

# UML General Framework for IT Educational Sector: A Critical Approach for Precise Communication & Analysis

Gufran Ahmad Ansari<sup>†</sup>, Mohammad Mahdi Hasan<sup>††</sup>, and Muhammad Nazrul Khan<sup>†††</sup>

<sup>†</sup>Faculty of Information Technology Department, College of Computer, Qassim University, Saudi Arabia

<sup>††</sup>Faculty of Computer Science Department, College of Computer, Qassim University, Saudi Arabia

<sup>†††</sup>Faculty of Engineering Department, College of Computer Qassim University, Saudi Arabia

## Summary

As we all know that the education affects all parts of our daily life. With the rapid changes in the field of teaching and schooling, the education sector has become the foremost challenge for any government to provide a quality education to their citizens. A good education is essential for every country to have a healthy and better life for every citizen. The main goal of this research paper is to design a General Education Framework for the Quality Education that contributes to providing a systematic assessment and quality education using UML. This approach provides a precise and clear picture of education quality framework and helps to communicate with other practitioners.

### Key words:

*UML, Quality, Students, Teaching, Education, Framework*

## 1. Introduction

The Unified Modeling Language (UML) is an eminent, dominant, leading graphical demonstrating language which is used to design various models within software engineering and other related industrial and scientific domains. UML is well accepted by academicians, educationists, and industry people for a long time [1-3]. It supports identifying, building, and supporting the artifacts of a software-intensive system and depicts graphically. UML model accepts a vision of a real-life system and describes in the form of images and symbolizations. UML was announced in the late 90s. The Object Management Group (OMG) presented the UML approach for software designers and scholars to produce effective and proficient software for the industry [4]. UML combines the methods from commercial modeling, object modeling, and component modeling and data modeling. Modeling is precise and crucial part of understanding the real-time problems.

UML is a multi-purpose language. Standard UML provides various notational constructs UML which may assist in framework development. The role of UML is to visualize, specify, construct, and document the artifacts of a software-intensive system [5-6]. UML allows applying the standard for writing and a design system. It covers many conceptual as well as concrete things which are written in a precise programming language [7-8].

Education is performing a very vital role in the growth and improvement in social, traditional national and financial development in all peoples by providing individuals a means to improve their talents, health, knowledge, and the ability for innovative work. [9]. There is no doubt that education is the foundation stone of every society. Thus, in every established society, the success of ideal education and providing of all needed to the people means to every individual person have fundamental right to be educated. The educational framework is the explanation of theories, principles, and processes that aim at regulating teaching processes and reforming methods [10]. An academic guidance is the foundation stone in the student life in the starting of his study. Academic guiding giving a lot of support and helps students to overcome the variety of challenges facing them during the period of their studies [11].

Quality is demarcated as a substance of goods and services whose quantifiable features fulfill a stable requirement distinct previously. The word quality also have the special meaning which means consultation with customer and their requirement. As demarcated by Oxford dictionary, the word quality means the grade of something's or the standard of approximately as measured in contradiction of additional belongings of an equivalent considerate. In software engineering, software quality is interrelated with binary factors. The initial is functional, that means how the software adapts to the functional necessities and conditions defined by "what" the user wants the software to do. The next one is the non-functional requirements, which is defined by "how" the user requirements the software to do. Like non-functional requirements are the software accessibility, dependability, proficiency, and usability etc. [12-13]. Software quality, besides confronting to the above two set of factors, also means freedom from deficiencies. For agile software development, altered significance of quality assurance as demarcated by as the expansion of software that can reply to change on every occasion the customer needs it to change. As a quality framework for software uninterrupted integration is also explain in very clearly [14-15].

According to Crosby quality as "conformance to requirement" and Deming's quality as "an expected

amount of consistency and reliability at little price and suitable to souk” is more towards quality in process. [16-17]. A good quality education is a kind of education that delivers all learners with abilities they require to become economically productive, develop sustainable livelihoods, contribute to peaceful and democratic societies and enhance individual well-being [18]. Providing the quality education is the responsibility of the government and have a duty to be managed through countrywide resources. Moreover, quality education is essential for community and financially influences in humanity [19].

Generally, the Quality Education required by the organizations is needed to follow General Quality Education Improvement Process Cycle which is shown below in Fig. 1.

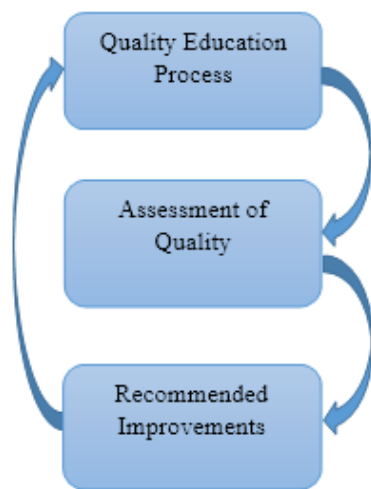


Fig. 1 General Quality Education Improvement Process Cycle

Fig. 1 shows at the top of the figure Quality Educational Process that educational organizations like school, colleges or universities are following the process to provide the Quality Education to their students. The middle-level rectangle box shows the Assessment of Quality process that provided by the educational organization based on the quality standard. Finally, assessment of quality process provides recommended feedback to the organization for improving the quality education process based on the standards.

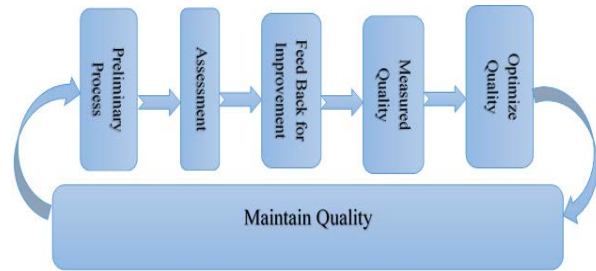


Fig. 2 General Quality Education Improvement and Measuring Process Cycle

Fig. 2 shows the General Quality Education Improvement and Measuring Process Cycle. According to the diagram, any organization who wants to assess the quality education needed to start with a preliminary process and follow the preliminary process policies and rules as the first step. The next rectangular box shows the assessment process start for the assessing the quality of education that provides by the educational organization based on quality standard. Next rectangle box provide the recommended feedback to the organization for improving the quality of education based on their policies and standards. After that the next rectangular box again measuring the quality of education based on the recommended improvement and the other rectangular box is showing the optimize quality of education and last big rectangular box recommended for maintaining the quality of a system.

In this proposed work we are focusing on to provide a general UML framework for quality education. The main contributions of this work can summarize as follows:

- A novel UML General Quality Education Evaluation Process Framework is designed
- Activity diagram for General Quality Education Evaluation Process
- Use case diagram for General Quality Education Evaluation Process
- Sequence diagram for General Quality Education Evaluation Process

This research paper is structured as follows. Section 1 is an Introduction and section 2 contains Related Works. Section 3 provides proposed UML General Education Evaluation Process Framework. Section 4 presents the Activity Diagram for the General Quality Education Evaluation Process Framework. Section 5 presents the Use Case diagram for the General Quality Education Evaluation Process Framework. Section 6 presents the General Sequence Diagram for the Quality Education Evaluation Process Framework. Finally, section 7 summarizes the paper conclusion and future works.

## 2. Related Work

In this unit, we concisely provide some existing works associated with our research work. First, we review some works which are related to quality education systems after that, we focus on UML modeling and design a framework that monitoring quality education and provide the clear picture of the system.

Education is one of the elementary requirements for human development. It is essential to get rid of individual and social poverty and to ensure sustainable growth [20]. There is no doubt that Education is the foundation stone of every society. Thus, in every established society, right to be educated is considered as a fundamental right [21].

To the best of our knowledge, few works have been done in IT education sector using UML to provide quality education system framework. In this research paper, authors have been developed TQM a framework that pressures continuous better-quality teaching as a reasonable and simple way to implement a quality framework in the higher education program. The eminence objectives for the assessed approaches were similarly identical altered. In the case of the CD-VML methodology given in these papers and explain in a very precise and clear manner. Many researchers have focused on the above work and publish their research work in reputed journals [22-25].

Faranak and Behnaz evaluated the quality of education facility which is essential to attract and retain tuition-based incomes. They recognized the service quality factors, for this they used two methodologies to measure the perception and exception of perceived quality [26]. The authors provided a structure for students that resonant out assessments of research that meet global standards for publication. This research paper proposed an intangible framework that scholars can use for future in educational control and managing to improve the quality of their research work. In this quality paper, the author explains in a very efficient and simple way that how assess and observer the quality of investigation in order to encourage research quality? In his study author do the documental study of major reference frameworks that are used through European higher education institutions with data analysis of a case study and designed by Research Assessment Exercise (RAE) [27-28]. In this research, paper authors proposed a quality framework for advanced level education that assesses the performance of organizations on the basis of performance of departing scholars [29].

## 3. Proposed UML General Quality Education Evaluation Process Framework

The key objective of this research paper is to design a general quality education framework that measures the quality education and presents the framework using various UML models. The framework allows to assess the education quality and provide the feedback for improvement. The complete assessment process for evaluating the education quality is given in Fig. 3 this framework has been designed with the UML concepts. UML class diagram shows the structure of the general quality education evaluation process by illustrating classes, attributes, and relationship. The whole quality education evaluation process has been designed with attributes and functions. The UML model encloses ten most important classes like Student, Teacher, Course Curriculum, Administration, UQGEF, Policy Procedure, Internal Assessment, External Assessment, Quality Control Committee and Requirement for Quality.

UML Quality General Evaluation Process Framework UQGEF class is associated with Student class, Teacher class, Course \_Curriculum, and Administration. These classes have a single association with UQGEF and also UQGEF has a single association with these classes. The UQGEF class has multiple associations with Internal Assessment and External Assessment classes and also Internal Assessment and External Assessment have a single association with UQGEF. Quality Control Committee has multiple associations with Internal Assessment and External Assessment and Internal Assessment and External Assessment have a single association with Quality Control Committee. Also, Quality Control Committee have a single association with Requirement for Quality class and Requirement for Quality class has multiple associations with Quality Control Committee. The Requirement for Quality class has multiple associations with Policy Procedure class also Policy Procedure class has multiple associations with Requirement for Quality. A Policy Procedure class has multiple associations with UQGEF class and UQGEF has a single association with Policy Procedure class. The above Fig. 3 process showing the complete quality evaluation process using UML and also showing the Quality Control Committee observing the quality assessment results and implement the suggestions to improve the quality and this cycle is repeated until the quality assessment results can be considered satisfactory.

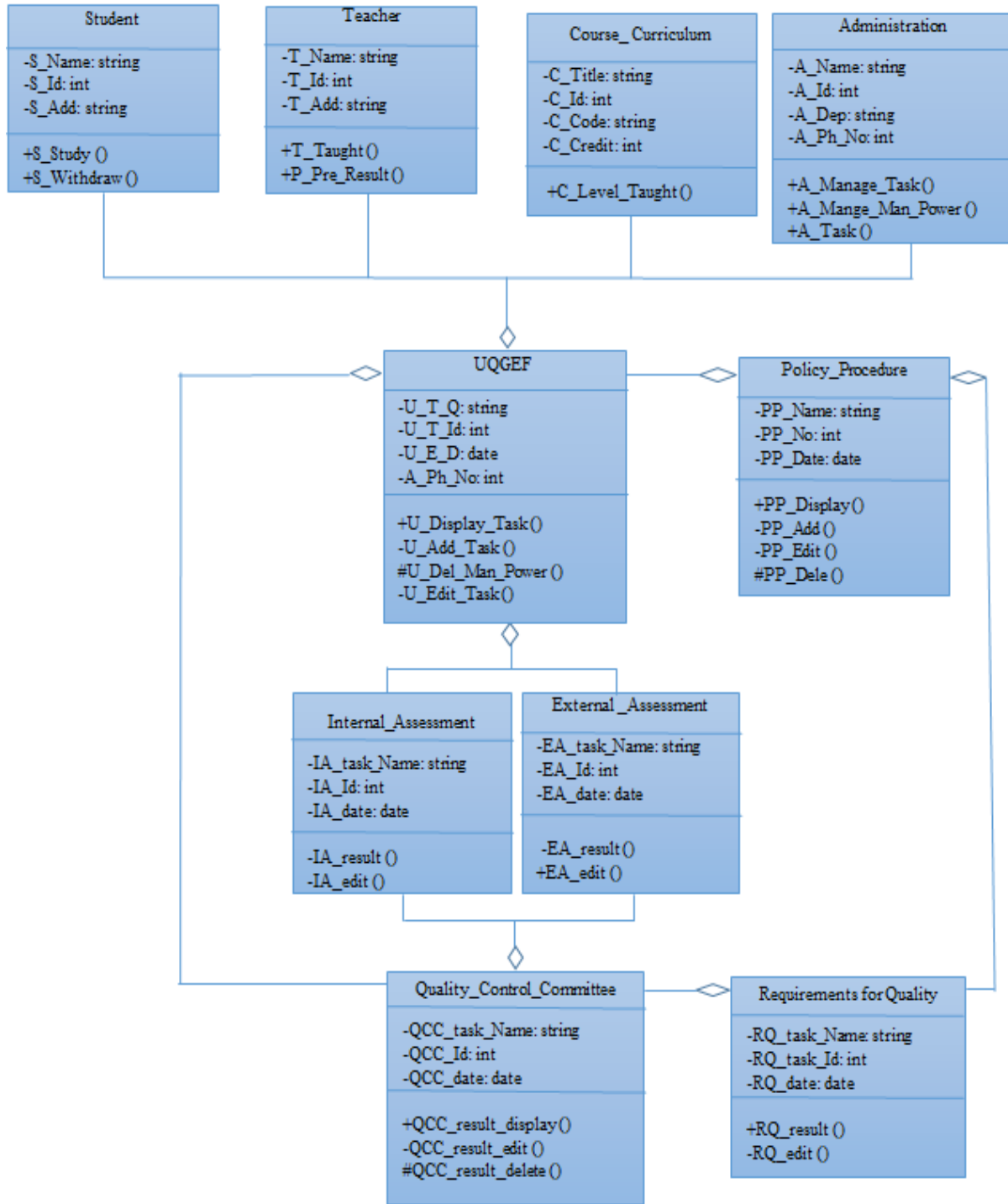


Fig. 3 UML class diagram for General Quality Education Evaluation Process Framework

#### 4. Activity diagram for General Quality Education Evaluation Process

In a UML, an activity diagram is a self-motivated diagram that displays an activity and related events. The activity diagram displays the variant of activities step by step from

the starting point to the finishing point with the drive of both similar and restricted behaviors. Basically, the activity diagram is the alteration of the state diagram in which maximum of the states are activities. The activity diagram of the above UML class model for General Quality Education Evaluation Process is shown in Fig 4.

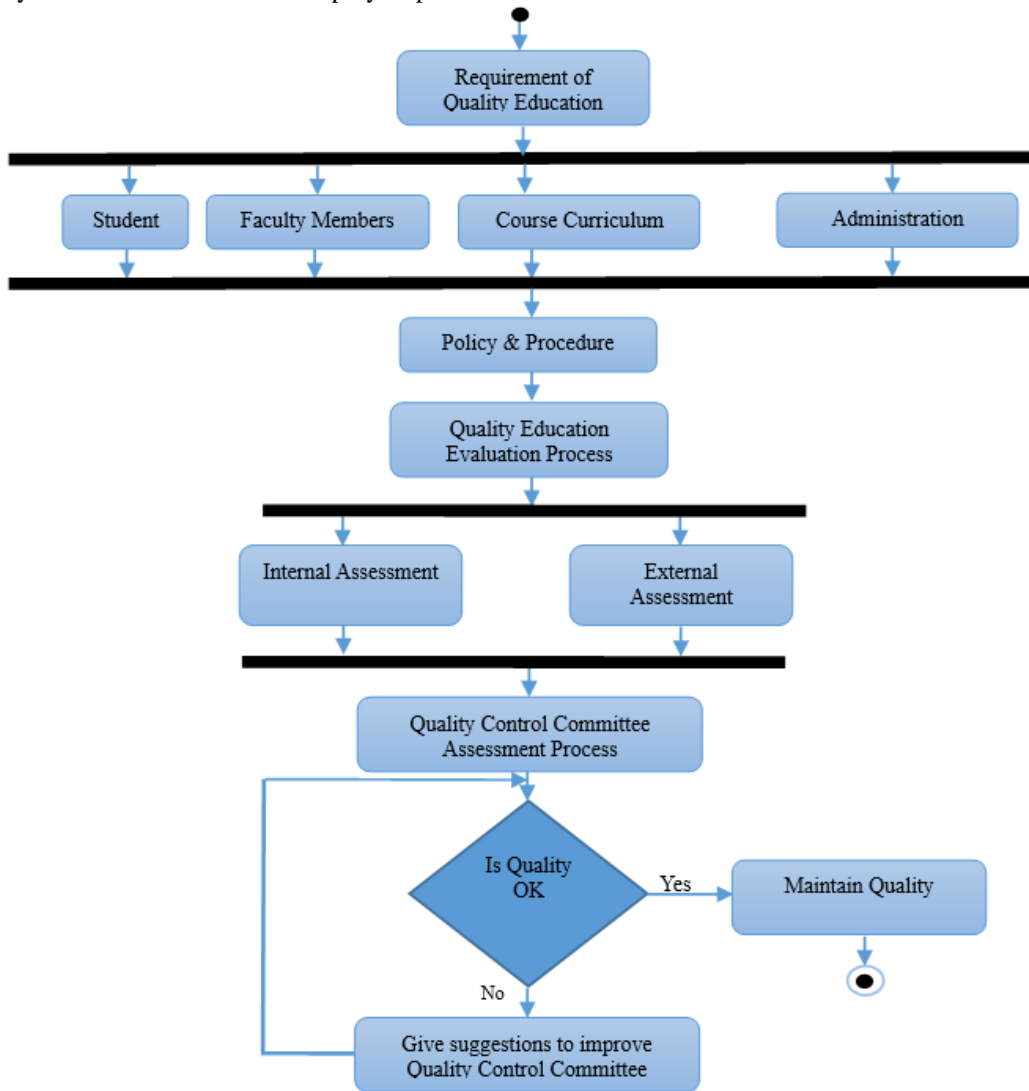


Fig 4 UML Activity Diagram for General Quality Education Evaluation Process

Activity diagrams are very useful for professional modeling where they are used for describing the processes involved in professional activities. The above activity diagram starts with the requirement of quality education and includes all the important elements which are needed to evaluate the quality of education like Student, Faculty Member, Course Curriculum, and Administration, besides that it also includes the Policy & Procedure after starting the process for quality evaluation.

Quality education evaluation process break into two process one do the internal assessment and other is an external assessment. Both of the assessments need to be completed and eventually submit the report to the quality control committee. After getting the report quality control committee check the desired quality is getting by the assessment report or not, if not then see the suggestions and provide the concerned authority to implement the suggestions and improve the quality. If the assessment

report suggests the desired quality has been achieved then the concerned authority maintain the quality and the process end.

## 5. Use Case Diagram for General Quality Education Evaluation Process

The use case diagram is a pictorial outline of the functionality and requirement of the system. Use case diagram shows the design structures.

The two major component of a use case diagram is used for Actor and Use cases. Use Case diagram demonstrations the connection between Actor and Use cases. An Actor is a party who acting the role organized with the system. The use case diagram used to understand the system. The Fig. 5 represent high-level use case diagram for the proposed frame work.

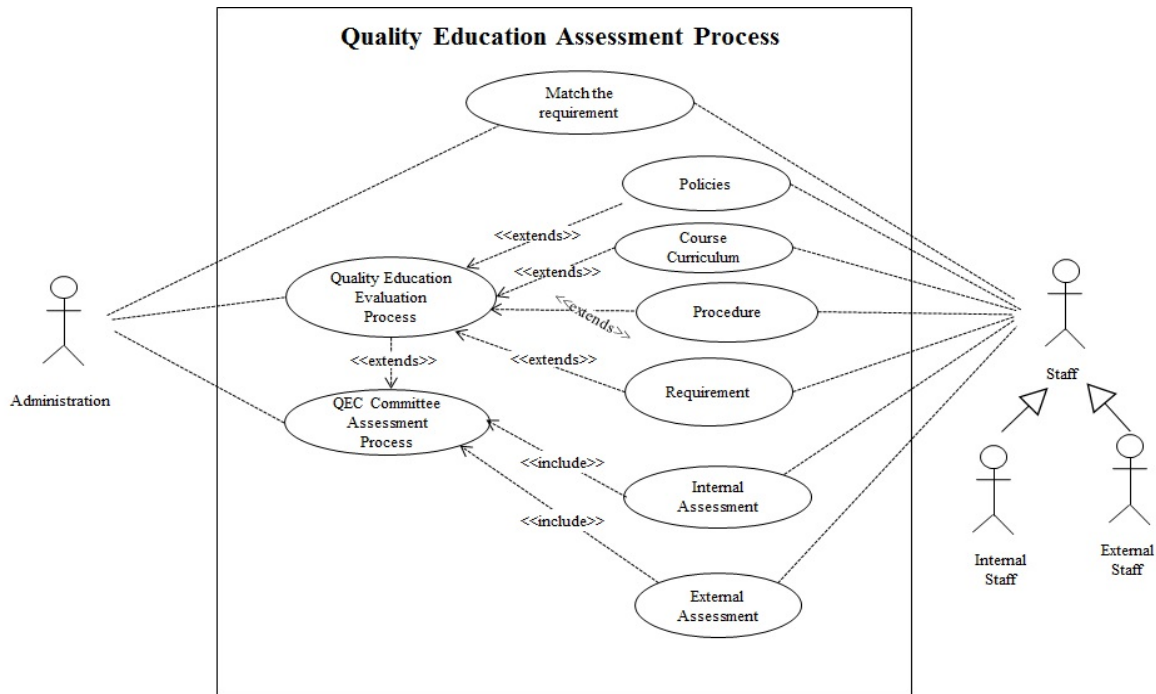


Fig 5 Use Case diagram for General Quality Education Evaluation Process

In the above primary actor i.e. Administrator who wants the assessment of quality education to evaluate, determine that desired quality has been achieved by the process or not. In this Use case diagram Quality Education Assessment Process has nine uses cases. The Administrator makes two main use cases, first Internal Assessment and Second External Assessment. QEC Committee Assessment Process is represented as a use case which includes assessment reports like Internal Assessment and Second External Assessment. Other cases match the requirements provide to the staff, i.e. other Actors. Some other cases like Policies, Course Curriculum Procedure and Requirements extends from the Quality Education Evaluation process. Actor i.e. Administrator after getting the report from QEC Committee and check the desired quality is getting by the assessment report or not if not then see the suggestions and provide the

concerned authority to implement the suggestions and improve the quality until it meets the desired quality. If the assessment report getting the desired level of quality, then concern authority supposed to maintain the level.

## 6. Sequence Diagram for General Quality Education Evaluation Process

A sequence diagram is made up of objects and messages. The sequence diagram shows object interaction organized in time sequence. The sequence diagram is also occasionally called as event diagram. UML sequence diagram for a quality education evaluation process is shown in Fig. 6.

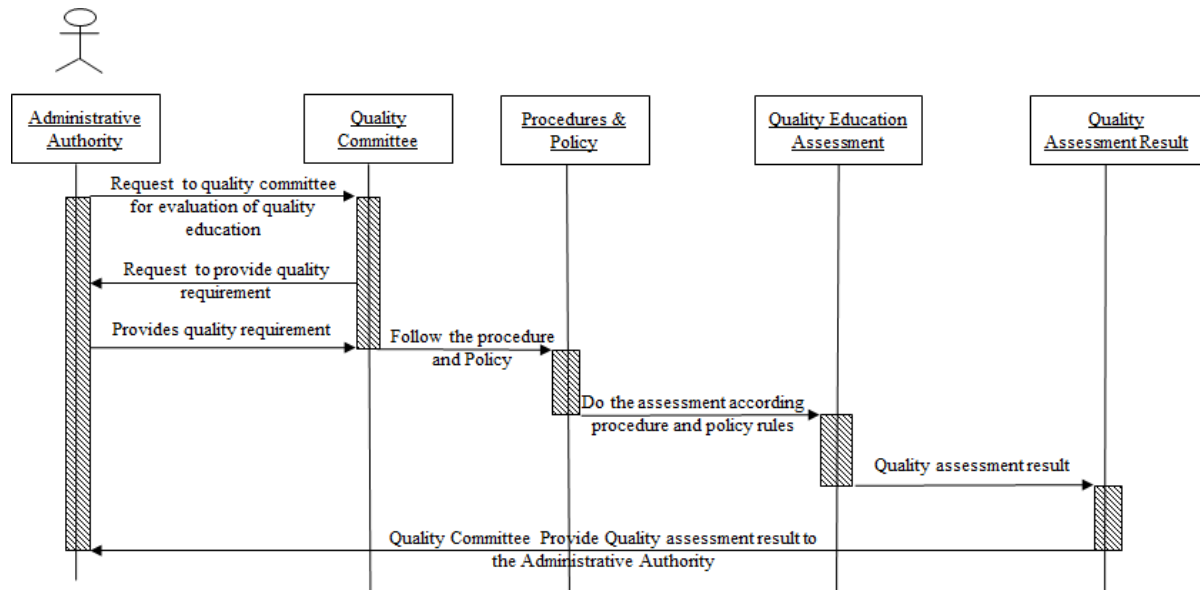


Fig 6 UML Sequence Diagram for General Quality Education Evaluation Process

It has five main objects which are displayed on the upper of the diagram in rectangular boxes with their class names. The five objects are Administrative Authority, Quality Committee, Procedure & Policy, Quality Education Assessment and Quality Assessment Result. The communication of information concerning two objects is denoted by an arrow and message on that arrow. The vertical lines show the life of the objects. According to the sequence diagram Administrative Authority request to a Quality Committee to do the evaluation of education quality. The quality committee requests to the administrative authority to provide the requirements for the evaluation of education quality then administrative authority provides the desired requirements to the quality committee. Quality Committee follows the procedure and policy and do the assessment according to the procedure and policy rules and prepare the education quality evaluation assessment result and finally, quality committee provide the result to the administrative authority.

## 7. Conclusion and Future Work

From the above work, it is concluded that the UML is a robust and dominant modeling language to answer many scientific and research problems. In this paper, The Quality Education Assessment Evaluation Process framework has been presented. This proposed framework is very useful for strategy makers, quality educational organizers who want to measure and improve the quality of the education system. The given framework has the

property of reusability. In future, we will go for field study and collect relevant empirical evidence from practitioners and analyze those data using data mining techniques.

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**Dr. Gufran Ahamd Ansari** received his Bachelor degree (B.Sc. Computer Science) from Shia P.G. College, Lucknow in 1997, MCA from DR. B.R. Ambedkar University Agra in 2002 and Ph.D.(Computer Science) from Babasaheb Bhimrao Ambedkar (A central) University, Lucknow, U.P., India in 2009. He is currently working as an Assistant

Professor in the department of Information Technology, College of Computer, Qassim University, Saudi Arabia. Earlier he worked as an Associate Professor Department of Computer Science & Engineering at MIT Meerut. Worked as lecturer at Azad Institute of Engineering & Technology (AIET) Lucknow, Lecturer, Senior Lecturer and Assistant Professor at Institute of Foreign Trade & Management (I.F.T.M), Moradabad U.P., India. He has over 15 years of experience in teaching undergraduate as well as postgraduate students of Computer Science and Computer Applications. Currently he is actively engaged in the research work on domain based of real-time system modeling through the Unified Modeling Language (UML). He has produced several outstanding publications in National & International Journal on various research problems related to the domain based UML modeling & Security, Testing and Designing.

**Dr. Mohammad Mahdi Hassan** received his Ph.D. from University of western Ontario, Canada. Empirical software engineering is his primary research area. He is currently working as an Assistant Professor in Computer Science Department at Qassim University, Saudi Arabia.

**Dr. Nazrul Islam Khan** received his Ph.D. from University of Lucknow India. He is currently working as an Assistant Professor in Computer Science Department at Qassim University, Saudi Arabia.