THE DEVELOPMENT OF LOGICAL STRUCTURES FOR E-LEARNING EVALUATION

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ABSTRACT

This paper deals with development of logical structures for e-learning evaluation. Evaluation is a complex task into which many different groups of people are involved. As a rule these groups have different understanding and varying expectations on e-learning evaluation. Using logical structures for e-learning evaluation we can join the different expectations of groups and can evaluate quality of e-learning with multidimensional targets.

Key targets form the base for a logical evaluation structure. The evaluation is successful or positive only if all key targets were achieved. If only one key target was not achieved the whole process has missed its target.

As a rule key targets can be achieved on different ways. This can be mapped by corresponding sub targets which form the inner logical structure of key targets. By this method very flexible target structures can be modeled. If consensus has been reached on the logical target structure of an e-learning project further evaluation can be performed based on adapted checklists and the use of measure theoretical methods as that has been presented in previous papers of authors.

KEYWORDS

Evaluation, e-learning, e-learning evaluation, evaluation target, logical target structures.

1. INTRODUCTION

Evaluation is playing a very important role during development, implementation and realization of an e-learning framework. Educational evaluation models and approaches were developed by several authors: D.L.Kirkpatrick and J.L.Kirkpatrick (2006), and especially for e-learning evaluation to Stufflebeam (1972), Khan (2004), Ehlers et al. (2006), Colace et al. (2006), Lam and McNaught (2008) and Ruhe and Zumbo (2009).

However, the groups which are involved into an e-learning framework: pedagogues, administrators, educators, multimedia designers, managers, stakeholders, decision makers, tutors, and learners have distinguished ideas and expectations on evaluation.

Moreover, e-learning is as a rule a work, time and cost intensive project which needs development and qualification from one implementation to the next. It is a team work result of different groups, experts or partners. If we try to measure the quality of e-learning we have to take into consideration the interests and expectations of all involved groups. Besides the groups mentioned above this can be moreover educational institutions and financial backers, for instance.

Figure 1 emphasizes that the interested groups in e-learning evaluation can have different expectations and distinguished targets. But all these groups have one common main target. They want to measure anyhow the quality of e-learning or want to know how successfully an e-learning course is running.
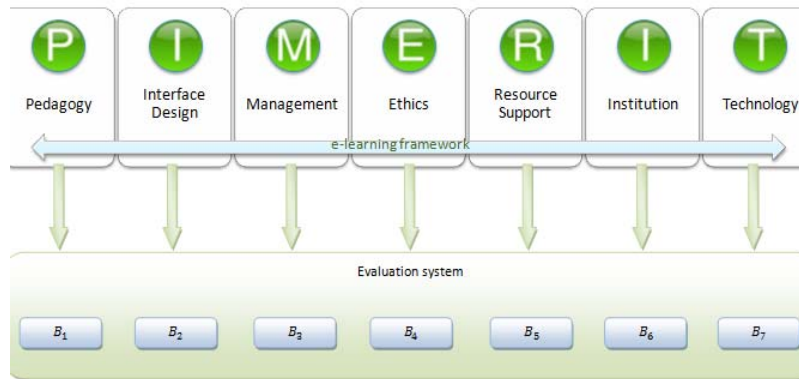
Figure 1. E-learning and evaluation

To create and develop e-learning courses different environments have to work together (Khan, 2004):

- Pedagogical environment
- Interface Design environment
- Management environment
- Ethical environment
- Resource support environment
- Institutional environment
- Technological environment

By means of logical structures we can evaluate the quality of an e-learning course not only in sense of expectations of involved different groups we can measure the quality of an e-learning course for each environment, too.

2. LOGICAL STRUCTURES OF KEY AND SUB TARGETS

By our model it becomes possible to evaluate for all involved groups how the corresponding group has achieved its target. Based on an adapted logical structure we can see how successful the components of an e-learning process are running, where we have to spend more attention and what should be improved for the next round. A further advantage of our model is we can consider very flexible logical structures, if necessary. Simultaneously it becomes possible to evaluate in a consistent manner how special single targets were achieved.

The formal details of this approach are presented by Uranchimeg, Hardt (2011). Key targets are involved into a logical structure via serial schemes. A corresponding main target can be achieved only if each key target of logical structure is achieved. If only one of key targets is missed the corresponding main target is missed, too.

Sub targets of key target are visualized by a parallel schemes (see Figure 2). That means if at least one of the sub targets is achieved we will consider the corresponding key target as achieved. A key target can consists of several sub targets. But to extensive parallel structures should be avoided. In this case we can get high evaluation values for a key target even in cases when the evaluation values for the sub targets are uniformly small. This should be noted during the design of a logical structure.

After definition of logical structure of an evaluation target the evaluation scores can be computed by means of the calculation rules presented in Uranchimeg, Hardt (2012) based on the observation data obtained by adapted checklists.
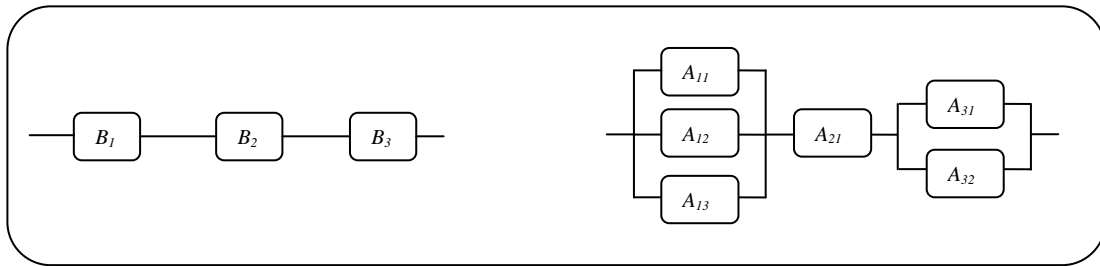
Figure 2. Visualization of logical structure

For instance, the score that an e-learning course whose logical target structure is defined as it is demonstrated in Figure 2 is calculated by

$$Q^*(C) = Q^*\left(\bigcap_{i=1}^{r} B_i\right) = Q^*\left(\bigcap_{i=1}^{r}\bigcup_{j=1}^{s_i} A_{ij}\right) = \prod_{i=1}^{r}\left(1 - \prod_{j=1}^{s_i}(1 - q_{ij}^*)\right).$$

Here denotes $q_{ij}^* = Q^*(A_{ij})$ for $i = 1, \ldots, r, j = 1, \ldots, s_i$, the estimation value for the score that the single target A_{ij} has reached its target. These estimation values are determined from the checklist data. It holds $0 \le Q^*(C) \le 1$ as well as $0 \le q_{ij}^* \le 1$. A value $Q^*(C) = 1$ means the main targets of a target structure C have been reached completely, $Q^*(C) = 0$ means the targets were missed. For the details we refer again to Uranchimeg, Hardt (2011).
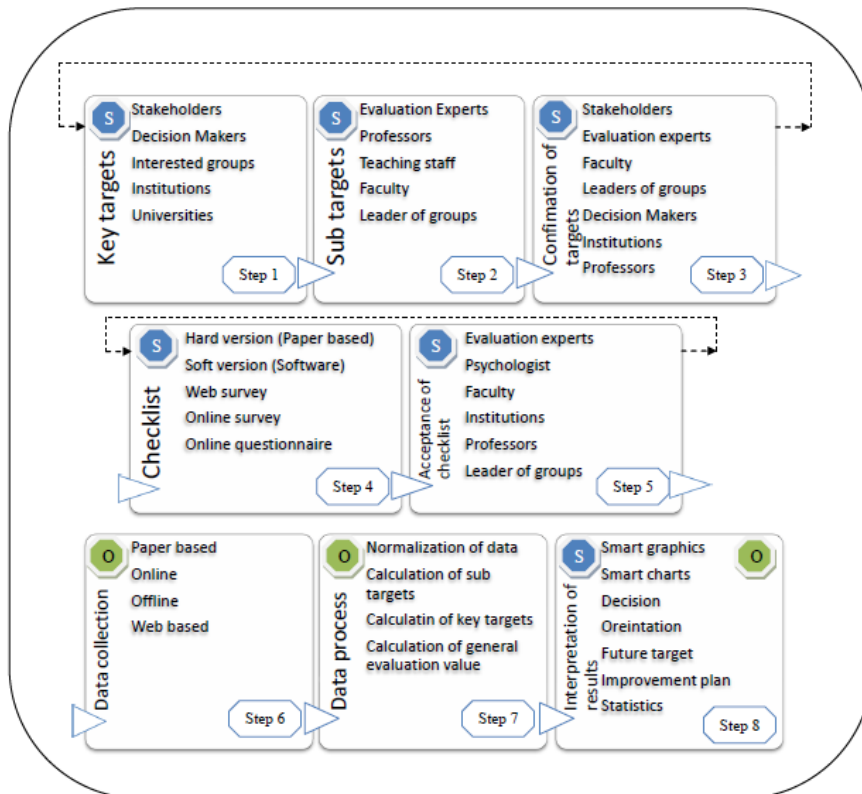

Figure 3. Logical structure of different groups

The e-learning evaluation process consists of eight steps (see Figure 3): 1) definition of key targets, 2) definition of sub targets, 3) confirmation of evaluation targets, 4) creation of checklist, 5) acceptance of checklist, 6) data collection according checklist, 7) data processing, 8) interpretation of evaluation results and outcomes. Some steps are subjective oriented (characterized in Figure 3 by 'S'), some are more objective oriented (characterized in Figure 3 by 'O'). Subjective steps should be repeated until agreement is reached between stakeholders or group leaders which are involved into e-learning process.

3. CONCLUSION

The structure oriented scoring model is an alternative to the frequently used linear evaluation models. By concentration to the logical structure of target of an e-learning process and calculation of the score by application of the corresponding rules of general measure theory we don't need the more or less subjective weight factors which are used for linear models.

The presented model offers the possibility to consider parallel and consistent the expectations of the different groups which are involved into development and implementation of an e-learning process. Hence, the model can be applied for global evaluation of an e-learning process as well as an evaluation of embedded processes. Via the consideration of group relevant logical sub structures it becomes possible to involve and to integrate all interested groups into an evaluation process. The corresponding data can obtained based one a general checklist where the data are processed according to considered logical structures of evaluation targets. This can avoid frequently observed conflicts at determination of priorities for evaluation. Using one checklist we can collect data from learners about all environments.

The use of model in context of formative evaluation can help the institutions to recognize weaknesses of an e-learning process or to monitor running processes.

Moreover, the structure oriented scoring model can be used in more general sense for structural evaluation and monitoring of functionality of general processes with a logically describable function target.

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