Review and discussion: e-learning for academia and industry

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Abstract

This paper presents a high level review and discussion about e-learning and proposes the use of interactive learning as a recommended method for staff training in industry and academia. Interactive learning is focused on the integrated e-learning and face-to-face learning to ensure that the process of learning can stimulate learners' interests, report their progress and have tutors to provide their feedback and guide learners to the expected targets. Learning activities and varieties have been illustrated with discussion about how industry and academia can use interactive learning. Five successful examples of interactive learning to demonstrate the effectiveness of interactive learning. Positive impacts have been reported in RBS, SMEs using SAP, University of Cambridge, University of Greenwich and Leeds Beckett University to support the positive outcomes for learners and trainers. Future directions have been discussed, particularly the use of emerging services can enhance the learning experience and satisfaction for learners and trainers.

1   Introduction

Investment in human resources is essential to the development of human capitals, whereby countries and organizations that have invested in human capitals are in a better position to acquire long-term benefits (Schultz, 1961; Reynolds et al, 2002). This is also relevant to industry, since employees need to keep their skills and knowledge up-to-date. A moving organization is the one that invests in people and ensure that all employees' skills are up-to-date to stay competitive (Bahrami et al., 1996; Reynold et al, 2002; Gould, 2009). By offering staff training, benefits for organizations are as follows. First, employees can complete their tasks quickly and efficiently without making mistakes that can cost the organizational reputation and financial loss (Sveiby, 1997). Second, products and services can be enhanced since the team for research and development, sales, marketing and operations have better competency, skills and knowledge to ensure that products and services are continuously improved (Day, 1994). Third, the organization can design and develop better strategies, new products and services as a result of the improved level of overall competency and collaboration (Gould, 2009). An organization can become an learning organization since the employees can learn from their previous errors, accelerate their progress and improve on their work performance as individuals and units. More time and effort can be used on development of the forward-thinking plans to reduce costs, errors and improve on collaboration, team work and market strategies (Treacy and Wiersema, 1997). In this way, it offers a greater level of competitiveness over their rivals. Human capital can include knowledge, skills, competencies, relationships and creativity implicit in an organization's workforce (Reynolds et al, 2002).

To facilitate better learning and training activities, the use of online resources have been blended successfully with education. One of these areas is known as e-learning, which offers the online delivery of information, communication, education and training (Sloman, 2001). Using electronically-based approaches, learning and training can be conducted at anywhere and anytime. It can save operational costs including costs for accommodation, travel and booking of physical classrooms that require all the employees to attend physically. Some forms of learning activities can be completed offline, such as watching the training videos, completing assignments and rehearsing skills that were acquired at the training workshops. The e-learning education can be improved significantly with the systematic approach to ensure that learners' progress can be reviewed at check points and demonstrate that there is an improvement on the learners' competency of knowledge and skills (Rothwell and Kazanas, 2011). One of such approaches is the use of blended learning to combine the use of classroom teaching and online learning activities together to produce a greater impact (Graham, 2006). Classroom-based teaching can allow learners to focus on consolidating their core skills and knowledge. Online learning resources and activities can ensure that learners can revise their work, discuss with their peers in online discussion and be involved in any quizzes or tutorials that can be rehearsed several times outside the classroom. The role of the tutor is crucial in the development in the

blended learning. The tutor is a teacher in the classroom, the motivator in both the online and classroom environment and an advisor on the online forum and learning activities. The research work conducted by Chang and Wills (2013) show that there is a 15% improvement on learner's satisfaction and performance of using the blended learning approach than using the classroom teaching approach.

The breakdown of this paper is as follows. Section 2 presents the related work and literature to e-learning. While acknowledging there is a need to improve the delivery of e-learning for staff training, interactive learning, the combination of online e-learning and face-to-face staff training, is proposed to be a better alternative than adopting e-learning alone. Section 3 presents how interactive learning can be conducted for industry and academia with five case studies to support. Section 4 sums up the paper with the plan for future work.

2   Related Work

This section describes the related work to e-learning review. This e-learning review consists of seven key areas that are presented as follows.

1) Emerging technologies: E-learning is considered as an emerging technology that makes impact on the workforce.
2) Continuing professional development (CPD): E-learning is used in continuous professional development, of which staff training and executive education are principal components.
3) The impacts on training: E-learning brings new concepts and implementations for training.
4) Effective team management and motivation: The purpose of training is to improve e- Learning implementations, in which effective team management and motivation are important factors.
5) Factors for using e-learning technology in learning: Bate's model and Alexander's model of e-learning are used to explain this. An industrial example is described to demonstrate both models.
6) Advantages and disadvantages of e-learning: The advantages and disadvantages of e- learning over traditional learning are described to highlight e-learning's strengths and weaknesses.
7) Interactive learning: Both face-to-face learning and e-learning have their strengths and weaknesses. This leads to the proposal to combine both face-to-face learning and e-learning with their positive effects on the employees and the organizations. The difference between interactive and blended learning is that interactive learning is focused on the dynamic interactions with the learners. Teaching can be tailored to different needs and different groups. Learners' progress can be checked and monitored (Sloman, 2001; Lundvall, 2010; Chang, 2003; 2015). Blended learning is more focused on the mechanism and a variety of learning techniques that learning should be taken place (Garrison and Kanuka, 2004; Graham, 2006).

2.1 Emerging technologies

Emerging technologies are technologies that create new industries and transform existing ones (Day et al, 2004). E-learning is an emerging technology that makes impact on the workforce and reshapes the relationship between employees and organizations. This concept has been elaborated by Bell et al. (2006), who highlight a set of significant and common challenges to both organizations and employees. These challenges are considered as human resource challenges that are driven by interaction between factors:
• The properties of emerging technologies.
• Changing character of people (employees and customers) and what they are seeking.
• The changing character of organizations and how they are approaching their human capital.

Interactions driving human resource challenges (Day et al., 2004) represents the relationship between emerging technologies, organizations and people. organizations play a central role because organizations should be aware of the impacts due to the changes in people (employees and customers) and emerging technologies. organizations provide training for office-workers, so that they can get familiar with organizations' emerging technologies to improve their efficiency. Thus, people and emerging technologies are linked together through organizations. E-learning can provide assistance for these interactions because it provides rapid communications between colleagues and improves the quality of the work. The process

of improving the quality of the staff in order to set a better quality of work is called continuing professional development (CPD).

2.2 Continuing professional development

The Engineering Council (US) defines continuous professional development (CPD) as "The systematic maintenance, improvement and broadening of knowledge and skill, and the development of personal qualities necessary for the execution of professional and technical duties throughout the practitioner's working life" (Friedman and Phillips, 2004). CPD, being essential for the organizations, includes executive education and staff training. Figure 1 illustrates the concept of CPD.

Lorriman's Windows (1997) explains the three key elements in CPD. First, there must be a mission by each individual for their self-improvement. Each member of staff should understand their key competencies and all learning should maximise the speed to develop these competencies. Secondly, organizations should redefine the role of their managers, so that coaching and developing of staff become a highly important activity. Thirdly, the organizations should provide a learning environment and maximise learning processes. How can we achieve these three elements? Training, especially training by e-learning, is a key solution used by many organizations. Lorriman's theory can be presented in Figure 1.
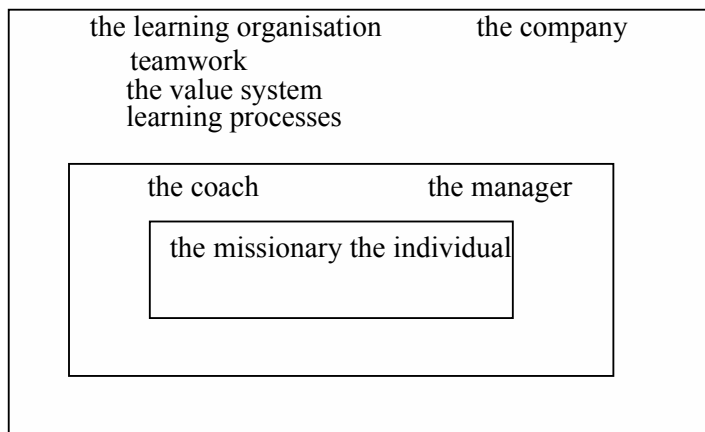

| the learning organisation | the company |
| teamwork |
| the value system |
| learning processes |

the coach   the manager

the missionary the individual

Figure 1: Lorriman's Windows

2.3 The impacts on training

Sloman (2001) claims the internet has changed the ways we work, including training. The ways that trainers conduct training and the way employees learn have become different because the internet and other technologies can allow the speedy distribution of information, knowledge sharing and self-learning, in which the trainers' role diminishes. However, Sloman (2001) is optimistic that "training may be entering a new age with growing respect for the importance of the function." He further adds that many organizations recognise that "people are a source of competitive advantage", hence training with e-learning becomes more important. A systematic training model has been increasingly accepted in the UK since the late 1960s. Through years of evolution, a common model was adopted, as shown in Figure 2.
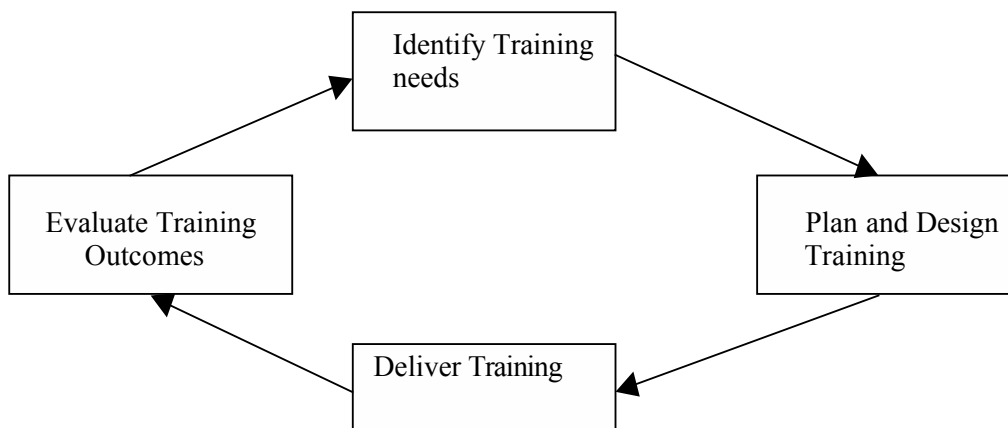
Figure 2: Systematic training model in the UK, Sloman (2001)

This model divides training into a series of sequential steps and the benefit of this model is to focus on the need to apply a systematic, disciplined approach to each stage in the process. E-learning not only can accelerate the speed in the whole cycle of the model but also can assist in each process of the training. For instance, the software and internet can assist directors to identify training needs for the organizations. Later, trainers can plan and design training with the aid of technologies. During the delivery of training, intranet, software and video- conferencing can assist the learning process. To evaluate training outcomes, online assessments can be used.

McKay's concepts of staff training

McKay (2000) classifies training into two types, either skill-based training or information- based training. In the context of this thesis, staff training means skilled-based training for office-workers and operational staff. She suggests training everyone together causes a problem because staff may end up with different levels of skills either weak or strong, which then results in team ineffectiveness. To solve this problem, one solution is to train different levels of staff with the appropriate methods. This enables the organization to make better investments in staff. This also saves the organization money in the long-term because less training will take place to reach the required standards.

2.4 Effective team management: a factor for effective e-learning implementations

One purpose of staff training is to build up competent teams, which are capable of handling tasks efficiently. Building competent teams improves the quality of work and the quality of team management, thus leading to effective team management, which is essential for the effective e-learning implementations. Lowe (1995) states that managers and all the employees should be continuously able and motivated to acquire new skills, so they can contribute to technology management within the big organizations, where each manager is in charge of at least one project that has several employees working together. The ability to manage the team for project completion, quality work, time management, training and human resource management is known as team management. Effective team management is important in influencing the project's success.

Motivation: a key factor for effective team management

Lowe (1995) and Steers et al (2004) both suggest that motivation is a key factor for effective team management. Both relate that the expectation theory is a more recent approach to study motivation. The concept is that for people to be motivated they should perceive this: if they increase their effort at work, this must lead to an enhanced performance that leads to appropriate rewards. In order to achieve this, motivation is a key factor. Osterloh and Frey (2000) elaborate that a good manager should raise the motivation of his team members. They also explain that keeping motivation high and transforming motivation into performance will be a key to successful management.

Freeman and Capper (1999) elaborate that online education at the University of Technology, Sydney (UTS) allows students to increase their motivation and interests in learning. More students feel online education is useful because they enjoy learning due to the increased motivation. Especially for non- English speaking background (NESB) students, they enjoy learning and knowledge sharing with their friends the most.

2.5 Factors for using e-learning technology in learning

From the previous example, increased motivation and interest in learning is a key factor for using technology in learning. Bates (1997) states four main factors to explain this:
1. To improve access to education and training
2. To improve the quality of learning
3. To reduce the costs of education

4. To improve the cost-effectiveness of education

Bates states that the fourth factor is not the same as the third as he argues that "for the same dollar expenditure learning effectiveness can be increased, or more students can be taught to the same standard for the same level of investment."

2.5.1 Bates' model of e-learning

Bates (1995) has taken a wide range of factors into consideration and summarises the following factors that influence effective implementations as the model of e-learning, the ACTIONS model:

A ccess
C osts
T eaching functions
I nteraction and user-friendliness
O rganisational issues
N ovelty
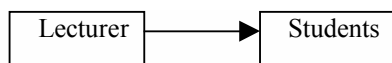**S** peed of course development/adaptation

In terms of '**A**ccess', all staff should have the easy access to the e-learning system. In terms of '**C**osts', the e-learning system should be cost-effective. The e-learning system should also provide '**T**eaching functions' for learning and training. For a lively e-learning system, '**I**nteraction and user-friendliness' are key elements. Furthermore, the e-learning system should address '**O**rganizational issues' by supporting organizations' goals and improving knowledge and skills of the staff. The e-learning system needs '**N**ovelty', the innovation that makes it more lively and creative. Lastly, the '**S**peed of course development and adaptation' of the e-learning system should be quick and efficient.

To elaborate this model, an industrial example in Section 3.2 will be used to demonstrate how these factors work. Before introducing this example, the four-level e-learning model is useful to illustrate for the process of learning.
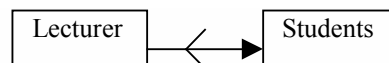
2.5.2 Alexander's four-level model of e-learning

Another e-learning model is illustrated by Alexander's four-level model of e-learning (Alexander and Cosgrove, 1995, Alexander, 2001). The first level is about online presentation and publishing. A lecturer can put course materials on his subject on the university's intranet. The second level is about online quizzes or assessment. This provides an alternative type of assessment. The third level is about online forums that allow students to provide feedback and the opportunity to discuss online. An example of this is that many students can join online forums, discuss opinions and exchange ideas to make their arguments clearer. Hence, the third level can train students how to express their thoughts and how to present them.

The fourth level is about interactive learning, particularly online role-play simulation. Not only does it combine all the benefits of the first three levels, but also it greatly strengthens knowledge creation and knowledge sharing by face-to-face presentations, face-to-face discussions, online debates and online discussions. Alexander's four-level model of e- learning contains aspects of interactive learning because this model makes use of software, internet and videoconferencing to assist learning, in the presence of lecturers and tutors. Alexander's model can be simplified in Figure 3:

| Lecturer | → | Students | | Lecturer | ⇄ | Students |

Level 1: Only lecturer directs instructions to students.   Level 2: Weak interaction between students and the lecturer.

Level 3: Strong interactions between students: to make their arguments clearer.

Level 4: Strong interactions between lecturer and students, and between students. Also, the lecturer can send instructions for students. This allows students to learn themselves.

Figure 3: Alexander's four level model of e-learning

Bates' model and Alexander's model focus on different aspects of e-learning in which Bates emphasises the factors influencing effective e-learning i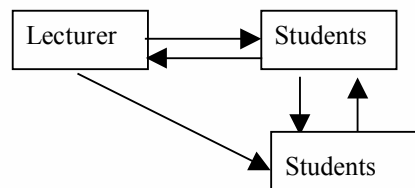mplementations but Alexander emphasises learning processes and their effects on learners. To illustrate both models are applicable to both industry and academia, five case studies with an effective e-learning implementation, particularly the adoption of interactive learning, will be explained in Section 3.2.

2.5 Advantages and disadvantages for using e-learning technology in learning

So far the definitions of e-learning, models of e-learning and an industrial implementation of e-learning have been discussed. In order to understand e-learning it is important to discuss its advantages and disadvantages in the industrial context, which is summarised in Table 1 and Table 2 (Horton, 2000; Chang, 2015). Although e-learning is a relatively new concept particularly for staff training, it has several distinct advantages over traditional classroom training.

Table 1: Advantages of e-learning (Horton, 2000; Chang 2015)

Advantages	Descriptions
1. **E-learning saves costs**	Saves 40-60% of the expense of training by traditional means. Savings include (1) travel expenses; (2) facilities and supplies costs; (3) administrative costs; (4) salaries and (5) lost opportunity costs.
2. **E-learning improves learning**	• E-learning uses learning technologies that assist students and trainees towards learning. • The interactions between peers and instructors can 'activate learners' • E-learning exposes learners to real-world data, which saves learners time in searching information and also assists learners analysing large collections of data. • E-learning provides a more in-depth learning experience.
3. **Extra advantages for learners**	• Learners can get the best instruction available. • Training occurs "just in time". • Learners set the pace and schedule. • Learners can have better access to instructors. • Training adapts to the learning styles. • E-learning produces positive effects.
4. **Extra advantages for instructors**	• Instructors can teach from different locations. • Instructors travel less. • Course content can be dynamic.
5. **Extra advantages for Organizations**	• E-learning delivers high-quality training, including training around the globe without travel. • E-learning creates valuable learning resources.

Table 2: Disadvantages of e-learning (Horton, 2000; Chang 2015)

Disadvantages	Descriptions
1. **More instructor effort required**	Instructors need more preparations, so that they can answer learners' questions and clear their doubts.
2. **More effort required by learners**	Online courses take 20 to 40% more time and effort than traditional courses.
3. **Conversion efforts take longer than expected**	Converting existing classrooms to online courses has proven harder than many designers expected.
4. **Distance learning is impersonal**	E-learning is often used as a type of distance learning and distance learning is "impersonal" due to the lack of face- to-face contact.

5. **Fear of the technology**	Many people feel technical problems are the main barrier for e-learning.

2.6 Interactive learning

As presented by Table 1 and Table 2, e-learning has their own advantages and disadvantages. The presence of tutors in face-to-face learning is essential to the development of e-learning since tutors can check learners' progress, provide feedback to learners' progress and assignments, motivate learners and help learners overcome difficulties in learning. Tutors should always be available at regular periods to ensure learners progress and feel satisfied about their progress. Hence, adopting e-learning with the presence of tutors in the process of learning can strengthen the advantages and minimizes the disadvantages of adopting e-learning alone. The combination of face-to-face training and e-learning is called interactive learning (Sloman, 2001; Lundvall, 2010; Chang, 2003; 2015). The aim is to ensure all learning materials can be delivered online and tutors can provide consultation and feedback to improve learners' progress and their level of competency. The combined effort can allow learners to stay more focused, understand the requirements to meet learning outcomes and work towards the feedback that tutors have provided. Thus, e-learning can be delivered in more structured and organized ways to improve learners' motivation, competency, learning satisfaction.

Other researchers have their own perspective on interactive learning, which include blended learning (Garrison and Kanuka, 2004; Graham, 2006), collaborative learning (Stahl 2001; Stahl et al., 2006) and flexible learning (Freeman and Capper, 1999). Blended learning focuses on the "types" of learning that make learning effective. In collaborative learning, the emphasis is on the use of technology that makes learning effective (Stahl 2001; Stahl et al., 2006). Flexible learning is a vague term because many types of learning are claimed to be "flexible". Interactive learning emphasizes the human interactions during the process of learning, which mainly include knowledge sharing and knowledge transfer. This emphasis can also investigate the effects from the combination of human interactions and the use of technology, especially efficiency after learning or training. That is why the term interactive learning is used in this research.

Interactive learning is an important part of this e-learning research. Before discussing its benefits to organizations, it is necessary to review the contents of interactive learning and how industry might make best use of them. Learning activities for interactive learning is essential for training and learning since the efficiency can be improved (Chang, 2003; Szummer et al, 2008). Learning activities are co-ordinated actions that exercise basic intellectual skills, thought processes, and analysis techniques. Learning activities can be used to teach, to exercise, and to test knowledge, skills and beliefs (Horton. 2000). A variety of learning activities for interactive learning are summarised in Table 3 and Table 4.

Table 3: Learning activities for interactive learning (Horton, 2000; Chang 2015)

Activity	Description	When to use it
Webcasts	Many distributed learners participate fully in a conventional training event transmitted by a network.	To teach material best taught by traditional classroom activities, especially ones that require extensive interaction between the instructor and learners.
Presentation sequences	Learners read, listen to, and watch carefully crafted explanations in a Web browser.	To provide a consistent high-quality explanation to all learners.
Drilled-and-practice activities	Learners repeatedly practice applying specific knowledge or a well-defined skill.	To help learners memorise facts that they must be able to recall without hesitation.
Scavenger hunts	Learners find reliable sources of information on the Internet or their corporate intranet.	To make learners more self-reliant by having them locate reliable sources of information on the subject they are studying.
Guided research	Learners gather, analyse, and report on information.	To teach learners to conduct informal research on a subject. This activity is especially valuable for learners who will have to conduct informal research as part of their job.
Guided analysis	Learners analyse data to evaluate its validity, spot trends, and infer principles.	To teach a formal analysis technique or to guide learners to discover trends and principles themselves.
Team design	Learners work as co-ordinated teams to produce a single design or to solve a complex problem.	To teach design skills that are applied as part of a team or to teach basic teamwork skills.
Brainstorming	Distributed learners work together to generate creative solutions to a problem or to accomplish some other goals.	To teach brainstorming in its own right or as part of a course involving problem solving, creative thinking, or team design.
Case studies	Learners study a meaningful, detailed example of a real-world event, process or system to abstract full concepts and principles.	To teach complex knowledge that cannot be reduced to a simple formula. To use specific, concrete particulars to teach abstract, general principles.
Role-playing scenarios	Learners adopt assigned roles in simulations involving complex interpersonal interaction	To teach subtle interpersonal skills and to reveal the complexity of many human endeavours.
Group critiques	Learners receive and react to the criticisms from their peers.	To teach learners how to use critical comments of others to improve their own work and how to offer helpful criticism of the work of others.

Virtual laboratories	Learners conduct experiments with simulated laboratory equipment.	To prepare learners to operate real laboratory equipment or to guide them to discover principles and trends on their own.
Hands-on activities	Learners perform a real task outside the lesson.	To teach hands-on tasks and to show learners how to apply abstract knowledge gained in other activities.
Learning games	People learn by playing. Learning games are computer simulations that let learners practice a highly interactive task.	To give learners experience performing a task without the risk or cost of the real activity.

Table 4: How do we learn via interactive learning (Horton, 2000; Chang 2015)

We learn by…	How we can learn this way
Listening to lectures, interviews, debates, sermons, speeches, stories, testimonials, and discussions among experts	Webcasts using audio and video. Case-study activities. Online conferences. Virtual response pads. Audio-conferencing and videoconferencing. Presentation sequences. Event-playback pages.
Seeking advice from parents, mentors, co-workers, bosses, psychologists, religious leaders, consultants, and friends	Mentoring. E-mail roster along with biographies of the instructor and learners. Discussion group and other collaboration mechanisms. Guest speakers in Webcasts. Scavenger hunt activities.
Reading books, manuals, papers, articles, poems, stories and reports	Presentation sequences. Related Resources pages and Course resources pages. Virtual libraries. Search-the-Net pages.
Watching presentations, demonstrations, performances	Webcasts. Presentation sequences. Event-Playback pages. Whiteboard and screen-sharing sessions.
Examining exemplars. Visiting and touring museums, factories, historical sites, other countries and cultures. Critiquing the work of others.	Virtual museums. Online conferences. Virtual field trips and guided tours. Featured Example and Code sample pages. Group-critique activities.
Critiques by experts, bosses, parents, peers and self.	Discussion groups and other collaboration mechanisms. Group-critique. Mentoring.
Modelling the behaviour of parents, teachers, experts and heroes. Examining the behaviours to others.	Mentoring. Webcasts with guest experts. Case-study activities. Role-playing activities. Simulators used as courses, learning games and tests.
Exploring. Trying things out. Taking things apart and putting them back together again. Finding our own way. Playing games.	Guided tours. Simulators used as courses, learning games and tests. Virtual laboratories. Hands-out activities. Exploratory tutorials. Choice pages. Brainstorming activities.

Discussing ideas with experts and peers.	Discussion groups, chat sessions, and other collaboration mechanisms. Mentoring. Online conferences. Email roster.
Practising skills and abilities over and over again. Drill and practice sessions.	Simulators used as courses, learning games, and tests. Drill-and-practice activities. Role-playing scenarios. Virtual laboratories. Hand-on activities. Procedure pages.
Memorising by mnemonics. Repeating affirmations.	Drill-and-practice activities. Presentation sequences.
Conducting research. Finding and analysing information on our own.	Scavenger hunt activities. Guided research and guided analysis activities. Case studies. Exploratory tutorials.

Both Table 3 and Table 4 show a variety of learning methods and summary about how people learn from interactive learning. However, the emphasis and combination of different types of learning can be varied between academia and industry. Even within academia, different universities and different courses may use different varieties and weightage. Similarly, industrial training can adopt some of the suggested methods and can vary between different sectors, courses and type of training. Further discussion will be presented in Section 4.

How to make effective e-learning implementation is also research question. All the learning methods for interactive learning are summarized. There are different types of learning activities for IL. Amongst all these activities, the role-playing scenarios and virtual laboratories are worth mentioning due to the researcher's experience. At the University of Technology, Sydney (UTS), role-playing scenarios were used to assist students' learning that increased the students' learning interests and motivations in learning. In contrast virtual laboratories are practised at the Centre for Applied Research Educational Technology (CARET), where they have developed software for simulation, learning, education and commercialisation. Their work is relevant to the industrial context because CARET is acting as a technical service provider.

2.7 Emerging Services

Cloud Computing has been provided as an emerging service for Higher Education, since teaching and learning activities can be conducted in the modern e-learning. Chang and Wills (2013) demonstrate the Education as a Service (EaaS) that has integrated learning and training activities at the University of Greenwich and has reported a 15% increase in the student learning satisfaction. The current emerging services include Massive Open Online Courses (MOOCs), which have been widely adopted by universities in the North America in particular to disseminate training and teaching activities. Their role is to offer learning and teaching to those who either cannot to pay for expensive tuition fees or those who have not been able to take on learning due to commitment from their work. The impacts to the current e-learning community have been phenomenon in a way that a vast population from the developing countries cannot take on the courses offered by the top-tier American universities. They have reported the effective learning to ensure additional resources can be offered to them directly since they cannot afford to do so even in their home countries. This provides incentives to those with poor financial backgrounds the opportunities and motivation to learn. Similarly, those with work and other commitment can broaden their knowledge of horizon and can on learning and training at their own pace. Nazir et al

(2015) report that MOOCs students have the low completion rate and conclude MOOCs are not suitable way of learning. However, this is not entirely the case. The reason why people take on MOOCs is due to flexibility (Yuan and Powell, 2013). Circumstances such as change of jobs, marriage, births of new children, death of family members, long-term illness and financial pressure can make people suspend their studies for some time. These people should not be taken into the statistics of incompletion rate. Moreover, the majority of the learners take on the modules they prefer due to the flexibility and interest. The problem lies with discipline, commitment they put in and the lack of structured ways of learning.

The case we would argue is that the use of interactive learning can ensure that learners can get engaged with trainers in real time through the videoconferencing technologies, online forum and chats. This can ensure learners get engaged and feel motivated by trainers who can point out students' problems. Students can attempt their assignment online and get feedback from the trainer. The advantages of adopting interactive learning are as follows. First, interactive learning can enhance their learning outputs since students can pay more attention to their work and ensure they can check their progress and meet deadline. Second, the direct feedback from teachers plays an important role since they can receive learning assistance and keep their progress up-to-date. Students' concerns and queries can be answered directly by the tutors. Third, learners are more aware of their own weaknesses, agenda, learning outcome, expectations and progress, which can be discussed with the teachers so that they can both meet their expected outcomes through structured ways of learning. Students' weaknesses can be identified by the tutors who will instruct students how to improve to meet the course requirements and get them ready to submit and present their work in time.

2.8 Issues to be resolved

To further expand the suggestions raised in Section 2.7, there are technical and organizational issues to be resolved. First, the network service needs to be upgraded with optic fibres, large network bandwidth and high quality of service, availability and reliability to ensure that learners can get connected to learning resources easily and efficiently without spending much time and effort to access to the learning resources at any time. Second, more varieties of learning resources should be provided such as the use of apps, dynamic functions and real-time videoconferencing related to web services, so that learners can ensure they can get hands-on experience of learning and receiving feedback in real-time. Blending learning resources with social media can help motivate some learners and allow them to get interpretations in a way that they can understand (Dabbagh and Kitsantas, 2012). Third, the use of peer-to-peer learning can be effectively used in a managed classroom or lab-based training. While using the Leeds Beckett University as an example, students with slower progress can be offered special sessions with not more than four students per session. Students can learn by reading learning online materials and reflecting their progress to the peers and tutor and tutor explain to them for any questions. Students can also learn from their peers when their peers make faster progress. The encouragement from peers can motivate desire for learning. The tutor then plays a central role to provide feedback, motivate learners and stimulate them for the subsequent level of learning more challenging tasks. In this way, the tutor can conduct Level 1, 2, 3 and 4 of the effective e-learning introduced in Figure 3 (Alexander and Cosgrove, 1995, Alexander, 2001).

Organizational issues should also be well reflected and properly managed before problems can be escalated to the higher levels. First, the management buy-in is required to ensure that all plans

have been well supported by the senior management. Second, there is resistance to use new technologies and new policies. Ali et al (2016) explain ways that lead to IT resistance and suggest recommendations to reduce this risk by involving users with staff training and ensuring they have made progress through techniques such as interactive learning. Different organizations may use e-learning for different purposes. Third, staff training is important for a high percentage of organizations since employees are required to keep their knowledge up-to-date and become familiar in using new services. In fast-paced services such as security for information management, organizations are required to plan ahead. A large scale surveys on security have been conducted with 220 responded out of 400 IT managers and professionals, whereby staff training have consisted 17% of the spending and investment in security (Chang et al., 2016 a). In their survey results, there are more than 50 respondents replying that their organizations will invest in £1 million and above their upgrading their security equipment, software and services. This is applicable to e-learning that all resources, data and personal details of learners, tutors and sponsors should be safeguarded and protected. Organizations that will invest more in staff training should be aware of upgrading their services and checking all their resources have been secure and protected. Fourth, the four-level model of adopting interactive learning can be adapted from the Alexander's model in Figure 3, since this model can improve the collaboration between learners themselves and between learners and tutors, apart from the previous evidences (Alexander and Cosgrove, 1995, Alexander, 2001, Chang, 2015) that the four-level model is easy to implement. Organizations can find it more acceptable to adopt interactive learning and use different varieties in Table 3 and Table 4 according to their own selections, so that MOOCs can be conducted at any time. The emphasis is to apply any knowledge they use at workforce to product greater impacts to organizations rather than revise for examinations.

3. Discussion

Since e-learning, particularly interactive learning, plays an important role in staff development and learning for academia and industry, case studies will be presented to demonstrate the effectiveness for training and teaching. This section presents two major topics for discussion to demonstrate impacts and contributions offered by interactive learning. The first topic is about how to use interactive learning with different types of emphasis and variations for academia and industry. The second major topic is the summary of case studies in selected universities and organizations. The third topic is the discussion about future direction in the adoption of interactive learning.

3.1 How to balance the use of interactive learning techniques for industry and academia

This section describes how to balance the use of interactive learning techniques for industry and academia since the emphasis and orientations can be different. Referring to Table 3, *webcasts, presentation sequences and Scavenger hunts* are the common grounds for all types of learning, since all the learners should be able to download webcasts and watch them. They will be able to search information they require to know such as the use of Google and any online resources. They need to be able to express their thoughts, learning experience and research findings well. Learners should be able to articulate their work in a way that is acceptable to both industry and academia.

3.1.1 Industry

How interactive learning in Table 3 can be useful to industry is described as follows. Practical skills relevant and effective to the job with better performances are the expected goals for the majority of staff training (Guzzo and Dickson, 1996; Janssen and Van Yperen, 2004). Hence, there is an emphasis with the practical skill training. For example, when high-tech machineries has been purchased to a manufacturing organization to increase productivity by 20% a day, all the production line staff need to undergone training to ensure that they are proficient in the use of the machinery and feel confident and comfortable to use machineries like expert users to reduce the percentage of errors they have made and improve the productivity. Similarly, staff in banks can perform more accurate audits and more thorough checks with less time and less effort to double check. In another example, developers can learn new languages and apply them more efficiently to their new projects. Developers can utilize or create libraries and functions to make new Application Program Interfaces (APIs), so that outputs can be presented quickly and appeared in a way that users can understand better about the services since APIs can interact between software and hardware more efficiently and directly without executing additional codes. All these examples support that ***Drilled-and-practice activities, hands-on activities and team design*** are common and suitable for these types of training. In developer workshops that core programming skills are aimed for improvement due to the running of simulations and experiments, then ***virtual laboratories and learning games*** are required to make that happen.

There are also other types of training that involve with knowledge update to allow employees to know about something new or learn something outside their main area of expertise. The main reason is due to the multi-disciplinary nature of the subject and the fast-pace of the area of investigation such as security and privacy, whereby funding has been awarded to interdisciplinary research projects (ESRC, 2016). In order to ensure both developers and legal experts understand each other's concerns, training has been provided to achieve mutual understanding. For examples, developers can learn laws, regulations and policies about their businesses and business partners since they can identify the difference between the US, UK and Europe towards privacy and data protection laws. Similarly, lawyers can learn about the impacts of ICT to legal challenges to ensure that both lawyers are equipped with the knowledge about IT and privacy laws. This type of training that is focused on knowledge based discussion without hands-on experience, then ***brainstorming, case studies and group critiques*** are essential to allow discussion and interactions between different peers. ***Role-playing scenarios*** can help motivate the team morale and ensure all the participants can be engaged in the learning activities.

3.1.2 Academia

Training in academia has been involved with the similar types of training as industry: skill-based learning and knowledge-based learning. Skill-based learning can help employees in academia to equip with the up-to-date skills and ensure they are familiar and confident to perform their tasks more efficiently and accurately. Similarly, knowledge-based training can allow employees to be ready with the latest development and theory on the topics of their interests. However, there is an another type of staff training focused on strengthening employees' research skills, since scientists need to conduct independent and advanced research as if they are experienced researchers (Creswell, 2013; Bryman and Bell, 2015). According to Creswell (2013), researchers need to learn the mixed method approaches including qualitative and quantitative skills. These skills will involve with data analysis, programming, logical interpretation,

presentation, surveys, case studies, interviews and academic writing. In general, research skills will need to adopt *guided research* and *guided analysis* as the main method of using interactive learning, with occasional use of *brainstorming, case studies, virtual laboratories and hands-on activities* to ensure that scientists can be fully independent to identify problems, design hypotheses, set experiments, collect results, interpret results and present what they have done.

3.2 Case studies

Selected five case studies from the academia and industry have been presented to show examples how to balance the use of interactive learning with their impacts.

3.2.1 Royal Bank of Scotland

Royal Bank of Scotland (RBS) introduced e-learning in 1999 and opened a new Training and Communication Network (TCN) to offer new staff training. RBS was reported to save millions of staff training since their employees could learn at any time and at anywhere without the need to book accommodation and travel (Morrison, 2003). Employees were reported to have their learning efficiency, morale and motivation up. However, RBS has undergone a period of downsizing due to their poor performance since Year 2008. According to Business Case Studies (2015), RBS still invests in staff training since it helps their businesses stay competitive. Their employees can attend more training and courses to ensure their skills are up-to-date and have better competency in the use of IT for providing a better quality of services. They have adopted Level 3 and 4 learning to all their staff training to ensure that their trainers can double check their employees are competent with their new skills and employees feel the sense of achievement after completing their training. Although RBS does not use the term interactive learning, their training sessions have the elements of interactive learning since all the employees are actively engaged in the learning process and they need to demonstrate how to make theory into practice. The impacts can be enormous for the organization since all the employees are well-quipped with the skills and knowledge they need to improve their business performance.

3.2.2 SAP and Small and Medium Enterprises (SMEs)

SAP has been used as an effective platform for businesses to provide them agility and the efficiency to complete tasks. Using SAP can allow each employee to work on related projects and understand the work-in-progress in other units. For examples, sales team can know the outputs of their recent products from product development team, number of supplies available each week from their suppliers and the cash flow of their products from all the sales agents and merchandizers. In this way, the use of SAP can interact with colleagues in other departments. SAP has been popular in Small and Medium Enterprises (SMEs) with similar cases since SMEs can effectively communicate their colleagues, suppliers, vendors and merchandizers at the same time. Thus, training is essential for employees to allow them to understand the business concepts and strategies set by SAP. Chang (2013) conducts research on how SMEs use SAP for their businesses and investigates the extents of return and risk in the adopting of SAP. All the SMEs involved have used interactive learning to ensure all the staff members are familiar with the processes, functions, products and transactions involved, particularly when they perform live orders and transactions with the other party. Each employee interacts with other business units and understands the progress of their work while being handled by other units or merchandizers. Interactive learning takes place in the form of teleconferencing to discuss with partners about their sales orders. Other forms of team designs, brainstorming, virtual laboratories and hands-on

activities based on Table 3 will be required to make interactive learning as smoothly delivered as possible. It is more popular in SMEs since there is a higher tendency for each employee to get involved in the work outside their units (Delmar et al., 2003).

3.2.3 University of Cambridge

University of Cambridge has started their e-learning consultancy services dated back in 2001, when the Center of Applied Research and Educational Technology (CARET) has established as well as the Cambridge Programme for Industry (CPI) has offered training courses for industry. Interdisciplinary services have been set up to offer part-time and distance learning courses, improve the quality of teaching and learning, increase the revenue and ensure all learners have the opportunities to use the quality services offered by CARET (Chang, 2015). CARET has become the University's main service provider for education and learning and has produced Sakai based virtual learning environments (VLEs) for students and staff. Students can understand complex concepts in a short period of time since they can learn the principles of natural sciences through watching the videos and simulations which can explain all the processes, ingredients, science principles and results. Students can grasp their level understanding in a shorter period of time and can use the 'additional time' to learn other new skills. Interactive learning can accelerate this process since both technology-based learning and trainers can point out the areas they do not do well and focus on the training on areas of weaknesses. This is the same for all industrial attendees since they can practice their new knowledge and rehearse several times. The use of interactive learning can ensure all the learners can identify where their mistakes are, have the opportunities to correct them and rehearse until they can fully grasp the new skill.

3.2.4 University of Greenwich

Chang and Wills (2013) report that the supply chain teaching at the University of Greenwich can be delivered by Cloud Computing, which can be further established into Education as a Service (EaaS) to blend different learning activities together and effectively deliver them to ensure that all students can improve their learning, and satisfaction of the learning experience. EaaS has adopted the interactive learning and has enhanced the qualities for both technologies and trainers. In other words, the technologies can provide more up-to-date information in real-time and trainers have a deep knowledge to explain all types of the live changes. This can motivate students since they can see the real issues in place and explanations associated with them. They have demonstrated the use of supply chain services and report that there is an overall 15% improvement in learning satisfaction. Chang et al. (2016 b) then investigate further on the impact of EaaS offered to two focus groups of students receiving their supply chain Cloud lessons through interactive learning over a period of one year. The results show two interesting observations. The first focus group has acknowledged the positive learning experience with an average of 15% improvement on learning satisfaction. The second focus group has commented that the delivery has exceeded their expectations. However, they have set very high expectations for the following years. Realistic goals have to be set, negotiated and agreed for the following delivery. The metrics and data analysis also suggest there is a high consistency among all datasets and a good quality of data. Investigations in 2013 and 2015 have provided the positive feedback that interactive learning has been effective in teaching supply chain Cloud for students.

3.2.5 Leeds Beckett University

Leeds Beckett University has offered MSc in Business Intelligence for postgraduate students to train them to be business or data analysts. Students can learn how to use SAS platform to create report, graphs, charts, workflows, analytics and visualization. They can connect to the Cloud servers and work directly on the Cloud services seamlessly without the need to know the complexity behind the scene. Students can import collected datasets into SAS, which can be saved in the Cloud and then transformed the datasets in a way that can be read, processed and analysed by SAS. Students can present their outputs in data analytics and visualization and feel confident that they get sufficient training as a junior data analyst (Alsufyani et al., 2015). Interactive learning has been effectively used to ensure that students can keep their progress up-to-date, their programming and IT skills can be improved on the weekly basis and regular feedback has been given to students to ensure they can revise areas that require their attention. Students find that there is an improvement in their learning outcomes. Learning satisfaction before and after the use of interactive learning has been measured and there is a 20% increase in their learning satisfaction in 2015. Thus, interactive learning has been very well delivered in higher education and training for data analysts.

3.3 Future directions

Future directions with e-learning services for industry and academia are as follows. First, the combined effort from interactive learning and technology-based learning can be managed and delivered more effectively to ensure that the learners' progress can be checked and monitored, so that learners can understand their weaknesses and areas that need to pay more attention. Any technological based learning, without the learners receiving feedback and support, will have less impact to their learning outcome. Second, the rise of Cloud Computing and Emerging Services can modernize the quality of learning to the next level, since learners can have better access to facilities and resources that they can expect to analyse the data and make sense of the data they have collected within seconds and minutes, by the use of analytics, visualization and easy-to-use interactive functions offered to the learners. Although MOOCs are designed for flexible learning, more structured ways to blend with interactive learning and Level 3 and 4 of learning interactions (Alexander and Cosgrove, 1995; Alexander, 2001) between tutors and learners as shown in Figure 3. Only when the instructors have established special work relationships with students and have the experience to lead students into Level 3 and 4 of interactive learning, students can demonstrate satisfactory learning satisfactions. Third, interactive learning can be adapted to different types of groups of learners and ensure learners always follow the weekly requirements on time, even by offline and online tutorial work. Learners should ensure they can rehearse a new skill several times until they can master the skill in the absence of tutors, who then guide the learners at the particular check points and ensure learners can acquire the skill through action research and learning by action. In other words, even if there are better facilities and technologies used in learning activities, if tutors do not convey the expectations for learners to follow (such as rehearse new skills) and convey instructions on how to check learners progress to provide feedback as well as learners take initiatives to be engaged in the process of learning, it will not make much difference. This is identical to Level 4 of learning that both learners and tutors are prepared to put in effort for each other and commit to raise their benchmark after each round of learning process. This recommendation is applicable to both industry and academia, although the appropriate emphasis and varieties of interactive learning activities should be adapted.

Additionally, emerging services that can integrate with blended learning and technologies will be recommended, since learners can have a better access to different resources, take responsibilities in their learning, make advantage of technology that can make search of information and presentation of complex concepts much easier and a better access to tutors. Instructors can play a more influential role as advisers to provide guidance rather than coaches to instruct all the times. With the use of emerging services that combines Cloud Computing, Big Data and Internet of Things, complex simulations in biological science, business intelligence, natural science, operations in machineries, software and service-oriented functions can be presented in a way that learners can find it easier to comprehend and acquire in their learning. Learners can repeat the simulations and learning resources such as videos several times until they can grasp the knowledge and they can rehearse as many times as they feel confident and comfortable to apply their new skills to the workforce, or apply their new knowledge for their research and publications. In this way, the use of emerging services can enhance the learning experience and satisfaction for learners and trainers.

4. Conclusion and future work

This paper illustrates a high level review and discussion of e-learning for academia and industry. Related work and literature have been presented to ensure that all types of learning activities can be blended together. Advantages and disadvantages of e-learning have been discussed, including the discussion about interactive learning, which takes the form of self-directed e-learning and the presence of trainers to check the learners' progress. Learning activities and varieties for interactive learning have been presented in Table 3 and Table 4. Better outcomes of learning are expected since interactive learning can ensure learners meet their expected level of competency and receive feedback from trainers to improve learning performance. Interactive learning can blend with emerging services such as MOOCs to help learners stay focused, work towards goals at different stages, receive feedback and encouragement to stay positive.

A variety of methods to conduct interactive learning has been discussed since the appropriate levels of emphasis and varieties are useful for different types of organizations. To demonstrate the effectiveness of interactive learning, five successful examples of interactive learning have been presented. Positive impacts have been reported in RBS, SMEs using SAP, University of Cambridge, University of Greenwich and Leeds Beckett University. Interactive learning can help learners achieve their goals, have improved rates of learning satisfaction and can ensure employees are equipped with the latest skills and knowledge to complete their tasks better and quicker with more efficiency. All detailed descriptions support different emphasis of delivering interactive learning can be adopted for academia and industry. Our future work will include conducting large scale surveys on interactive learning to investigate the extents of positive impacts to different types of organizations and use quantitative analysis to validate our research contributions.

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