Evaluating System Functionality in Social Personalized Adaptive E-Learning Systems

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Abstract. Along with the theoretical and practical research on introducing a social dimension to adaptive educational hypermedia, the evaluation of such systems becomes more important. Existing evaluation methods are mostly based on statistical and qualitative analysis, in which researcher bias is built in and unavoidable. Moreover, they adopt either a traditional "as a whole" approach making it difficult to evaluate a system from different perspectives, or a "goal specified" approach, which only covers a specific aspect. Therefore, this study proposes a *generic method for evaluating system functionality*.

Keywords: adaptive educational hypermedia system, evaluation, framework.

1 Introduction

The evaluation of social personalized adaptive e-learning systems has been considered a complicated and effort-consuming task. Several evaluation approaches [1-3] have been developed, only covering limited perspectives.

2 System Functionality Evaluation Methodology

We have developed a *component-based evaluation framework*, which uses a Likert Scale (1-5) and has four components: *(1) System Functionality; (2) Learning Perspective; (3) System Prospect* and (4) *Overall System Classification*. The first one, System Functionality, is further detailed here. This component aims at using a Likert Scale to evaluate system functionalities from different performance aspects such as accessibility, effectiveness, operability, reliability, scalability and usability. We associate a weight, 'w' with each considered performance aspect, which represents its significance. The score value of this component, '$Comp_{FUNC}$', is calculated using Eq. 1 for representing the overall system value against the considered system functionalities. The score value is measured by taking summation of product of the considered performance aspects of system functionalities, '$SubSys_{(aspectID,subSysID)}$', and the associated weight, '$w_{(aspectID,subSysID)}$', where '*aspectID*' represents a considered performance aspect; '*subSysID*' represents a considered sub-systems; 'm' represents the number of the considered sub-systems. The generalized description of '$SubSys_{(aspectID,subSysID)}$' for each considered system functionality represented as

'$F_{(aspectID,funcID,subSysID)}$', could be calculated using Eq. 2, where '*funcID'* represents a considered system functionality; '$w_{(aspectID,funcID)}$' represents the corresponding associated weight; 'n' represents the number of the considered system functionalities within the sub-system. '$F_{(aspectID,funcID,subSysID)}$' could be calculated using Eq. 3, where '$q_{(i,\ j)}$' represents the j^{th} question related to the considered system functionality, '$F_{(aspectID,funcID,subSysID)}$', answered by the i^{th} respondent; 'w_j' represents the corresponding associated weight of this question; 'k' represents the number of the questions related to the considered performance aspect of a considered system functionality; 'a' represents the total number of respondents. The term '1/a' is used to minimize the level of biasedness arising from the answers of a respondent.

$$Comp_{FUNC} = \sum_{subSysID\ =\ 1}^{m} SubSys_{(aspectID,subSysID)} \times w_{(aspectID,subSysID)} \quad (1)$$

$$SubSys_{(aspectID,subSysID)} = \sum_{funcID\ =\ 1}^{n} F_{(aspectID,funcID,subSysID)} \times w_{(aspectID,funcID)} \quad (2)$$

$$F_{(aspectID,funcID,subSysID)} = \frac{1}{a} \times \sum_{i=1}^{a} \sum_{j=1}^{k} q_{(i,j)} \times w_j \quad (3)$$

3 Conclusion

We have developed *component-based framework* for evaluating social personalized adaptive e-learning systems, aiming to reduce researcher bias, as well as provide a broader performance perspective of such a system. This evaluation methodology were used to evaluate the Topolor system [4] and allowed identifying a set of important features for further improvement [5]. Here, we have only described the first aspect of this framework, the System Functionality evaluation methodology.

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