BENEFITS AND FINANCIAL IMPACTS OF ADOPTING TECHNOLOGY IN LEARNING

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ABSTRACT

This paper summarizes the results of an analysis of the impacts of adopting information and communication technology (ICT) solutions in a learning context. The analysis is based on a literature survey of articles reporting research cases studying the impact of adopting ICT based solutions in various learning contexts. The subject has been reviewed using the term blended learning that can incorporate both e-learning and m-learning approaches, as the boundaries between the various ICT solutions have become increasingly blurred. The focus of the study is on adult learning contexts. The contribution of this paper is to summarize how researchers evaluate and show the impact of adopting ICT in learning, and what the critical factors contributing to the success of ICT based solutions in learning are.

KEYWORDS

Impact analysis, adopting ICT in learning, ICT supported learning, blended learning, workplace learning

1. INTRODUCTION

During the recent years, there has been a lot of public debate on adopting information and communication technology (ICT) in learning. Big ICT companies, such as IBM, Apple and Microsoft, have launched initiatives aiming at bringing ICT to schools, universities and other learning contexts. The education system is investing money and effort on providing teachers and learners with digital content, communication devices and digitally enhanced learning environments.

The adoption of ICT based solutions for learning is not simple. Technical devices require investments, and they can become obsolete quickly. Developing digital content and changing teaching, learning and management practices takes time and resources. In this paper, we aim to explore how the current body of research knowledge supports decision makers in getting information on the impact of ICT based solutions on learning. We will contribute to this through exploring the following questions through a literature survey:

- How do researchers evaluate the impact of adopting ICT in learning?
- According to studies, what kinds of factors contribute to the impact of ICT based solutions in learning?

In order to conduct the search for material related to the study, it was necessary to define the terminology. The following definitions will be used in this article: ***Blended learning*** is used to describe learning systems that combine traditional face-to-face instruction with computer-mediated instruction (Graham, 2006). ***E-learning*** is instruction that is delivered on a digital device such as a computer or a mobile device (e.g. mobile phone or tablet) whose purpose is to support learning (Clark & Mayer, 2008). ***M-learning*** has to provide the means to study and learn anywhere and at any given time, using a mobile device, and with no permanent physical connection to a network (Gregoriev et al., 2004).

Using the definitions above it can be seen that e-learning is often used as a general term. We can conclude that m-learning can be part of e-learning, and blended learning can incorporate m-learning and e-learning approaches. For the purpose of this study, and in this article, the term blended learning is used, because it encompasses the necessary elements.

2. METHODS AND MATERIAL

We collected research material through the means of a literature review (Webster & Watson, 2002). The focus was on articles written after the year 2000. The articles were collected mostly through searches in Google Scholar and subsequent electronic journals and databases, looking for articles combining one of the following terms: *elearning*, *e-learning*, *blended learning*, *technology enhanced learning*, *mobile learning*, *mlearning* or *m-learning* with *impact*, *case study*, or *field trial*. The study progressed through the reference lists of relevant articles.

The analysis revealed that there was a dearth of scholarly articles offering solid facts and figures about the Return of Investment (ROI) of e-learning solutions in workplace settings. It was easier to uncover articles and case studies about e-learning or blended learning experiments in higher education. Even in these cases, the focus was usually on the learning outcome or participant (student or instructor) satisfaction.

Material assembled for this study includes also articles highlighting benefits of blended learning solutions other than cost savings. As the financial impact is often difficult to measure – and because it is not always straightforward, as savings can result from a multitude of factors – it is important to look also at the other perceived advantages blended learning has to offer.

3. BENEFITS OF BLENDED LEARNING

According to Osguthorpe & Graham (2003), the main goals for instructors designing blended learning environments are pedagogical richness, access to knowledge, social interaction, personal agency, cost effectiveness and ease of revision. In other words, these are the main characteristics that a successful blended learning system should have.

Bersin (2004) states that in the early stages of e-learning many programs failed. One of the reasons was that it was too easy to disengage, as there was no class to go to and no time set aside for learning–it is difficult to include an extra part into an already very busy day. The solution is a blended learning program and finding the right blend.

Snipes (2010) also reminds that there is not just the one right solution, and much of the success of blended learning is attributed to putting the building blocks of a company's learning content together so that the combination results in a highly engaging learning environment. Real learning does not come from a one-time training event; it requires a longer learning process. In order to really impact the learners, the experience needs to be engaging and personal. The goal is a long-lasting business impact, not just a transient effect.

To get the most out of an e-learning or blended learning solution, it is best to use an IT architecture that supports targeting and personalization. Thus, training efforts can be directed at the employees and competencies that have the biggest need for learning and knowledge. (Ley & Ulbrich, 2002)

Table 1 summarizes the benefits of blended or mobile learning reported by researchers. The studies that are based on the expectations of the studied group are marked in italics; the rest of the articles are based on case studies and field trials.

Table 1. Main benefits of blended learning

Benefit	**Mentioned by**
Ability to return to material and revise	Şahin (2010b); *Schooley (2009)*
Adaptability, tailoring	*Beutner & Pechuel (2012);* Quentin-Baxter et al. (2008
Better student performance	Bonk et al. (2002); Quentin-Baxter et al. (2008); Şahin (2010a); Sancho et al. (2009); *Singh (2003)*
Cost effectiveness	*Bastiaens & Martens (2000); Beutner & Pechuel (2012);* Bollinger et al. (2011); Brennan (2004); Cohen & Nachmias (2009); Kim et al. (2008); Kim et al. (2009); Quentin-Baxter et al. (2008); *Schooley (2009); Singh (2003)*
Expanding access to training	*Bastiaens & Martens (2000);* Bollinger et al. (2011); *Singh (2003)*
Immediacy, access just-in-time or in context	*Bastiaens & Martens (2000); Beutner & Pechuel (2012);* Bollinger et al. (2011); Bonk et al. (2002); Şahin (2010b)
Immediate feedback; interaction	Bonk et al. (2002); *Singh (2003)*

Improved collaboration and teamwork	Bonk et al. (2002); Şahin (2010b); Sancho et al. (2009
Improved learning or instruction	Bollinger et al. (2011); Cohen & Nachmias (2009); Kim et al. (2008); Kim et al. (2009); Quentin-Baxter et al. (2008); *Singh (2003)*
Increased motivation; reduction of absences or drop-out rates	Cohen & Nachmias (2009); Quentin-Baxter et al. (2008); Şahin (2010b); *Singh (2003)*
Independence of location and time, flexibility, convenience	*Bastiaens & Martens (2000); Beutner & Pechuel (2012);* Bollinger et al. (2011); Bonk et al. (2002); Brennan (2004); Kim et al. (2008); Kim et al. (2009); Şahin (2010b); *Schooley (2009)*
Influence on organization: development, productivity, recruitment, competence	*Bastiaens & Martens (2000);* Cohen & Nachmias (2009); Kim et al. (2008); *Leary & Berge (2007);* Quentin-Baxter et al. (2008); *Schooley (2009)*
More active students	Bollinger et al. (2011); Bonk et al. (2002); Şahin (2010b); Sancho et al. (2009)
Repeatability and consistency	Bollinger et al. (2011); Bonk et al. (2002); *Schooley (2009)*
Time savings; better use of time	*Beutner & Pechuel (2012); Leary & Berge (2007); Singh (2003)*

Several trends emerge in the studies. Freedom from the limitations of time and place is appreciated as well as the possibility to learn "just-in-time" when the information is needed, possibly in context. Blended learning also offers the possibility to tailor and personalize the learning experience. Cost-effectiveness is another key factor, and it comes through both savings and improved processes. Blended learning is seen to be motivating for the student, and often results in better retention, quicker learning and improved results. Communication and interaction are improved, and students feel less self-conscious about asking questions or having to reread the material several times than they would in a traditional classroom situation.

4. FINANCIAL IMPACT OF BLENDED LEARNING PROGRAMS

Finding specific company cases proved to be difficult, probably because their sensitive nature makes companies reluctant to share them. Some companies do not even measure the impact their learning solutions have; in a study by Bonk (2002), nearly 60 % of the respondents' companies had not completed a formal evaluation of the impact of Web-based learning. Of the companies that had measured the impact, 30 % had done an analysis such as the ROI calculation and 47 % had analysed the improvement in job performance.

Wenger & Ferguson (2006) write that initial investments in the infrastructure in blended learning are high, but after the investments have been made, the cost per student tends to be lower. The cost of content is high as well, but after a while the increased multipurpose use lowers the cost for additional applications.

Bersin (2004) points out that one should not roll out an e-learning or blended learning program just to save costs. The initial investments of e-learning solutions are usually quite high, comprising of infrastructure, content development and technology upgrades among other things. Also, savings can be a one-off thing, and a company cannot expect to continue on saving money on a yearly basis. According to Bersin, one should not measure the ROI of a training program based on how much money the company has saved. Instead, the focus should be on the improved skills that bring about new savings. Bersin states that if one increases productivity by one percent, it has over 10 times the financial impact of a one percent decrease in training costs. For companies wanting to save money, it is very important to focus on developing a purposeful, thought-out blended learning program – otherwise the initial costs will far outweigh the potential savings.

Microsoft has published some figures of learning examples with Microsoft learning products. According to their case studies, blended solutions helped to lower the costs of training, citing reduction figures of 30 % in one case. In the case of Microsoft de Argentina, the blended solution cost "a fraction" of the corresponding face-to-face training. (Ziob & Mosher, 2006)

At Avaya, a blended learning program helped salespersons perform better and increase the close rate, broaden the selection of products sold, increase the return on sales, reduce discounting and shorten the sales cycle. For the first six months after the learning program, the company reported over $36.3 million in incremental revenue with a 46.1 % ROI. (Chute et al., 2006)

Lewis & Orton (2006) reported an ROI of 17 to 1 for a learning program at IBM. Their calculations are based on the total costs for the creation and deployment of a management training module and the tangible cost benefits based on the use over 18 months. In addition to the cost savings, graduates of the program were asked to assess the direct financial first-year annual impact that the leadership training had on their

department. The average value given was $415,000, which gives an ROI figure of 47 to 1. IBM has also noticed that giving employees meaningful opportunities to learn and develop their skills means that they are less likely to leave the company in the first three years after they have been hired (DeViney & Lewis, 2006). As hiring and training new employees is expensive, improved employee retention can save a lot of money.

Similar findings are reported in Worthen's article (2001); the relatively high initial training investment of a company paid off because turnover was reduced through employee satisfaction. At GE, an ROI calculation on an orientation course revealed that employees could master the contents of the course in only three hours when studying online, whereas the onsite course had taken three days – and those three days required attendants to be flown to an offsite training facility. In this case, a lot of money was saved, especially since the training facility would have needed to be upgraded, causing an additional cost of $4.5 million.

Schooley (2009) reminds that technologically enhanced learning environments are cost-effective once the technology is in place and the company culture is adjusted so that these new learning patterns are embraced. Relying too much on financial justification may endanger the effectiveness of the learning program. Self-paced e-learning programs may enable learners to assimilate material often much faster than in a traditional classroom.

Forrester have calculated the ROI for a hypothetical North American insurance company with 5,000 employees (Schooley 2009). According to their calculations, the implementation of an e-learning program would generate an estimated 69 % ROI over three years. The figures depend on how well the company succeeds in supporting their employees in the change. In the Forrester example, the company would invest heavily to implement the e-learning program. The expected benefits exceed the costs, however, because savings can be gained from faster competency, training flexibility and consistency, and travel expenses. The Forrester model estimates that the investment will have paid itself back in 12 months.

Kapp & Vasta (2003) have written about the methods for calculating a performance-based ROI. They also stress that many factors need to be taken into account to fully evaluate the financial impact of an e-learning initiative. Although e.g. travel expenses can be cut and savings made, they do not really constitute an ROI and focus on the company's main concern – the need for education. To really convince a company of a good return on their investment, it is necessary to show how their blended learning contribution will benefit the company financially in the long run. Benefit types include improved employee productivity, improved quality of work and improved customer satisfaction.

Bollinger et al. (2011) have a case study on a HIV care course in Zambia. In their study, the online course initially cost $1,204 per student, but subsequent sessions were reduced to $171 per student, as the material was ready. The result was that the cost per student was significantly lower than that of comparable courses. In resource-limited and remote areas, distance learning programs are also less expensive to deploy.

Singh (2003) concludes that while producing a Web-based self-paced and rich learning environment might be expensive to deploy, it could be just as effective to create a more affordable blend using generic off-the-shelf products, recorded events, case studies etc. It is not always a question of how fancy the system is, rather than whether it fits its purpose. In many cases, simpler solutions will do and thus enable savings.

Beutner and Pechuel (2012) studied the acceptance of m-learning in German companies. Their study showed that many people were concerned about the costs involved with the technology and could rarely see any real potential to make savings when compared to the current education budget. To make m-learning more acceptable and attractive in companies, it would have to be seen as a money saving solution.

Cohen & Nachmias (2009) developed a cost-effectiveness model for Web-supported instruction that has been implemented at Tel Aviv University. The model uses data on how students and faculty use the Web, gathered from Web logs. The model provides information on the advantages that result from the improvement of the teaching process, not just financial benefits. An analysis of all the courses at the university revealed that a few courses managed to gather a significant part of the student benefits. This confirms that blended or e-learning is a highly context-sensitive method and cannot guarantee equal results in every case, even in the same university.

Brennan (2004) writes that it is difficult to clearly show a cause-and-effect relationship between training and performance, since it depends on so many different factors. It is also not possible to affect all areas of business improvement with just training. Many participants in Brennan's study had difficulty in ascertaining the benefits of their blended learning programs through a ROI or cost-benefit analysis. Isolating the effects of training and finding all the necessary information is challenging, which makes doing the calculations harder.

Leary & Berge (2007) write about the challenges smaller companies might face when considering e-learning solutions. Small organizations might not have personnel, whose (sole) responsibility is to be in

charge of employee learning and training, but focus is needed to build a successful blended learning program. Small companies find it hard to justify the sometimes high initial investment costs of e-learning, since the economies of scale do not apply to them, and the staff might have very different needs when it comes to training. According to Leary and Berge, the solution is to have a good strategy, one good training professional and, importantly, to start small. Even smaller companies can benefit from blended learning, and even a small effort can create a favourable outcome, if it is executed well.

There is a growing trend in workplace learning to measure the impact of blended learning by evaluating the increase in learner skills. A study by Kim et al. (2009) revealed that their survey respondents predicted a trend toward assessing the impact of blended learning at a higher level. This would mean that the quality of blended learning would also be analysed through its benefits to the company using tools like ROI or cost-benefit analysis. (Kim et al., 2008; Kim et al., 2009)

5. CONCLUSIONS

The results of this literature study show that blended learning can offer many benefits for companies looking to diversify their learning portfolio. Blended learning enables learners to study whenever and wherever it suits their needs, often just when they need a particular piece of information. Blended learning also offers the possibility to review and repeat learning modules and possibly feel less self-conscious about doing so or asking questions. In an optimal case, the learning material is tailored, learners are motivated and the result is a more efficient and capable employee for the company. Increased employee performance can in the long run also lead to significant cost savings.

In many cases, cost reductions can be the reason why a blended learning program is launched. In a simplified case, its reason for being is to eliminate costs related to travel, lodging and instructor time. These expectations can, however, lead to a huge disappointment. In order to build a successful blended learning program, substantial initial investments in technology are required. Also, careful work and planning goes into creating the right blend and relevant material. The material and the technology need to be updated regularly. This is by no means inexpensive, so it is important not to get blinded by the possibility of immediate cost savings. On the other hand, it is possible to benefit financially if the learning program is well-designed and will eventually lead to improvements in employee productivity or money-saving changes in organizational culture. Success depends largely on user acceptance and motivation and finding the right blend. Even if the result does not produce huge cost reductions, other benefits might still make it worthwhile.

M-learning solutions have gradually become notable elements of many blended learning programs. Therefore the impact analyses carried out in the field of blended learning are relevant also for the m-learning research community. Use of the same terminology and measures enhances the collaboration between the research fields and makes it easier to develop the right blend based on diverse approaches. In addition, when proceeding with the m-learning solutions from piloting to commercialization, it is increasingly important to be able to present measurable benefits. The models developed for assessing the impacts of the blended learning programs could be useful for that purpose.

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