# An Ontology-Based Approach for Designing Web Usability Evaluation Questionnaires

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**Abstract.** Questionnaires are widely used instruments to carried out usability evaluations, but their correct construction is often a complex task since a lot of previous real administrations are required to obtain a fine-tuned version of the questionnaire. In this work a new approach to design questionnaires is proposed. The approach is based on an ontology and it supplies for some new features useful for novel designers.

## 1 Introduction

Nowadays, the usability of Web interfaces is being considered a factor of increasing importance in application development. Usability [2] can be defined as the effectiveness, efficiency, and satisfaction with which specified users achieve specified goals in particular environments, although, since this definition is really abstract and generic, these three attributes must be detailed in more concrete features, taken into account the specific execution environment of the application.

Currently, usability is a buzz word in Web because usable applications enable to enlarge their scope, and therefore, more users can access the information or products that they present [3]. But developing usable Web sites or applications can entail costs in terms of time and resources, since usability must be taken into account in all phases of the development life cycle [1], including usability evaluation in different process's stages. The evaluation must be carried out using different methods, like testing, inspection or inquiry, which comprise in turn different techniques, like user testing [4], heuristic methods [5] or questionnaires [6], respectively.

In this work we are focused on the use of questionnaires in usability evaluation processes, which are used to obtain collect not only information about users but to obtain their likes, dislikes, needs, and understanding of the system by asking them about some concrete interface's aspects. Questionnaires are widely used

instruments in usability evaluation, for many reason. The most important are basically the following:

- Once they are constructed, they can be used repeatedly to evaluate the same application or similar ones.
- These measurement instruments allow user to carry out the evaluation remotely or with very low interaction between evaluation participants and testers, and therefore, they are cost effective to administer and to score and they enable the gathering of a lot of data when using them as surveys.
- Questionnaire data can be used as a reliable basis for comparison or for demonstrating that quantitative targets in usability have been met.
- They give testers feedback from the point of view of the user.

The correct construction and administration of a questionnaire may increase evaluation costs in terms of time and resources, because a lot of previous experience is needed in order to develop an appropriated questionnaire with a minimum figure of validity and reliability. If the questionnaire is not well-designed, biased results will be obtained, because it doesn't collect data about what testers can measure. But, as pointed at [7], the use of 'quick and dirty' questionnaires, e.i. with no demonstrated validity and reliability, are justifying to allow low cost assessments of usability in industrial systems evaluation.

In this paper we sketch how the construction of questionnaires can be easily carried out using web applications based on an ontological questionnaire model. This approach is specially useful to novice information architects without large amount of project resources who want to construct a questionnaire to evaluate and to improve usability of a concrete Web application.

The rest of the paper is structured as follows: In section 2 we describe the core components of the model and the relationships between them. In the third section, a case study is proposed in order to show some of the benefits of this ontological approach; and to finish, conclusions and future directions are depicted.

## 2 A Questionnaire Model for Usability Evaluation

### 2.1 Main Model Entities

As it has been described in the previous section, the design of a usability questionnaire oriented to evaluate a specific Web application can be made easier if a model that support the whole process is available. This model must hold all the entities that take part in the part in the evaluation, and also it must be rich enough to enable some reasoning activities that allows for the construction of a solid questionnaire suitable for the application that the tester wants to evaluate.

Focussing on the aim of this paper, the main model entities must represent:

- The questionnaire and the questions it includes, taking into account that they can be organized in sections.
- The usability attributes that the evaluator wants to evaluate.

– The different functionalities that the application holds, which depend on the kind of Web application.
– The tasks that lead the evaluation participant.

The model must be completed with other strictly essential terms, some of they described in [10], that enable the representation of all the knowledge needed to carry out a usability evaluation using attitude questions as much as opinion or factual-type ones. Figure 1 depicts a high abstraction UML diagram that shows the core model entities used in this paper.

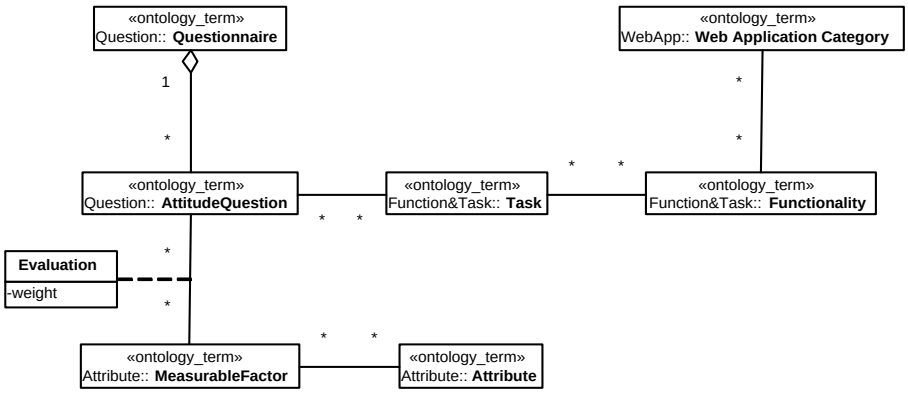


**Fig. 1.** UML diagram: Core classes of the usability questionnaire model

As we are aimed to design closed-ended attitude questionnaires, we represent here exclusively the knowledge about the questions that enable the collection of a user opinion according to his/her personal experience. It would be possible that participants had never used the application before, so, to achieve that they can create for themselves a opinion about the system, they can make use of a collection of task that they have to carry out. Each task is aimed to evaluate a specific functionality of the application, and in addition, we have considered that usually each kind of Web application contains a minimum well-defined set of functionalities. Questions are formulated to the user according to the task that he/she have realized, so its possible to adjust the statement text with the performed task.

Another important model section is about the attributes that can be evaluated using the questionnaire. Taking into account the terminology used in [11], a usability attribute can be defined as a system feature that contributes to make the system more easy-to-use. As we have previously exposed, the questionnaires we are modelling are attitude questionnaires, so they enable the acquisition of the user satisfaction about the application, and we can not considere that the results reflect directly a usability attribute, rather they obtain the perception the users have about the attributes. Then we have defined as measurable factor the

system feature that can be obtained using an attitude questionnaire. This factors can have different impact level on different usability attributes, although exclusively satisfaction attribute [12] can be directly obtained taking into account the overall questionnaire result. Normally, different questions relate to different measurable factors, and each factor is composed of weighted contributions from the ratings received for its statements.

### 2.2 Model Ontologies Integration

## 3 A Ontology-Based Approach for Questionnaire Design: A Case Study

To prove the usefulness of the integration of a questionnaire model based on ontologies we have implemented a prototype that guides questionnaire designs following a set of sequential steps. The information requested in the different phases of the design process doesn't require a very wide knowledge about usability evaluation, so, this approach can be consolidated in a useful tool to novice information architects and Web designers.

The generic architecture of an system based on this ontological models is represented in Figure x, which has been used in other application areas like [9]. The system is composed of a content layer and an application layer. The content layer contains different ontologies that .....

Web applications can be classified according to what developers want to do with the core objects of the application. According to this criteria, we have adapted the taxonomy shown in [8] of Web applications,

### 3.1 Guided Questionnaire Design

## 4 Conclusions and Future Work

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