and progressive SMEs. A comparison of these large and small organisations was conducted using both survey and interview instruments and a series of recommendations ensued. What emerged from this phase of the research was the importance of a blended approach to the courseware, accreditation and the requirement for some form of higher level qualification underlying the learning material.

The next phase of the project focused on the development and academic approval of an online/distance education Diploma and an MSc in Quality Management: Lean and six sigma, hosted on a MOODLE Learning Management System. Evaluation has been conducted with 3 consecutive cohorts of students from industry over a 2 year period. Evaluation results have been incorporated into the framework and design guidelines for future iterations of these and other programmes are presented.

Introduction – eLearning & the importance of education for industry

In today’s global economy, the key to maintaining the competitive edge in organisations is knowledge. Knowledge has become one of the critical driving forces for business success. Organisations are becoming more knowledge intensive, they are hiring “minds” more than “hands”, and the needs for leveraging the value of knowledge are increasing (Wong, 2005). Information and Communication Technologies (ICT) that offer new communication facilities with faster information retrieval and flexible manipulation possibilities are key enablers of the knowledge economy. eLearning is at the forefront of this ICT innovation supporting the knowledge economy and has been identified as one of the fastest growing areas of the high technology

sector . However the actual uptake of e-learning in the workplace and academic environment has been a lot slower than originally predicted (Shoniregun and Gray, 2003). In "The real truth about e-learning's future," it has been claimed that in a few years "there will not be a division between e-learning and traditional learning, as learning will naturally evolve to utilise technological progress to improve learning efficiency" (Masie, 2001).

eLearning encompasses training, education information, communication, collaboration, knowledge management and performance management and assists in keeping employees' skills current to help bottom line performance. eLearning addresses many business issues such as reducing costs, providing greater access to information and accountability for learning, and increasing employee competence and competitive agility. Many organisations have also embraced eLearning as a means to ensure regulatory training (Blocker, 2005) .

However, attitudes to, awareness of and take-up of eLearning in Small and Medium Enterprises (SMEs) is significantly lower than in large organisations (Brown et al., 2004). This can be partly attributed to the differences in scale and available resources between large and small organisations. Specific reasons for the relatively slow uptake of eLearning in both large and small organisations include:

- Expectations of eLearning courses not being met (Brown et al., 2006);
- High drop-off rates from courses (Brown et al., 2003);
- Lack of organisational infrastructure (Wong, 2005);
- Poor pedagogic design of eLearning courses (Melis and Weber, 2003; Wong, 2005).

Pedagogic approaches & implications for eLearning

In order to ensure that all forms of learning including eLearning are effective, pedagogy is critically important and the most appropriate approach should be used where possible. There are four major pedagogic approaches to learning, each offering different possibilities and limitations regarding the use of technology for distribution and presentation of learning material and support of learning processes.

- Behaviourism
- Cognitive Learning Theories
- Constructivism
- Social Learning Theories

Behaviourism

Behaviourism views learning as changes in behaviour. These changes in behaviour occur as a result of the individual responding to stimuli, and the consequences the responses yield.

From an eLearning perspective - using multimedia capabilities to present learning material act as different types of stimuli, and then elicit appropriate reinforcers that are individually adapted to each student. Through this process, the level of difficulty can be increased to chain several stimuli-response patterns, and one can teach the students the correct responses to increasingly complex stimuli.

Cognitive Learning Theories

Cognitive learning theories focus on the learning activities in the mind. Learning is making sense of the world. The mind processes perceptions through beliefs and understanding, in order to give appropriate responses. Over time, facts, principles and concepts are discovered and internalised.

The Cognitive Learning theories' approach is suitable for facilitating the learning of facts and principles, and then combining these into constructs. Component Display Theory is a typical example of how teaching should be structured according to cognitive learning theories (Merrill, 1983).

Applied to e-learning, the important features would be those necessary to present the learning material on all levels, facts, concepts, procedures and principles, through sequences demonstrating the relationships

between these in several ways. The students' must also be evaluated on their performance and given the feedback they need to proceed in the learning sequence.

Constructivism

Constructivism also sees learning as construction of learning out of experience, but differs from cognitive learning theories' view of the learner. Constructivism sees the learner as an active agent, not a passive processing unit, and it sees knowledge as a personal and subjective construction, not an internalisation of external rules.

Communication becomes a key to facilitating learning. The teacher does not assist the learner to internalise predefined learning, but motivates and facilitates the learner's discovery of knowledge in co-operation with the learning environment and other students. This requires creating an environment where the student can be stimulated to think and act beyond his current level of competence. Also, the learner should be active in formulating the problems, as well as in solving them; this will be important for his motivation.

Social Learning Theories

Social learning theories recognise that different forms of learning may be explained both in terms of behaviourism, cognitive learning theories and constructivism, but places learning and the application of learning in a social setting. The key point is that learning is dependent on the social context, because individual thinking is shaped by participating actively in real situations; thus the learning must also be applied in a social setting.

From an eLearning perspective, one has to simulate a complex social setting making it as similar to the situation where the learning is to be applied as possible. This means that the students must be placed in contexts similar to the social settings where their learning is to be applied, working in a fellowship and building their competence in close co-operation. Undertaking eLearning courses has often been viewed as an isolated experience resulting in poor motivation and high drop off rates, however incorporating collaborative activities through social learning theories can help to alleviate this concern.

Student motivation. Learners as Passive vs. Active

Student motivation is of vital importance for learning. In behaviourist and constructivist theories the learner is passive in that s/he is responding to stimuli or building his or her understanding of the world according to perceptual stimuli. To motivate students and ensure effective learning, one must make available all the necessary stimuli in an optimal sequence and adapt feedback to their responses in a way that is suited to the individual learner. The sequence of the learning material is important in all approaches. But in constructivism and social learning theories, the learner is seen as actively seeking and acting in a social context, which makes motivation more important and more demanding.

European Survey of Small and Medium Enterprises

To understand attitudes, awareness and expectations from eLearning courseware throughout Europe, a survey was conducted in SMEs from five European countries: Ireland, Poland, Spain, Sweden and UK. An identical questionnaire was used in all countries, translated into local languages. The total survey comprised of 101 SMEs, selected from three different sectors; Engineering products, Food and Component manufacturers. "Component manufacturer" is defined as a company that builds their own product from their own design, so that they have a final product and an end customer. "Engineering Products" means sub-supply - this company builds a product to a customer specific design with primary business is to sell to other companies who then sell on to customers.

eLearning: CD-ROM Vs. On-line learning

The investigation about how familiar the SMEs were with on-line learning and CD-ROM based education resulted in the following:

	YES	NO	Missing
Used On-line learning	16	82	3
Used CD-ROM based education	37	62	2

Table 1: experiences with e-learning and CD-ROM based education.

For the majority of SMEs eLearning still seems to be quite “new”. The split on country and sector the information regarding the experience of using eLearning is:

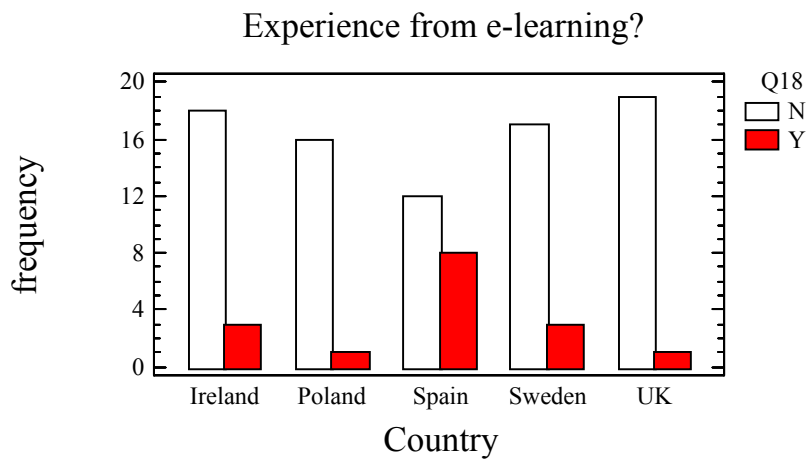


Figure 1: Experiences from On-line learning, shown by country.

Here we have quite large differences with regards to country with Spanish companies having more experience and the SMEs from UK having the least experience.

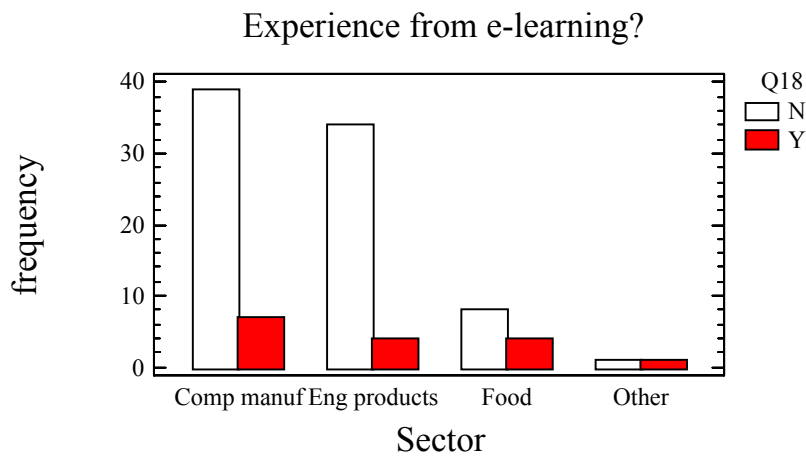


Figure 2: Experiences from On-line learning, shown by sector.

CD-ROM based educational activities were more commonly used among the SMEs than on-line learning. Apart from the UK, which was particularly low, the other countries experiences of using CD-ROM based educational activities was similar.

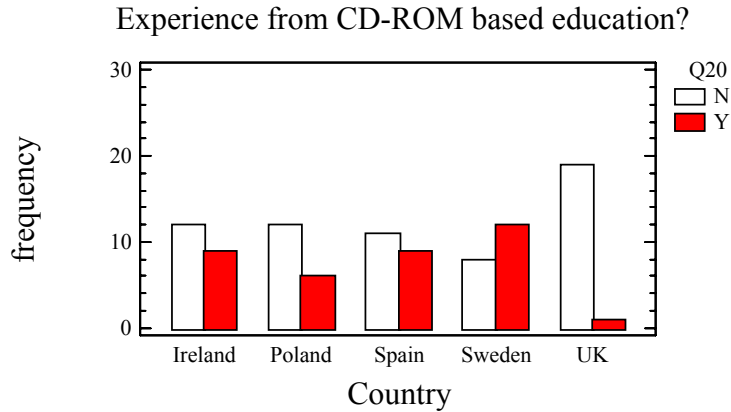


Figure 3: Experiences from CD-ROM based education, shown by country.

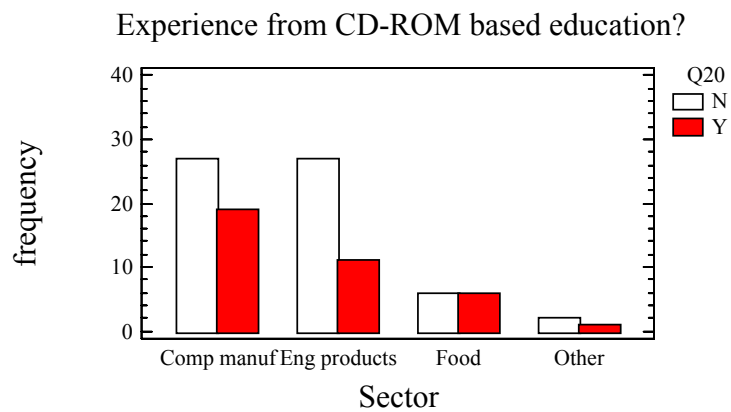


Figure 4: Experiences from CD-ROM based education, shown by sector.

The SMEs' opinion towards educational tools and activities that were using web based tools and/or PC technology is mixed. The impressions of using these tools were answered by 16 and 35 SMEs respectively and the pros and cons are virtually the same for both on-line learning and CD-ROM based education. The greatest advantages are said to be:

- *Flexibility-you could do it when you want and you don't have to follow a curriculum*
- *Efficiency - saving time and money not having to travel etc.*

The greatest disadvantages are:

- *Lack of motivation – no contact with other students, so there is no knowledge shared*
- *Demand for self-discipline – “its your own responsibility”*
- *No direct contact with teacher*
-

Regarding the use of educational tools and activities that use web based tools and/or PC technology approximately 35 of the 74 (47%) companies that responded were generally positively disposed to eLearning. Some suggest that a combination of traditional training and web/PC-based training is the best.

Sixteen (16) companies out of the 74 (22%) clearly prefer face-to-face training and when web-based training is compared with a CD-ROM the most preferred the web-based approach. The lack of a personal trainer seems to be the biggest negative factor and together with that, goes the ability to ask questions.

Courseware Development and Comparative Analysis with Large Organisations

To enable deployment of courseware on multiple platforms, A SCORM compliant suite of interactive standalone eLearning courses in the continuous improvement arena was developed, more specifically in “Lean Thinking” Tools and techniques. SCORM (Sharable Content Object Reference Model) defines the reference structure to produce e-learning content, applying standards and specifications generated by different groups of a model. This enables learning content, learning technologies and the system to communicate with each other, ensuring that standards and metrics of e-learning standards will be met. SCORM is not a standard by itself, but it is a reference model which tests and controls practical efficiency of a set of independent standards and specifications. SCORM is compliant with current and emerging standards including IEEE, IMS and AICC (ADL, 2006).

Course development and implementation was conducted in conjunction with a selected number of high-technology large multinational corporations and progressive SMEs. A comparison of these large and small organisations was conducted using both survey and interview instruments. In terms of involvement in and experience of eLearning what clearly emerged was that the large organisations are significantly ahead of the small and medium enterprises. All large organisation respondents had some involvement in eLearning and 67% have been using eLearning for some time (greater than 5 years). This compares to only 20% of the SMEs that have had any involvement in eLearning. Both the large organisations and the SMEs indicated that there were a number of benefits and pitfalls to eLearning being effective learning. Both groups still considered face to face training as being more preferred in terms of effectiveness than eLearning but all agreed that eLearning would be an integral part of the future of training.

The primary barrier from the large organisation perspective was the delivery environment. 28% were concerned that courses delivered to the desktop were not as effective as those that were undertaken at a dedicated learning centre because of motivational issues and interruptions. The primary barriers from the SME perspective again included the concern about lack of personal motivation when left to complete courses on their own but even more so was the lack of immediate response to questions and trainer interactions. Within the large organisations, there were significant differences to the response that eLearning is the most important development in training in our lifetime with 42% somewhat agreeing, 29% somewhat disagreeing and 29% disagreeing totally.

Both groups agreed that eLearning courses are more effective when undertaken in a dedicated learning centre as opposed to being delivered to the desktop primarily due to a lack of motivation when left to undertake the course on their own. Cost is always an issue for the SME; Cost is currently not the most important concern for the large organisation but will be vital in the future. The consensus among both the large organisations and the SMEs is that eLearning is more effective when combined with traditional forms of learning and that the future lay in some form of “blended learning” solution. This has also been borne out in the literature by a number of commentators (Brown et al., 2006).

Based on feedback from participants and companies that engaged with the first phase of the project, the next phase was the development and academic approval of an online/distance education Diploma (level 9 NQAI special purpose award) in Quality Management: Lean Systems. The design of this programme was based on a combination of inputs. This included feedback from the validation and testing of the lean courseware from industrial students who had undertaken the courseware and feedback from training, learning and development and continuous improvement specialists and professionals (i.e. the phase 1 research).

Further data was gathered through implementing the programme with 4 consecutive cohorts of students from industry (in excess of 100 students) over a 2 year period (2006-2008) and a series of in-depth case studies are currently underway with 2 large and 2 small organisations. Best practice in Technology Enhanced Learning for those in the workplace is outlined in the next section, more specifically what works and what does not work from both technological and pedagogical perspectives with a particular focus on the differences between large organisations and SMEs.

Iterations of the Framework and Design Guidelines

The primary outcomes from this phase of the research included the importance of a blended approach to the courseware, accreditation and the requirement for some form of higher level qualification underlying the learning material, as outlined in figure 5, the proposed framework.

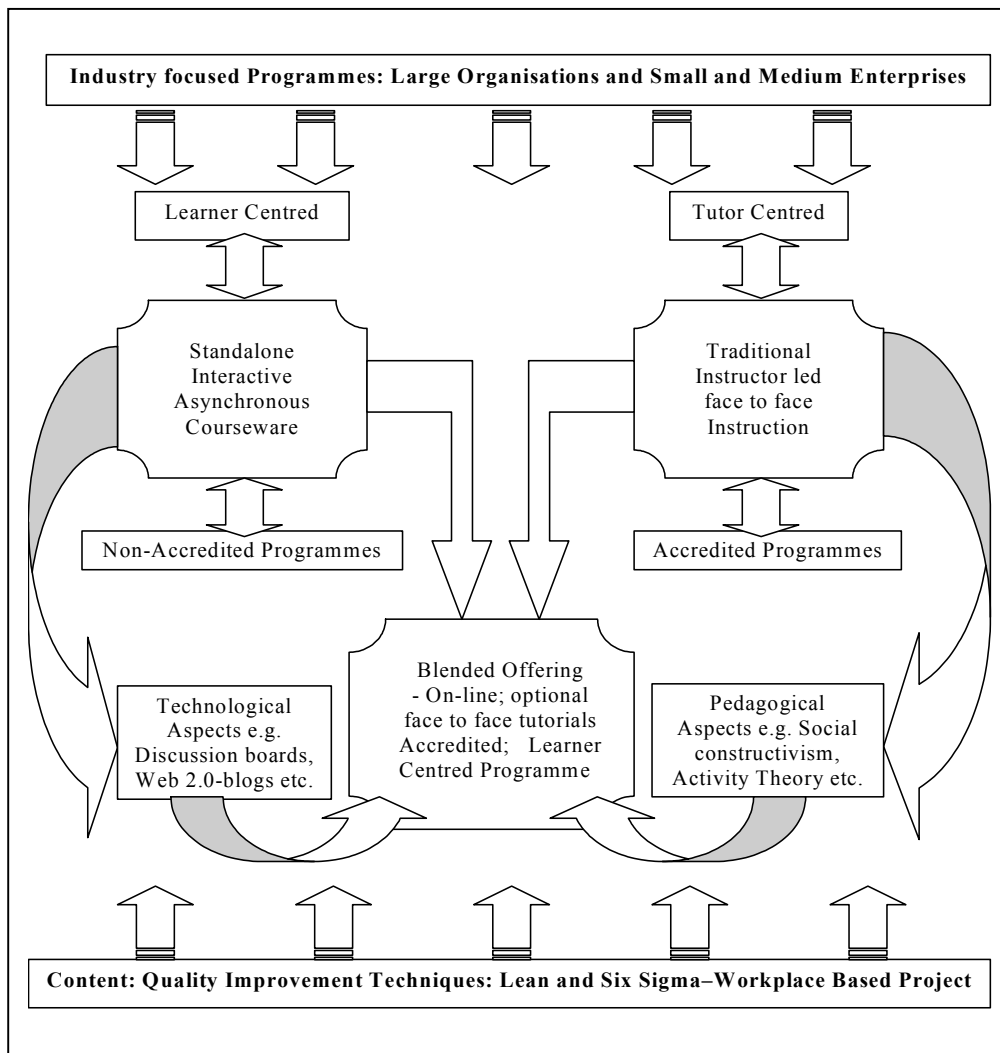


Figure 5: Proposed framework as to how eLearning can be deployed to support continuous improvement programmes within organisations.

Summary design guidelines incorporated in the iterative framework are outlined below:

Iteration 1: Stand-alone Asynchronous Courseware

- Context sensitive content
- SCORM Compliant
- Instructionally Designed Material
- Engaging Media rich material
- Self paced learning tool
- Self assessment to monitor student progress
- Accessible over the internet or off-line via CD ROM
- 100% eLearning material

Iteration 2: Courseware integrated into a University Accredited Diploma –Version 1

- Context sensitive content
- Blended Solution – combination of online and face to face
- Strong emphasis on Instructional Design for self study Material
- Deployed on custom-developed Learning Management System
- Peer supported learning activities – online and off-line (non-mandatory)
- Practical application of the courseware in a Workplace based project (single most important element)
- Assessment – Examination, Assignment and Project

Iteration 3: Courseware integrated into a University Accredited Diploma –Version 2

- Context sensitive content
- Blended Solution – combination of online and face to face
- Strong emphasis on Instructional Design for self study Material
- Deployed on Open Source Learning Management System (MOODLE)
- Peer supported learning activities – online discussion boards (mandatory – 20% of assessment) – online social constructivism
- Practical application of the courseware in a Workplace based project (Again identified as single most important element)
- Assessment – Examination, Participation (20%), Assignment and Workplace Project

Figure 6: Iterative Guidelines as to how eLearning can be best deployed to support continuous improvement programmes within organisations.

The latest iteration of the diploma programme has been so well received by participating industrial students that the model has now been applied to further domains including Innovation, Technology Management and Information Technology. To enable progression, versions of the programmes are now available up to MSc (Masters) level degree as outlined below. The eventual goal is to enable progression to Doctorate level for those in the workplace. This approach is in line with the recent call for a restructuring of third and fourth level qualifications as outlined by the Expert Group on Future Skills Needs 2007 report - Tomorrow's Skills - Towards a National Skills Strategy (Hunt, 2007).

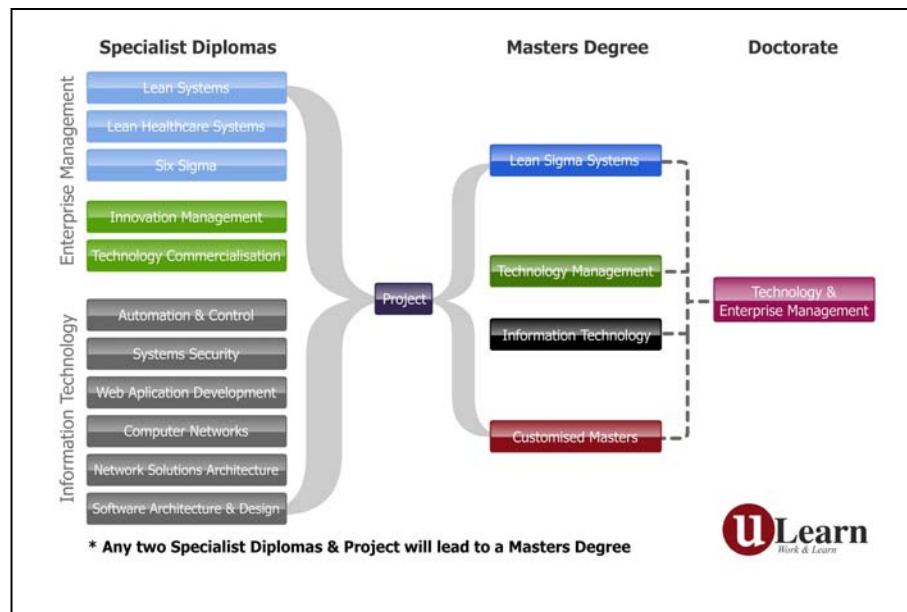


Figure 7: Extension of model to other domains and expansion to MSc and Doctorate Levels

Conclusions and Recommendations

Feedback from the survey described that the SMEs opinion towards educational tools and activities that are using web based tools and/or PC technology is mixed. The greatest advantages are said to be:

- *Flexibility - can be undertaken you want and you don't have to follow a curriculum*
- *Efficiency - saving time and money not having to travel etc*

The greatest disadvantages include:

- *Lack of motivation- no contact with other students, so there is no knowledge shared*
- *Demand for self-discipline - "its your own responsibility"*
- *No direct contact with teacher*

The lack of a personal trainer seems to be the biggest negative factor and together with that, goes the ability to ask questions. From a pedagogic perspective, the initial material was designed using behaviourism as an approach, with its inherent advantages and drawbacks, the main one of course being the challenges associated with motivation. However the feedback from the phase 1 testing was very positive with all having undertaken the courseware providing positive feedback and reporting that significant benefits have ensued, hence eLearning can be viewed as an effective means of delivering education to industry.

However as a response to the survey critique, a blended solution where the courseware has been incorporated into a formal University accredited diploma has been developed. This diploma draws heavily from social learning theory where a combination of on-line content, e-discussion boards, on-line tutoring is used and supplemented with occasional face-to face tutorial sessions and off-line project supervision. The combination of formal accreditation, contact with peers and mentors combined with the relevance of a work based project alleviates a number of concerns expressed by the SMEs including motivation, self discipline and teacher contact. Preliminary results from those that have undertaken the programme and their organisations are extremely positive so much so that the student numbers have grown significantly over the last two years and this trend looks likely to continue. The other key outcome is that the model is being replicated in other domain areas within the University including Innovation, Technology Management and Information Technology. The overall conclusion that can be drawn from this research project is that effective use of Learning Design can result in an extremely useful and beneficial educational experience for those in the workplace.

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