E-Learning Geschäftsmodelle und Einsatzkonzepte

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Evaluation and Optimization of E-Learning Scenarios

by Gabriela Hoppe and Michael H. Breitner

Abstract

- This article aims at principles, methods, and tools to evaluate, justify and optimize educational institutions’ and companies’ educational budgets.
- It is outlined that besides well-known benefits e-learning offers many important, non-quantifiable and quantifiable, but not monetarily ratable benefits. These benefits are systematically analyzed by an adapted six-level e-learning evaluation approach. The e-learning characteristics are exploited.
- Practical results and recommendations for all involved stakeholders in e-learning scenarios are presented, e.g. a spiral process model for evaluating e-learning scenarios.

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A. Introduction

E-learning is learning which is supported and/or made possible by the use of information and communication technology (ICT). ICT may not only act as auxiliary means but has to be immediately connected with the learning process (Seufert/Back/Häusler, 2001). E-learning is often discussed in connection with “modern” learning needs and augmenting effectiveness and efficiency of learning. Actual and future learning needs and paradigms base mainly on the growing importance of information and knowledge. Information as factor of production and tradable commodity is a deciding competitive advantage. In today’s “information society” or “knowledge society”, the productive handling of information and its transformation into knowledge plays an important role. The half-life of today’s knowledge is averagely three to five years (Bentlage/Hummel, 2002). To keep pace with actual developments and concepts, life-time “learning-on-demand” or “just-in-time learning” is a necessary skill every member of the information society has to possess or to develop. Effective and efficient learning methods and mechanisms are needed which allow finding and filtering real-time, actual and task specific information to enable people to construct problem specific knowledge. The need for such methods and mechanisms has to be seen in connection with the trend that the capability to use modern ICT will be a regular basic skill in the future. Thus ICT-based e-learning has developed an often propagated means to meet actual and future learning needs and paradigms.

E-learning offers substantial advantages compared to conventional courses, seminars, trainings or workshops. Although some advantages of e-learning are obvious, e. g., increased flexibility, the significance of e-learning however faces remarkable changes: After a euphoric phase with exceptional investments when e-learning was seen as a solution for many problems in human resources development, today many budgets are questioned or cut. This applies as well in the academic sector as in the private sector. Thus, evaluation approaches are needed which allow a systematical consideration of as well costs as benefits of e-learning scenarios.

Academic literature has already taken up these new challenges. Obvious benefits in terms of advantages are pointed out by various authors (e. g., Morgan, 2000; Seibt, 2001; Jansen et al., 2002; Köllinger, 2001; Köllinger/Ross, 2002). A detailed consideration of the target group’s specific benefits of e-learning (compared to its costs) is rarely achieved (Gröhbiel, 2002, for a more detailed analysis of benefits and costs of e-learning). Advantages and benefits of e-learning are a common theme in the e-learning literature. In contrast, methods and approaches of evaluating benefits of e-learning are rarely discussed. After mostly descriptive papers and studies presenting new methods of evaluating e-learning in the past, today subjects like education evaluation or education controlling are found more often (e. g., Payome/Gamböck, 2003; Ehlers/Schenkel, 2005). However, many papers only focus on single aspects like the participants’ satisfaction or measuring learning success. Literature still lacks an approach which systematically consolidates all benefit orientated aspects of e-learning evaluation.

Following, a combined inductive and deductive approach is used. First, main elements of and approaches to e-learning evaluation are described. Afterwards the more sophisticated models of evaluation by Kirkpatrick and Schenkel are introduced. Main focus of this paper is Section D. Methods for all levels of evaluation that concentrate on the spe-
cific characteristics of e-learning are developed here. All case studies and examples are
taken from (Dittler, 2002) and (Hohenstein/Wilbers, 2003). Although examples present-
ed in this paper focus continuing education in companies, the introduced ideas and methods
are applicable to all education institutions deploying e-learning with slight adaptations to
the particular context.

B. Importance and Problems of Evaluating E-Learning Scenarios

A particular e-learning scenario is characterized by all characteristics e-learning can be
described by, e. g., the underlying theoretical approach, the type of operating device, the
temporal and geographic distance, or the level of interactivity (for more characteristics
see, e. g., Hoppe, 2005). Due to the multitude of different e-learning characteristics and
e-learning as well as conventional education scenarios, a decision process has to take place
to determine the most effective and efficient education scenario. According to different
objectives of education, effectiveness means the contribution to achievement of objectives
(Kerres, 2001). In this respect, effectiveness has to address pedagogical as well as techn-
nological, economical, societal, and political objectives. Due to the described trends, i. e.,
the necessity to fund e-learning sustainably and to justify educational budgets more and
more, it is not sufficient to concentrate on effectiveness. Moreover, education institutions
as well as companies practicing continuing education have to focus efficiency aspects.
The need of efficiency considerations is also emphasized by (Kerres, 2001). Efficiency
indicates the relatively largest contribution to achievement of objectives referring to the
resources spent. According to this, even an e-learning scenario with lower learning success
compared to “traditional” training could be favored as more efficient because it requires
less effort and thus less costs. To measure effectiveness and efficiency evaluation methods
are needed.

Evaluation generally means a systematical analysis and valuation of the usability of a
target object. The evaluation of e-learning is discussed controversially (e. g., Schenkel/Ter-
gan/Lottmann, 2000; Horz/Fries/Hofer, 2002; Schulmeister 2003). Depending on purpose
and object of evaluation, different evaluation methods exist and different evaluation
approaches are useful. The strategic or political function of evaluating e-learning in an
organization is the justification of e-learning to outsiders; the control or decision function
of evaluating e-learning in an organization is an internal optimization process to analyze
effects of e-learning also compared to traditional training and to detect and eliminate weak
points of an e-learning scenario (e. g., Hoppe, 2005). The academic and the private sector
have different aims when evaluating e-learning.

In the academic sector, the main problem is sustainable funding of e-learning. In the
last years, a variety of e-learning projects was initiated. Not all of them have (already) led
to utilizable, transferable, and/or marketable products or results. Governmental funds in
the last years were the favored revenue model for funding academic e-learning projects.
Solely in the German support program “Neue Medien in der Bildung” (new media in edu-
cation) of the Bundesministerium für Bildung und Forschung (BMBF, Department of Edu-
cation and Research), 100 project consortia with about 540 subprojects were promoted in
the last four years with a funding of about 200 million Euro (DLR, 2004, and www.medien-
Evaluation should accompany the whole life cycle of an e-learning scenario to provide exploitable results. Thus evaluation is a continuous process. As far as evaluation goals as well as the specification of an e-learning scenario can change, evaluation can lead to different results over time. A not only continuous but also cyclic evaluation process is suggested to consider these possibly changing conditions.

Process models are a common means to structure processes and enhance their transparency. Process models lay down preconditions, results, supporting methods or tools. They are usually designed as phase models. Continuous evaluation processes can be conducted following a four phase spiral shaped process model. Figure 2 gives an overview of the suggested spiral process model for evaluating e-learning scenarios.

The four phases of this spiral process model (determination of objectives, formative evaluation, realization of an e-learning scenario, summative evaluation) can be detailed in terms of identifying single activities.

### E. Conclusions and Future Research

The euphoric years with very optimistic visions of and exceptional investments in e-learning are over. Today, expected e-learning costs and benefits have to be analyzed and evaluated in detail. Several methods are introduced to enhance Kirkpatrick’s four- and Schenkel’s six-level-approach for evaluation. Furthermore, ways of integrating it into e-learning scenarios are shown. Particularly benefit orientated aspects are analyzed and especially the

| Tab. 3: Methods of evaluating benefits of e-learning scenarios on different evaluation levels |
|-----------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| **0 Product Level**              | **1 Reaction Level**            | **2 Learning Level**            | **3 Behavior Level**            | **4 Results Level**             | **5 ROI Level**                 |
| - Quality guides                 | - Digitized questionnaires      | - Multiple choice questions     | - Digitized questionnaires      | - Digitized questionnaires      | - Cost comparison between      |
| - E-learning standards           | - Logfiles                      | - Vocabular tests               | - Work samples                  | - E-mail reminders              | conventional and e-learning     |
|                                  | - Interviews                    | - Clozes                       | - E-mail reminders              | - Key figures                    | scenarios (input minimization) |
|                                  | - Observations                  | - Classification exercises      | - Repeated knowledge tests      | - Results before and after      | - Comparison before and after   |
|                                  |                                  | - Open questions                | - Forums                       | educational activities           | educational activity (output    |
|                                  |                                  | - Written exams                 | - Chats                         |                                  | maximization)                  |
|                                  |                                  | - Role playings                 |                                  |                                  |                                  |
|                                  |                                  | - Forums                        |                                  |                                  |                                  |
|                                  |                                  | - Chats                         |                                  |                                  |                                  |
|                                  |                                  | - Logfiles                      |                                  |                                  |                                  |

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qualitative benefits are systematically analyzed in order to allow a methodical correct identification and elimination of weak points in e-learning scenarios. Table 3 shows various methods on each of the six levels of evaluation derived from the models of Kirkpatrick and Schenkel as well as from several case studies.

Theoretically the four-level approach is custom in many companies. But surveys and case studies discussing evaluation methods of educational activities indicate that there is mostly a limitation to the reaction level. Both, the evaluation of conventional education and of e-learning, face the same problems for higher evaluation levels: Collecting, validating, and analyzing the necessary data is very complex and can cause high costs. Even if tried, it is also not possible to easily quantify all necessary inputs for a return on investment calculation monetarily. Privacy aspects, personal rights, and works committee’s rights limit the possibilities of evaluation as well. All attempts of evaluation on the results and ROI level therefore have always to be critically analyzed. In long-term studies it has to be analyzed whether and how companies follow an integrated approach of evaluating their educational activities including the upper levels. However, it becomes clear that the specific e-learning characteristics facilitate evaluation as necessary data can be easier collected. Questionnaires can be faster distributed and answers can be automatically evaluated. By using blended learning, even the often necessary relationship between tutor and students is made possible. Knowledge transfer and the use of new skills can be evaluated without a media break and at reasonable costs.

Evaluation methods are not limited to the deployment of e-learning, they can also be applied to system development and to operating adaptive e-learning systems (Maske/Bartels/Breitner, 2005) or as a possibility for additional revenues (Hoppe/Breitner, 2004; Breitner/Hoppe, 2005). The adoption of a structured process model for evaluation processes is suggested. A cyclic process model which integrates the phases determination of objectives, formative evaluation, realization of an e-learning scenario, and summative evaluation can serve as a reference framework for evaluating and optimizing e-learning scenarios.

References


Summary

Due to cutbacks of educational budgets it becomes more and more necessary to test education for effectiveness and efficiency. A goal is to find principles, methods, and tools to justify and optimize educational institutions’ and companies’ educational budgets. E-learning can be an alternative or a supplement to cost-intensive conventional courses which normally require the physical presence of instructors and learners. Besides well-known benefits like flexibility increase, e-learning offers many important, nonquantifiable benefits. Moreover quantifiable, but not monetarily ratable benefits arise. These benefits are analyzed by adapting and expanding Schenkel’s modified version of Kirkpatrick’s four-level evaluation approach for e-learning. Comprehensive methods are outlined to evaluate each level of an e-learning scenario from software engineering to return on investment (ROI). A systematic and comprehensive evaluation and optimization of education becomes possible which is not focused on monetary values only. It becomes evident that the e-learning characteristics offer substantial advantages compared to conventional education, e. g., the observation of learning results is easier. Practical results and recommendations for all involved stakeholders in e-learning scenarios are outlined.

Zusammenfassung


JEL: I21, I23, O33, M53