Prototype of Web2-based system for Quality Assurance Evaluation Process in Higher education Institutions

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Abstract—The process of quality assurance in higher education is a complex process requiring many of the arrangements. This process consists of several stages; the most important stage is the evaluation. This paper provides the unified modeling language diagrams (UML) for the quality assurance evaluation process in any higher education institution. Also, the prototype implementation of this system is discussed. Our work in this paper is based on the Egyptian (QAAP) Quality Assurance and Accreditation Project. There are three stages for the evaluation process: self-evaluation stage, external evaluation stage, and peer reviewing stage. Our system focuses on the first and the second stage. Finally, the implementation of the system is provided.

Index Term—Quality assurance, evaluation process, Higher education institution, QAAP, UML

I. INTRODUCTION

Quality assurance is a planned and systematic review process of an institution or program to determine whether or not acceptable standards of education, scholarship, and infrastructure are being met, maintained and enhanced. A tertiary institution is only as good as the quality of its teaching staff—they are the heart of the institution that produces its graduates, its research products, and its service to the institution, community, and nation. Accreditation is a process of self-study and external quality review used in higher education to scrutinize an institution and/or its programs for quality standards and need for quality improvement. The process is designed to determine whether or not an institution has met or exceeded the published standards (set by an external body such as a government, national quality assurance agency, or a professional association) for accreditation and is achieving its mission and stated purpose. The process usually includes a self-evaluation, peer reviews and site visits. Success results in accreditation of a program or an institution [13].

All countries have some kind of quality assurance mechanism in place, although they differ significantly in terms of purpose, focus and organisation. Quality evaluation is only an internal responsibility of higher education institutions in some countries where no national agency exists, e.g. in Austria, Switzerland, the French community of Belgium, Germany and Slovenia. In many countries there is an obligation for universities to have their own quality evaluation system and a body at national level responsible for the organisation and stimulation of this process, e.g. in Portugal, Spain, Germany and Iceland [2].

The evaluation has to lead to concrete measures if to be considers valid and valuable. There should be a long-term strategic plan for the evaluation so that the institutions know what to expect. Every university has the responsibility to make a plan and program for the evaluation of quality [2]. In our country (Egypt), the quality evaluation process for any higher education institution (HEI) consists of three stages: self-evaluation, external / internal evaluation, and peer reviewing evaluation as shown at figure 1 [17]. At figure 1, The QAMS DB refers to the database of the quality assurance management system according to [1].

Fig. 1. The Quality Assurance Evaluation Process
II. EVALUATION STAGES

When evaluating the institutions means judging the strategies, goals, plans, systems, methods and the organisations that the institutions use to secure and develop the quality devices are “evaluate to develop” and “quality is a journey not a destination” [2].

To maintain and improve quality, higher education institutions have to evaluate themselves, which is the first step in the evaluation process. The next step is external (sometimes called internal) evaluation, which includes a visit of the external evaluation commission that issues a report with recommendations [5]. The final step is the peer reviewing / the site-visit evaluation.

Our system (Quality Assurance Evaluation System or QAES) focuses on the first two stages for two reasons. The first reason is that the major (if not all) of Egyptian higher education institutions try to be enrolled in QAAF now because it is a new trend in Egypt. The second reason is that the third stage is based on the two other stages and if the institution success to precede the first two stages it will be able to transfer to the third stage easily.

Self-evaluation means that a unit or an organisation appraises its own activities, their requisites and outcomes. Self-evaluation is a way of collecting information on the evaluation target and a tool for HEIs to improve their activities. Self-evaluation can be undertaken on the organization's own initiative or at the behest of an external body [4].

The next step in the evaluation process is external evaluation, which includes a visit of the external evaluation commission that issues a report with recommendations. Tasks of the external evaluation commission will be: to overview the contents of the self-evaluation report, to visit the higher education institution, which is the object of external evaluation, and to form an evaluation report with recommendations. A dialogue between the evaluators and the evaluated institution has to be present [5].

**External evaluator** is an external experienced person in the field of specialization who is invited to review the structure and content of a programme, its relevance to the Intended learning outcomes (ILOs), the standards and appropriateness of student assessments and attainment against the specification, and evaluating the existing learning resources and whether or not they satisfy the programme requirements. The institution is responsible for specifying the evaluators’ role and appointing them [7].

I. THE FEATURES OF QUALITY ASSURANCE EVALUATION SYSTEM (QAES)

Our main idea is to create an automated system to help every one who deals with the evaluation process of any institution. The biggest problem that may face the institution during the quality evaluation process is how to generate its self evaluation report. Also, during the internal (external) evaluation stage it is required from the evaluator to generate the evaluation report in a specific format. This may take several time and many efforts to be finished. Another difficult that may face the evaluation team is appropriate tool that is required to connect them with each other in some tasks. The evaluation process also must contain the recommendation report from the evaluators’ point of view. The all of these processes will be executed automatically with our system. The quality assurance evaluation system QAES is our designed system. The input and output for the system can be illustrated at fig. 2.

![Fig. 2. QAES Input / Output](image)

The inputs of the system are all documents required for the evaluation process as the institution data, staff data, students' data, buildings data...etc.

The main outputs of the system are:
1. The self-evaluation annual report of the institution.
2. The internal / external evaluation report.
3. The recommendation report.

There are also a lot of related outputs for the system that the evaluation team may use it to communicate during the evaluation process. These outputs includes visit time table that is created by the president of the evaluation team to determine each evaluation task and its period. The system also provides a lot of services for the evaluation team as:

1. Allow the president to determine each team member tasks
2. Allow the team member to agree, disagree, or comment on these tasks.
3. Allow evaluators to upload their daily notes about the evaluation process.
4. Allow the president to update any report of any member and inform the member.
5. The president can generate and print the pre-visit report.
6. Allow to all members to print all evaluation reports and update their data at any time.
7. Allow each member of the team to view the report of the other members about the same institution.
8. Allow the team to communicate in writing the final evaluation report for the institution at the same time.

II. UML DIAGRAMS FOR THE QAES

The Unified Modeling Language (UML) is a standard language for specifying, visualizing, constructing, and documenting the artifacts of software systems, as well as for business modeling and other non-software systems. The UML represents a collection of best engineering practices that have proven successful in the modeling of large and complex systems. The UML is very important parts of developing object oriented software and the software development process. The UML uses mostly graphical notations to express the design of software projects. Using the UML helps project teams communicate, explore potential designs, and validate the architectural design of the software [1].

A. Use-case Diagram

A use case is a set of scenarios that describing an interaction between a user and a system. A use case diagram displays the relationship among actors and use cases. The two main components of a use case diagram are use cases and actors. An actor is a user or another system that will interact with the system you are modeling. A use case is an external view of the system that represents some action the user might perform in order to complete a task.

Figure 3 represents the use-case diagram for QAES. This diagram contains 3 actors:

1. **Institution**: the institution actor refers to the person who is responsible for entering the institution data required for the evaluation process. This actor will:
   1. Fill the institution form with required data as institution location.
   2. Enter the evaluation data as the institution mission.
   3. Upload the required documents.
   4. Generate and view the self-evaluation report automatically by the system.

2. **Administrator**: administrator is the actor that controls the whole system. This actor will:
   1. Create new account.
   2. Modify existing account data.
   3. Add new evaluation criteria for both institution and evaluators.
   4. Add evaluation features.

3. **Evaluator**: the evaluator is considered to be the main actor in our system. Evaluator will perform the main tasks that the system is created for. As you see in the following figure, there are two types of evaluator:
   a. **President**: this actor represents the president of the evaluation team of any institution. This actor can:
      1. Create the visit time table of the institution and send it automatically to the team members.
      2. Specify the evaluation tasks for every member and send these tasks to their member.
      3. Create the pre-visit schedule for the evaluation process.
   b. **Member**: the member actor represents the evaluator that is a member of an evaluation team for an institution. This actor will share a set of tasks with the president of the evaluation team as:
      1. View the self-evaluation report of the institution.
      2. Evaluate the institution data.
      3. Generate the evaluation report.
      4. Generate the recommendation report and sends it to the institution.
      5. Modify the account data.
Fig. 3. The Quality Assurance Evaluation System Use-case Diagram

B. Class Diagram

This part shows the main classes that are used to build the QAES using the class diagram that is shown at figure 4. There is an abstract class called evaluator class. This class has a set of methods that represent its object operations as Generate_evaluation_report(), Print_documents(), and Recommendation_report(). The evaluator class is called superclass because it contains two subtypes (president evaluator subtype and member evaluator subtype). The president evaluator has the attributes ID, Name, Institution ID, Email, and telephone and perform the following operations: Generate_time_table(), Specify_tasks(), Check_member_reports(). The Member evaluator has the same attributes as the president evaluator but he will perform different operations as: Accept his tasks that has been determined by the president evaluator or comment on it and sends the comment again to the president by the Accept_tasks() method. He also will generate the daily report about his work during the evaluation process in the institution by Daily_report() method.

Another class is called the Task class which is used to represent the set of tasks that the evaluators will do during the evaluation process. This class contains the attributes: Task_ID, Institution_ID, Start_time, and End_time and contains also two methods: Complete_Task() which will be used to check either the task is completed successfully or not and Task_result() which will be used to return the result of task to the final report.

Fig. 4. The Quality Assurance Evaluation System Class diagram

The last class is the Institution class that contains the institution information (Name, Location, number of staff, and number of students) as its attributes and contains also asset of methods that represents its operation as:

1. uploadfile() method: which allow the institution to upload its documents and files required for the evaluation process.
2. `fillformdata()` method: which allows the institution to fill the required data (descriptive data) about itself.

3. `viewrecommendation()` method: this method returns the comments and recommendation from the evaluators (president or member) to the institution in order to modify and develop itself.

4. `modify_data()` method: allows to institution to modify and update its data, files, and documents to meet the evaluators recommendations.

There are three relationships between classes in figure 4. The first one is the relationship between the Member evaluator and the Task. This relation means that each member will perform many tasks. The second relationship between President Evaluator and task means that the President will determine a set of tasks for each member evaluator. The third one is the evaluator-institution relationship that means each evaluator (President or member) will evaluate one or more institution.

III. IMPLEMENTATION

The QAES prototype is a web2-based system which is being used now in the Quality Assurance Center - Mansoura University - Egypt during the institution’s evaluation. The prototype implementation is concentrated on the PHP and Ajax web technique. The data base is created by using MySQL DBMS. The system contains a set of screens according to the user who deals with it as administrator, institution, or evaluator. Figure 5 shows a general view for the system implementation and outputs.

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**Fig. 5. Case study for using QAES**
IV. CONCLUSION

The urgent need for development requires us to deal with quality assurance using modern technology. One such technology is to build systems based on the computer to manage quality assurance, especially in higher education institutions. The most important point in quality assurance in higher education is the process of quality assessment. Therefore, we must develop a system to manage the process of assessing the quality assurance system enables users to easily complete the evaluation process. Building such a system would reduce a lot of fuss, time, and effort on both of the institutions that fall within the evaluation process and the evaluation team during the evaluation of this institution. It would also provide an appropriate environment for the rapid exchange of information and views between members of the evaluation team and also the rapid development in the institution's performance.

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