Learning as a Service – A Cloud-based Approach for SMEs

Ileana Hamburg
Institut Arbeit und Technik
Westfälische Hochschule
Gelsenkirchen, Germany
hamburg@iat.eu

Marius Marian
Department of Computers and Information Technology
University of Craiova
Craiova, Romania
marius.marian@cs.ucv.ro

***Abstract*: The paper deals with e-learning within small and medium enterprises (SME). Previous experience of authors within EU-funded projects showed that SMEs need to adopt some organizational and technological measures in order to improve e-learning readiness. In the same time, these measures correspond to the stages in building a lifelong learning (LLL) strategy by using the novel trans-theoretical model presented. The paper then proposes a new approach for LLL within European SMEs, based on cloud computing meant to both facilitate and reduce costs of accessing and management of e-learning strategies, technologies and content. This is a work in progress related with our intent to develop a set of guidelines for SMEs willing to incorporate cloud computing services in correlation with the trans-theoretical model.**

Keywords-e-learning; cloud computing; SME.

I. INTRODUCTION

E-learning refers to the support of modern communications and computer-based applications for two fundamental human-development processes, learning and teaching. In our paper, we want to emphasize the benefits of e-learning within small and medium enterprises (SMEs) from the novel context of cloud computing.

It is known [1] that due to the recent economic recession, many SMEs are facing the challenge of shortage in new skilled labor, and in combination with this the inability to realize innovative technological developments. SMEs can tackle this and gain competitive advantages by improving their performance through the use of new e-learning methods. The problem is that most e-learning technologies, methods and strategies have been developed for the needs of large companies, and are not flexible enough to be adapted for the specific learning needs of SMEs operating in diverse economic sectors. Limited capital and know-how resources in SMEs, difficulties to precisely delineate what competences are lacking, and the need for having flexible and efficient learning strategies hinder their employees to achieve a better qualification that helps them to cope with the increased marked competition and client requirements. What SMEs need are flexible learning models enhanced by technology to "reduce training costs per learner in order to be able to train a greater number of employees without increasing spending on training" [2], supporting the development of creativity, facilitating adaptive learning on the job, the deepening of linkage with other knowledge resources within company. The learning processes in SMEs differ from those in schools and higher education because they have to be integrated in working processes, and learning systems have to be implemented into the SME's workflow.

"Today companies are looking for services that provide what they need while giving them the convenience of and time to concentrate more on their business. Not only does cloud computing offer more flexibility than traditional methods, but also gives a business the luxury of letting their employees gain access to information while they are mobile as well as at their desks" said Shuveb Hussain (Head of Cloud Computing and Virtualization Research at K7 Computing Co.) [3]. Cloud computing will evolve from a futuristic technology into a viable alternative, not only for business but also for LLL strategies that have to be integrated with the business ones.

This paper will present work in progress within a cooperation of the LLL study groups of the Institut Arbeit und Technik Gelsenkirchen and University of Craiova.

Section two of the paper presents some learning strategies within European SMEs; section three describes benefits of cloud computing services in connection with social media to improve/substitute these strategies supporting personal, interactive and collaborative learning, and the last section enounces the future work steps.

II. LEARNING STRATEGIES WITHIN EUROPEAN SMES

E-learning within SMEs was the focus of two previous projects undertaken by the authors: ARIEL [4], [5] and SIMPEL (*SMEs: Improving E-Learning Practices*) [6]. ARIEL was an observatory EU e-learning project; it uncovered the widespread lack of successful take up of e-learning by European SMEs. In SIMPEL, an "optimal model" for the introduction of e-learning in an SME was developed and guidelines for all involved published. The SIMPEL findings have been used for the development of a framework for an LLL strategy in SMEs.

This framework suggests measures to improve LLL readiness and steps to develop LLL strategies. It uses a combination of the trans-theoretical model which is a model for behavior change, and recommendations from ARIEL, SIMPEL and eCASME (*eCApture of SME's training needs and specification*) [7] projects. It uses a top-down and bottom-up approach targeting both the individual and the organization. It aims first to raise awareness of the potential benefit of LLL to the individual and the organization. It aims to change the attitude and behavior of individuals and

 ISBN: 978-1-61208-215-8

companies towards LLL. Last but not least the framework should help companies to implement sustainable LLL strategies.

All three projects mentioned earlier – ARIEL, SIMPEL, eCASME, required SMEs to adopt some organizational and technological measures. These measures correspond to the planning, action and maintenance stages in building a LLL strategy by using the trans-theoretical model for organizational behavior change. This is illustrated in Figure 7. At each stage we mention the electronic tools that may contribute to master the stage effectively.

A. Company Situation and Necessary Qualifications

The first step for an SME is to analyze its own business goals, the company situation, and also the difficulties encountered by the company in achieving these goals.

Once the analysis has reached a conclusion, the SME will be able to determine what qualifications are needed by the staff to overpass the identified difficulties. Some methods used to achieve such qualifications include LLL strategy, e-learning, short term qualifications, etc.

The electronic tool useful for gathering documents in various versions and making them available throughout the company (either for everyone or in base of differentiated access rights) is a Wiki portal (either on its own or as part of a Learning Management System – LMS, such as the open-source projects Moodle or Sakai). Additionally, a forum for discussions may found itself useful, again either stand-alone or as part of an LMS.

B. Concept

The next step is finding suitable offers and services for the qualification needs required by the work tasks. This implies determination of learning contents, forms and media used for the LLL strategy, and also identification of relevant knowledge and data flows.

For the internal communication and gathering of information, the wiki and/or the forum mentioned previously may still be used. Feedback sheets and/or databases such as provided in LMS (e.g. Moodle, Sakai, etc.) help gather the information even more precisely.

To find suitable offers, SMEs may use web searching, and particularly, social networks such as Xing, Facebook probably also being useful.

C. Planning

This step implies specifying LLL measures as well as the time, the actors, the technological and organizational infrastructure, and the tools needed for an efficient realization of these measures. This is followed by the preparation of a financial (business) part of the LLL model providing a framework for the economical dimension of the LLL strategy in the company, linking the planning with the process level of the implementation.

Here, an excellent planning instrument for SMEs is for example MindManager, linking mind maps with basic project management features. For the financial planning it is necessary to draw on the data of business or enterprise management software (depending on the size of the company, this may range from simple spreadsheets up to very specific enterprise planning resource planning packages, which vary greatly according to size, branch and needs of the companies concerned.

D. Implementation

In this stage, LLL solutions that correspond to the learning culture of the company will be produced (or purchased and customized) and put in use. This may cover the whole range: from buying standard learning software packages to subscribing to podcasts and other web-based offerings, to running a CoP (*community of practices*), and using/running an LMS with self-developed learning contents. For SMEs, it may be useful to gang together or to make use of offerings through professional associations in order to minimize costs.

A further step may involve tests and certifications. In all likelihood, SMEs will not go further than running online quizzes for testing knowledge. Certification will most likely be taken out of offerings by craft chambers and other officially recognized certification agencies (including universities).

E. Evaluation and improvement

SMEs will certainly want to estimate how effective and financially efficient the training was. A complete evaluation concerns human and financial resources, developed measures, participation, improved knowledge, behavior, competences and expectations of the participants to the LLL trainings, and the observable changes in the company.

This raises the issues of quality control of e-learning and return on investment (ROI). Here it is not possible to point to one or two tools that do it all. Many different parameters may play a role into this [8]. It is important not to follow a narrow, purely economic frame in this evaluation.

III. LLL Strategies For SMEs and Cloud Computing

In the following, we will briefly present some of the LLL strategies used for example by German SMEs ([9], [10], [11]), and we will then propose a new approach in which cloud computing can be employed by SMEs in their LLL processes.

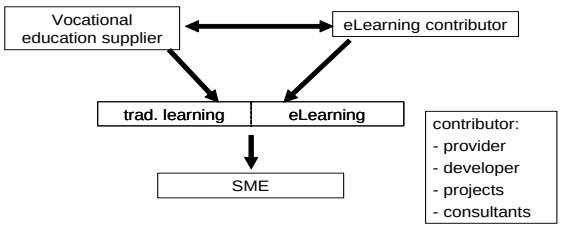

Figure 1. Cooperation with vocational education suppliers

In Figure 1, SMEs which are consumers of learning related products and services including e-learning, cooperate with vocational education suppliers to disseminate these, and to achieve their qualification needs.

 ISBN: 978-1-61208-215-8

Figure 2 exemplifies another strategy in which distributors of learning programs offer their services as a subscription. The point to be emphasized here is the distribution manner.

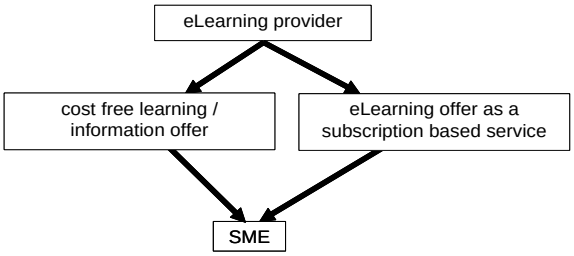

Figure 2. Subscription based services

The distributor in this business model gives first a trial offer or a free of charge basic information or learning offer. So clients know the services or products and request the suitable services for a fee.

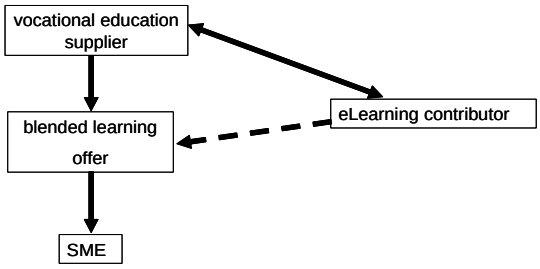

Figure 3. Refining of face-to-face courses

In Figure 3, the providers of learning services offer their services to the providers of traditional vocational education helping thus SMEs to build an integrated LLL strategy.

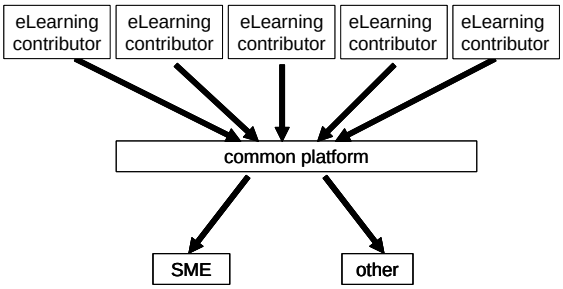

Figure 4. Content syndication model

It is a common practice to have different e-learning distributors pooling their contents on a common platform as depicted in Figure 4. This enables a common marketing and common standards (for certifications for example). The common platform can be established as a brand, after a while. The clients SMEs have then the possibility to access one platform for all courses. The content syndication model is designed mainly for smaller and niche/topic-oriented providers of learning content.

Another LLL strategy is that illustrated in Figure 5, where a franchisor offers a complete package of services to his franchisees.

SMEs from one sector work together, in informal or formal ways, e.g. in associations, to develop and to use e-learning applications, contents, platforms or courses together (as seen in Figure 6).

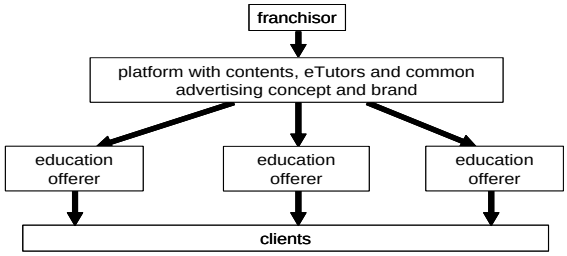

Figure 5. Franchising of e-learning

Among the LLL strategies presented so far, the two most used in the German SMEs community are *subscription-based services* and *content syndication model*.

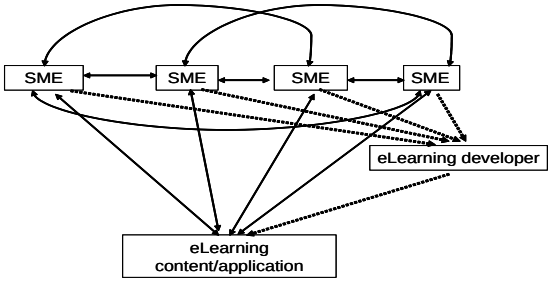

Figure 6. Sector courses developed by collaboration between SME

Cloud computing is a novel interpretation of sharing resources over Internet, on-demand and on a pay-per-use paradigm. These resources are diverse, ranging from software applications to data to computing and internetworking infrastructures. The cloud is seen as a natural evolution since it does not alter fundamentally the existing technologies; rather, it is growing on a successful collaboration/combination of them. Computing as a service and not as a product represents in fact the next public utility. SMEs could drastically reduce the costs pertaining to their LLL strategies and processes by adopting the cloud.

A first application of cloud computing is in the trans-theoretical model (see Figure 7). Some IT support or the entire IT infrastructure within the stages of the model can be moved into the cloud. Each stage as we have mentioned is using a certain number of software tools and these tools are better off in the cloud (due to reduced budget costs and delegated administration). In the traditional approach SMEs have to provide for the e-learning infrastructure with both hardware and software components. This means investing in the e-learning system: capital, human resources, etc. Traditionally, SMEs have developed their own intranets in which web-based e-learning systems were deployed. The economic crisis has redirected SMEs in finding alternatives to this paradigm. One of them is to shift towards incorporating cloud services in the e-learning process, and occasionally, aggregate in communities of sector-orientated

 ISBN: 978-1-61208-215-8

employers. This could be the case for SMEs playing in the same sector of activity, having a consolidated economic position on external markets that agree to participate into a win-win approach with similar co-national actors for improving their employees' skills and qualifications. Similar actors are those that have interlocked business relationships and shareholdings. Common business interests and common needs could lead to a common e-learning strategy. Obviously, the main reason of moving the individual learning management system into the cloud remains the reduction of set-up, maintenance and evolution costs. One interesting consequence of this shift into the cloud is if we consider an association of employers and the planning step of the trans-theoretical model. The various companies' statuses could drive a joint effort for establishing a common list of needs of qualifications for that business sector, and then in the successive steps of the model, to prepare, purchase or share knowledge and competence-building processes within a guild of SMEs. Additionally, migration of the traditional learning system into the cloud demands for a common set of good practices. SMEs, knowledge providers and CSPs all benefit if such an informative guide would be available. The NetKnowing project is intending to develop such a set of best practices for European SMEs willing to move their learning management systems into the cloud.

The cloud is seen in literature in three major classes of services: infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS). IaaS is a complete virtual machine running a specific operating system, in most of the cases acting as a server. For an e-learning environment, the cloud approach means that the cloud service provider (CSP) is in charge with delivering the infrastructure of the learning system and its operational management. The CSP is also in charge with the customization of the learning solution for the particular constraints of the individual SMEs. These may concern primarily scalability (variable volumes of managed data) and high-speed computing. In practice, large CSPs such as Google Cloud Platform, Amazon Elastic Compute Cloud, and Microsoft Azure are already offering support for hosting e-learning solutions. Top open-source learning / content management systems allow configuration and operation into the cloud (e.g. Moodle directly on Amazon Web Services via BitNami, Blackboard Moodlerooms solution, SCORM Cloud for Sakai). But these commercial solutions need to be compared and evaluated taking into account various budgeting and business constraints of SMEs. A guideline for either individual or community of SMEs seems thus necessary.

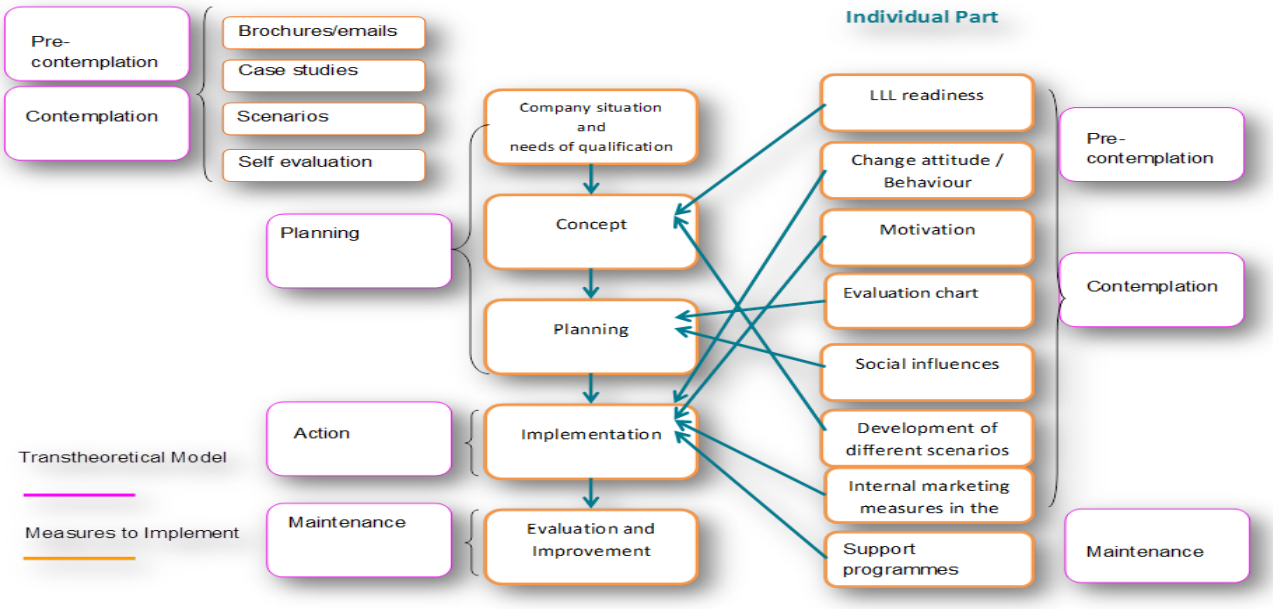

Figure 7. The trans-theoretical model

PaaS is is an extension of the IaaS to accommodate the middleware and to improve the performance in using it. It may be for example a web-based e-learning development platform containing the web/application server, the integrated development environment, the associated database and all additional utilities for development and testing. PaaS offers SMEs the possibility of acquiring on-demand usage-time for different types of software services. This includes a wide range of applications: office tools, graphic utilities, data storage facilities, etc. SaaS is dynamically scalable, device independent, and most of the applications are collaborative, allowing thus multiple users to share documents and work on them concurrently. Adding social media services through SaaS can only enhance this collaboration. A trivial example here, concerning office tools for SMEs, is Google Docs.

 ISBN: 978-1-61208-215-8

The deployment models into the cloud range from private cloud (an extension of the enterprise Intranet), to community-based cloud (the participants to this model are various organizations with a common mission or the same business goals), to public cloud (the CSP makes available its services to any customer via Internet), up to the hybrid cloud (actually an intersection between the previous deployment variants).

For our investigation, it is clear that SaaS and PaaS are the most suited categories for SMEs since the supporting IT instruments are out-sourced and need no longer be managed in-house. Taking for example the financial aspect of the software licenses this is no longer the task of the SMEs (instead CSPs will install, configure, update, fix and administrate them).

Security risks associated with the sensitive e-learning content and the related access control will be handled by the CSPs. Having the data stored into the cloud is a disadvantage for attackers since sensitive data (such as evaluation tests, exam answers, quizzes, etc.) is not as easy to locate on a particular hardware resource as is in the traditional intranet approach. Also, disaster recovery is no longer a problem of the SMEs instead this is delegated to the CSP. When client hardware terminals fail, the CSP in conformity with the service level agreement will ensure that the restoring time will be minimal and whether data restoring will be complete. Correlated with this, the SME's might get interested in aspects such as business continuity and data availability when moving the e-learning process into the cloud. Therefore, SMEs must establish and understand well the procedures necessary to have the data and the e-learning system available under any critical circumstance. Our current work concerns development of cloud adoption guidelines for SMEs addressing such sensitive topics.

For the subscription-based services, SMEs and e-learning providers benefit financially by moving the learning offer into a SaaS-like cloud service instead of buying a product (such as for example, the supporting software applications that need to be hosted and administered on the SMEs hardware/network). The same applies for the shared platform within the content-syndication model.

IV. CONCLUSIONS AND FUTURE WORK

This paper describes a work in progress related with our intent to incorporate cloud computing services for the referred two most used LLL strategies in two on-going projects, NetKnowing 2.0 [12] and ReadiSME [13]. This means changing the technological paradigm for the current e-learning platforms and LLL strategies used by SMEs.

The goal is to investigate how much the cloud and social media are beneficial for both SMEs and e-learning providers, mainly in reducing costs and improving knowledge transfer. The next step is to describe and discuss scenarios with SMEs representatives about the proposed application in this paper, and to test them in 1 – 2 SMEs from project partner countries.

A guideline will be developed referring LLL in SMEs and cloud computing with precise indication how to use the cloud in different stages of a LLL strategy. Related security and privacy risks will also be addressed.

ACKNOWLEDGMENT

This work was supported by the strategic grant POSDRU/89/1.5/S/61968, Project ID61968 (2009), co-financed by the European Social Fund within the Sectorial Operational Program Human Resources Development 2007 – 2013.

The studies have been carried out within the innovation-transfer projects ARIEL, SIMPEL and eCASME supported by the EU LLP Leonardo da Vinci sub-programme.

REFERENCES

[1] European Commission Report, "Assessing the Performance of European SMEs", September 2010, available on-line at http://ec.europa.eu/ enterprise/magazine/articles/smes-entrepreneurship/ article_10581_en.htm

[2] Steve Fiehl, Michel Diaz, and Antoine Solom, "The first e-learning barometer in Europe", October 2011, available on-line at http://www.crossknowledge.com/en_GB/elearning/media-center/publications.html?mictrl=cklgWhitepaper/show&sid=survey-e-learning-europe

[3] Michael Byrne, "Planning Gowth", January 2011, available on-line at http://www.smeadvisor.com/2011/01/planning-growth/

[4] ARIEL project, "Analyzing and Reporting the Implementation of E-Learning in Europe", March 2012, available on-line at http://www.ariel-eu.net.

[5] D. Beer, T. Busse, I. Hamburg, U. Mill, and H. Paul (eds.), "eLearning in European SMEs: observations, analyses and forecasting", 2006, pp. 2 – 6, Münster, Waxmann.

[6] D. Beer, T. Busse, I. Hamburg, and C. Oehler (eds.), "Improving e-learning practices in SMEs", Proceedings of the SIMPEL final conference, 2008, pp. 3 – 7, Brussels.

[7] eCASME project, "eCApture of SME's Training Needs and Specification", March 2012, available on-line at http://ecasme.amt.ul.ie.

[8] C. Porco, "Measuring the success of e-learning initiatives", available at http://www.prescientdigital.com/articles/learning/measuring-the-success-of-e-learning-initiatives/

[9] T. Hall and I. Hamburg, "Learning in social networks and Web 2.0 in SMEs' continuing vocational education", International Journal of Web Based Communities 5 (4), 2009, pp. 593-607.

[10] St. Engert, I. Hamburg, and J. Terstriep, "Promoting online education for new working environments in companies", in U. Demiray, S. Sever (eds.): Marketing online education programs: frameworks for promotion and communication. Hershey, 2011, PA: Information Science Reference, chapter 23, pp. 337-358.

[11] I. Hamburg, "Learning solutions and social media based environments for companies", in Life long learning for competitiveness, employability and social inclusion, International conference, 11-13 November 2011, Craiova, Romania, Editura Universitaria, pp. 31-37.

[12] NetKnowing 2.0 project, March 2012, webpage available on-line at http://www.netknowing.com.

[13] ReadiSME project, "Lifelong Learning readiness for SMEs", March 2012, webpage available on-line at http://www.readisme.com.

 ISBN: 978-1-61208-215-8