# A Proposed Web Application for Quality Improvement of Academic Programs in Higher Education Institutions (HEIs) *

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## Abstract:

In this research, we have proposed and developed a web application as an evaluation tool for academic programs in Higher Education Institutions (HEIs). The purpose of this tool is to explore and report strengths and weaknesses in different practices within academic programs based on specific standards. In addition, the tool proposes corrective actions to enhance the strengths, as well as interventions to overcome the weaknesses. This evaluation tool consolidates continuing improvement of academic performance and learning outcomes. The implementation of this web application has included weighting and scoring of indicators automatically in order to reduce time and efforts. It has utilized the AArU standards for programmatic evaluation. Internal or external reviewers or evaluation teams can use it. The responses to quantitative and qualitative indicators have been filled online by the relevant evaluation teams during data collection. Then, the weights and scores of each program in all domains have been computed using a novel mathematical model for weighting and scoring.

The researchers have used a focus group discussion to explore the current situation regarding quality evaluation of academic programs in the Palestinian HEIs. Moreover, they have discussed the target situation and the actions required to bridge the gap between both situations. The focus group consists of directors of quality in these HEIs. The outcomes of the research highlights the necessity of having such a tool to evaluate the academic programs and propose corrective actions for improvement. After implementation of the web application and training its users, we have conducted a survey for testing and validation based on four dimensions, usability, performance, security and acceptance. Results show that the application has achieved very good scores in the four dimensions. According to users' suggestions and comments, we have improved the application's usability and fixed some security issues in the latest version.

Keywords: Academic Program, Evaluation, Web Application, Quality Assurance, Accreditation, Standards, Weighting, Scoring, Mathematical Model, Softwate Engineering.

**تطبيق ويب مقترح لتحسين جودة البرامج الأكاديمية**
**في مؤسسات التعليم العالي**

## ملخص:

في هذا البحث، اقترح الباحثون وطوروا تطبيق ويب كأداة تقويم للبرامج الأكاديمية في مؤسسات التعليم العالي. والغرض من هذه الأداة هو استكشاف نقاط القوة والضعف وتوثيقها حول الممارسات المختلفة في البرامج الأكاديمية بناءً على معايير محددة. كما تقترح الأداة إجراءات لتعزيز نقاط القوة، والتدخلات اللازمة للتغلب على نقاط الضعف. وتهدف أداة التقويم إلى التحسين المستمر للأداء الأكاديمي ومخرجات التعلم المنشودة. وقد شمل تطوير تطبيق الويب المقترح احتساب الأوزان والدرجات للمؤشرات تلقائيًا لتقليل الوقت والجهد. وقد استندت إلى المعايير الصادرة من اتحاد الجامعات العربية للتقويم البرامجي، لتستخدمها فرق التقويم والمقومون الداخليون أو الخارجيون. وتستجيب فرق التقويم ذات الصلة للمؤشرات الكمية والنوعية عبر الإنترنت أثناء جمع البيانات، ثم يحتسب التطبيق أوزان المحاور الرئيسة والفرعية والدرجات التي حققها كل برنامج أكاديمي باستخدام نموذج رياضي مبتكر أعد خصيصاً لهذا الغرض.

استخدم الباحثون المجموعة المركزة لاستكشاف الوضع الحالي والوضع المستهدف والإجراءات اللازمة لجسر الفجوة بين الوضع الحالي والمستهدف فيما يتعلق بحوسبة تقويم جودة البرامج الأكاديمية في مؤسسات التعليم العالي الفلسطينية. استهدفت المجموعة المركزة مسؤولي الجودة في مؤسسات التعليم العالي. وأكدت النتائج على ضرورة إيجاد مثل هذه الأداة لتقويم البرامج الأكاديمية ووضع الإجراءات اللازمة لتحسينها. ومن ناحية أخرى، وبعد بناء تطبيق الويب وتدريب المستخدمين، أجرينا مسحا لاختبار النظام والتحقق من صلاحيته وفق أربعة أبعاد: سهولة الاستخدام، وفاعلية الأداء، والأمن والحماية، ورضا المستخدم. وأظهرت نتائج المسح أن التطبيق حقق درجات جيدة جداً في الأبعاد الأربعة، ووفقًا لمقترحات المستخدمين وملاحظاتهم، قمنا بتحسين سهولة الاستخدام ومعالجة بعض الثغرات الأمنية في الإصدار الأخير من التطبيق.

الكلمات المفتاحية: البرنامج الأكاديمي، التقويم، تطبيق الويب، ضمان الجودة، الاعتماد، المعايير، الوزن، تسجيل الدرجات، النموذج الرياضي.

# 1 INTRODUCTION

Quality evaluation of academic programs aims at measuring the extent to which these programs comply with specific quality standards. This process highlights the main strengths and weaknesses and proposes improvement plans that should be integrated with the strategic plans of Higher Education Institutions (HEIs).

In this paper, we have proposed and developed a web tool for program evaluation with several features. For instance, it makes periodical program evaluation easier with the minimal efforts and cost and the maximal flexibility, efficiency and accuracy. It implements a proposed mathematical model suitable for any number of domains, standards and indicators. It enables HEIs to compute weights and scores of different standards easily. Quantitative indicators are treated as supportive evidences to the corresponding qualitative indicators. In addition, other required evidences such as documents, pictures, reports could be uploaded to the web tool. It provides an easy wizard for building self-evaluation reports (SERs), which simplifies the task of internal and external reviewers as well as Quality and Accreditation Agencies (QAAs). Finally, it provides a comparison module that compares the results of the current evaluation with the previous ones, showing the quality improvement of academic programs effectively.

This paper consists of seven sections. The first section introduces the problem statement, the objectives, the research methodology as well as the research instruments and scope. The second section provides a literature review. The third section shows the proposed mathematical model. The forth section discusses the system analysis and design, whereas the fifth section introduces the system implementation. The sixth section discusses the results including the results of the focus group and the survey, while the last section provides the conclusion.

## 1.1 Problem Statement

Unfortunately, academic program evaluation is complicated and time-consuming if performed manually. Participants of a focus group with directors of quality in the Palestinian HEIs have emphasized the importance of developing a web tool as a remarkable contribution to facilitate the evaluation process. In summary, it provides HEIs and QAAs with a fast and easy tool for internal evaluation and external review. Moreover, it provides an online repository of up-to-date information and statistics for all programs, e.g. a Decision-Support System (DSS) for decision-makers. Therefore, we have utilized Information and Communication Technology (ICT) to develop the proposed web application. We will discuss the results of the previously mentioned focus group in details in section 6.1.

## 1.2 Research Objectives

The overall objective is to employ ICT in improving the quality of academic programs in various domains leading to better Intended Learning Outcomes (ILOs), educational environment, research activities as well as teaching and learning services. This has been achieved through the following objectives:

1. Develop and implement an information system for short-term evaluation of academic programs with a database that maintains their data up-to-date.
2. Reduce time and efforts required for (internal) self-evaluation of academic programs in HEIs.
3. Provide QAAs with an efficient tool for periodic external review of the academic programs in the accreditation process.
4. Enable decision makers in both HEIs and QAAs to develop their strategic plans and to track the quality improvement of academic programs.

## 1.3 Research Methodology

The framework of this research employs the following scientific-research methodologies with their own data collection tools:

- Surveying: this includes related work and literature review about the academic quality in general, and program evaluation and review as well as the tools and procedures employed in this process. In addition, we

have used a focus group and a questionnaire to investigate application importance and validity respectively.

- Mathematical Modeling: we have proposed and implemented a mathematical model for weighting and scoring of different domains and standards as well as the overall score of an evaluated academic program.
- Prototyping and Experiments: we have developed a prototype to prove the concept before developing the full version with agile methodology. We were interested that all stakeholders and technical people can come together to deliver the desired outcomes. Needless to say that our web application interfaces highly need end users' interaction. Using such methodology, we have been able to elicit system requirements and refine the application [32-34]. In addition, we have conducted several experiments for testing and validation based on four dimensions, system usability, performance, security and acceptance.

## 1.4 Research Instruments, Population and Scope

The researchers have employed a focus group and a questionnaire as the main research instruments for data-collection. The first instrument's data was collected from eight Palestinian HEIs and the Palestinian Accreditation and Quality Assurance Commission (AQAC) in order to measure the importance of such system and their needs in this regard. The authors have used this data in the analysis and design of the proposed web application. The second instrument's data was received from quality experts and self-evaluation teams who implemented program evaluation using the developed web application. This data was used in enhancing its usability, performance, security and acceptance.

The scope of this research is limited to the Palestinian and the Arab HEIs. The developed system was initially implemented at al-Quds Open University (QOU) in self-evaluation of its programs. The system targeted QOU and other national and Arab universities, QAAs at the national and regional levels, and interested researchers in the field.

# 2 LITERATURE REVIEW

Evaluation of Higher Education Institutions is an internationally orientated practice which is essential to gain accreditation, remain competitive, and meet high-quality standards. Nowadays, HEI's are increasing in number and size as they offer diverse programs which pose challenges for their efficacy [1, 2]. There are two levels of evaluation, evaluation at the institutional level and evaluation at the program level. Both could be internal (self-assessment) or external, where educational units and faculties, usually, initiate the process through a rigorous self-evaluation [5].

In the current section, the authors focused on program accreditation in the USA and Europe in addition to some countries from Asia. It is important to perceive the process as a tool to improve the institution outcomes rather than an end in itself [3]. Case studies focused on agencies offering globally reputable assessment standards.

Different bodies and umbrellas were founded to organize and regulate the work of accreditation agencies such as the International Network for Quality Assurance Agencies in Higher Education (INQAAHE). INQAAHE was founded in 1991 to control the educational quality of its members all over the world and works closely with national accreditation bodies, both governmental and non-governmental (e.g. ENQA in Europe and CHEA in the USA) [3, 4].

The US does not have a national ministry of education that regulates academic standards like other countries and institutions that seek accreditation from private non-profit accrediting organizations [5]. The Council for Higher Education Accreditation (CHEA) is the largest United States organization for promoting academic quality through accreditation. The US Department of Education (USDE) and CHEA do not accredit schools, however they validate whether an accreditation agency is credible and at the same time recognizes institutional and programmatic accrediting organizations. Nevertheless, the USDE recognition is the most important form for many reasons of which, student's federal aid and credits transfer to other schools [12, 13,

21]. The USDE and CHEA recognize three types of accreditation agencies: Regional, National, and Programmatic [21]. Regionally accredited schools, such as state schools, may devalue credits from nationally accredited schools, except those for specific careers like faith, criminal justice, clinical hypnosis and healthcare.

The US Department of Education (USDE) and the Council for Higher Education Accreditation (CHEA) recognize many specialized and programmatic accreditors, such as:

- Accreditation Board for Engineering and Technology (ABET).
- Association to Advance Collegiate Schools of Business (AACSB).
- Liaison Committee on Medical Education (LCME) for medical schools that grant an M.D. degree.
- The Accrediting Council on Education in Journalism and Mass Communications (ACEJMC).

The list of recognized programmatic accreditors is available at the USDE, where programmatic accreditors could coincide with regional or national accreditation [21].

The AACSB is the largest non-profit business education alliance in the world. It has the highest merited faculty, reliable and demanding business curricula. AACSB provides quality assurance and professional development services to over 1,500 member organizations and more than 785 accredited business schools that offer degrees for business and accounting programs at the bachelor's, master's and doctoral levels [14]. The business and accounting schools must comply with the AASCB standards as minimum requirements to be accredited in the following fields: strategic management and innovation; participants (e.g. students, faculty and professional staff); learning and teaching; academic and professional engagement [15, 16]. There are other accrediting bodies committed to quality of business programs worldwide, such as the Accreditation Council for Business Schools and Programs (ACBSP) and the International Assembly for Collegiate Business Education (IACBE). The AACSB is the most rigorous, then the ACBSP and then the IACBE [14].

The LCME is an accrediting body for medical education programs leading to the M.D. degree in the United States and Canada and is recognized by the US Department of Education [17, 18, 19]. The programs must first hold institutional accreditation for initial and continuing accreditation by the LCME since it is a programmatic rather than an institutional accreditor. Institutional accreditation of medical schools is granted by a regional accrediting agency, which is required to be qualified for federal financial assistance [17]. To achieve accreditation, a medical education program leading to the M.D. degree must fulfill the LCME standards [19].

The ACEJMC is responsible for the evaluation of journalism and mass communications programs at colleges and universities in the United States, Puerto Rico and outside the country with no government control thus guaranteeing a free press and free speech. Programs are evaluated every six years with three possible results accredited/ reaccredited, provisional or denial. Seventy five percent of journalism/mass communications program courses should be from liberal arts and sciences courses where the student should get a broad background in that area in addition to the skills and theories taught in the program [5].

Unlike USA, the accreditation bodies in Europe are generally governmental. The European Network of Information Center (ENIC) was established by the UNISCO and the Council of Europe to provide information on education systems in ENIC and foreign countries, recognition of foreign degrees and qualifications, loans, scholarships and mobility. The European Commission established the National Academic Recognition Information Centre (NARIC) in 1984 to offer advice concerning foreign education systems, diplomas and the study period. The European Association for Quality Assurance in higher education (ENQA) was established in 2000 and works as a regulator to foster quality assurance for HEIs in the European Higher Education Area (EHEA) member states [7].

In Finland, universities are accredited only by an act of the Parliament. In Spain, there is an authorized national body responsible for higher education quality. In the UK, the

government recognizes the bodies that can grant UK degrees. The Accreditation Organization of the Netherlands and Flanders (NVAO) is an independent accreditation organization in the Netherlands and Flanders. Under this system, accreditation focuses on the quality of individual programs, and institutions may request NVAO to conduct a so-called institutional quality assurance assessment [8, 9]. The system comprises six assessment frameworks: institutional quality assurance assessment; limited program assessment; extensive program assessment; limited initial accreditation; extensive initial accreditation and an assessment framework to determine whether an institution or a program has any distinctive features.

In Germany, the Accreditation Council certifies accreditation bodies that accredit study programs for bachelor and master's degree. The Accreditation Council recognizes some programmatic accreditors, such as [22]:

- The Accreditation Agency for Degree Programs in Engineering, Informatics/ Computer Science, the Natural Sciences and Mathematics (ASIIN).
- Foundation for International Business Administration Accreditation (FIBAA).
- Accreditation Agency for Study Programs in Special Education, Care, Health Sciences and Social Work (AHPGS).
- Agency for Quality Assurance and Accreditation of Canonical Study Programs (AKAST).

One of the popular accreditation agencies in Asia is the Malaysian Qualifications Agency (MQA), which was setup under the Malaysian Qualifications Act 2007 to accredit academic programs provided by educational institutions, qualifications and higher education providers (HEPs) [10]. To develop and deliver higher education programs, the MQA has published various documents, such as Malaysian Qualifications Framework (MQF), Code of Practice for Institutional Audit (COPIA), Code of Practice for Program Accreditation (COPPA), Guidelines for Good Practices (GGP) and Program Standards (PS). The PS describes the minimum levels of acceptable practices that cover all the nine quality assurance areas: program aims and learning outcomes, curriculum design and delivery, assessment of student learning, student selection, academic staff, educational resources, program monitoring and review, leadership, governance and administration, and continuous quality improvement. Different program standards have been issued such as Accounting, Art and Design, Biotechnology, Building Surveying and Business Studies [5]. Those program standards cover the core areas of all program levels including certificate (level 3), diploma (level 4), bachelor (level 6), master (level 7) and doctorate (level 8) [10].

The Council of Quality Assurance and Accreditation at the Association of Arab Universities (AArU) is the largest non-profit Arab accreditor. This Council has issued several quality manuals for program accreditation such as the Quality Assurance Manual for Academic Programs in the Colleges of Arab Universities and the Manual of Quality Standards and Accreditation for Open and Distance Learning (ODL) Universities and Programs. They contain the main standards and the minimum requirements for program accreditation [2, 20].

The national Accreditation and Quality Assurance Committee (AQAC) was established in Palestine in 2002. The AQAC's main objectives are to introduce and develop the culture of quality assurance, and to set public policies in education and scientific research in the Palestinian HEIs [23]. However, the AQAC has not yet developed a comprehensive quality manual for institutional nor for academic program evaluation.

It is worth mentioning that only two Palestinian HEIs, who participated in the previously mentioned focus group, have conducted self-evaluation for two academic programs since being established, one program at each HEI through some funded projects.

In a previous research, the author proposed a similar web-based system for institutional evaluation, called WIES, with a mathematical model for weighting and scoring. This system was implemented as a self-evaluation of QOU in 2015-2016 [25]. The main module of WIES was limited to self-evaluation. For instance, the

QAAs and external reviewers had no access to the application, so it cannot be used effectively for external review. It provides self-evaluation teams with an easy evidence-based web tool using the AArU standards for institutional evaluation in 11 domains. According to its users, the main advantages of WIES are flexibility and efficiency in the procedure of institutional evaluation.

In addition to quality models, HEIs adopt excellence models for self-evaluation practices and continuous improvement. This process is essential for the HEIs to sustain outstanding levels of performance that meet or exceed the expectations of customers. One of the well-known and widely used excellence models is the European Foundation for Quality Management (EFQM) that is dedicated to increasing the competitiveness of businesses. The EFQM model is based on nine criteria, five 'enablers' and four 'results', as shown in figure 1. The enablers cover what the organization does, and the results cover what the organization achieves. The achieved score identifies two levels of excellence; committed to excellence and recognized for excellence [26 -29]. However, the evaluation process in EFQM is still time-consuming, since it is performed manually, and the scores are computed using some excel sheets.

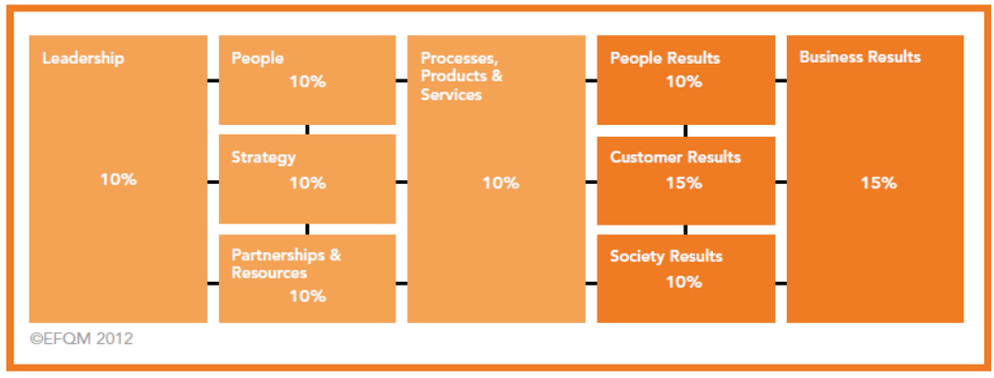
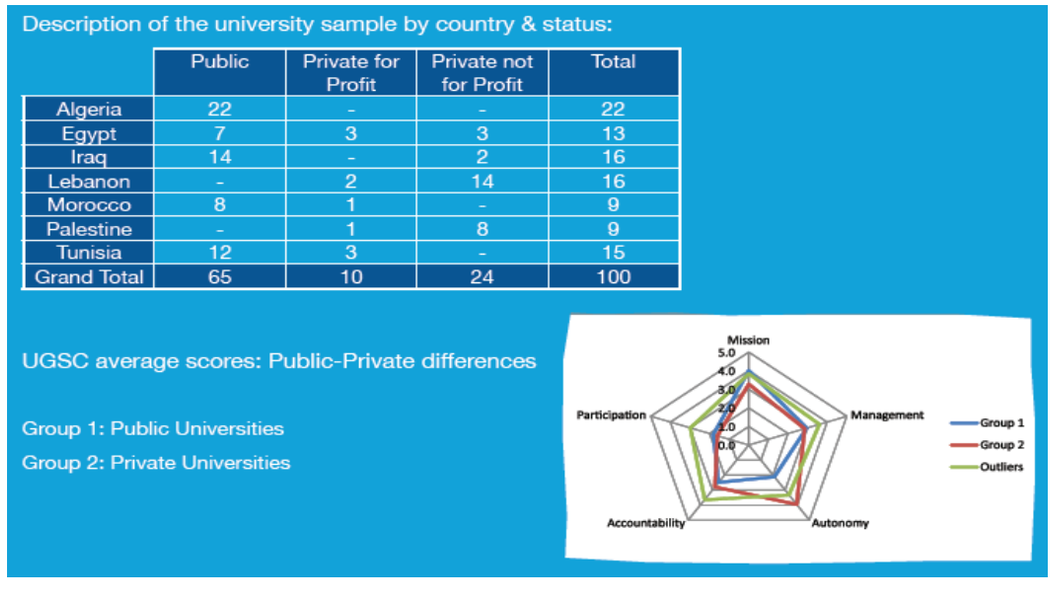



**Figure 1. Enablers and Results of the EFQM Model [26]**

Ensuring trustworthy relations between the HEIs and their stakeholders is essential since gaining their trust is a key to success. HEIs governance plays a key role in the improvement of quality education. The World Bank has proposed a famous benchmark tool that helps HEIs reform and monitor governance progress, which is University-Governance Screening Card (UGSC). A hundred HEIs in the Middle East and North Africa (MENA) region have been evaluated based on this UGSC during the period 2012 to 2017. It covers five axes, where each is scored using a five-scale radar chart, as shown in figure 2 [30 ,31]. Unfortunately, evaluation and scoring are also performed manually using some excel forms.




| | Public | Private for Profit | Private not for Profit | Total |
|---|---|---|---|---|
| Algeria | 22 | - | - | 22 |
| Egypt | 7 | 3 | 3 | 13 |
| Iraq | 14 | - | 2 | 16 |
| Lebanon | - | 2 | 14 | 16 |
| Morocco | 8 | 1 | - | 9 |
| Palestine | - | 1 | 8 | 9 |
| Tunisia | 12 | 3 | - | 15 |
| Grand Total | 65 | 10 | 24 | 100 |

**Figure 2. University Governance Screening Card [30].**

# 3 THE PROPOSED MATHEMATICAL MODEL

In order to measure the weights and scores of the different domains of the program evaluation system, we have proposed a mathematical model that is being described in this section. The higher the score is, the more the strengths and the less the weaknesses are.

Let (d) be number of domains, ($n_i$) number of indicators in domain i, and (N) total number of indicators in all domains, then we can write the weight of domain i ($w_i$) as follows:

$$w_i = \frac{n_i}{N} \qquad (1$$

Where:

$$N = \sum_{i=1}^{d} n_i \qquad (2)$$

Let (yi) be number of indicators in domain i with "yes: 2" response, and (ti) number of indicators in domain i with "to some extent: 1" response, then we can write the score of domain i (si) as follows:

$$s_i = \frac{2.y_i + t_i}{2.n_i} \qquad (3)$$

Weighted score for domain i (wsi):

$$ws_i = w_i . s_i = \frac{2.y_i + t_i}{2.N} \qquad (4)$$

The program's total score (s):

$$s = \sum_{i=1}^{d} s_i = \sum_{i=1}^{d} \frac{2.y_i + t_i}{2.n_i} \qquad (5)$$

# 4 SYSTEM ANALYSIS AND DESIGN

In order to develop our web tool for program evaluation robustly, we have passed into the phases of system development lifecycle, including system analysis and design. We used a focus group for needs assessment and system analysis, where the participants have provided us with their requirements and the main expected functions of the proposed web application.

Accordingly, we have designed the different modules of the web application. Figure 3 illustrates the Entity-Relationship Diagram (ERD), which describes the design of the database of our web application. It consists of four main entities, university, college, department and program with relations of 1-to-many. Each has its own attributes mainly, ID, name, website and other relevant information.

Other important entities are domains, indicators, report, QNT-tables, users and other required entities. A program is evaluated based on quality indicators and requirements (report) classified into standards (domains). Users have access to the above entities based on their roles and privileges. QNT-tables refers to quantitative indicators. Figure 3 depicts the detailed attributes of all entities.

Figures 4 and 5 show the flowchart diagram that describes how the system components operate and interact. After successful login, the system checks the user's type, permissions and privileges that enable him/her to perform specific tasks as follows:

1. Admin: the system's owner who has full access and control to all parts of the system and can perform all tasks, which include creating and editing users with different types and different objects when required. An object might be a QAA or a HEI (e.g. university) and its organizational structure, such as colleges, departments or programs.

2. QAA agency: this account has the same permission level as the admin, except creating a QAA agency object and editing responses to indicators or requirements.

3. University: this account can edit its profile including its name, address, president's name and contact information. It can also view its colleges, departments and programs as well as the evaluation reports, the responses to quantitative and qualitative indicators and the evaluation results, including weights and scores of all programs' standard domains.

*4.* College: this account enables a user to edit a college's information, create college departments and show all programs within the departments of his college as well as tracking their evaluation process and results online.

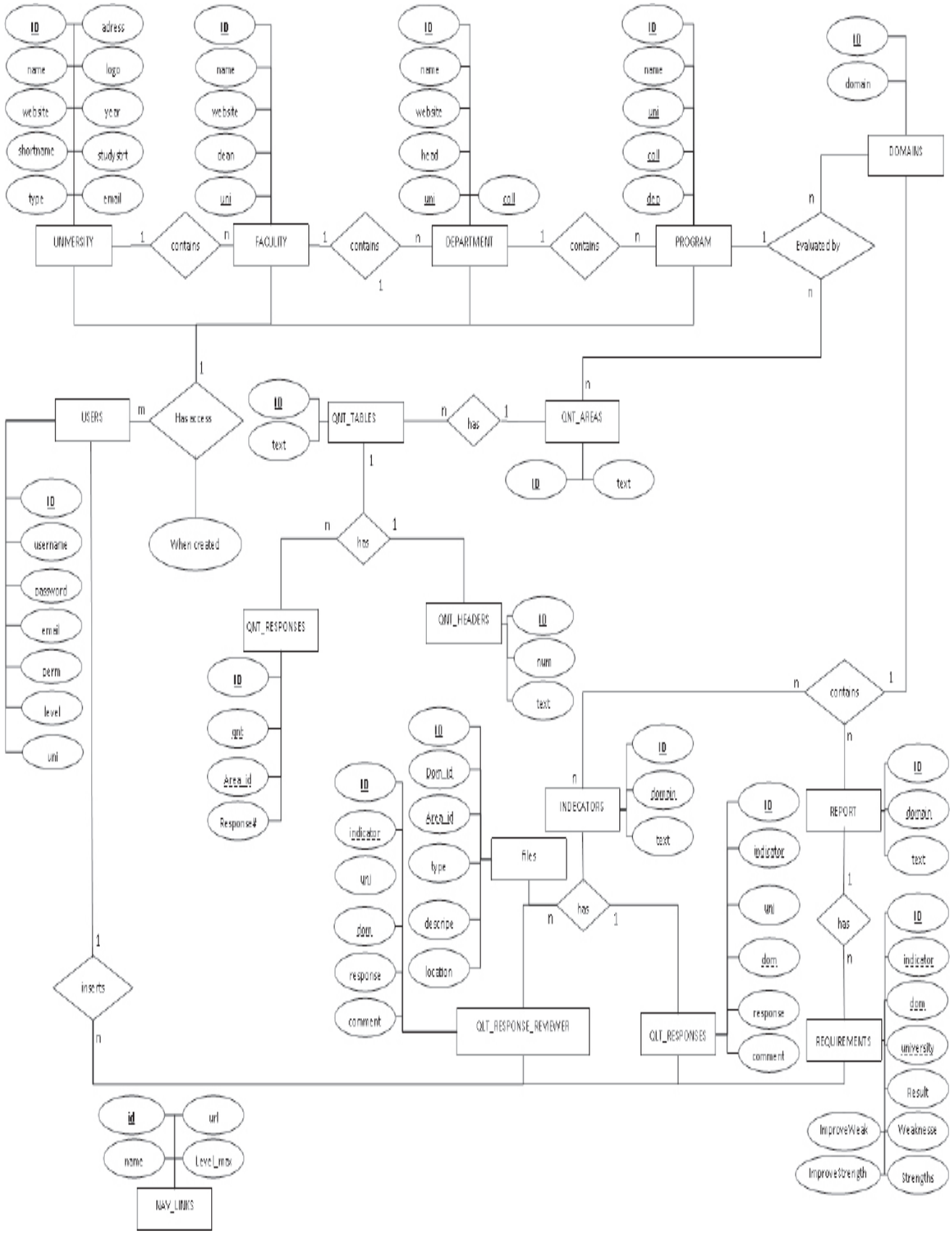



**Figure 3. Entity Relational Diagram (ERD) of the Developed Web Application**

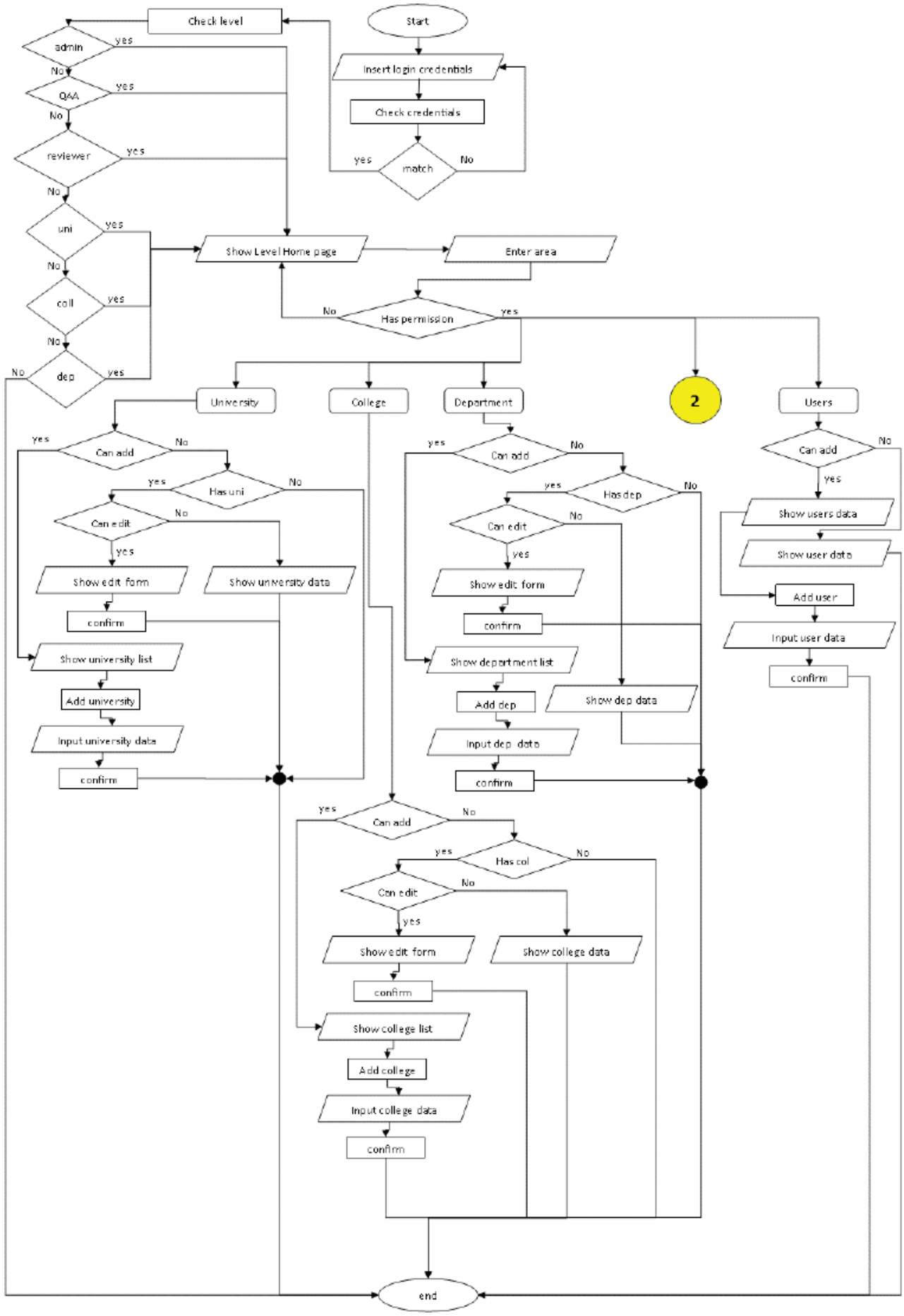



**Figure 4. Flowchart of the Developed Web Application (Part 1)**

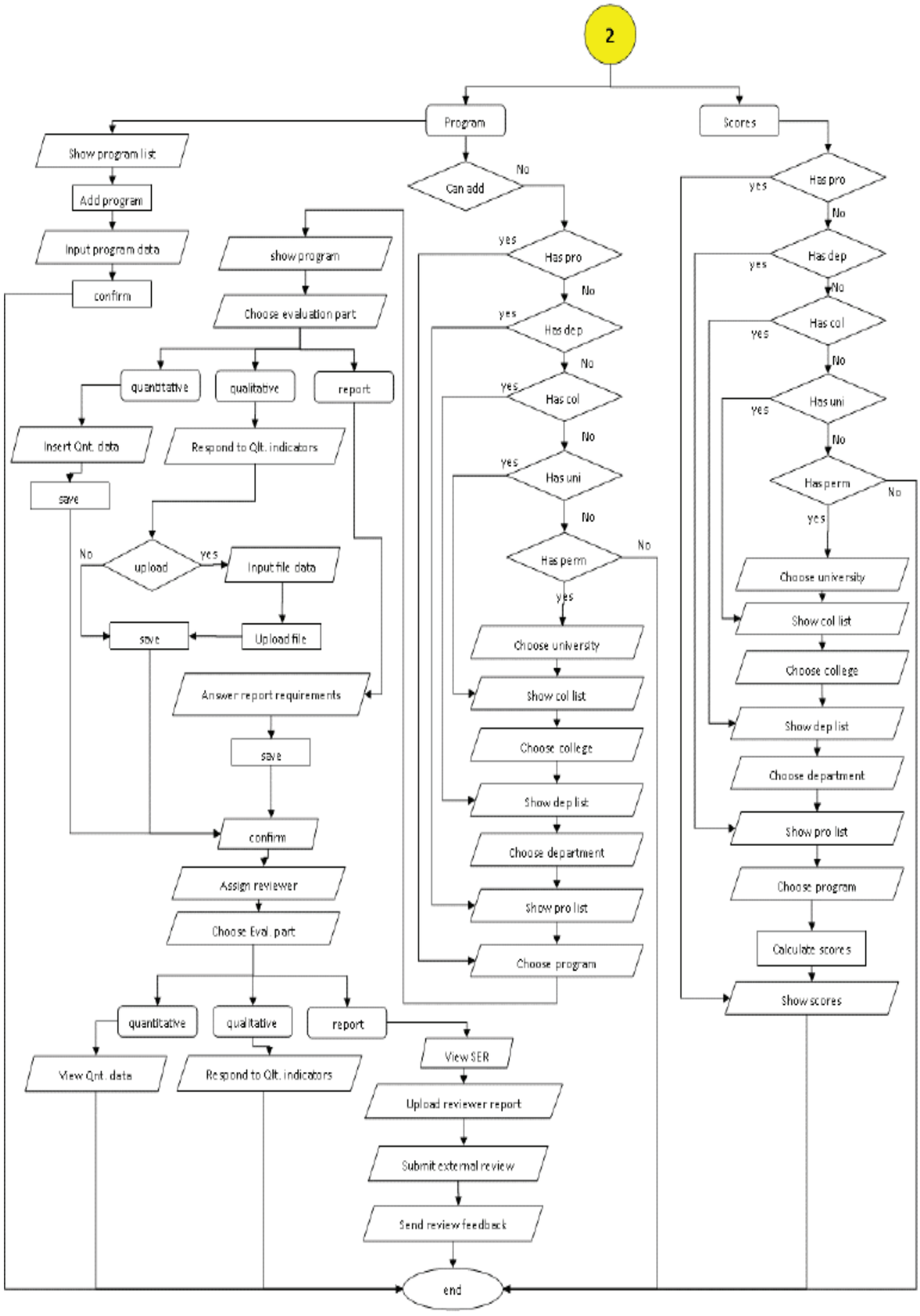



**Figure 5. Flowchart of the Developed Web Application (Part 2)**

5. Department: this account enables a user to edit the information of the department, creates academic programs of his/her department and leads the self-evaluation team in the evaluation process to these programs. He/she has the right to complete the quantitative indicators, responds to qualitative indicators and uploads evidences, answers requirements and creates a self-evaluation report (SER).

6. Reviewer (tester): this account enables a user to review an evaluation report of a specific program assigned to him/her by a QAA agency. He/she will also be able to respond to qualitative indicators compared with the responses of a self-evaluation team and submit his/her external-evaluation report.

In order to have clear and better understanding of the interaction between the user (i.e. the client) and the system (i.e. the server), figure 6 shows the sequence diagram of the system. A QAA can add a university, a college, a department or a program, while an evaluation team can evaluate a program, and an external reviewer can review the SER of his/her assigned program/s.

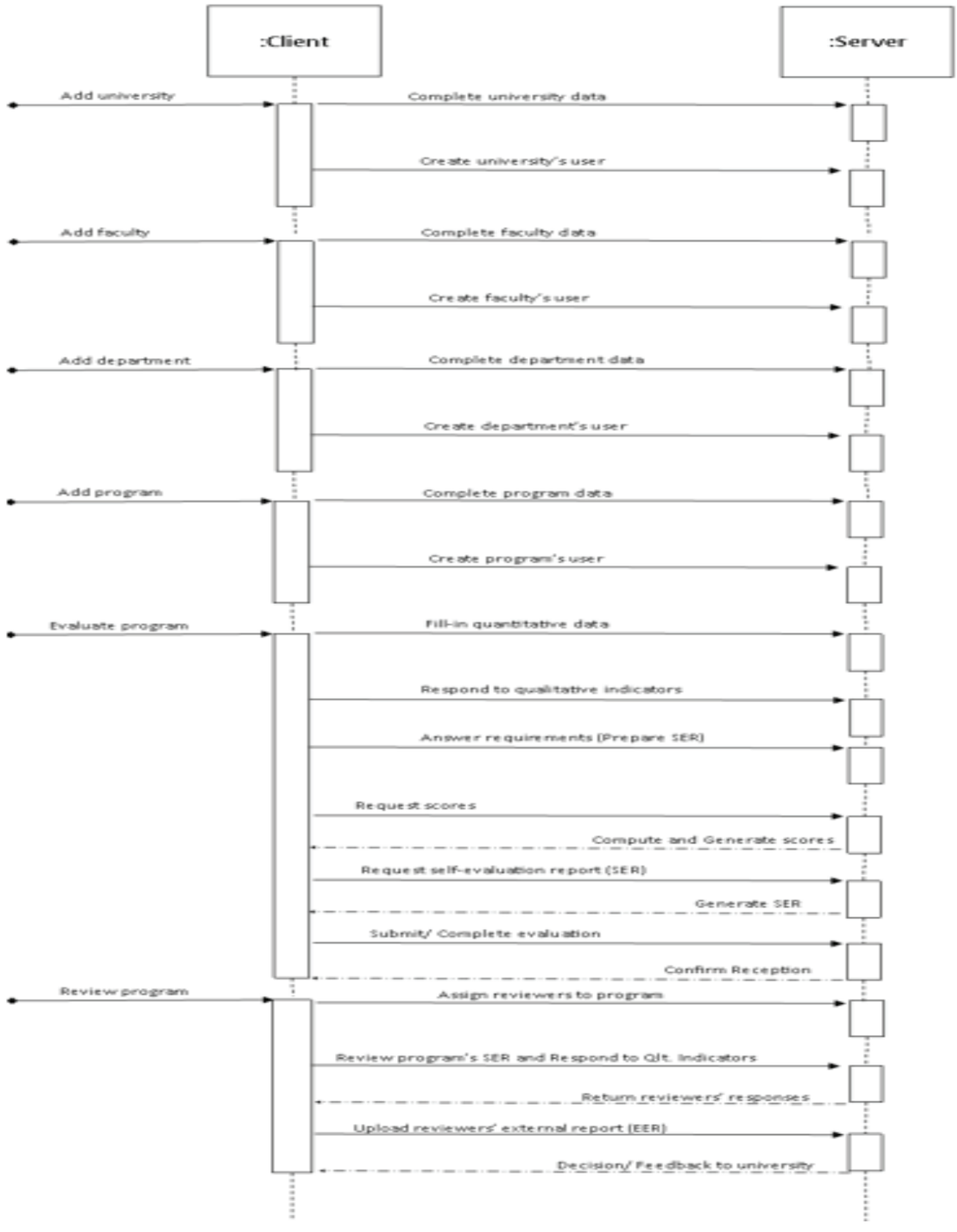



**Figure 6. Sequence Diagram of the Developed Web Application**

A program's evaluation passes into two phases, self-evaluation and external review. In the first phase, the dean of a faculty assigns an evaluation team to complete the evaluation process. This involves entry of quantitative data, response to qualitative indicators to get scores of a program and each of its domains, response to quality requirements, generation and submission of Self-Evaluation Report (SER). In the second phase, the QAA assigns external reviewers to review each program, study the SER, conduct field visits, and submit External-Evaluation Report (EER). Based on the EER, the QAA can then make decision to accredit, reaccredit, or reject the program.

# 5 SYSTEM IMPLEMENTATION

We have implemented and developed the proposed web tool for program evaluation using HTML5, PHP and MySQL with responsive web design to be adaptive with different devices. This has passed into three main phases. At first, we have developed the database depending on the entity relational diagram (ERD) shown in figure 3. In the second phase, we have developed the main user interface shown in figure 7 and the evaluation forms shown in figures 8 and 9. In addition, we have developed the scores report shown in figure 10 and the SER wizard (i.e. the quality requirements) shown in figure 11. Finally, in the third phase, we have implemented the system functions and procedures based on the flowchart shown in figure 4 and figure 5 as well as the sequence diagram shown in figure 6. We have also implemented the mathematical model for weighting and scoring of the qualitative indicators of all domains.

Figure 8 shows the quantitative-indicators forms of an academic program, where the evaluation team can fill-in the required quantitative data for the program under evaluation. Figure 9 shows the qualitative-indicators forms, where the evaluation team can respond to qualitative indicators and provide each with relevant evidences.

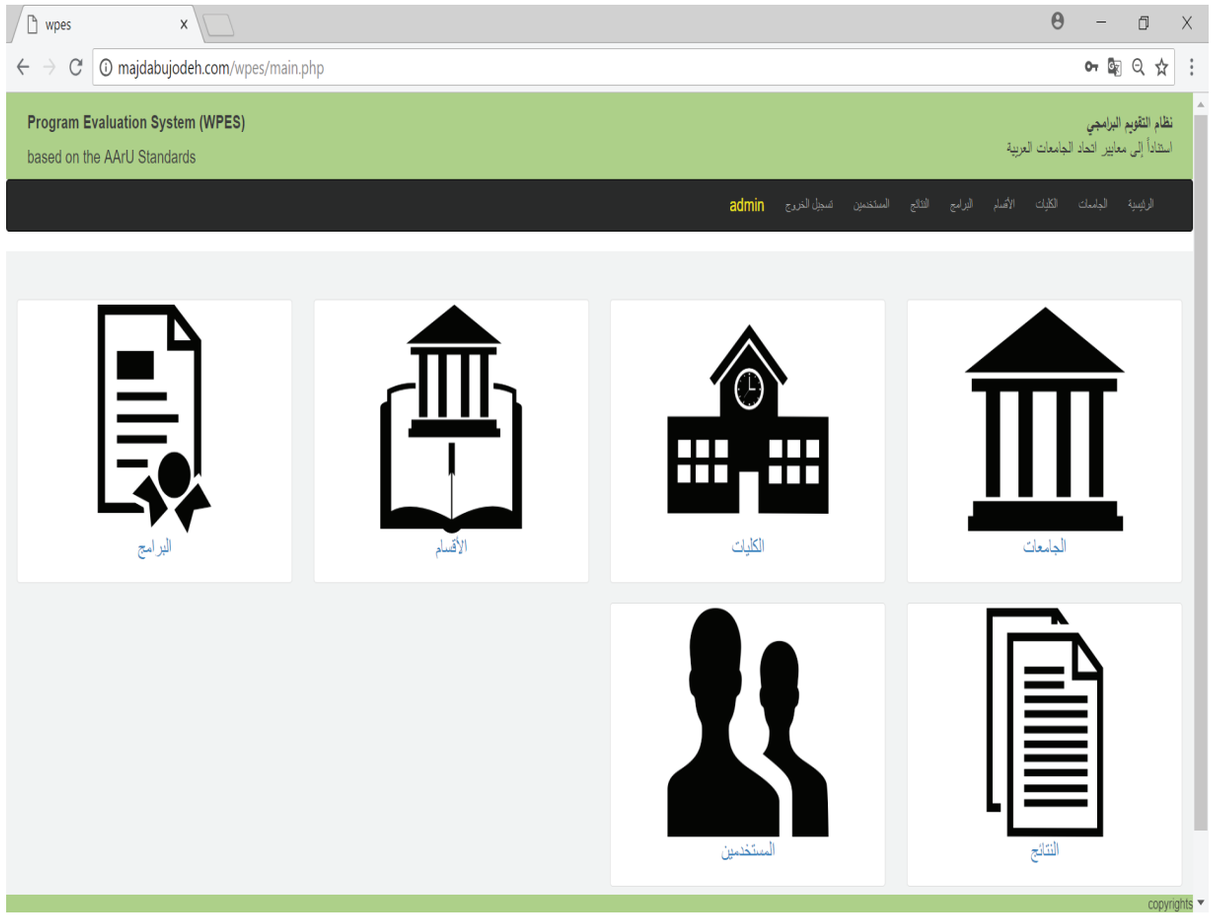



**Figure 7. Main User Interface of the Developed Web Application**

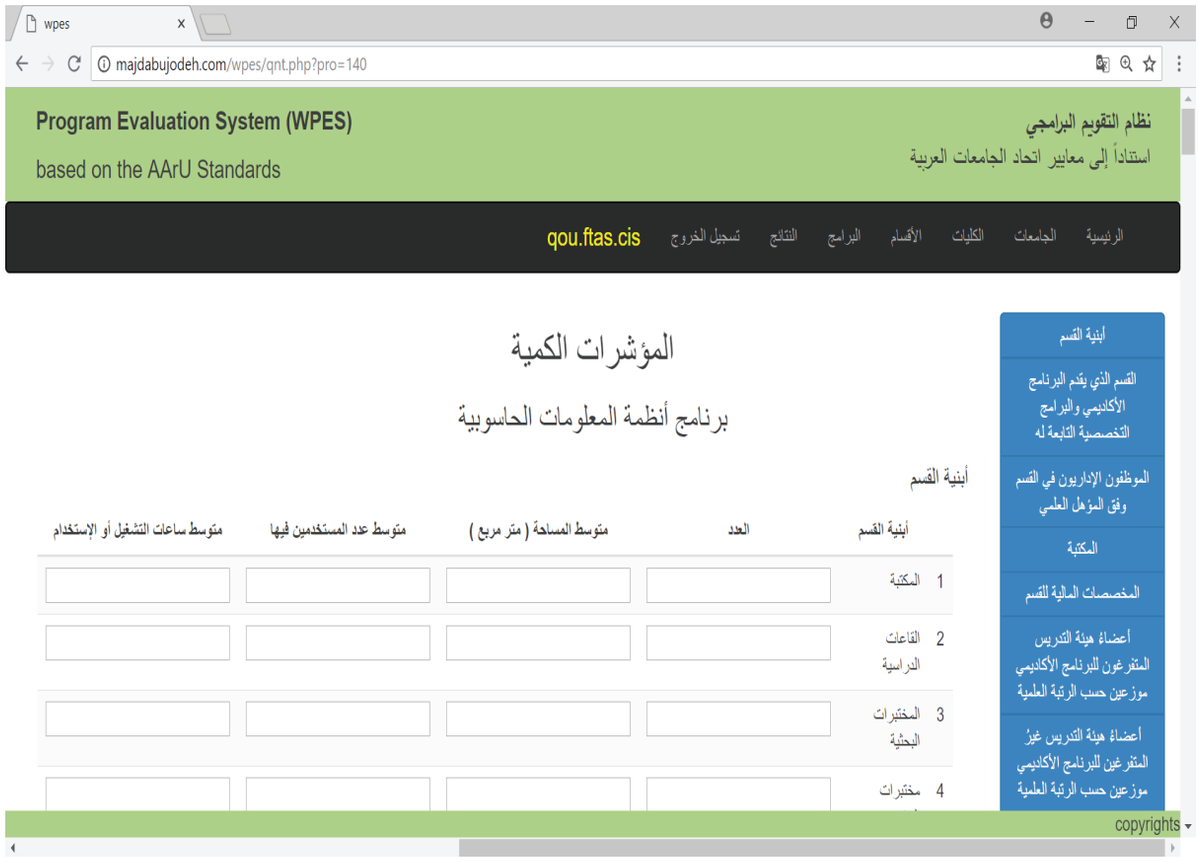



**Figure 8. Quantitative Indicators Forms of an Academic Program**

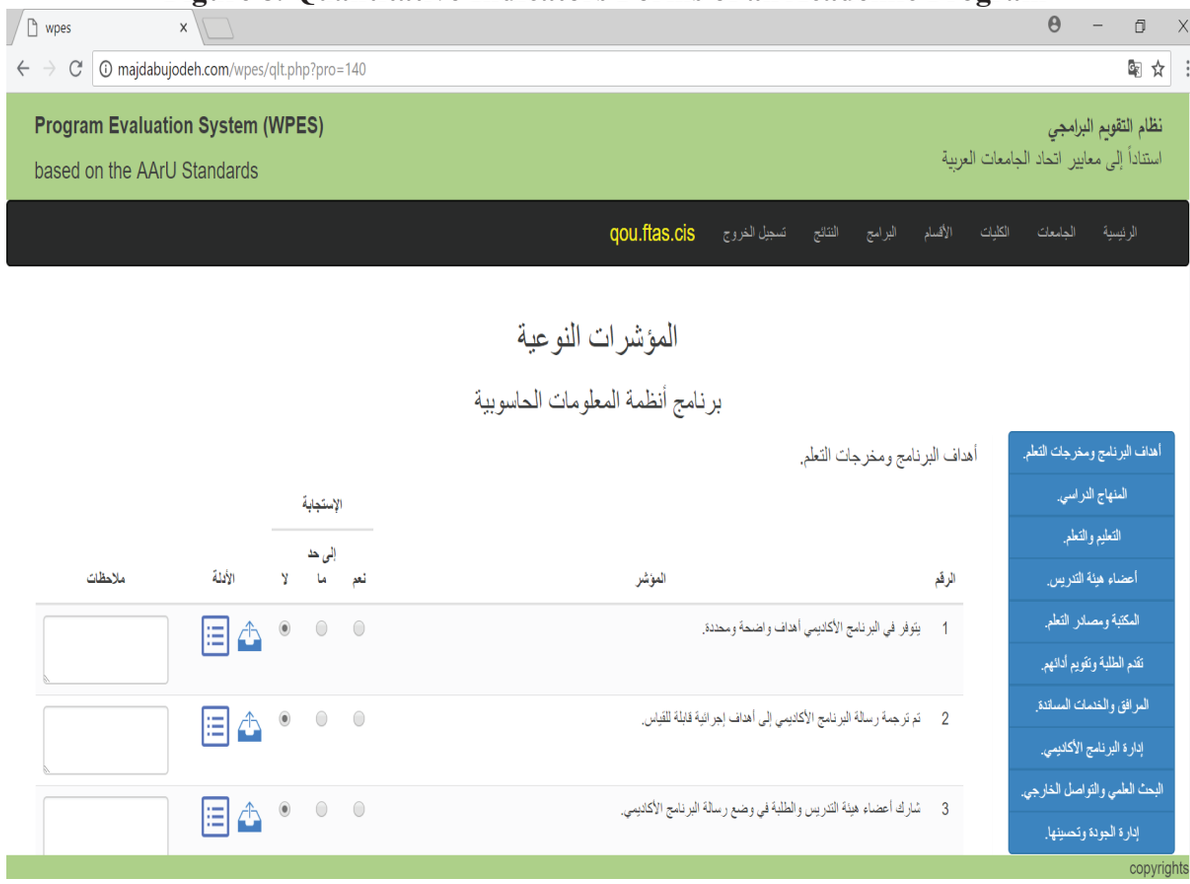



**Figure 9. Evaluation Domains and Qualitative Indicators with Evidences of an Academic Program**

Figure 10 shows the weights and scores of each domain as well as the total program score, while figure 11 illustrates the SER wizard, which is used by the self-evaluation team to respond to the quality requirements, and finally generate the SER.

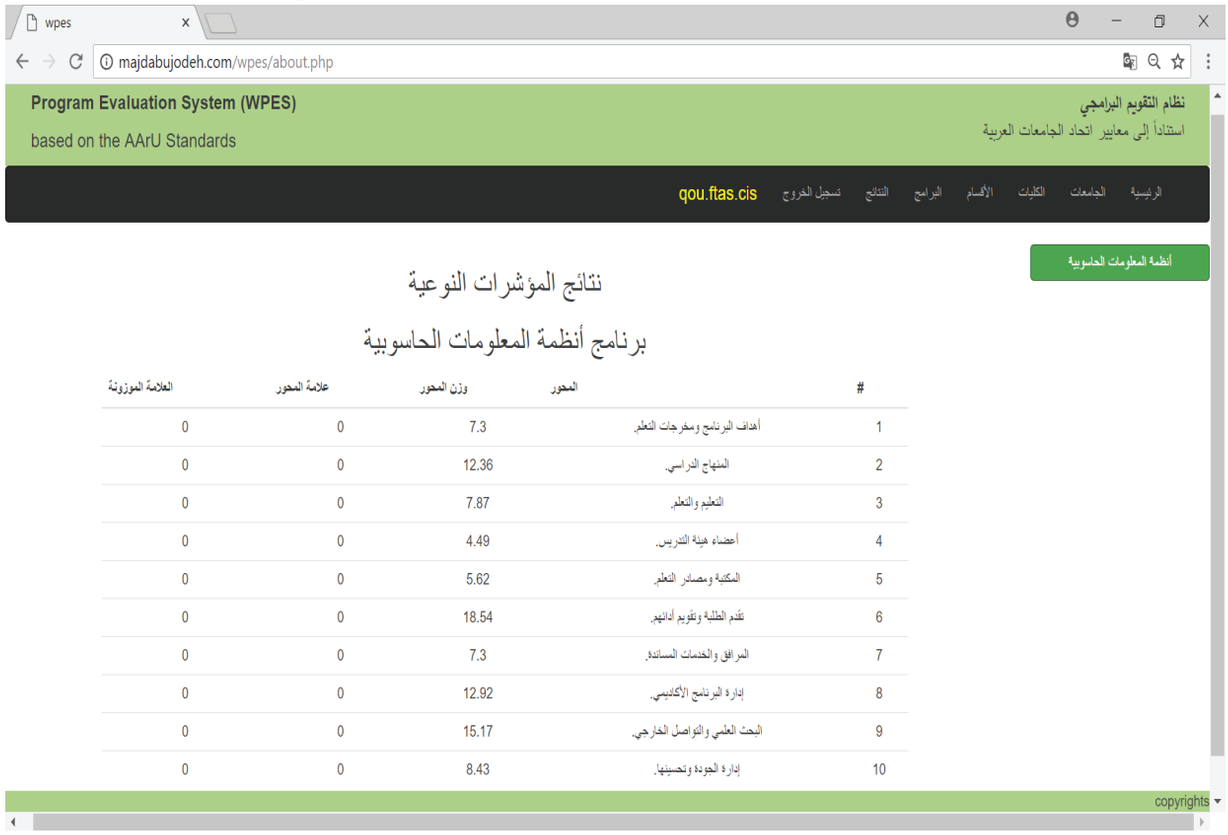



**Figure 10. Results (Weights and Scores) of the Evaluation Domains (Program Quality Standards)**

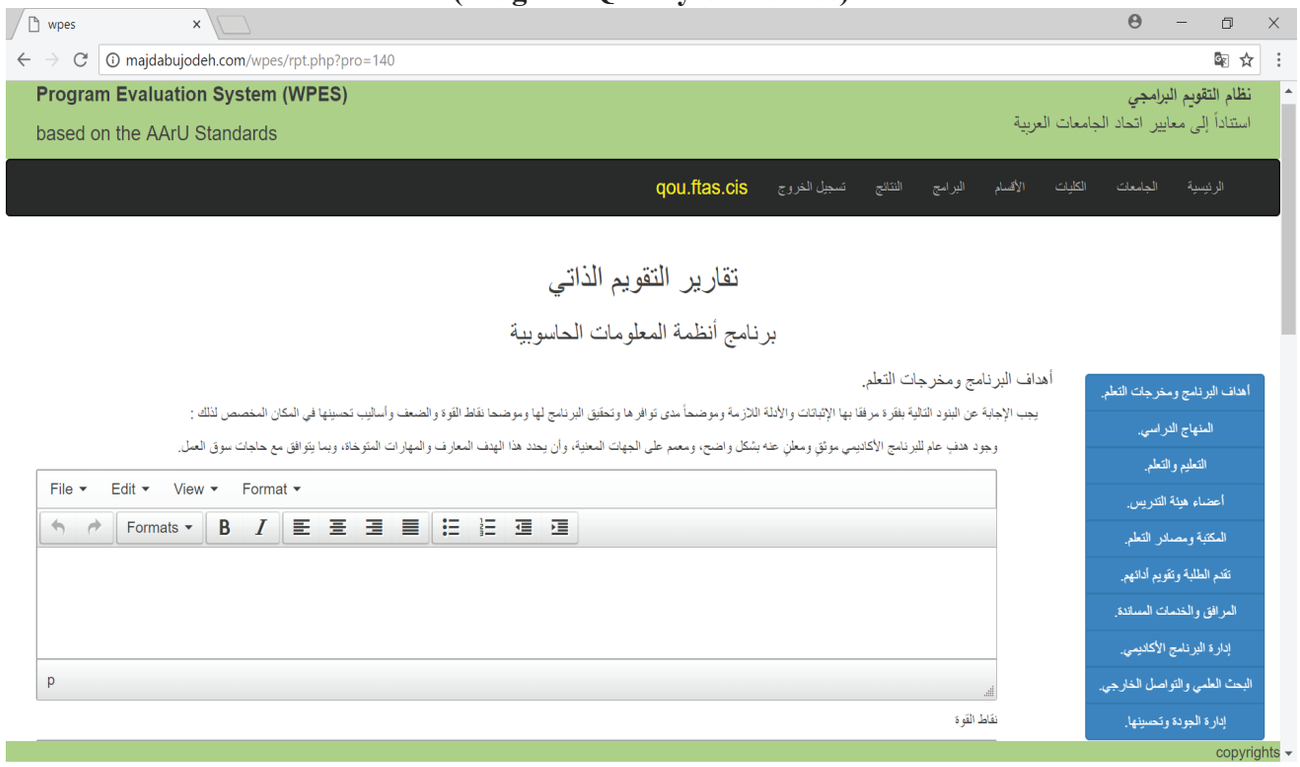



**Figure 11. Self-Evaluation Report (SER) Builder: Response to Quality Requirements of a Sample Domain**

# 6 RESULTS AND DISCUSSION

## 6.1 Focus Group Results and Discussion

The first data-collection tool we have used in this research is the focus group (FG) to measure the relevance and importance of this research and the developed web tool for academic program evaluation in Palestine. The target audience of this FG has consisted of directors of quality units in ten Palestinian HEIs. We have discussed three main issues, current situation; desired situation; and how to bridge the gap between the current and the desired situations. We have designed this FG with five to seven questions for each issue, collected responses of all participants and conducted a qualitative data-analysis. In the following paragraphs, we will discuss the results of the mentioned issues in more details.

The Current Situation: The participants have shown that there are advantages and importance to conduct internal and external evaluation of the academic programs. For example, it is an opportunity to highlight the strengths and weaknesses of the academic programs, develop improvement plans, raise the current situation and evaluate the performance of staff and faculty. The focus group shows that only two academic programs have been evaluated in the participating Palestinian HEIs within the last three years based on some projects funded by the Quality Improvement Fund (QIF) and the Palestinian Market Development Program (PMDP). Dedicated evaluation teams have employed the AQAC and ACM standards in this evaluation process. They used designated paper forms, templates, and interviews with the program alumni. After evaluation, they manipulated the concluded weaknesses with some training to provide the academic staff with the required skills. Some challenges have emerged during the evaluation process, such as the scarcity of human and financial resources, lack of expertise to perform the evaluation, and lack of relevant data. Other challenges have been related to reluctance and resistance of the programs' administrative staff.

The Desired Situation: Results of the focus group showed that national standards (e.g. AQAC's) should be updated and refined before being used as a reference for program evaluation in the Palestinian HEIs. They also showed that AQAC should be an independent body responsible for external evaluation or review. This is important for HEIs to gain confidence, to have more control and to monitor the improvement of their programs. They agree on the necessity of setting a unified framework, standards, benchmarks and mechanisms with some flexibility. They should be suitable with different programs and HEIs are responsible to conducting periodic evaluation abided by national and international standards. The FG participants also appraise the importance of using ICT to improve and speedup the evaluation process, as it helps to utilize the data analysis and obtain accurate results. They also suggest disseminating the evaluation results through conducting workshops amongst the Palestinian HEIs for mutual benefits.

Bridging the Gap between Current and Desired Situations: the FG participants stressed that the Palestinian HEIs should be obliged to conduct periodic evaluation for their academic programs as a condition for reaccreditation and gaining state financial support. They agreed on having a system of weights and scores that measures the extent to which academic programs achieve quality indicators of all domains and subdomains. After reviewing the quality assurance manual for academic programs issued by the AArU and how appropriate it is for evaluating academic programs in the Palestinian HEIs, the focus group agreed that this manual needs some development and improvement in terms of qualitative and quantitative indicators as well as the benchmarks. After reviewing the proposed web-based program evaluation system (WPES) that have been developed and implemented in the research, participants agreed that the system is showing privacy to the individual HEIs and store the data and the results in one storage. However, the system needs to provide technical support and be more user friendly and easy to use. The participants are so eager to use it as a pilot to conduct evaluation for at least one academic program in their HEIs and are keen to use it as an evaluation tool once the MoEHE adopts and disseminates it.

## 6.2 Survey Results and Discussion

In this section, we provide the results of a survey that targeted the users of the developed web application for program evaluation, in order to check its reliability and validity. For the purpose of system testing and evaluation in terms of usability, performance, security and acceptance, we have targeted a population, which consisted of quality assurance experts and self-evaluation teams from the Palestinian and Arab HEIs. A sample of 60 participants has been selected from the previously mentioned population. The sample consists of the web application users including quality directors in the Palestinian and Arab HEIs and self-evaluation teams at QOU. A questionnaire has been adapted from Smithsonian Mobile App Testing Survey [24], which consists of 18 quantitative items (multiple choice) and six qualitative items (open questions). After being arbitrated by four referees, it has been published online using Google forms and distributed to the sample, where 46 participants responded to it. Table 1 describes this sample.

**Table 1.**

**Description of the Sample**

| Item | | No. of Participants | Av. % |
|---|---|---|---|
| 1. Gender | Female | 6 | 13.0% |
| | Male | 40 | 87.0% |
| 2. Work Field (Specialization) | Engineering/ CS / ICT/ Agriculture | 10 | 21.7% |
| | Business and Economic Sciences | 6 | 13.0% |
| | Humanities/ Education/ Law | 18 | 39.1% |
| | Quality Management/Assurance | 9 | 19.6% |
| | Social Sciences/ Media | 1 | 02.2% |
| | Scientific Research | 1 | 02.2% |
| | University Administration | 1 | 02.2% |
| 3. Work Experience | Less than 5 years | 3 | 06.5% |
| | 6 – 10 years | 9 | 19.6% |
| | 11 – 15 years | 12 | 26.1% |
| | 16 – 20 years | 15 | 32.6% |
| | More than 20 years | 7 | 15.2% |
| 4. Qualification | Diploma | 1 | 02.2% |
| | Bachelor | 6 | 13.0% |
| | Master | 10 | 21.7% |
| | PhD | 29 | 63.1% |
| 5. Familiarity with Web Applications | Always use them | 22 | 45.7% |
| | Frequently use them | 11 | 23.9% |
| | Occasionally use them | 12 | 26.1% |
| | Rarely use them | 2 | 04.3% |

### 6.2.1 Quantitative Results

In this subsection, we discuss the quantitative results of the survey. Figure 12 shows the evaluation of the application usability according to ten criteria, where easy navigation of the application and easily understood language achieved the best results, with 81.3% and 80.4% respectively. On the other hand, its design for all user levels achieved 67.4%. Results of the other criteria range between 67% and 81%.

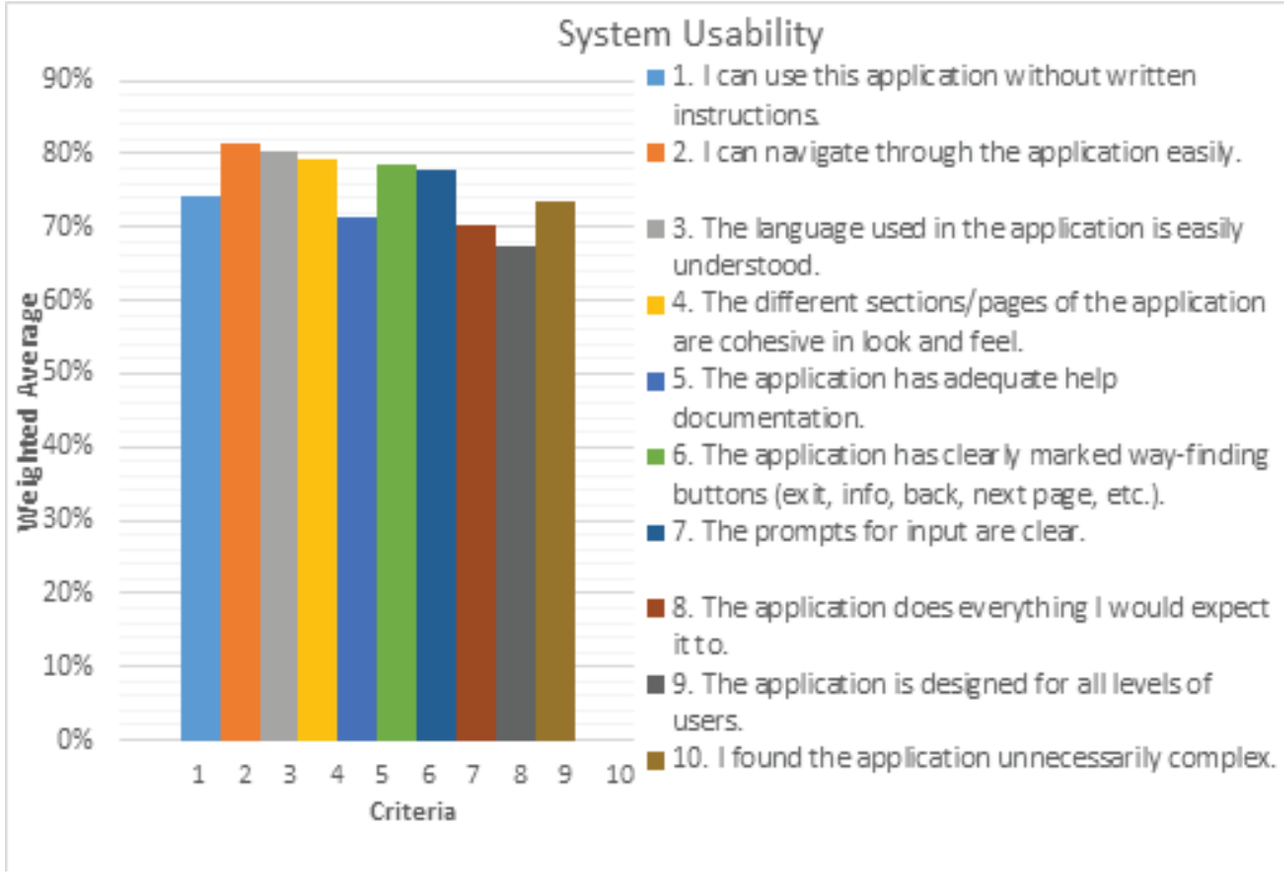



**Figure 12. Usability of the Developed Web Application**

Figure 13 shows the evaluation of the system performance, where its response time has the best result with 78.7%, then for no considerable functional-errors with 74.3%, then for correct/ relevant output with 73% and finally, for input validation with 71.3%. Figure 14 depicts the evaluation of application security. Results show that the application achieved 74.3% for session expiry, 73.9% for correct permission handling and 54.8% for login bypass. The latter result shows that sessions are not well implemented, and this bug has been fixed and tested thoroughly in the last version. Figure 15 illustrates the evaluation of application acceptance. Results show that the application achieved 80.4% in its single criterion, which asks if the users recommend others to use it.

Figure 16 shows the overall results of the four evaluation dimensions used to evaluate the developed web application. It achieved an overall usability of 75.4%, which is quite good for the application at the current stage and therefore, the application will be improved by time as long as we receive comments and recommendations from the target users. In the second evaluation dimension, the application achieved an overall performance of 74.3%, which requires some enhancement based on the users' responses and comments. Regarding the third dimension, it achieved an overall security of 67.7%, which should be improved according to users' recommendations and comments. Finally, the fourth dimension achieved an overall acceptance of 80.4%, i.e. users were satisfied with the web application and accepted using it for academic program evaluation. In general, the above results encourage us to disseminate the application and release the first version for the potential users and beneficiaries, taking into

consideration that we will continuously improve it according to users' comments and recommendations.

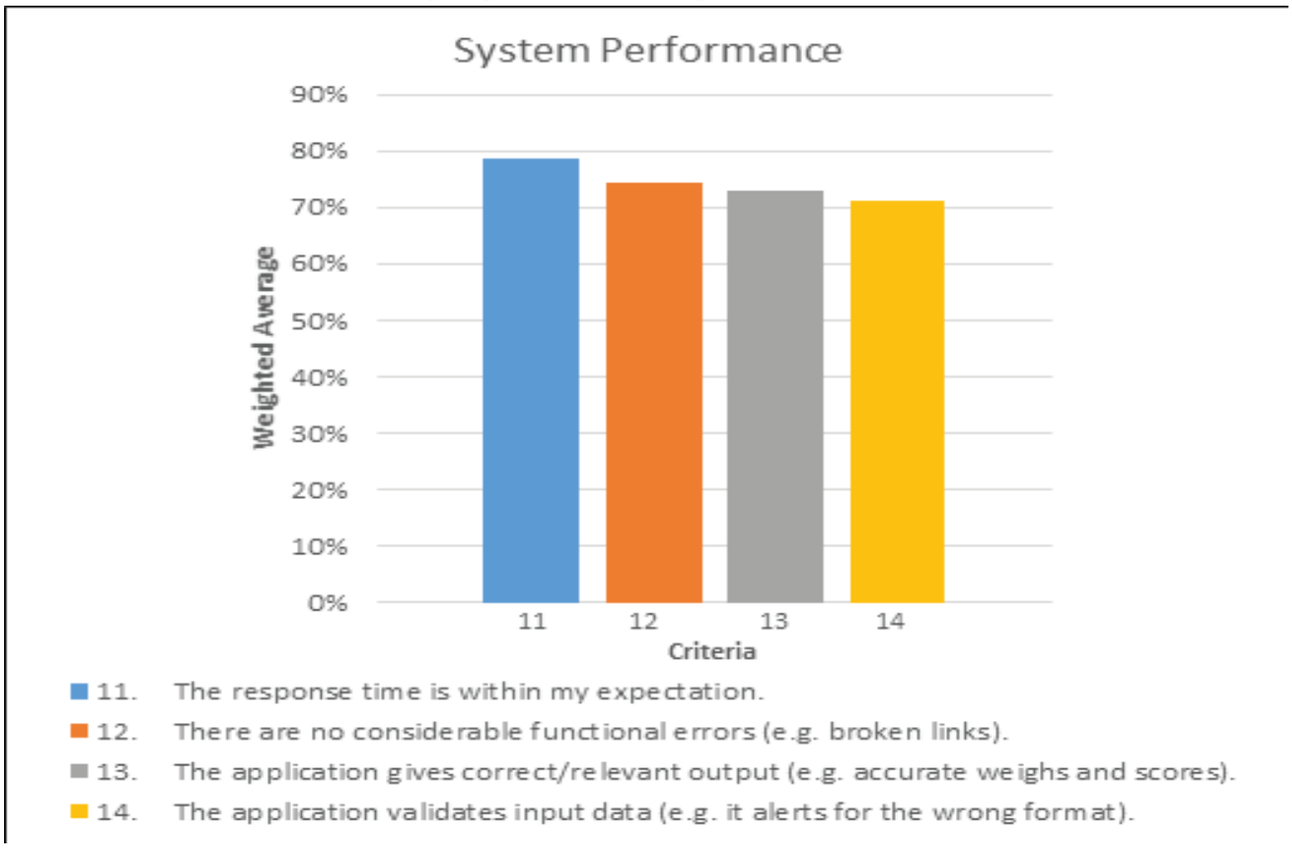



**Figure 13. Performance and Function of the Developed Web Application**

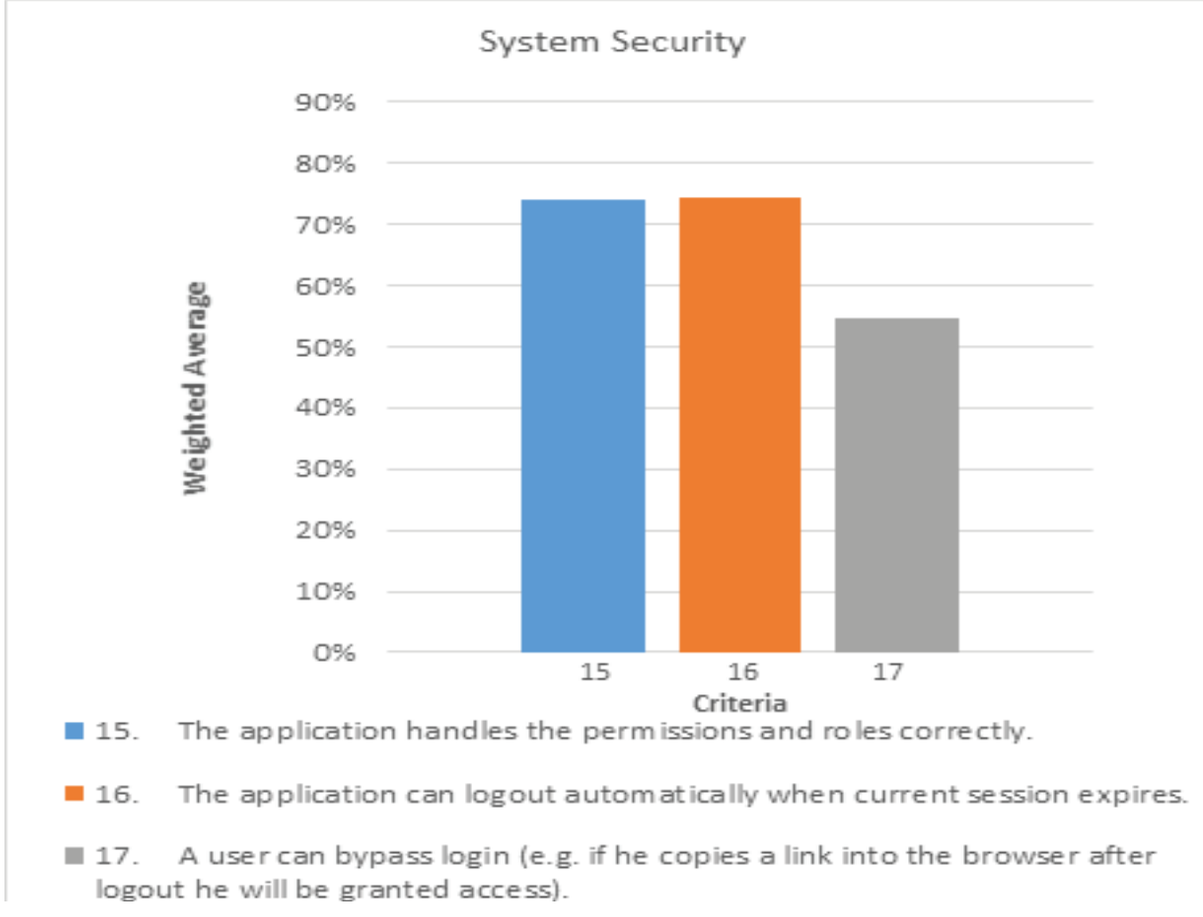



**Figure 14. Security of the Developed Web Application**

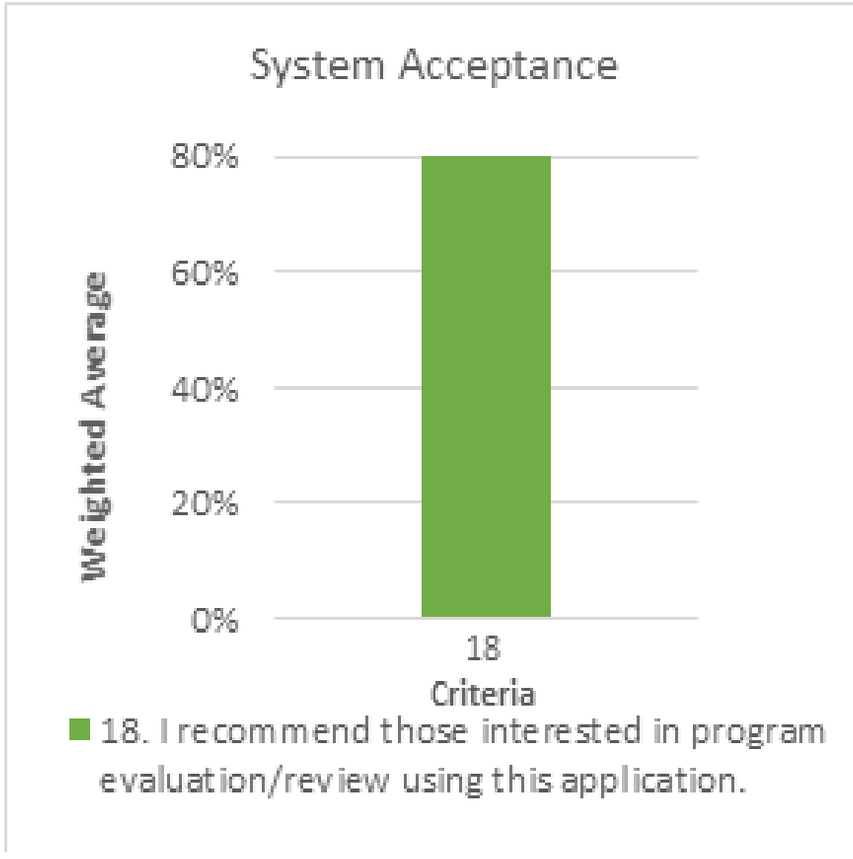



**Figure 15. Acceptance of the Developed Web Application**

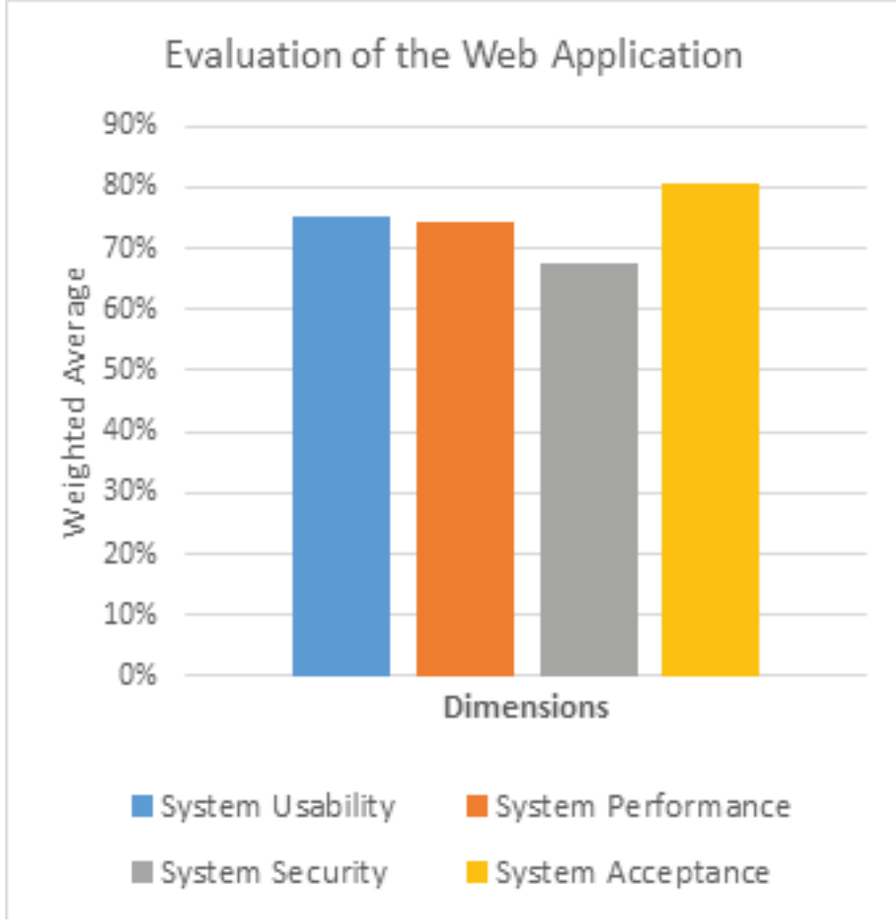



**Figure 16. Summary Results of all Dimensions of the Survey**

### 6.2.2 Qualitative Results

In order to validate our quantitative analysis, we used six questions with open answers in the last part of the survey, where each participant could provide some qualitative comments and recommendations. In this subsection, we will discuss the results of this part, which totally agree with the quantitative results discussed above, as follows:

***1.*** Lessons learned from the application: The participants' responses can be summarized in the following points:

- The application facilitates the process of program evaluation, accuracy and speed in obtaining results related to strengths and weaknesses and ways to improve them.
- The application helps in identifying the standards, indicators and mechanism of evaluating the quality of academic programs.

***2.*** Consistency of the application: The participants' responses can be summarized in the following points:

- Most responses (65%) indicated that the application answered their queries.
- Around 13% of the responses indicated that the application answered their queries to some extent.
- Around 22% had some questions but most of them were not related to the functions of the application and its mechanism, but rather to the content of the criteria and indicators.

***3.*** System usability:

- Most of responses (78%) indicated that there were no comments on usability (e.g. screen design, navigation etc.).
- Some of the responses (8.6%) suggested some improvements to the design of the user interface such as design, color and formatting.
- The rest of the responses focused on asking questions about reformulation of criteria and indicators related to the quality manuals for program accreditation and evaluation issued by the Association of Arab Universities (AArU) on which this application was based, rather than the core of the application's functions and usability. A single response indicated that the application was not easy to use.

***4.*** Most positive aspects of the application: Respondents' responses to the most important and positive aspects of the application were as follows:

- The application is easy to use and navigate between screens.
- The application facilitates and speeds up the program evaluation process while maintaining accuracy.
- The application provides a digital repository for quantitative and qualitative data and important documents of academic programs at universities.
- The application provides an effective tool to ensure that academic programs achieve the overall quality standards.

***5.*** Most negative aspects of the application: Participants vary in their answers, which can be grouped as follows:

- ♦ Most of the participants mentioned that the application had no negative aspects.
- ♦ Cons that will be considered since they are related to the scope of the study, while ignoring irrelevant responses. Notice that the italicized sentences are the participants' comments and non-italicized sentences are the authors' responses.
- The application needs some experience and skills in using web applications. However, the users of this application must have basic skills in using computers and web applications.
- The responses to the qualitative indicators are not saved if you do not click the commit button. This is normal, since the commit button is used to save the entered data, and there is no need to save each indicator separately.
- There are no scores for each indicator and the responses are limited to only three options. Actually, the application assigns a score of zero, one or two to each indicator, and then calculates the weighted-average score of each standard domain and then the accumulative

score of an academic program.

- The user can bypass the login (e.g. if the user copies a link within the system and logout, then paste it into the address box). Accordingly, this issue has been fixed in the latest version.
- Some terms are not understood when looking in the indicators and requirements. We will add a list of terms and their definitions in the help menu.

♦ Some responses are irrelevant to the scope of the survey, i.e. the application functionality is rather related to the standards and indicators, such as:

- The application deals with the college as a separate university, and assumes there is a library for each college while it should be for the whole university, where the college is part of it. This is not related to the web application, but to the standards and indicators of the quality manual issued by the Association of Arab Universities (AArU).
- There are many details and the repetitions of the indicators. Huge efforts are needed in data collection and data entry. This response is not related to the application but to the content of the criteria and indicators.

***6.*** Recommendations and suggestions to improve the application: Participants provided important recommendations to improve the application as follows:

♦ Most of the responses are out of scope and are related to the content of the quality and accreditation manual for academic programs released by the AArU. However, we will provide the AArU with those comments to consider in further releases.

♦ Some participants showed that they are satisfied with the application and have no comments or suggestions.

♦ Some participants asked for more work on the application's usability in general. Accordingly, we have added the following menus:

- Help menu, which includes a list of terms with their definitions and a user manual, so that a user can get help on how to navigate through the application and use it.
- About menu, which provides some information about the web application, the developing team, the quality and accreditation manual, and the copyrights.

# 7 CONCLUSION

Quality of academic programs, especially in higher education, is widely considered and adopted and it is a concern of all the HEIs in Palestine. The research has been conducted as there is a necessity of having a tool to conduct a review and evaluation of each academic program throughout these institutions. This is to improve their performance, which leads to an improvement to their graduates, and furthermore widen the horizon for them to have better job opportunities and to be globally recognized. The proposed web application will play a vital role in enhancing the review and evaluation processes for the academic programs in the HEIs and remark improvements.

The application provides HEIs and QAAs with a comprehensive and efficient tool for easy, accurate, fast and short-term evaluation of academic programs. Moreover, it offers a Decision Support System (DDS) and up-to-date digital repository of quantitative and qualitative data that describes performance of the HEIs for decision-makers. Accuracy comes from the fact that it is an evidence-based system and the scores of all domains and indicators are measured effectively. QAAs can rely on this application and the generated scores of academic programs in HEIs as a ranking system that enhances competitiveness among them, and hence, improves quality.

Results of the focus group for needs assessment have shown the necessity of developing this application and employing it in program evaluation. Participants have also provided us with valuable suggestions to improve its look and feel as well as performance. In addition, results of the survey we conducted for system testing and validation after implementation of the web application have approved its usability, performance, security and acceptance. Both quantitative and qualitative parts of the survey have emphasized the application's reliability and validity. However, the participants' suggestions

and recommendations have helped us in enhancing its usability and security.

Compared with a previous Web-based Institutional Evaluation System (WIES) [25], the proposed application has several advantages and features over the previous one, such as:

1. It enables QAAs to add organizational structures for HEIs, including accredited faculties, departments and programs as well as assigning external reviewers.
2. It provides self-evaluation teams with easier Self-Evaluation Report (SER) builder.
3. It enables external reviewers to add their responses to the qualitative indicators and submit their External-Evaluation Reports (EERs).
4. Better usability in terms of design, colors, menus and responsive design that works very well with smartphones and tablets. We have added two menus that help users in the evaluation and review process.

Finally, the application was given to the national AQAC and the Palestinian HEIs, then to the regional and international HEIs and QAAs (e.g. the AArU). Several workshops and seminars have been conducted in Palestine and Jordan to highlight the advantages of having such an application in place.

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