

A ROLE-BASED ONLINE EVALUATION SYSTEM

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ABSTRACT

This paper describes the design and implementation of a Role-based Online Evaluation System (ROES). Originally, ROES was designed to be a user friendly, generic, web based system for students to rate their instructors. The final product is suitable for the assessment of essentially any type of function or performance. This article also includes a brief survey of currently used student-teacher evaluation systems and a discussion of our future efforts.

KEYWORDS

Online Evaluation, Assessment, e-Education.

1. INTRODUCTION

Many colleges and universities regularly ask students to evaluate various aspects of pedagogy such as their instructors' teaching effectiveness. Historically, such evaluations were produced using "bubble" sheets completed by hand with the data totals produced using a scanning device. These forms are generated by the institution or purchased as is the case when using the IDEA (Individual Development and Educational Assessment) form [KSU, 2006]. Bubble sheet forms are tedious to complete, expensive, and time consuming and troublesome to administer and score. The results are frequently difficult to interpret and constructing an historical or cumulative record and making their results available are a challenge. The increased emphasis on the development of online courses makes it difficult to administer evaluations during scheduled class times as is done with sheet forms. Recently, as outlined in the next section, colleges and universities are moving toward more efficient and flexible, less expensive, student friendly online evaluation systems.

In this article we describe the design and implementation of the Role-based Online Evaluation System (ROES) developed at the University of Akron as an ASP.NET [Prosize, 2002] web application in C# server-side code, HTML, and JavaScript for use on the Internet. The purpose of ROES was to deploy a cost-effective, web-based system that significantly extends the capabilities, flexibility, benefits, and confidentiality of paper-based rating methods while incorporating the ease of use of existing online surveys and polling programs. A comparison of ROES with paper and online teaching evaluation systems is given in the sequel.

2. ONLINE EVALUATION SYSTEMS

2.1 Existing Online Evaluation Systems

Online student teacher evaluations to rate teaching effectiveness are becoming more popular. For example, officials at Deakin University in Australia recognized the potential savings in time and expense they would gain by replacing their existing paper system by an online evaluation method [Goodman, 1999]. With the paper-based system, off-campus students were required to mail in their evaluation forms, and coding those forms into digital format would take up to three months to complete. In 1997, they implemented an HTML and CGI-based online system that yielded a forty to fifty percent student response rate. Deakin released their final online evaluation system, which provided different forms for on- and off-campus students in 1998. Students could log in with a unique ID and complete an evaluation for each of their teachers.

Drexel University also released an online evaluation system [Scoles, 2000 and McGourty, 2002] that was based on HTML, SQL, and the Perl scripting language. The motivation for replacing the traditional paper and pencil approach with an online process was the need to meet new accreditation standards developed by the Accrediting Board of Engineering & Technology (ABET). Specifically, the course evaluation process had to provide faculty with the flexibility to create course dependent surveys. Instructors would submit questions on a template email, which would be uploaded as an evaluation form into the system. Students used their name and birth date to log in and submit evaluations. Email was used as the main source of communication to students and faculty, reminding students to fill out their evaluations and providing instructors with real-time response rate data during the evaluation period so they could encourage more participation if necessary.

Columbia University implemented their WCES (Web Course Evaluation System) in 1997 [McGourty, 2002 and 2006, Koontz, 2006]. Their system was capable of performing midterm and end of term evaluations. WCES allowed faculty to customize their surveys and was linked directly to the registrar's office for security and for obtaining student course information. A public web site allowed anyone, including prospective students, to view evaluation results by professor or course.

Three Chinese universities (HKUST, HKU, and HKPU in Hong Kong) collaborated for the creation of two online evaluation systems, COSSET (Centralized Online System for Student Evaluation of Teaching) and OSTEI (Online System for Teaching Evaluation of Instructors) [Ha, 1998]. COSSET contained many features of previously discussed evaluation systems, while OSTEI was a formative questionnaire-based system. COSSET relied on registration information for student logins; OSTEI used a combination of instructor ID and questionnaire ID for students to log in and was considered less secure than COSSET. One major benefit of OSTEI was the instructor's ability to create a custom questionnaire. An instructor would register on the system, creating his or her own user ID, password, and questionnaire ID. They also had access to built-in questionnaires and a question bank consisting of 800 questions that could be used on a custom questionnaire.

Finally, an online IDEA form is currently available [KSU, 2006] and is delivered by giving each student a unique URL. Other features such as restricting students to one submission per course, reports, and student anonymity are similar to the original IDEA strategy.

2.2 Benefits and Challenges of Online Evaluation

Officials at the educational institutions mentioned in the previous section noticed some benefits of web-based evaluation over their former paper-based systems. One benefit is the immediate and flexible feedback available to reviewers. The online systems were also much easier to administer than paper-based evaluations. Since the forms were already in a digital format, time and money typically spent on overhead tasks were saved. Digitally stored data could also be readily used for analysis and establishing historical trends and comparisons. Online evaluations were more convenient for students. Additionally, students provided more useful and coherent responses to open-ended questions when using the online forms. Finally, online systems had the added benefit that users could be sent email with links to the evaluation forms and results. Instructors

could view detailed formative results and department chairs and deans had immediate access to summative statistical results. Other noted benefits include language censoring and publicly available ratings data.

Officials also noted some challenges of using online evaluations. For example, if students complete online evaluations over a period of time they may influence each other, thus polluting the data. The authors are not aware of any studies along these lines. Perhaps the largest difficulty observed by the schools was low response rates. A Drexel/Columbia non-response bias study found that women, upper-classmen, and those with higher GPAs were more likely to respond to online evaluations. Response rates were greatly improved through the use of such things as email reminders. A major concern of students was that their evaluation responses would not be confidential because of necessary login methods. The last major challenge was “culture change”, a natural bias against the online system simply because it was not the familiar way of performing evaluations. Culture change was overcome with promotion, a common and necessary component of all successful online evaluation systems.

The above mentioned online evaluation systems were developed to target the specific needs of the institutions which developed them. The adaptation of the systems to other institutions is a challenge, hence, rarely occurs. The online IDEA form is designed to be usable by different institutions, but the questions on the form are not customizable to specific needs of individual institutions.

2.3 System Design

The design goal of ROES [Walters, 2005] is to resolve some of the issues mentioned above. Specifically, it is to be made accessible and customizable so that it can serve any number of institutions, as well as, user friendly and anonymous so that students will not be afraid to use it.

ROES is designed as a “thin-client” web application [Prosize, 2002] requiring only a web browser administer and use. No additional software needs to be downloaded making it easily accessible. Any institution can create an account in ROES and specify a variety of evaluation forms to meet the specific rating needs of different academic disciplines within the institution.

In order to make ROES easy to use, its users are treated as role players. A single user, called the account administrator, can register a new ROES account on behalf of the institution. A form administrator can create and modify evaluation forms to be completed by evaluators. Those Individuals who are being rated have the role of evaluatee. A reviewer is able to view the results of an evaluation. The system automatically brings up the proper interface for an individual user based on that user’s role(s). Users do not have to navigate through interfaces unrelated to their roles.

In UML (Unified Modeling Language [Fowler, 2003]), a use case diagram describes the interactions of users and components in a software system. The use case diagram in Figure 1 was developed to show what actions can be performed by each type of role player in the ROES system.

The diagram in Figure 2 illustrates the work flow for the various roles within the system. Execution would begin at the top of the diagram and proceed toward the bottom, starting with a login attempt and ending with server processing. Each role follows a specific line of execution; for example, an account administrator’s actions are shown along the left-hand side of the diagram. Note that a reviewer’s execution loops back from the server processing step when a reviewer chooses to view evaluations for more than one evaluatee. Additionally, an evaluatee’s execution path is not shown because the evaluatee role is basically a subset of the administrator and reviewer roles. The streamlined workflow for each type of role players makes it possible for ROES to implement an easy to use GUI (graphical user interface). ROES’ GUI guides the users through their workflow based on their roles.

Building evaluation forms can be a tedious task for the administrators. ROES is designed to automatically generate evaluation forms from a list of evaluation items in Microsoft Excel spreadsheets. This use of Excel spreadsheets simplifies the form creation process.

Ensuring anonymity is crucial for encouraging students to perform evaluations and to give fair evaluations to their teachers. ROES has two facilities to ensure anonymity. Firstly, ROES can automatically create evaluator accounts based on randomly generated user IDs from a Microsoft Excel spreadsheet. Such IDs have nothing to do with the students’ university IDs. Randomly generated evaluator IDs can be distributed indiscriminately to the students. When a student submits an evaluation through ROES, it generates an internal evaluation number to be assigned to the evaluation data. After that, no trace is left in the

system to identify which evaluator ID is used to generate the evaluation. Students can be assured that their responses on ROES evaluation forms are truly anonymous.

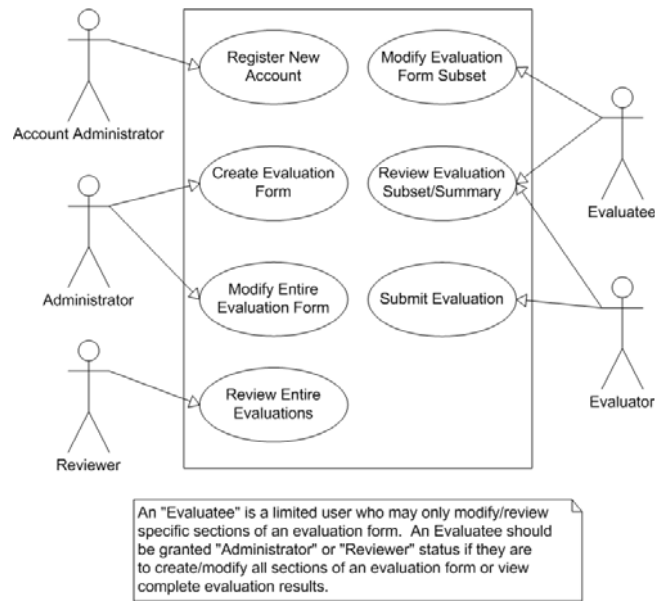


Figure 1. ROES use case diagram for different role players.

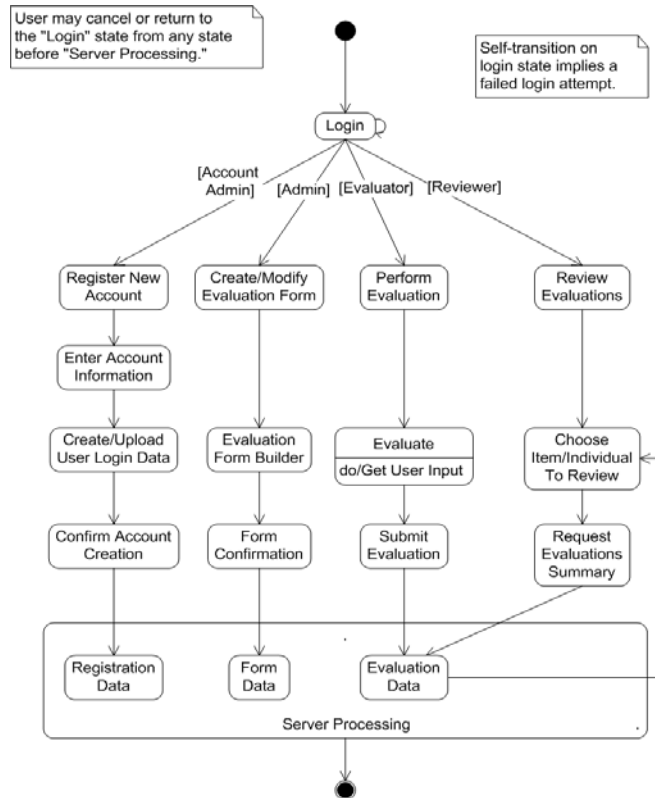


Figure 2. ROES state diagram for different role players.

2.4 Implementation

ROES takes advantage of the latest development technologies in its implementation. It is an ASP.NET web application to be used on the Internet and was written using Microsoft's Visual Studio .NET development environment in the C# programming language. Client code was written in HTML and JavaScript, with potentially embedded server-side script written in C#. Code that executes on the server to process event handlers for events such as button clicks is also written in C#. Microsoft's SQL Server 2000 is used for database operations, including the storage and retrieval of login information, as well as evaluation form display and submission data.

The roles implemented in ROES were authenticated using the .NET role-based security mode for forms authentication. A sibling component of forms authentication is URL or role-based authorization which can be thought of as folder-based protection. When a user is authenticated with forms authentication, their roles are assigned to their identity in the form of an Internet cookie that is used for authorization. A web configuration file is used to specify which of the four web folders FormAdministrators, FormEvaluators, FormEvaluates, or FormReviewers a user may access. If a user is not authenticated or attempts to access a folder they are not authorized to access, they are redirected to a web page specified in the web configuration file. After successfully logging into ROES, users are taken to an action page that dynamically presents options to them based on their roles.

3. CONCLUSION

ROES is currently under evaluation at the University of Akron in four senior level courses in Mathematics and Computer Science taught by the authors. Eighty nine percent of the respondents indicated that they preferred the online method over the traditional paper form. Eleven percent indicated "no opinion" while no one responded in favor of the paper form. When questioned, evaluators did not express concerns about confidentiality issues. Initial testing indicates that ROES is an easy to use, adaptable, and extendable online evaluation system. Most of all, ROES is customizable at institution, college, department and evaluatee levels.

ROES can easily be used for midterm and end-of-semester evaluations at universities. It could also be used for mid-course feedback (with an enhancement allowing evaluators to submit multiple evaluations), for anonymous surveys or quizzes to grasp overall student understanding of coursework, for company supervisor/employee evaluations, or even just for informal polls. The benefit of ROES being an online system is that it is accessible to anyone willing to setup and perform an evaluation.

Although ROES is a useful and usable stand-alone system, it can be improved. Currently, ROES can only perform authentication via the use of Excel authentication files that are uploaded to the OES server. But it may be desirable to allow the system to connect to an external authentication data source, such as a university's registration system, PeopleSoft, or another SQL Server database on the Internet. It would be also desirable to allow authentication, file uploads to be performed securely via SSL (Secure Sockets Layer); ROES does not currently have security measures in place to safeguard the transmission of data over the Internet. Improvements can also be made to enhance ROES users' experience. For example, users may want more form controls in addition to the "select" and "textbox" control types currently provided by ROES. Finally, it may be useful for the account administrator to be able to view usage statistics for their account, such as how many users are active in their account, how many evaluation forms have been created, how many evaluations have been submitted, and response rate data.

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