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## **MINIMIZING ABET REVIEW PROCESS UNCERTAINTY: THE ROLE OF INNOVATIVE QUALITY ASSURANCE TOOLS**

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**ABSTRACT:** The new ABET accreditation system was first introduced to the American Engineering Education in the middle of 1990s. Since its introduction, majority of academic literature focused on the most appropriate procedures for forming Program Educational Objectives (PEOs) and student outcomes (i.e. A-K), giving little attention to the process of developing innovative quality assurance tools that can enhance accreditation success and minimize review process uncertainty. Based on a case study methodology at An-Najah National University (NNU) in Palestine, this paper aims at closing the aforementioned gap by proposing a novel form of ABET quality assurance tools that can increase the chance of having a successful ABET review process. The findings of the case study analysis illustrates the successful experience of NNU in getting accreditation for seven of its Engineering programs, it illustrates in particular a number of practical quality assurance tools that were developed and adapted by the Faculty of Engineering at NNU; these tools were found very useful in minimizing ABET review process uncertainty.

**KEYWORDS:**Quality assurance; ABET; Engineering Education; Innovative Quality Tools; Accreditation .

### **INTRODUCTION**

The literacy rate in Palestine is ninety one percent; Palestinians are the most educated population in the Middle East and North Africa (MENA) region [1]. However, as in other countries in the region, mismatch between the qualifications demand and supply is always a major challenge for the higher education institutions [2,3].Qualifications refer to the capacity, knowledge, or skill that make someone suitable for a particular job or activity [4].

Higher education is the backbone of any society; the quality of higher education shapes the quality of human resources in a country. Quality in higher education means the educational process ensures that students achieve predetermined educational objectives/outcomes and thereby satisfies the needs of the society and helps in the national development [5].

It is difficult to ensure good educational quality in developing countries; many private and public universities/colleges are offering engineering degrees, but products of these universities/colleges could work only in their own country and educational globalization has little or no meaning for them [6]. On the other hand, international accreditation can insure that graduates have met the educational requirements necessary to enter the profession, provides opportunities for the industry to guide the educational process to reflect current and future needs, and enhance the mobility of professionals [7]. ABET (Accreditation Board for Engineering and Technology) accreditation provides assurance that a college or university program meets the quality standards established by the profession for which the program prepares its students [8]. ABET accreditation enables academic institutions to demonstrate to the public that they are serious about advancing the quality of their programs. It is recognition by the technical professions that these programs are preparing students well, and it encourages "best practices" in education through formal, continuous quality improvement processes. Programs seeking accreditation from the Engineering Accreditation Commission of ABET must demonstrate that they satisfy all of the following General Criteria [9-11]:

- **Criteria 1: Students, Student performance** must be evaluated. Student progress must be monitored to foster success in attaining student outcomes, thereby enabling graduates to attain program educational objectives.
- **Criteria 2: Program Educational Objectives**, The program must have published program educational objectives that are consistent with the mission of the institution, the needs of the program's various constituencies, and these criteria.
- **Criterion 3: Student Outcomes**, The program must have documented student outcomes that prepare graduates to attain the program educational objectives; usually these outcomes are referred to as **a** to **k** outcomes.
- **Criterion 4: Continuous Improvement**, The program must regularly use appropriate, documented processes for assessing and evaluating the extent to which both the program educational objectives and the student outcomes are being attained. The results of these evaluations must be systematically utilized as input for the continuous improvement.
- **Criterion 5: Curriculum**, The curriculum requirements specify subject areas appropriate to engineering but do not prescribe specific courses. The faculty must ensure that the program curriculum devotes adequate attention and time to each component, consistent with the outcomes and objectives of the program and institution.
- **Criterion 6: Faculty**, The faculty must be of sufficient number and must have the competencies to cover all of the curricular areas of the program. There must be sufficient faculty to accommodate adequate levels of student-faculty interaction, student advising and counseling, university service activities, professional development, and interactions with industrial and professional practitioners, as well as employers of students.
- **Criterion 7: Facilities, Classrooms, offices, laboratories, libraries, and associated equipment** must be adequate to support attainment of the student outcomes and to provide an atmosphere conducive to learning.
- **Criterion 8: Institutional Support**, Institutional support and leadership must be adequate to ensure the quality and continuity of the program. Resources including institutional services, financial support, and staff (both administrative and technical) provided to the program must be adequate to meet program needs.

ABET accreditation process follows the tradition of accreditation in the USA, the ABET follows a voluntary participation by institutions to offer themselves to assess the quality of their programs. An internal self-study evaluation forms the basis of the beginning of the accreditation process. Based on the study report, the appropriate ABET Commission forms an evaluation team for the site visit. Following the visit, the peer team provides the institution with a written report to allow for correction of errors or misrepresentation of facts. The peer team examines the following in a comprehensive manner and recommend accreditation and relevant actions: organization and management of the institution, educational programs offered, maturity and stability of the institution, admission process and number of students enrolled, teaching staff and teaching load, physical facilities finances etc., curricular content, sample student work, record of employment of graduates, support services to the students, clearly stated policies. Accreditation is usually granted for a period ranging from 2-6 years, depending on the weakness of the program, the peer team recommends specific action to be taken by the commission [12]. However, much literature has focused on the most appropriate procedures for forming Program Educational Objectives (PEOs) and student outcomes (i.e. A-K) as an essential part of the accreditation process, giving little attention to the process of developing innovative quality assurance tools that can enhance accreditation success and minimize review process uncertainty. This paper provides an attempt to propose a novel form of ABET quality assurance tools that can increase the chance of having a successful ABET review process.

An-Najah National University NNU is the largest university in Palestine with more than 22000 students. NNU is concerned about developing its quality of education, and providing a wider range of opportunities for its graduates. The University conducted several evaluation programs for the quality of education over the last few years such as the UNDP evaluation program and the IEP. In 2011, the Faculty of Engineering and Information Technology at NNU started the preparations to achieve ABET accreditation for a group of its engineering programs. Following the new ABET Engineering criteria; fruitful efforts resulted on October 2013 with accreditation of seven engineering programs at the same time, these are: Civil Engineering program, Mechanical Engineering program,

Industrial Engineering program, Electrical Engineering program, Chemical Engineering program, Mechatronics Engineering program, and Telecommunications Engineering program.

Several publications [13-16] presented different experiences of programs' ABET accreditation. This paper presents in particular a number of practical quality assurance tools that were developed and adapted by the Faculty of Engineering and Information Technology at NNU in securing ABET accreditation for seven of its engineering programs; these tools were found very useful in minimizing ABET review process uncertainty.

## **RESEARCH METHODOLOGY**

In order to empirically explore the development of innovative quality assurance tools that can increase the chance of having successful ABET review process, a case study was conducted in the premises of the Faculty of Engineering and Information Technology of An-Najah National University in Palestine. Case studies typically use any and all types of methods for collecting and analyzing research data [17]. In other words, case study research design has the unique strength in providing a full range of evidence through the use of multi-sources of data. In 2011, the Faculty of Engineering and Information Technology embarked on a journey to improve the quality of its educational programs following the new ABET Engineering criteria. The "ABET project" started with seven engineering programs at the same time. Implementation of this project resulted in a successful ABET visit in October 2013. In this research inquiry, data were mainly collected through in-depth interviews with administrative and staff members involved in the project, and who took part in the implementation of the project phase. Observations at the Faculty of Engineering and Information Technology were another important source of data used; this was followed by the collection of documentary evidence. Observations and documents collection were deemed necessary as they captured things that escaped the interviewees' awareness during interviews. The data sources used in the case study are summarized in Table 1.

**Table 1.** Sources of case study data

<b>Interviews</b>	<b>Observations</b>	<b>Documents</b>
<ul style="list-style-type: none"><li>• Dean of Faculty</li><li>• Program chairs</li><li>• Teaching staff</li><li>• Quality engineers at ABET centre</li><li>• Members of project steering committee</li><li>• Members of the Program quality assurance committees</li></ul>	<ul style="list-style-type: none"><li>• Covered all aspects of project initiation, planning and implementation.</li></ul>	<ul style="list-style-type: none"><li>• Various sources of publications and internal reports</li></ul>

## **DATA ANALYSIS AND RESULTS**

The process of data analysis followed the steps of Miles and Huberman [18] for coding and then analyzing interview data. The analysis process started by transcribing and studying the qualitative data (i.e. reading through interviews, and revising field notes and archival documents). The emerging patterns (i.e. themes) from data analysis are presented below.

### **Centralized ABET project office**

The results show that due to the size of the project, it was decided by the University administration that it is necessary to have a centralized ABET project management office, called ABET project office/center. ABET project office is responsible for defining and maintaining standards for ABET criteria implementation in the Faculty of

Engineering and Information Technology. It was evident in the results that the ABET project office created economies of repetition in the development and implementation of all processes related to the preparation of ABET accreditation in the seven engineering programs. For this purpose, the center has become the source of archival documents, guidance, and metrics related to the practice and execution of ABET criteria. To complement this role, the ABET project office conducts internal auditing at the seven engineering programs at the end of each academic semester. These auditing efforts aim for identifying any inaccuracies in the direct and indirect data collection and processing measures, or to detect any course portfolio's lack of materials and samples. Once the auditing process is completed, the ABET project office provides each program with a detailed report outlining the auditing process findings. These reports were found very helpful for programs to improve their ABET criteria implementation and data assessment errors minimization. In addition to this, the ABET project office played a very important role in the process of minimizing resistance to change of adopting ABET criteria in the program management and teaching efforts. The ABET project office developed strategies to understand and then deal with source of resistance among teaching and administrative staff at the involved programs. A number of periodic meetings and training workshops were held with the teaching and administrative staff concerning ABET accreditation to update people in different programs about latest ABET requirements and to provide orientation for newly recruited staff members about the ABET system.

### **ABET computerized system**

In order for the ABET project office to be able to deal with direct and indirect data for seven engineering programs simultaneously, a computerized information system was deemed necessary. The computerized system was accessible by all teaching staff from the seven engineering programs including the program chairs. Teaching staff was able to enter their students' marks in the different course work with proper identification with student outcomes covered in these course works for direct assessment. The computerized system also made it possible for other indirect data to be collected by conducting students' survey, alumni survey, and employers' survey. To increase efficiency of performing evaluation processes, the computerized system is equipped with student outcomes matrices displaying function for each engineering program based on the direct and indirect data collected. It was also found that the computerized information system was very supportive in developing the continuous improvement actions for the program as it allows teaching staff to fill in a quality assurance report for each course they teach to outline what needs to be improved at the course level; making it possible for the program to continually improve their offered courses.

### **ABET project steering committee**

Soon after the establishment of the ABET project office, a decision was made by the University administration that a body within the Faculty of Engineering and Information Technology is needed to support the steering of the project office actions. The main concern of the committee is making strategic decisions about the management and monitoring of the ABET accreditation project including processes and procedures to maintain ABET criteria, assessing and validating any changes in these processes as part of the continuous improvement of the quality assurance system used, and controlling the execution deadlines of the project and any needed extensions or changes. This role of the steering committee was found to be very helpful to all programs involved in the project. However, to maintain this role, ABET project steering committee meets weekly to coordinate preparations for the ABET accreditation process. In some cases, the steering committee provides direct advice and/or technical support to chairmen of different programs regarding any emerging accreditation-related issues and how these issues should be tackled.

### **PEOs maintenance committee**

Due to the fact that PEOs adequacy and their consistency with the mission of the institution constitute an important aspect in preparing an engineering program for ABET accreditation, a special committee from each engineering program, called PEOs Maintenance Committee, has been created. The PEOs maintenance committee is responsible for ensuring that the PEOs of the engineering program are always up-to-date and are consistent with the university Mission by the end of each evaluation cycle. The committee does this through detection of any changes to university mission, detect any changes to global trends in teaching/ curriculum of the engineering program, and it is also

responsible for collecting further suggestions and comments via committee members own personal contacts with industry and local market, apart from the official contacts and meetings with constituencies.

### **Program quality assurance committee**

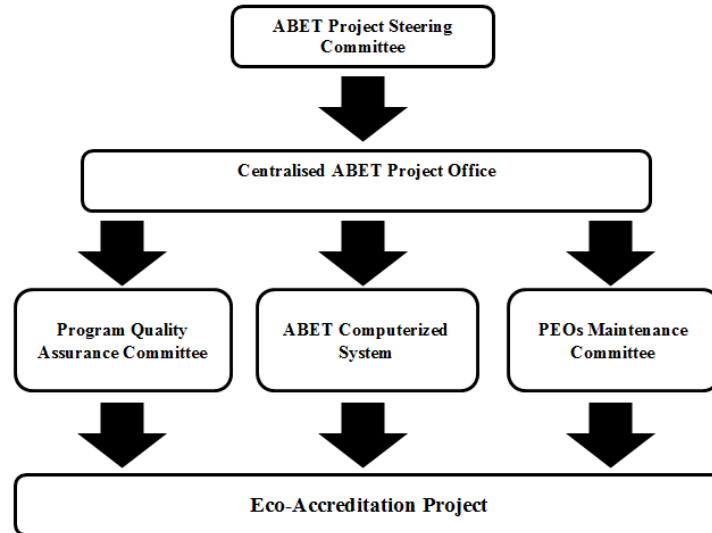
In order to ensure good governance of the ABET project, and to further enhance proper ABET criteria implementation, the Program Quality Assurance Committee was created for each engineering program involved in the project. The committee is responsible, in coordination with the ABET project office, for the program's quality assurance framework. It acts as a forum for discussing inputs from the program constituents that can affect the program curriculum, PEOs, or teaching methods that guarantee improvement of students' outcomes. It also acts as a planning engine for the program where all the continuous improvement actions, based on direct and indirect assessment, are generated. However, to make sure that teaching staff is always able to provide helpful measures to enhance student outcomes attainment in each course offered by the program, the program quality assurance committee oversees the quality assurance reports as prepared by the teaching staff. The committee is able to provide guidance and help on some elements of the measures suggested by the staff member to improve its effectiveness. Furthermore, the committee promotes the voice of the students in the program quality framework through effective representation of students in the committee meetings where appropriate. Based on all of these actions, the committee reports the program chairman on the set of recommended actions to be taken to improve the program and it follows up on its implementation.

### **Eco-accreditation project**

Although preparing an educational program for ABET review process needs a considerable amount of efforts and resources, the environmental aspects of the ABET Project at An-Najah University has been a priority. This was reflected in the green policy implemented at the ABET Centre of completely relying on electronically scanned copies of documents instead of hard-copies. Paper consumption was minimal as it was only used for official correspondences in some certain cases. The green policy of the project was further fostered by the presence of the ABET computerized system through which all of the direct assessment, indirect assessment, and quality assurance reports of courses were performed. Subsequently, programs review materials and archives were all available electronically for the ABET review visit, which made it a seamless process with easy access to information.

## **DISCUSSION AND CONCLUSION**

In this paper, a case study methodology has demonstrated a novel form of ABET quality assurance tools that can increase the chance of having a successful ABET review process. Figure 1 summarizes the innovative quality assurance tools developed. The results of this research are discussed in the context of innovation systems to close the gap that has been posed at the beginning of this paper of obscure development of innovative quality assurance tools that can enhance accreditation success.



**Figure 1.**Innovative Quality Assurance System

The available theory and research on innovation systems provides a rich framework for some of the important issues facing innovative quality assurance tools development mentioned in this paper. According to Kaluzny[19], innovative quality assurance systems are divided into two essential strands of diffusion and adoption perspective. The first perspective of diffusion focuses on the spread of new tools and pattern of implementation within an institution. The analysis of results have shown that the emerging quality assurance tools were used at different levels at the Faculty of Engineering and Information Technology with many different managerial levels involved at both the development and implementation phase of these tools. For example, the ABET project steering committee is working in close relationship with deanship and university administration to make strategic decisions about the management and monitoring of the ABET accreditation project. The PEOs maintenance committee is working in close relationship with the program chair to detect any changes in the University mission and global trends in education that can affect the program PEOs. Also, the program quality assurance committee acts as a forum for discussing the inputs from the program constituencies including the program staff who can share and comment on any issues related to the assessment and evaluation of courses and other issues. While the diffusion perspective of innovation has been researched in many different areas such as health care quality assurance and other services, its application to the education quality assurance has proved to be promising in this paper. The acceptance by different managerial levels of these new set of quality assurance tools have been a natural result of the top management support represented by University Administration and Faculty Deanship. However, the second strand of innovative quality assurance systems is the focus on individuals within institutions as the adoption unit and considers factors that instill or jeopardize the successful implementation and impact of innovative quality tools. The analysis of interviews blended with the observations noted has reflected the role of the teaching staff at the case study institution in the process of ultimate implementation of the innovative tools. The main features of this role stemmed from the ability of staff to be part of these quality assurance tools by participating in different committees at the program level, they also had the ability to share their experiences of using these quality assurance tools with other committees in other engineering programs, and in some cases with the ABET steering committee. In addition, teaching staff were trusted to implement ABET processes and procedures in the way that provides them with a sense of ownership and authority to make decisions on their courses; this inevitably enhanced the feeling of responsibility among staff members and helped the adoption of the innovative quality assurance tools.

While this research attempt has presented significant insights and contributions to designing innovative quality assurance tools that can minimize ABET review process uncertainty, the findings from exploratory case studies cannot be easily generalized. Hence, further case studies are needed to enrich the findings, and to facilitate their

application in the higher education institutions. Further, the paper explores the utilization of these quality assurance tools in an institution based in a developing country. It would be valuable for future studies to further investigate the utilization of such tools in other institutions based in developed countries, such as American or European higher education institutions, where cultural difference might affect the ability of these tools to minimize the ABET review process uncertainty.

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