Impact of Management Information Systems Techniques on Quality Enhancement Cell's Report for Higher Education Commission of Pakistan

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Abstract. The way to achieve high quality education is through the quality affirmation. Higher education Commission has developed processes for the evaluation of the scholastics program's quality. The department of Quality Assurance has set up Quality Enhancement Cell which works under indicated Criterions. The point is to compose gathered information to produce useful information for QA clients. At present QEC is setting Self-Assessment Report through their predefined Performa and manual of models to help scholarly foundations. The fundamental issue of setting up this report is the utilization of manual strategies, which is the reason for delivering reports with repetitive errors and clearly, lumbering to oversee. The proposed solution for this issue is, as one may have seen in this time, fast move towards automation. MIS techniques will be applied by utilizing software development tools and database integration and broadly utilized reporting tools. Utilizing above mentioned tools and techniques will empower QA and clients to play out their job viably, reduce the repetitive information, save clients time and upgraded clarity. A more easy to understand Graphical User Interface helps client to accomplish more exact data for the decision making which will help them complete their tasks in impressively less time. This procedure have a major space for system enhancement system management more graphical reports more auxiliary changes by the assistance of software development tools.

Keywords: Self-Assessment Report · Higher education commission · Automation · Quality Enhancement Cell · Quality assurance · Management information systems

1 Introduction

Quality is a term which has always be confused with other concepts. The word quality has a Latin word "quails" its meaning is 'what sort of'. It has a range

of different meanings. Quality is something for you knowingly known. But there are things that are better than others. A high evaluation accorded to an educative process [11]. Where it has been demonstrated that, through the process, the students' educational development has been enhanced not only have they achieved the particular objectives set for the course but, in doing so, they have also fulfilled the general educational aims of autonomy of the ability to participate in reasoned discourse, of critical self-evaluation, and of coming to a proper awareness of the ultimate contingency of all thought and action [15].

Through above examinations, you will comprehend that esteem is undefined and setting focused. It stretches out from meaning "standard" to 'flawlessness'. Both are significantly settled in their different qualities operationalize in independent, institutions, and, the national practice will be visualize later. "Values can be justified in as a lowest 'threshold' by which the accuracy is judged" [4]. It is quite possible to have higher education institutions to have a common understanding in formulating to have teaching and research standards with high quality.

The administration measurement of value is most likely more likened to the instructive methodologies. We realize that not at all like physical products, administrations are vaporous to the degree that they can be expended just the length of the action or the methodology proceeds. Prominent issue of quality had been identified in the higher education in the Medium Term Development Framework (MTDF) [12]. Therefore, to enhance the quality of output and efficiency of the higher education learning systems, a mechanism of establishment of QECs has been developed by the Quality Assurance Committee to improve the standards of quality of higher education in an organized way with consistency across institutions. QEC prepared SAR to assess a systematic process of collecting, reviewing and using relevant quantitative/qualitative data and information from multiple and diverse sources about educational programs, for the purpose of improving student learning, and evaluating academic and learning standards. With a specific end goal to accomplish the subsequent reports the way toward finishing SAR is complicated [2]. The fundamental issue of setting up this report is the utilization of manual techniques, which is the reason for creating reports with repetitive errors and obviously, unwieldy to oversee. The answer for this issue is, as one may have seen in this time, quick move towards automation [13]. Applied MIS techniques by utilizing software development tools and database integration and generally utilized reporting tools. Utilizing above mentioned tools and techniques will empower QA and clients to perform their job effectively, lessen the repetitive data, save clients time and enhanced clarity [3].

1.1   Self-Assessment Report Manual by HEC (Document Prepared By: Dr. Abdul Raouf)

Criterion: Program Mission, Objectives and Outcomes

Each program must have a mission, measurable objectives and expected outcomes for graduates. Outcomes include competency and tasks graduates are expected to perform after completing the program. A strategic plan must be

in place to achieve the program objectives. The extent to which these objectives are achieved through continuous assessment and improvements must be demonstrated [10].

Standard 1: The program must have documented measurable objectives that support Faculty/College and institution mission statements.

- Document institution, college and program mission statements.
- State program objectives. Program educational objectives are intended to be statements that describe the expected accomplishments of graduates during the first several years following graduation from the program.
- Describe how each objective is aligned with program, college and institution mission statements.
- Outline the main elements of the strategic plan to achieve the program mission and objectives.
- Provide for each objective how it was measured, when it was measured and improvements identified and made. Table 1 provides a format for program objectives assessment.

Table 1. Program objectives assessment

Objective	How measured measured	When measured	Improvement identified	Improvement made
1.				
2.	- do -			
3.	- do -			
4.	- do -			
5.	- do -			

Standard 2: The program must have documented outcomes for graduating students. It must be demonstrated that the outcomes support the program objectives and that graduating students are capable of performing these outcomes.

- Describe how the program outcomes support the program objectives. In Table 3 show the outcomes that are aligned with each objective..

- Describe the means for assessing the extent to which graduates are performing the stated program outcomes/learning objectives. This should be accomplished by the following (Table 2):

– Conducting a survey of graduating seniors every semester.
– Conduct a survey of alumni every two years.
– Conduct a survey of employers every two years.

Table 2. Outcomes versus objectives

Program objectives	Program outcomes			
	1	2	3	4
1.				
2.				
3.				

– Carefully designed questions asked during senior projects presentations.
  These questions should be related to program outcomes.
– Outcomes examinations.

   The data obtained from the above sources should be analyzed and presented
in the assessment report.

   It is recommended that the above surveys should be conducted, summarized
and added to the self-study assessment report. Departments should utilize the
results of the surveys for improving the program as soon as they are available.
An example follows:

1.2   Example (Program Objectives-Program Outcomes)

An example of program objectives and program outcomes is given below.

(1) Program Objectives (as developed by the department)

• Foundation
• Skills and Tools
• Awareness and Professional Ethics

① Objective 1
To provide students with a strong foundation in engineering sciences and design
methodologies that emphasizes the application of the fundamental mathemati-
cal, scientific and engineering principles in the areas of engineering.

② Objective 2
To provide students with skills to enter the workplace well-prepared in the core
competencies listed below:

• Design and modeling experience
• Open-ended problem solving ability
• Experimental and data analysis techniques
• Teamwork experience
• Oral written and multimedia communication skills
• Experience with contemporary computing systems and methodology

③ Objective 3
To provide students with knowledge relevant to engineering practice, including ethical, professional, social and global awareness, the impact of engineering on society, the importance of continuing education and lifelong learning in both technical and non-technical areas.

(2) Program Outcomes (as developed by the department)
Degree of skills and capabilities that will reflect on their performance as engineers:

- Students shall have an ability to apply knowledge of mathematics science and fundamental engineering to mechanical engineering problems.
- Students shall have an ability to identify, formulate and solve practical engineering problems.
- Students shall have an ability to design components, processes and systems to meet desired needs.
- Students shall have an ability to conduct engineering experiments to study different engineering systems, including various modes of operation, performance evaluation, properties of materials and manufacturing techniques, as well as to use laboratory instruments and computers to analyze and interpret data.
- Students shall have an ability to use modern tools, techniques, and skills necessary for practicing mechanical engineering including computational tools, statistical techniques, and instrumentation.
- Students shall have an ability to work in a professional engineering environment, and to understand the associated economical considerations.
- Students shall have an ability to communicate effectively in written, oral, and graphical forms, including the use of professional quality visual aids.
- Students shall have an ability to work effectively in teams including multidisciplinary teams to solve engineering problems relevant to their field.
- Students shall have an understanding of the professional and ethical responsibilities of engineers.
- Students shall have an understanding of the impact of engineering on society and environment.
- Students shall have recognition of the need and an ability to engage in life long learning of engineering.
- The program outcomes are the by products of the program objectives and are interrelated. An example of interrelation between the program objectives and the program outcomes is shown in the following table.

Standard 3: The results of program's assessment and the extent to which they are used to improve the program must be documented.

- Describe the actions taken based on the results of periodic assessments.
- Describe major future program improvements plans based on recent assessments.

Table 3. Relationship between Program objectives and Program outcomes

Program objectives	Program outcomes										
	⊙	2	3	4	5	6	7	8	9	⊙0	⊙⊙
1	⊙	⊙	⊙	▪	⊙	▪	▪	▪	▪	▪	▪
2a	⊙	⊙	⊙	⊙	▪	⊙	▪	▪	▪	▪	▪
2b	⊙	⊙	⊙	⊙	▪	⊙	▪	▪	▪	▪	▪
2c	⊙	▪	▪	⊙	⊙	⊙	▪	▪	▪	▪	▪
2d	▪	▪	▪	▪	▪	⊙	▪	⊙	▪	▪	▪
2e	▪	▪	▪	▪	▪	⊙	⊙	⊙	▪	▪	▪
2f	▪	▪	▪	▪	⊙	⊙	▪	▪	▪	▪	▪
3	▪	▪	▪	▪	▪	⊙	▪	⊙	⊙	⊙	⊙

Legend: ⊙ Denotes substantial contribution to the objective and ⊖ denotes moderate contribution to the objective. ▪ Denotes no contribution to the objective.

- List strengths and weaknesses of the program.
- List significant future development plans for the program.

Standard 4: The department must assess its overall performance periodically using quantifiable measures.

- Present students enrolment (undergraduate and graduate) during the last three years indicating percentages of honor students, student faculty ratio, average graduating grade point average per semester, average time for completing the undergraduate program and attrition rate.
- Indicate percentage of employers that are strongly satisfied with the performance of the department's graduates. Use employer's survey.
- Indicate the median/average student evaluation for all courses and the % of faculty awarded excellence in teaching award.
- Present performance measures for research activities. These include journal publications, funded projects, and conference publications per faculty per year and indicate the % of faculty awarded excellence in research award.
- Present performance measures for community services. This may include number of short courses per year, workshops and seminars organized.
- Indicate faculty and students satisfaction regarding the administrative services offered by the department. Use faculty and students surveys.

2   Problem Statement

The main problem of preparing this report is the use of manual methods, which is the cause of producing reports with repetitive errors and obviously, cumbersome to manage. The proposed solution to this problem is, as one may have observed in this era, rapid move towards automation.
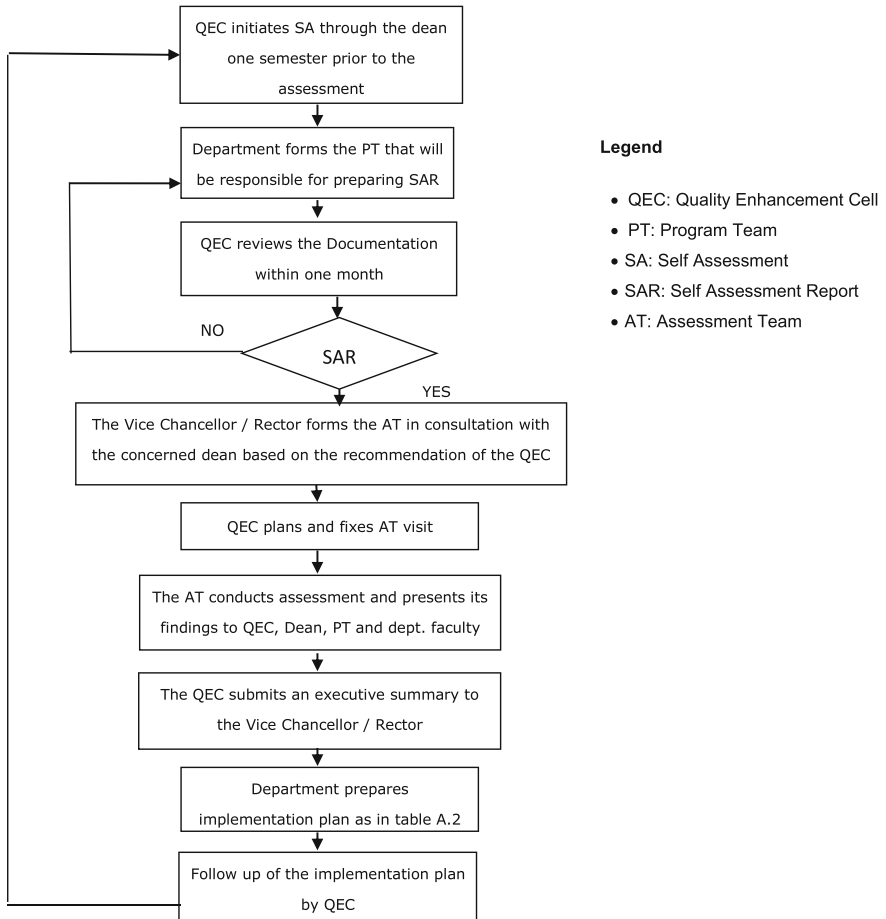
Fig. 1. Self-Assessment procedure

3   Method of Research

This research is aimed that of the process of Self-Assessment Report gets automated by using technology, for example through user friendly software then this will help in enhance the process of QA Reporting for HEC. Therefore this research is a Descriptive Research in which the method of research is Observational Research. Since the respondents in this research work in a natural environment, this method is convenient in assessing multiple users performing their jobs.

Using detailed investigation methodology adds a lot for the investigation, for instance:

- Detailed research reveals difficulties as well as excessive ailments to ensure that remedial procedures may be instituted. This might assistance in presenting ideas for predicaments exactly where progress may be required.
- Detailed exploration facilitates the particular prediction of the future by results about existing disorders, effects and by persons in the direction of a particular matter.
- Detailed exploration provides a much better and much deeper comprehension of any trend by an in-depth study from the trend.

3.1   Research Methodology
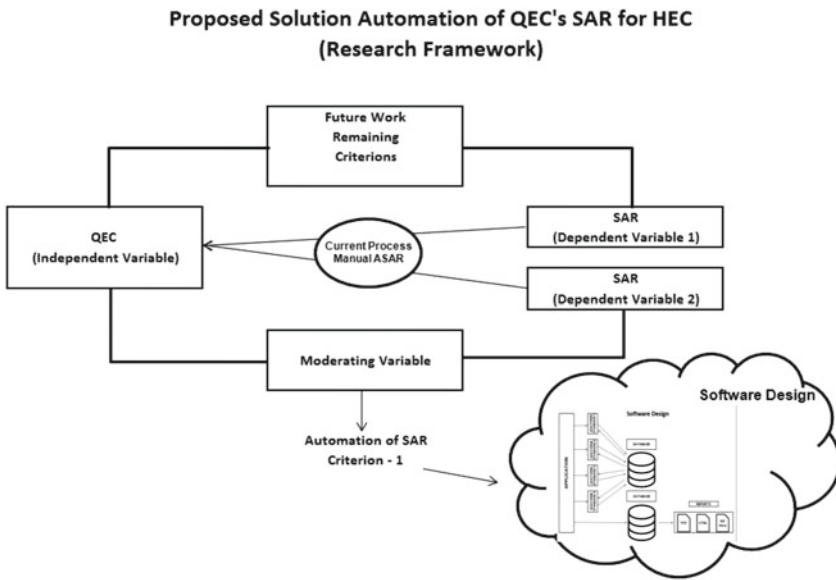
Fig. 2. Proposed solution automation of QEC's SAR for HEC

3.2   Design of Research

In view of these variables and hypothesis, the Research Design followed for this thesis is Qualitative Research Design. Reasons for choosing this design:

- This design helps in identifying & controlling extraneous factors also.
- This design is efficient in using available resources.

3.3   Techniques & Instrument of Research

Research instruments included a single List of questions. The set of questions was structured. Various factors relevant to the study have been integrated from the set of questions. There were 20 issues in which concerned numerous qualities in addition to considerations. The set of questions was made in view from the study ambitions. The options from the set of questions derive from Contract by making use of Liker Range.

- Strongly Agree
- Agree
- Disagree

3.4   Target Population

The sample of the SAR user is selected for the research, those who are working for QEC. Those individual SAR users who are preparing their report by manual method. On a whole we have taken almost 61 responses from different institutions.

3.5   Data Analysis

The purpose of the research is to analyze the aspects which are affecting the adoption of Automation of QEC's SAR. The researcher selected the questionnaire for collecting the responses. The average graph of respondents is showing high requirement for the automation of SAR.

3.6   Research Methodology

The representation of the operation sequence uses job-based encoding [13], and the length of the chromosome equals the total number of operations. The job number denotes the operation of each job, and the $l - th$ occurrence of a job number refers to the $l - th$ operation in the sequence of this job. Figure 1 presents an example considering a rescheduling with a 4 jobs and 3 machines.

3.7   Impact of Research Question

The study will apply the following impacts, when the SAR will automate.

- Time saving
- Process
- Error Reduction

Figure 3(a) shows the significance of Automation of Self Assessment Report by high requirement of respondents. Figure 3(b) shows the significance of process Improvement viewed by respondents. Figure 3(c) shows the significance of Time saving can be viewed by the positive responses. Figure 3(d) shows the magnitude of error reduction is shown by the positive responses.
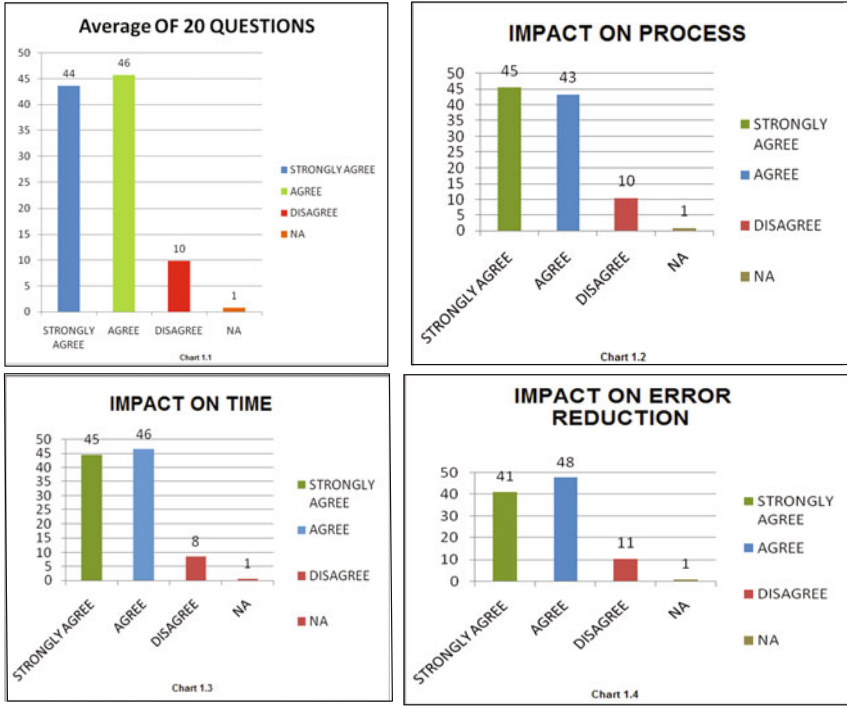
Fig. 3. Questionnaire graphical analysis

4   Conceptual Model

The above given diagram is a conceptual model of all entities participating in the process of making SAR. This model only shows how the whole process works currently without having being automated. From this diagram one can start to figure out how the software can be evolved in the system to provide or achieve the outcomes which are supposed to be achieved.

The process starts when an institution wishes to approve its program by HEC. QEC personal sends a request to HEC which in return supplies 'SAR Manual' in order to prepare SAR Report. QEC user inserts MISSION OBJECTIVES & OUTCOMES based on the CRITERION-1 in Self Assessment Report Manual. Finally report is generated as per the format of HEC.

4.1   Waterfall Models

There are different models used for software life cycle the one which is suitable in SAR is Waterfall Model. As this model distinguishes the whole process into distinct phases.

"A software requirements specification (SRS) is a description of a software system to be developed, laying out functional and non-functional
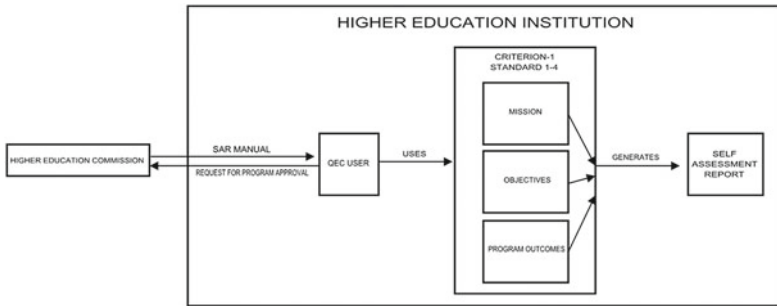
Fig. 4. Conceptual model

requirements" [8]. This model is used as a frame work or it provides a specified format to develop any software in a predefined phases. It starts from gathering requirements from users and then moves on to produce software design. Later this design will be implemented after unit testing. The last two phases may not need very much consideration in SAR.
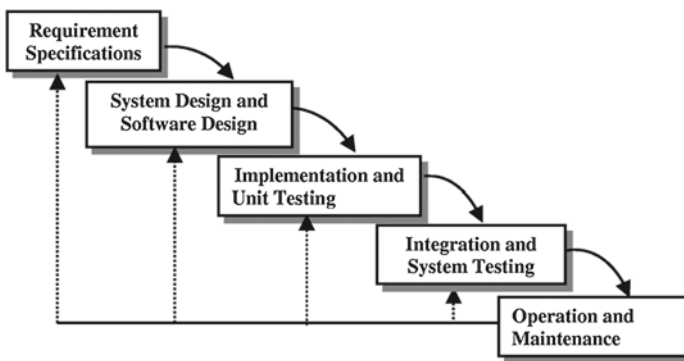

Fig. 5. Waterfall models

4.2   Languages

For the above purpose, C# & VB Languages have been selected to process SAR Report. C# & VB is usually a multi-paradigm programming language encompassing strong typing, essential, declarative, sensible, universal, object-oriented (class-based), and also component-oriented programming disciplines. C# & VB is one of the programming languages designed for the Common Language Infrastructure.

4.3   Programming Methodology

Object-Oriented Programming has the following advantages over conventional approaches [7]:

Provides a clear modular structure for programs which makes it good for defining abstract data types where implementation details are hidden and the unit has a clearly defined interface.

- Makes it easy to maintain and modify existing code as new objects can be created with small differences to existing ones.
- Provides a good framework for code libraries where supplied software components can be easily adapted and modified by the programmer. This is particularly useful for developing graphical user interfaces [1].

4.4   Platform

Visual Studio is a complete set of development tools for building C# & VB applications, XML Web Services, desktop applications, and mobile applications. Visual Basic, Visual C#, and Visual C++ all use the same integrated development environment (IDE), which enables tool sharing and eases the creation of mixed-language solutions [14].

4.5   Database

A Relational database is a computerized database whose association is focused around the Relational model of information, as proposed by E.f. Codd in 1970. This model arranges information into one or more tables (or "relations") of columns and sections, with a Primary key for each one line [6]. By and large, every element sort portrayed in a database has its own particular table, the lines speaking to occurrences of that substance and the segments speaking to the characteristic qualities depicting each one occurrence (Education Indicators [9]. Since each one column in a table has its own particular interesting key, pushes in different tables that are identified with it can be connected to it by putting away the first line's one of a kind key as a characteristic of the optional line (where it is known as a "remote key"). Codd [6] demonstrated that information connections of subjective unpredictability can be spoken to utilizing this straightforward set of ideas. The different programming frameworks used to keep up social databases are known as Relational Database Management Systems (RDBMS).

Essentially all Relational database frameworks use SQL (Structured Query Language) as the dialect for questioning and keeping up the database.

A good choice would be "Microsoft SQL Server is a relational database management system developed by Microsoft. As a database, it is a software product whose primary function is to store and retrieve data as requested by other software applications, be it those on the same computer or those running on another computer across a network (including the Internet)" [17].

Fig. 6. Types of reporting tool

4.6   Reporting Tool

The Visual Studio Report Designer provides a user-friendly interface for creating robust reports that include data from multiple types of data sources [5] (Fig. 6).

'Visual Studio' reports let you slice and dice your data and present it in detail or summary form regardless of how the data is stored or sorted in the underlying tables. It offers a great deal of power and flexibility to analyze and present results [16].

4.7   Software Architecture

User authentication and password protection Managers and QEC directors given the authorization to change all the aspects of SAR report the director is working with are also given the authorization to access the whole report but with the exception of few section which are in read only mode.
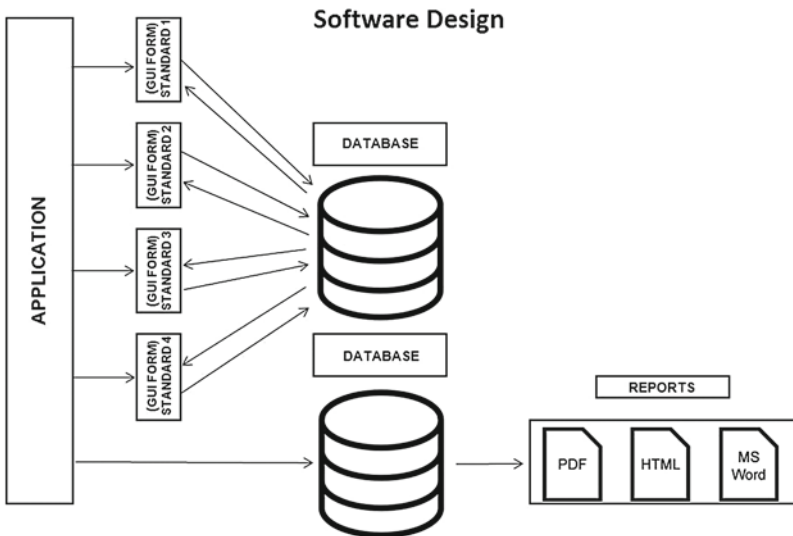

Fig. 7. Software design

4.8   Software Design

Is the process by which an agent creates a specification of a software artifact, intended to accomplish goals, using a set of primitive components and subject to constraints. Software design usually involves problem solving and planning a software solution [17]. The figure explains main components of ESAR Design. Application interacts with the four graphical user interfaces (GUI) sequentially. GUI component establishes two way communication with database components (that comprises related tables) once all the required data is stored in database, user initiates the process of generating report (an ultimate components of ESAR) this final result will also be saved (Fig. 7).

5   Result

- Figure 2 illustrates the research framework and demonstrate the function of moderate variable.
- Figure 4 shows the process of Self-Assessment Report through conceptual model.
- Figure 5 demonstrates the software design of Self-Assessment Report.
- TIME: the process of ESAR will significantly save the user's time.
- MIS Techniques: the above advantages of results may well be achieved MIS techniques.
- REDUCTION OF REPEATION ERRORS: using RDBMS.
- FLEXIBILITY IN FUTURE MODIFICATION: can be achieved using OOP techniques.

6   Conclusions

Quality assurance is a portal to "High quality education". With a specific end goal to evaluate the programs quality Higher Education Commission" has created predefine Criterions forms. The department of Quality Enhancement Cell which works under those predefined Criterion. This Criterion is met utilizing frames with applicable information. Thusly, this will bring about an enhanced interaction with QA clients utilizing E-SAR. One of the other major advantages of it will be as better organized report. In this manner, the real issue for QA clients of following QEC procedures can extensively be all around encouraged utilizing the proposed solution. Infect, repetitive errors are better managed with it. A well designed application is most suitable to accomplish the proposed results for future work. In future, alternative design technique of HCI can be utilized to furnish client with more upgraded collaboration in SAR making.

   In order to discuss the process of QEC's SAR, we clearly observe that the whole process is currently based on manual work. There is a dire need to automate SAR process which reflects from the survey data analysis, collected from the QEC users. The remaining Criterion of SAR can easily be considered by applying MIS technology and software development tools in order to automate.

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