Developing and Qualifying Computing Programs for ABET Accreditation: A Practical Approach

Atiq Ur Rahman, Hejab M. Alfawareh, Saleh M. Altowaijri

Faculty of Computing and Information Technology, Northern Border University, Rafha, Kingdom of Saudi Arabia

Summary
Globalizing, cross-border education has led many countries to improve methods for better education on an international level as well as to increase the mutual recognition of collecting and analyzing education evidence by one another. The collection, processing, use and delivery of education data will be based on equivalent minimum education and technical standards, and educational service providers will work based on a common approach to implement these standards that foster closer cooperation between them and educational systems. The accreditation of educational program is a corner stone of the above-mentioned objectives. The Accreditation Board for Engineering and Technology (ABET) Criteria for Computing Accreditation Commission Programs are based upon the skills, knowledge and behavior that the students gain through the curriculum in a program. The student outcomes (SOs) are the acquired skills, knowledge and behavior which the student achieves through the curriculum. Every program needs to have its own SOs and to assess it as per defined assessment cycle, as well as to achieve program educational objectives (PEOs). The achievement of the program SOs and PEOs is verified by the assessment and evaluation process. In this paper, an establishment Self-study process and a development process for continuous improvement for computing programs to achieve the accreditation is discussed. The proposed process is applicable to get the accreditation for bachelor program in computing discipline and to satisfy the ABET criteria. In result, we will show how the SOs and PEOs assessed and evaluate through curriculum accordingly.

Key words:
Accreditations, Student outcome, Program educational objectives, Assessment, Evaluation, Continuous Improvement

1. Introduction

The Northern Border University is unique in the sense that it is multi-campus university consisting of three campuses in Arar, Rafha, and Tarif. In addition, the Rafha campus consists of two sections one for male students and a separate one for female students. The faculty of Computing and Information Technology (FCIT) operates in both sections with separate sets of faculty members but the programs (i.e. Computer Science, Information Technology, and Information Systems) are identical for both sections. Each section has its own vice-dean but common departments and one Dean of faculty for both sections. There is one Quality and Academic Accreditation Unit (QAAU) for both sections. There is a common process for students' admission, registration, quality assurance, continuous improvement, and institutional support.

1.1 ABET Accreditation and its Impact

In its online description under the title "A Valued Credential" [14] ABET describes accreditation [among other things] as follows:
The ABET accreditation review process is an intensive team effort, and program accreditation is voluntary in the U.S. So why go to the trouble? Because the process yields data and insights, you can use to deliver the best educational experience and preparation for your students.
ABET accreditation tells your prospective students, peers, and the professions you serve that your program, has received international recognition of its quality, promotes "best practices" in education, Directly involves faculty and staff in self-assessment and continuous quality improvement processes, Is based on "learning outcomes," rather than "teaching inputs.", Can more easily determine the acceptability of transfer credits.
ABET's business is accreditation and as an institution of higher learning, we take their view on programs accreditation to be positive. The FCIT setup a Quality and Academic Accreditation Unit (QAAU) to work on the quality assurance and accreditation process towards achieving ABET accreditation for our three programs (CS, IT, and IS).

1.2 Problem Statements

There are many established technique, process and models in literature for obtaining international academic accreditation, but a very limited model focus on specific country or society to highlight their issues, problems and to find the solution as per their ministry of education policies and procedures. Due to the ministry policies and some cultural differences every model established for obtaining international accreditation does employ for accrediting computing programs in Saudi Arabia. E.g., One bachelor program running in multiple campuses and further each campus running the same program separately in boys' and

Manuscript received February 5, 2019
Manuscript revised February 20, 2019

girls' section which affects the facets of the requirements of the accreditation of the global academic in terms of:

- Measuring the output of the student.
- Measuring the outputs of the program
- Faculty members
- Continuity and improvement

1.3 Research Objectives.

- To create model which employ both to national and international accreditations.
- To develop a process for establishment and review of PEOs and SOs.
- To develop a process for assessment and evaluation for continuous improvements.
- To define the process for developing/review the curriculum to fulfill the requirements of the program as per the accreditation board.
- To clear the requirements of the faculty as per the needs of the accreditation board.
- To List the facilities and institutional support requirements as per the needs of the accreditation board.

2. Challenges in ABET Criteria

This section presents the difficulties faced during the self-study process and concerns with the problems in each criterion, especially with the problem of continuous improvement. Significant improvements are possible against different criteria, especially assessment and evaluation in continuous improvement.

It is worth reading that design and implementation of curriculum, reviewing, assessment and evaluation were recently the hot topic for discussion of many researches. The authors proposed various development in the process of program establishment, assessment and evaluation and heighted the problems and challenges [15, 16, 17, 18, 19, 20]. Computing colleges are supposed to continuously review their programs based on the current qualifications as per the country economical needs that affect the industry and related profession. The continuously review process may result in developing specialized computing programs or adjusting the computing programs to cope the community changes and challenges at the institutional level. Such developments are anticipated to result in graduating computing professional that enhance their contribution in the market, especially with the growing demand.

Based on the given problems and issues, the following Research Questions (RQ) are separately formulated which aimed to achieve the goals of our research.

Criterion 1: Students

- What important evidence required for this criterion.
- How the academic advisor needs to maintain the record of the meetings and the monitoring process of student work and his guidance.
- How to complete the requirement of the office hours in female section by male faculty members who teach in Female section, because male faculty members can't be present physically due to the restriction policy in Saudi Arabia.
- How to maintain the record related to transfer students?

Criterion 2: Program Educational Objectives

- What is the PEOs Establishment process.
- How to Form Industrial Advisory board, and what is the frequency of meeting.
- How to maintain the alumni records. What is the frequency of meeting or conducting alumni survey.

Criterion 3: Student Outcomes

- How to map SOs effectively to the PEOs and courses.
- How to involve the constituencies in the process of establishment and review.

Criterion 4: Continuous Improvements

- What is the process of assessment and evaluation in continuous improvement.
- What action need to be taken as a feedback during completion of cycle.
- What is course-based assessment.
- What is rubric-based assessment.
- What student work sample needed for keeping record.
- How to maintain file for each SO that show its assessment, evaluation and improvement?

Criterion 5: Curriculum

- What are the ABET requirements for computing curriculum.
- How to maintain the record of the textbooks and display in the library/department?
- How to fulfill all the courses requirements of ABET to have in the program curriculum?

Criterion 6: Faculty

- How to describe the qualifications of the faculty and how they are adequate to cover all the curricular areas of the program and meet any applicable program criteria. Is the description should include the composition, size, credentials, and experience of the faculty.
- How to describe the faculty workload Summary and the information in terms of workload expectations or requirements (for the year of the Self Study).
- What is the role by the faculty with respect to course creation, modification, and evaluation, their role in the definition and revision of program educational objectives and student outcomes, and their role in the attainment of the student outcomes.

Criterion 7: Facilities

- How to satisfy the ABET standards with respect to the facilities.
- What safety requirements satisfy the ABET requirements.
- What requirement satisfy the faculty offices facilities?
- What requirement satisfy the class room facilities?
- What requirement satisfy the Laboratory facilities?
- What requirement satisfy the Library facilities?

Criterion 8: Institutional Support

- What are the requirements and evidences related to criteria 8 to provide during the visit.
- What are the requirements for the faculty hiring and retention program and what expects a program to have a proper faculty hiring procedure in place.

3. Program Development According to the ABET Standards

To achieve the objectives, the activities have been undertaken in three phases as follows as shown in Figure 1.

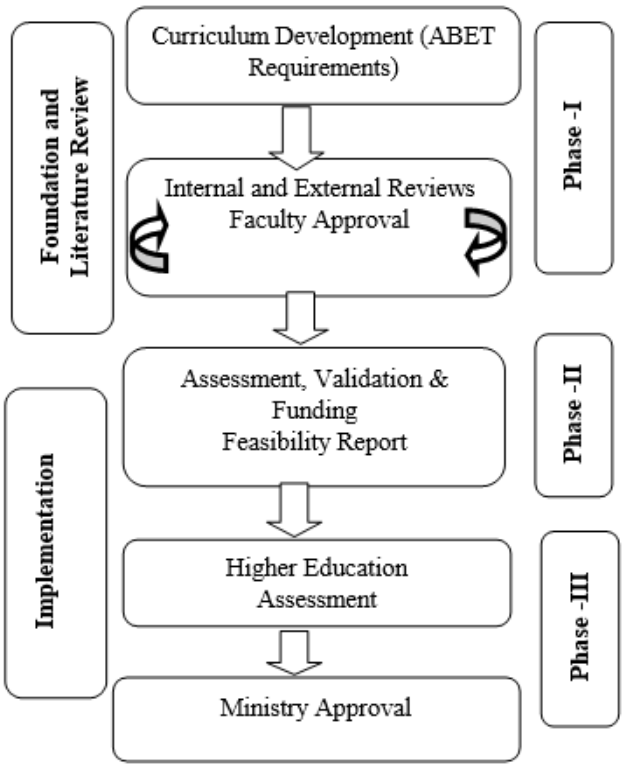

Fig. 1 Program Development

4. Qualifying Computing Program for ABET Accreditation

This section explain in details the process for qualifying the requirements of ABET's criteria and how to cope with the problems. The QAAU is responsible for conducting the ABET accreditation process, with the help of and in collaboration with all faculty members, staff and student of the NBU. The QAAU is constituted of a chair-person and includes a representative for each of the three departments of the Faculty. This representative, in turn, chairs a sub-unit in the corresponding department. Because the QAAU needed to both develop specialized knowledge about each of the ABET self-study criteria, while allowing each sub-unit to overview the self-study of its corresponding program, we have organized the work of the QAAU as summarized in Figure 2., and described below:

Each member of the QAAU (the chair-person and the representatives of each department) oversaw one common-faculty criterion and for one program-specific-criterion.

Each member develops the necessary knowledge for the criteria responsible for and acts as an internal consultant for other sub-units, regarding its two criteria.

Discussions regarding common faculty criteria involve all members. Once consensus is established, their

corresponding chapter in the self-study report is redacted by the member in charge of all programs.
Program specific criteria are primarily studied by the member in charge of the program (e.g. the IT sub-unit initially prepares the chapter corresponding to criterion 2, for the IT program). The output is adapted by other members for their own program. However, the representative of each program can choose to deviate from the initial content if he/she sees fit. It should be noted that this organizational aspect does not include criterion 5, for which the QAAU chair-person was in charge for the three programs.

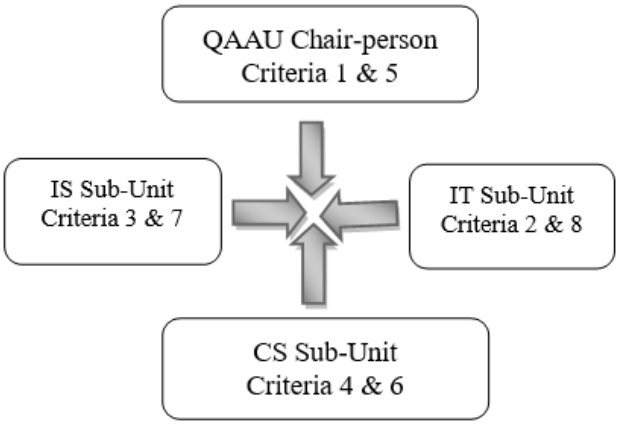

Fig. 2 Criteria specialization in the QAAU

Criteria 1: Students

1. Admission: The Deanship of Admission and Registration centrally supervises students applying to the Faculty of Computing and Information Technology. The admission procedures are regulated under the "Education and Examination Regulations". All newly admitted students spend their first academic year in the Preparatory Year Program (PYP).
The university Council decides the number of students to be admitted for each academic year according to the recommendation of various faculties. The Deanship of admission and registration implements all policies in coordination with the faculty. Admission takes place only once each year in the Beginning of the academic year except in some cases.
2. Evaluating Student Performance: Students' performance in courses is evaluated according to a letter grade system (A-F), the grade point average (GPA) is computed on a 5.0-point scale. The CGPA is computed as a weighted average, based on credit hours.
For each course, student performance and progress are monitored and evaluated by several instruments by an instructor. Theoretical and practical instruments are used such as exams, assignments, quizzes, presentations and reports. The final grade is determined by using a grading system, and students must repeat the courses in which they have earned a grade F.
3. Advising and Career Guidance: One of the academic advising goals is to ensure that students enrolled in the program, fulfill all the university, faculty, and department requirements and graduate on time. To realize this, it is important to maintain a continuous monitoring of the academic performance and progress of the students, and if required, students are advised on the course selections that they should enroll in each semester. This monitoring is facilitated through a study plan developed by the department.
The assignments of an academic advisor are discussed in the Department Council and approved by the head of department. The assigned Academic Advisor starts supervision at the start of the program and continuously monitors students' performance and progress. The advisor meets with the students at the start, mid and before and after the final exam to discuss different academic issues.
Additionally, the academic advisors prepare and maintains a student portfolio, which includes the following primary documents i.e., Personal information, Graduation checklist form, Academic records etc.
4. Graduation Requirements: Students must complete a minimum of 136 Credit hours to graduate. A student graduates after successfully completing all graduation requirements according to the degree program plan, provided that the cumulative GPA is not less than 2.0 out of 5.0. Students seeking graduation with the degree of Bachelor of Science in Computer Science at NBU must fulfill the requirements in Table 1.

Table 1: Graduation Requirements

Requirements	Credit Hours
Preparatory year	27
University requirements	14
Faculty requirements	20
Department requirements	54
Departmental Elective courses	9
Faculty Elective course	3
Free courses	9
Total	136

All students expected to graduate in a semester must follow steps that are shared by the students, the academic supervisors, the faculty administration, the graduate unit in the faculty and the university represented by the Deanship of Admission. These steps can be summarized as follows in Figure 3.

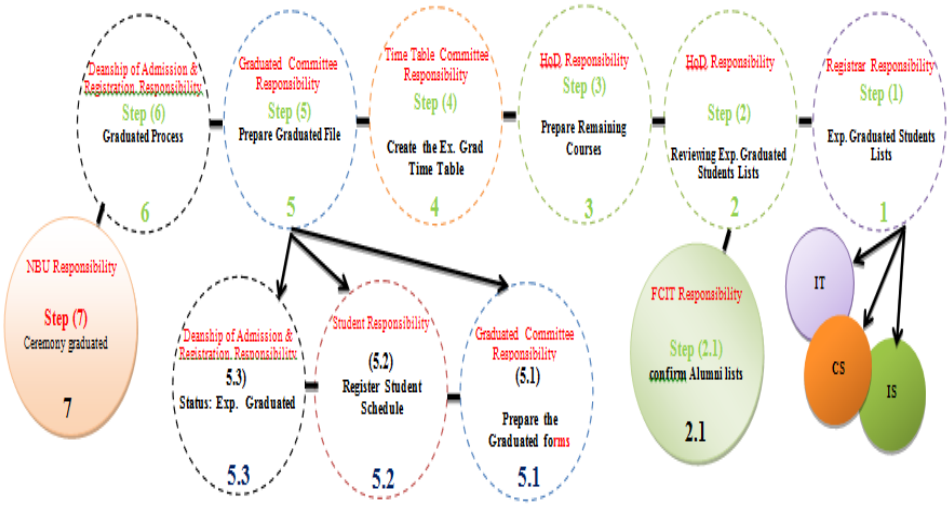

Fig. 3 Graduation Process in Department of Computer Science

5. Transfer Students and Transfer Courses: The transfer of a student from outside the University may be accepted under the following conditions:

- The student should have studied at a recognized faculty or University.
- The student shall not have been dismissed from that University for disciplinary reasons.
- The student shall satisfy the transfer conditions, as determined by the University Council.

The transfer of a student from outside the University may be accepted after being approved by the Admission and Registration Committee and accredited by the Vice Dean of Academic Affairs under the university admission rules and regulations.

Equivalent courses for transfer's students: The Faculty Council evaluates the courses that were taken by the student outside the University, based on the recommendations of the Departments that offer equivalent courses. The courses evaluated as equivalents are recorded in the student's academic transcript but are not included in the calculation of his cumulative GPA.

After obtaining the approval of the Admission and Registration Committee and the accreditation of the Vice-Dean of Academic affairs, the student can ask to evaluate the courses he took outside the University as equivalent courses as per the university rules and regulations:

Transfer from One Faculty to Another within the University: A student may transfer from one faculty to another within the University in accordance with the rules endorsed by the University Council.

Criteria 2: Program Educational Objectives

ABET's evaluation of a program essentially begins with the evaluation of how Educational Objectives of the Program (referred to as Program Education Objectives or PEO) help in achieving the institution's mission. For this purpose, ABET requires discussion on how PEOs are consistent with the mission of the institution and is there a review process in place for the PEO. Meeting this requirement may require some revision of the PEOs and the mission. In our case we had to rewrite the mission and PEOs.

1. University Mission Statement

Producing graduates with distinguished scientific and research capabilities and contributing to the development of the community knowledge.

2. Faculty Mission Statement

To produce graduates capable of getting employment and/or pursuing post-graduate studies in various areas of computing, by providing them with quality education and a creative, collaborative and challenging academic environment

3. Department Mission Statement

To prepare our students to become successful professionals in the field of computer science as well as responsible and proactive citizens. To this end, the department will provide a stimulating, student-centered academic environment, offer up-to-date curricula and pedagogy, and encourage continuing intellectual development.

4. Program Educational Objectives

The Computer Science Graduates are expected to:

- Professionally practice the foundational knowledge of the computational domain.
- Effectively and ambitiously, participate in higher education and contribute to scientific research in the field of computer science.
- Recognize the limits of their knowledge and initiate self-directed learning opportunities.
- Respect their ethical and social responsibilities and contribute to the economic development of the society.
- Develop and demonstrate strong communication, teamwork and leadership skills.

4.1 Consistency of the Program Educational Objectives with the Mission of the Institution

The mission of the Northern Borders University is twofold:

- To ensure that its graduates possess distinguished scientific and research capabilities.
- To contribute to the development of the community knowledge.

These capabilities and knowledge implicitly concern all the fields of specialization offered by the University. The computer science program contributes to the achievement of this mission for the specific field of computer science, and the following statements verify as to how the department Educational Objectives are consistent with the University mission:

The first and second objectives refer to foundational and specialized knowledge and skills that our graduates are expected to possess. These objectives are consistent with equipping our graduates with excellent scientific knowledge in the computer science discipline. Moreover, this knowledge and skills constitute a foundation which our graduates can choose to build upon by deepening and developing them, during their undergraduate studies. Thus, this objective reinforces the scientific and research capabilities of the graduates.

The third objective ensures that our graduates adopt a scientific attitude of healthy doubt in the way they approach their work. This objective thus reinforces their scientific and research capabilities. Moreover, being able to identify and initiate self-learning opportunities when necessary is expected to instill in them an attitude of self-responsibility for their intellectual development. The knowledge of the community being, at least, equal to the sum of individual knowledge. By perpetually developing their individual knowledge our graduates directly contribute to the development of the community knowledge.

The fourth objective ensures that our graduates, as computer science experts, are aware of their responsibilities towards the community. These responsibilities include making the community benefit from their expertise. Thus, this objective is indirectly related to developing the knowledge of the community.

The communication and collaboration skills that are expected to result from satisfying the fifth objective are expected to reinforce the ability of our graduates to share their knowledge with the community, thus the collaboration and leadership skills directly contributing to the development of the community knowledge.

Table 2 below maps the University mission with the PEO.

Table 2: Mapping University Mission with PEOs.

University Mission	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5
Scientific Abilities	✓	✓	✓		
Research Abilities	✓	✓	✓		
Community Knowledge			✓	✓	✓

4.2 Consistency of the Program Educational Objectives with the Mission of the FCIT

The mission of the faculty of CIT is to ensure that upon graduation, our students are able to pursue confidently the alternative they choose between two possible directions, in the field of computer science: employment or graduate studies. The educational objectives of the program of computer science are directly related to these abilities.

The following statements verify as to how the Program Educational Objectives are consistent with the Faculty Mission Statement:

The first objective refers to the foundational knowledge in the computational domain that our graduates are expected to possess so that they can confidently propose solutions to their employers vis-à-vis real-life problem-solving skills, thus increasing their opportunities to seek employment in the field of computer science. Alternatively, this foundational knowledge is a prerequisite in pursuance of graduate studies. This objective is thus relevant to their ability to both successfully get employed and to pursue graduate studies.

The second objective directly refers to the pursuance of higher education and contributes to the scientific domain in the field of computer science, so that they can confidently present themselves as experts in the field, thus increasing their opportunities to seek employment.

The third objective ensures that our graduates develop a scientific attitude of healthy doubt in their approach to real-life problems and are committed to self-directed lifelong learning. This is relevant to the advancement of their career and to the pursuance of their graduate studies.

The fourth and fifth objectives further reinforce the ability of our graduates to get and sustain employment, as this is the route that a majority of them chooses upon graduating. These two objectives specify human qualities and skills

that will facilitate their long-term professional success and integration in society at large.
Table 3 below maps the faculty mission with the program educational objectives.

Table 3: Mapping Faculty Mission with PEOs

Faculty Mission	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5
Employment (CS)	✓	✓	✓	✓	✓
Graduate Studies (CS)	✓	✓	✓		

4.3 Consistency of the program educational objectives with the mission of the CS Department

The CS department mission states three complementary qualities that it aims at developing in graduates: success as professionals, induce responsibility and proactivity as citizens. The five educational objectives of the computer science program are directly related to these key ideas in the mission statement of the program. The following statements verify as to how the Program Educational Objectives are consistent with the Department mission:
The first objective refers to the ability of our graduates to demonstrate and apply a sound understanding of the foundational knowledge of computer science to the benefit of employers. This is relevant to become successful professionals.
The second objective refers to the pursuance of higher education and contributes to the scientific research in the field of computer science. Thus, they can confidently present themselves as experts in their field, which is relevant to become successful professionals.
The third objective ensures that our graduates are committed to adopt a scientific attitude to work and to keep knowledge up-to-date, which constitutes an asset in our rapidly-evolving economy. Thus, this objective is relevant to graduates become successful professionals.
The fourth objective refers to the fact that graduates are expected to serve society with a commitment as a responsible citizen, by being able to understand and respect their professional, societal and ethical responsibilities. These include continually working towards the improvement of society and using one's knowledge, expertise and skills as a force causing a positive change when necessary. This objective is relevant to responsible and proactive citizenship.
The fifth objective refers to skills that will allow graduates to have a positive contribution to any team they are part of, be it smaller workgroups or larger organizations. Additionally, these collaborations and communication skills can aid in the advancement of the public debate. This objective is thus relevant to the future professional success of our graduates, and to their proactive citizenship. Table 4 below summarizes the coverage of the department mission vis-a-vis the program educational objectives.

Table 4: Mapping Department Mission with PEOs.

Department Mission	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5
Successfulness	✓	✓	✓		✓
Responsibility				✓	
Proactivity				✓	✓

4.4 Program Constituencies

The program constituencies of Computer Science Department and the needs of the constituencies are listed below:
Students: Both the current students as well as those just going to the point of exit from the Computer Science Department. The educational objectives meet the needs of students by providing them with a solid basis through which they can easily find jobs in computing upon graduation from the program as well as prepare them to excel in the field.
Alumni: The graduates of the Computer Science Department. The alumni expect a continued high-quality educational program as their career and reputation are associated with the quality of their alma mater. In addition, the PEOs will help them to engage in long-term self-directed learning.
Faculty: The instructors involved in teaching and research in the Computer Science Department. The educational objectives meet the needs of faculty by providing opportunities for faculty to impart their knowledge of computing and advance their career in academia and research.
Employer: The national and international organizations where our graduates are likely to secure a job after the completion of their degree. The program educational objectives meet the needs of the employers by providing them the able workforce to meet the work challenges of the industry.

4.5 Process of Establishment of PEOs

The Head of Department initiated the PEOs establishment in line with the institutional mission and the program constituents' needs. The Process was initiated by Head of department. The faculty as one of the constituencies was actively engaged in this process through meetings. Additionally, in this process, informal discussions were held with some selected students and their feedback was incorporated. The final list of PEOs for bachelor's in computer science was reviewed in the QAAU meeting and transmitted for approval to the institution hierarchy.

4.6 Process of Revision of the PEOs

We understand that PEOs must be reviewed every 3-5 years. A PEO review process is in place. The expected period to hold PEO review process in the coming cycle. The review process is established considering the following points. 1) All the constituencies are to be involved in the review process. 2) Each constituency present review of the PEOs considering how important these PEOs are for them. We divide the process of review of the PEO into two steps as "Importance Assessment" and "Consistency".

Importance Assessment for Program Educational Objectives: We have formed an "internal advisory board" (IAB) for the Faculty of Computing and Information Technology that include members of the Program Assessment Committee, the Heads of the three departments and distinguished faculty members from each department. As part of the annual meeting of the IAB, the members will be asked to rank program educational objectives on a 5-point scale. A rating of 1 is considered as not important while a rating of 5 is considered absolutely essential. The average importance points of each objective are indicative of the level of agreement by the advisors. This review from the IAB will serve as the basis for the revision of PEO. Further information regarding the reasons of disagreement with the current set of PEOs can be elicited and used as a basis for its revision.

In addition to this internal assessment of the PEO, we also plan to form an external board of advisors, which would include members from the industry. However, to establish such a board we need links in the industry through our alumni and so far we do not have many alumni at places within the related industry. As soon as we have a sufficient number of links in the industry, we can start the formation process for the external board of advisors. The constituencies of PEO's review process will comprise of graduating students, faculty members, alumni and employers.

Criteria 3: Student Outcomes

ABET [1] defines Student Outcomes (SOs) as follows: Statements that describe what students are expected to know and be able to do by the time of graduation. These relate to skills, knowledge, and behaviors that students acquire as they progress through the program. Measurable performance indicators need to be derived from the SOs. These typically cover the learning domains of Bloom's taxonomy [5, 4], namely Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation.

Prior to the decision of pursuing ABET accreditation (i.e. until academic year 2013-2014), bachelor programs at the faculty of CIT had a different set of SOs, which were deemed non-compliant with ABET's requirements. Indeed, they were also classified in four learning domains ("Knowledge", "Cognitive Skills", "Interpersonal Skills and Capacity to Carry Responsibility", "Communication, Information Technology and Numerical Skills") and their attainment was harder to evaluate. Moreover, they included aspects that should be part of educational objectives, according to [1, 4, 8]. Finally, the way the old SOs would enable the prescribed student characteristics was unclear. Thus, there was a need to unify terminology.

Therefore, to allow for a direct enablement of student characteristics, and after several working sessions of the QAAU, we decided to adopt 10 SOs recommended by ABET for the Information Systems program, 11 SOs recommended for the Computer Science program, and 14 SOs recommended for the Information Technology program. The major reason for adapting these ABET's SOs is that it is possible to measure their attainment. In addition, they offer a good balance among the different learning domains of Bloom's taxonomy (knowledge, comprehension, application, analysis, synthesis and evaluation). Computer Science Department adopted the Student Outcomes a-k as announced in ABET guidelines of Criterion 3. The skills and characteristics that students must possess at the time of graduation are accomplished through various courses taken by the students during the program. The assessment and evaluation process have been established for the SOs to quantitatively measure them and relevant to the program.

A. Computing Student Outcomes

a. An ability to apply knowledge of computing and mathematics appropriate to the program's student outcomes and to the discipline.
b. An ability to analyze a problem, identify and define the computing requirements appropriate to its solution.
c. An ability to design, implements, and evaluate a computer-based system, process, component, or program to meet desired needs.
d. An ability to function effectively on teams to accomplish a common goal.
e. An understanding of professional, ethical, legal, security and social issues and responsibilities.
f. An ability to communicate effectively with a range of audiences.
g. An ability to analyze the local and global impact of computing on individuals, organizations, and society.
h. Recognition of the need for and an ability to engage in continuing professional development.
i. An ability to use current techniques, skills, and tools necessary for computing practice.

Computer Science Program Specific Student Outcomes:

j. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
k. An ability to apply design and development principles in the construction of software systems of varying complexity.

B. Relationship of Student Outcomes to Program Educational Objectives

Program Educational Objectives (PEOs) as described in the criteria 2 identify academic and professional accomplishments achieved by the students after 3-5 years post-graduation. The graduates possess the characteristics represented by the "Student Outcomes" at the time of graduation. These characteristics support them in accomplishing the prescribed PEOs. Table 5 shows the mapping of Student Outcomes (SOs) to Program Educational Objectives (PEOs).

Table 5: Mapping of Student Outcomes (SOs) to Program Educational Objectives (PEOs) Computer Science

(SOs)	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5
a	✓	✓	✓		
b	✓	✓	✓		
c	✓	✓	✓		
d					✓
e				✓	
f					✓
g				✓	
h			✓		
i	✓				
j	✓		✓		
k	✓				

PEO 1 is "Upon completing the program, graduates will be able to professionally practice, analyse and solve computer science problems. By relying on their foundational knowledge of computer science, mathematics, algorithms, programming languages, databases and networking." the objective support student outcomes a, b, c, i, j and k, while d, e, f, g, and h are not significantly related to PEO1.

PEO 2 is "Upon completing the program, graduates will be able to thoroughly understand the working of a computer system and the interaction of its different component. It enables them to pursue higher education and contribute to the scientific research." the objective supports student outcomes a, b, and c, while d, e, f, g, h i, j, and k are not significantly related to PEO2.

PEO 3 is "Upon completing the program, graduates will be able to recognize the limits of their knowledge and initiate self-directed learning opportunities." the objective supports student outcomes a, b, c, h and j, while the other SOs are not significantly related to PEO3.

PEO 4 is "Upon completing the program, graduates will be able to understand and respect their professional, ethical and social responsibilities." the objective supports student outcomes e and g, while the other SOs are not significantly related to PEO4.

PEO 5 is "Upon completing the program, graduates will be able to demonstrate strong communication, team-work and leadership skills." the objective supports student outcomes d and f, while the other SOs are not significantly related to PEO5.

C. Process for the Establishment and Revision of the Student Outcomes

Establishment of Student Outcomes: The Department of Computer Science has established a set of outcomes for the program that describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge and behaviors that students accomplish as they progress through the program. The formal Student outcomes were established by due process in the Computer Science department in consideration to Academic accreditation requirements.

The Quality Assurance and Accreditation Unit (QAAU) sub-committee for the department of Computer Science was assigned the task to prepare Student Outcomes for the program. The sub-committee worked closely with the sub-committees from the other two departments at the Faculty of Computing and IT. To enable the student characteristics listed by ABET in the document "Criteria for Accrediting Computing Programs" under "General Criteria" and "Program Criteria for Computer Science", these characteristics were chosen as Student Outcomes for the bachelor's in computer science program. The other two programs at the faculty also chose to do the same. The decision to select these outcomes was supported by the fact that many other similar programs from other institutions used as benchmarks.

Revision of Student Outcomes: We plan to consider the revision of Student Outcomes (SO) every five years with the first revision expected to be in after completing the first assessment cycle. The process of revision of the SO is summarized in the following.

Indirect Assessment: Indirect evidence of student achievement requires that faculty infer actual student characteristics, knowledge, and values rather than observe direct evidence of learning or achievement. Indirect methods provide the perspectives of students, faculty or other people who are concerned with the course or program or institution, such as an alumni.

The feedback regarding the SO will be received from the four constituencies of the program through surveys. The FCIT has a Program Assessment Committee (PAC), is to review this feedback from the constituencies. The

committee will set a threshold for the importance value of all SO and will consider the revision of the SOs which received an importance assessment value less than the threshold.

Direct Assessment: Direct evidence of student performance or attainment relies upon direct scrutiny or examination of student performance or attainment either for individual students or for representative samples of students. These methods allow you to collect the evidence of student learning or achievement directly from students and the various works they submit as course activity (assignment, exam, term paper, etc.). Therefore, two methods are established to evaluate these characteristics gained through student outcomes.

Criteria 4: Continuous Improvement

Continuous improvement has mainly two parts, Assessment and Evaluations. Assessment is defined as one or more processes that identify, collect, and prepare the data necessary for evaluation. Evaluation is defined as one or more processes for interpreting the data acquired though the assessment processes to determine how well the student outcomes are being attained.

For the assessment and evaluation of student outcomes we used the following direct and indirect assessment processes [1, 2, 3, 14]: CLOs based (Direct Assessment), Exit Survey, Alumni Survey, Course Evaluation Survey, and Faculty Survey. We calculated a Weighted Average Percentage value for each student outcome (SO) representing its attainment level based on multiple assessment processes. This value is weighted average of each SO's percentage calculated based on a certain assessment method. The data preparation for Direct Assessment was based on CLOs achievement. Each course addresses a set of student outcomes. In our view, deciding if the SOs addressed by a course have been achieved based on the data from the course.

Data Preparation for Indirect Assessment based on Course Survey [7, 9, 11]. The course evaluation survey is conducted using Google forms and we calculate the percentage of respondents who "Strongly Agree", "Agree" or "Agree to Some Extent" for each question. Then we take the average of those questions which are related to SOs. This value represents the average percentage of respondents who "Strongly Agree", "Agree" or "Agree to Some Extent" showing to what extent the SO have been achieved in the course.

Indirect Assessment is based on Exit Survey, Faculty Survey and Alumni Survey. In each of these surveys, different questions refer to different SOs. For each question, we calculate the percentage of respondents who "Strongly Agree", "Agree" or "Agree to Some Extent".

4.1 Assessment and Its Frequency

Various assessment processes are used for the assessment and evaluation of student outcomes in the department of Computer Science for the Bachelor Program. These assessment methods along with its frequency are listed in Table . In addition, the program constituents responsible for providing the feedback are also shown.

Table 6: Frequency of Data Collection for Assessment.

Constituent Providing Feedback	Assessment Process	Direct/Indirect Assessment	Frequency
Faculty	Course Based Assessment	Direct	Once per Semester
Graduating Students	Senior Exit Survey	Indirect	Once per Year
Alumni	Alumni Survey	Indirect	Once per Year

Student outcomes are assessed through various direct and indirect methods. The student outcomes are tabulated along with direct and indirect methods for its assessment in Table 7.

Table 7: Student Outcome Assessment Processes

SO	Assessment Method (s)	Collected By
(a)	Course Based Assessment	Quality and Academic Accreditation Unit
	Exit Survey	Survey Conducting Committee
	Alumni Survey	Department
(b)	Course Based Assessment	Quality and Academic Accreditation Unit
	Exit Survey	Survey Conducting Committee
	Alumni Survey	Department
(c)	Course Based Assessment	Quality and Academic Accreditation Unit
	Exit Survey	Survey Conducting Committee
(d)	Course Based Assessment	Quality and Academic Accreditation Unit
	Exit Survey	Survey Conducting Committee
	Alumni Survey	Department
(e)	Course Based Assessment	Quality and Academic Accreditation Unit
	Exit Survey	Survey Conducting Committee
	Alumni Survey	Department
(f)	Course Based Assessment	Quality and Academic Accreditation Unit
	Exit Survey	Survey Conducting Committee
	Alumni Survey	Department
(g)	Course Based Assessment	Quality and Academic Accreditation Unit
	Exit Survey	Survey Conducting Committee
	Alumni Survey	Department
(h)	Course Based Assessment	Quality and Academic Accreditation Unit
	Alumni Survey	Department
	Alumni Survey	Department
(i)	Course Based Assessment	Quality and Academic Accreditation Unit
	Exit Survey	Survey Conducting Committee
	Alumni Survey	Department
(j)	Course Based Assessment	Quality and Academic Accreditation Unit
	Alumni Survey	Department
	Alumni Survey	Department
(k)	Course Based Assessment	Quality and Academic Accreditation Unit
	Exit Survey	Survey Conducting Committee
	Alumni Survey	Department

4.2 Assessment Processes

4.2.1 Direct Assessment

Table 8 indicates the direct assessment method used to assess and evaluate the attainment of Student Outcomes

(SOs), frequency of assessment, and the expected level of attainment.

Table 8: Direct Assessment and Evaluation Processes for Attainment of Program Outcome.

Assessment Tool(s)	Frequency	Expected Level of Attainment	Data Collected and Evaluated By
Course Based Assessment	Each Semester	More than 70%	Quality and Academic Accreditation Unit

Course Based Assessment: Faculty members design course syllabus for the subjects, they teach in each semester and are asked to give hard copies to students in their first lecture. This syllabus contains student learning outcomes as well as student outcomes mappings. Faculty member selects the student outcome covered by the taught subject.

The idea is to assess Course Learning Outcomes (CLO) of a course using different assessment tools such as quizzes, assignments, class participation, group discussion, mid exam, lab exam (if any), and final exam and then mapping these CLOs with the program's SOs. faculty member maintains a course folder of the taught courses. It is containing all the information collected through these assessment methods including the instruction materials, lab work, assignments, quiz, exams and student sample work. This method requires keeping record of the following course data in the course folder.

Assessment methods are detailed in an assessment plan with the corresponding weight and mapping that suggests the alignment to a specific CLO. The total weight of these assessment methods is 100.

- CLO to SO mapping. This maps each CLO to one or more SO.
- Detailed Marks for all the assessment methods for the students.
- Student sample work having low, medium and high.
- Achievement of the CLOs.
- Achievement of the SOs.

The weight of different assessment methods is given in the table 9.

Table 9: Assessment method and corresponding weights

Assessment Methods	Weight
Participation	5 %
Quizzes	5 %
Assignments	5 %
Mid-Term	20 %
Group discussion	5 %
Lab Activities	20 %
Final Exam	40 %
Total	100 %

Each assessment methods addresses one or more student learning outcomes and is recorded as given in table 10.

Table 10: Assessment Methods alignment with Course Learning Outcomes

Assessment Methods	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
Quiz 1(2%)	X				
Quiz 2(3%)					X
First Assignment (2%)		X			
Second Assignment (3%)				X	
Mid-Term (20%)	X	X	X		
Group discussion (5%)	X		X	X	X
Participation (5%)	X		X	X	X
Lab Assignment (20%)	X	X	X	X	X
Final Exam (40%)	X	X	X	X	X

The CLO are mapped to one or more student outcomes (SOs). For example, a CLO-1 of Computer Graphics is "To understand various hardware and software required for computer graphics applications" is mapped to student outcome "a". Table 11 shows the questions targeting CLO1 in different assessment tools.

Table 11: Questions related to CLO-1 in Different Assessment Methods.

Assessment Methods	Questions	Weight
Quiz1	Question 1	2
Mid Term Exam	MCQs	4
	True or False	1
	Question 1 and 2	4
Class Participation		1
Group Discussion		1
Lab Activities 1+2		3
Final Exam	True or False	4
	MCQs	5
Total		25
Achievement Grade		0.7*25= 17.5

The achievement grade for CLO-1is 17.5 with a threshold of 70%. Now in order to evaluate whether CLO 1 is achieved by students, each student questions related to CLO 1 in different assessment methods are accumulated and compared as follows:

*If students accumulated grades for CLO1 ≥ 0.7*Acheivement Grade*
CLO1 is achieved
Else
Not achieved.

Each student grades are accumulated in different assessment methods for CLO-1 as shown in Table 12.

Table 12: Attainment of CLO-1.

Student ID	Quiz1 Question 1	Mid Term Exam MCQs + T/F+Q1 and 2	Lab Activities 1+2	Class participation	Group discussion	Final Exam T/F + MCQs	Total /17.5	CLO Achievement Grade (0.7*17.5= 12.25). [A] Achieved, [N] Not Achieved
xx	2	3	3	1	1	6	16	A
xx	2	2	1	1	0	4	10	N

The percentage is computed that how many students in the course registered achieved each CLOs and is shown in Table 13.

Table 13: Percentage of CLOs Attainment by all students.

Evaluation	CLO 1	CLO 2	CLO 3	CLO 4	CLO 5
xxxxx	A	A	A	A	A
xxxxx	N	A	A	A	A
xxxxx	A	A	A	A	A
Students Achieved	2	3	3	3	3
	66.66%	100%	100%	100%	100%
Students Not Achieved	1	0	0	0	0
	33.34%	0%	0%	0%	0%

Once the percentage of students achieved a particular CLO is obtained, it is mapped with the Student Outcome. If the percentage is greater than 70% then that particular student outcome is achieved otherwise not achieved. This is shown in Table 14.

Table 14: Student Outcomes attainment.

CLOs	Student Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CLO_1	66.66 %										
CLO_2		100%									
CLO_3										100 %	
CLO_4									100		
CLO_5										100 %	
AVG	66.66 %	100%							100	100 %	

The course targeted student outcomes a, b, i, and j in Table 14. Student outcome a is not achieved because its average is less than the threshold value (70%).

4.2.2 Indirect Methods

Table 15 indicates the indirect assessment methods used to assess and evaluate the attainment of Student Outcomes (SOs), frequency of assessment, and the expected level of attainment.

The satisfaction levels of all these surveys for the attainments and relevance of PEOs and SOs are rated as follows:

1. Strongly agree
2. Agree
3. Agree to Some Extent
4. Disagree
5. Strongly Disagree

Agreeing to a survey question represents the positive feedback. It means that the first three options in the above five satisfaction levels are considered as an attainment of that particular SO.

Exit Survey: This survey is conducted at the end of the semester for the graduating students. In this survey, the students are asked to express their opinion regarding attainment of student outcomes. The students are also asked about the final year project to give an opportunity to enhance pedagogy, if necessary. At the end of the survey, students are asked open ended questions regarding facilities, favorite subjects, and faculty in order to take action by the department accordingly if necessary.

Alumni Survey: This is a comprehensive survey regarding the program educational objectives and student outcomes due to the professional exposure of alumni. The alumni are asked “how well you were prepared by the department of Computer Science to achieve the student outcomes?” Then, because of their industrial and professional experience, the alumni are asked about the importance of each student outcome in their professional career. They are also asked about the program strengths and weaknesses as well as their suggestions for the improvement of the program curriculum.

Table 15: Indirect Assessment and Evaluation Processes for Attainment of Student Outcome.

Assessment Tool(s)	Frequency	Expected Level of Attainment	Data Collected and Evaluated By
Exit Survey	Each Semester	60% of Graduating students Strongly Agree, Agree or Agree to Some Extent	Quality and Academic Accreditation Unit
Alumni Survey	Annually	60% of Alumni Strongly Agree, Agree or Agree to Some Extent	Quality and Academic Accreditation Unit

4.3 Evaluation of Student Outcomes

The course file submission is the start of the evaluation process carried out by Assessment and Evaluation Committee at the completion of a term. The assessment process based on course learning outcomes is granular and provides adequate direct assessment quality metric of covered theoretical and practical work in computer science program. The assessment methods tools to assess CLO are diverse and give instructor and student sufficient opportunity to demonstrate the course comprehension and acquired skills. Based on available course file, satisfaction criterion of a student outcome is considered achieved, if average of percentage of CLOs mapped to that student outcome is equal or greater than 70%. Using this criterion, the **A** means the student outcome is achieved and the **N** means the student outcome is not achieved, while a blank box means this student outcome is not evaluated by this particular course. The Table 16 details the achievement of SOs correspondingly and Table 17 shows the summary of the SOs. The intension is to grow this table progressively as the new term finishes, a new row is added. This way a direct comparative history is maintained and provide a course level progress. The overall SOs achievement numbers are discussed in the later analysis, to provide the global view of the program via course-based assessment, while this table form the backbone of the direct evaluation in CS program.

Table 16: Course based assessment of Computer Science student

Course Code	Course Title	Student Outcomes										
		a	b	c	d	e	f	g	h	i	j	k
xx	Programing -1	A									A	
xx	Programing -2	A	N	N						N	A	N
xx	Software Engineering		A		A		A			A		A
xx	Operating System	A	A							A		
xx	Computer Networks	A	A							A	A	

Table 17: Summary of Student Outcomes

Term year	Assess Courses	Student Outcomes [A: Achieved, N: Not achieved]										
		a	b	c	d	e	f	g	h	i	j	k
Spring-xx	Total Courses	12	13	7	1	0	1	0	1	14	10	2
	Achieved	9	10	7	1	0	1	0	1	12	6	2
	Not Achieved	3	3	0	0	0	0	0	0	2	4	0
Fall- xx	Total Courses	3	3	2	0	0	0	0	0	1	0	0
	Achieved	3	1	1	0	0	0	0	0	0	0	0
	Not Achieved	0	2	1	0	0	0	0	0	1	0	0
Total courses evaluated		15	16	9	1	0	1	0	1	15	10	2

Table 18: The exit survey summary results

Title	Student Outcomes											
	Term-Year	a	b	c	d	e	f	G	h	i	j	k
Exit survey	Spring-17	A	A	A	A	A	A	A	A	A	A	A
	..		.	..	.	.	.	.	.	.	.	.

Table 18 shows the exit survey for Spring-2017 computer science graduates' accomplishments of all SOs. The sample size is 12. For Spring-2017, the student's response has been overwhelmingly positive for a to k SOs. Since the satisfaction criterion is 70%, we consider the attainment satisfactory if percentage of students disagreeing and strongly disagreeing are less than 30%. Whenever the attainment is unsatisfactory, an improvement plan is required. The proposed improvement plan is presented in the departmental meeting for approval.

The course learning outcome-based survey is suggested for the next academic year to provide more granular qualitative indirect assessment after completion of a course in the CS program.

The CLO-SO based assessment provides summary of SOs attainments in a term. This summary is used by Assessment and Evaluation Committee to identify following corrective course of actions:

- Revision in pre-requisite as inadequate pre-requisite knowledge.
- Revision in course or course material or provide more helping material, modification in text or reference material.
- Modifications in course assessment methods.
- Revision of the learning accomplishments of a course.
- The student outcomes (d, e, f, g, h) are weakly evaluated in the assessment summary for the terms.
- The graduation project addresses most of the Computer Science Student Outcomes and missing in the presented evaluation. It is the terminal comprehensive activity and provides students with the opportunity to exhibit the acquired skills and knowledge during the program.

4.4 Continuous Improvement

The Quality and Academic Accreditation Unit of the faculty of Computing and Information Technology have implemented the required forms for direct and indirect assessment with the help of Assessment and Evaluation Committee. Data collected form Course Based Assessment and Exit Survey is presented. The key components of assessment and evaluation presented in Figure 4 have contributed to the following modifications as discussed under QAAU committee and presented to Department Council:

- The course learning outcomes-based survey is suggested.
- Frequent workshops and lectures, seminars related to ABET are planned to be organized. This will make our faculty and administration more aware and helpful in implementing the detail procedures and improvements in the CS department.
- Process of conducting surveys needs to be improved in order to ensure that the maximum number of respondents fill the survey.
- The assessment committee is looking into the CLO based assessment method for the student outcomes and determines the reasons of non-achievements. The trigger is initiated with not achievement of SO in a particular course. Later, details analysis of course file to assess the achievement of CLO is performed. Then, the Assessment and Evaluation Committee requires from the instructor to provide Continuous Improvement Plan and Strategies.

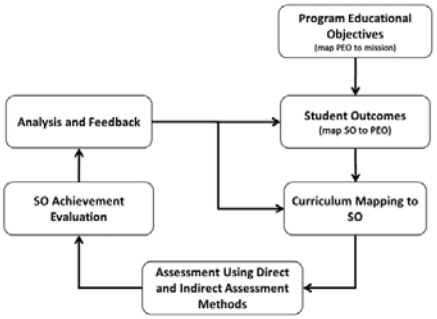

Fig. 4 Key Components of Assessment Process

Criteria 5: Curriculum

5.1 The Curriculum aligns with the Program Educational Objectives

The Computer science courses alignments with the program educational objectives are shown in the following Table 19.

Table 19: Computer Science courses alignments with PEOs.

Course	Program Educational Objectives (PEOs)				
	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5
Operating System	✓	✓			
Computer Networks	✓	✓			
Computer Graphics	✓	✓			
Senior Project	✓	✓	✓	✓	✓
Software Eng.	✓	✓	✓		

5.2 Curriculum Alignment to Student Outcomes

The computer science courses have a set of Course Learning Outcomes (CLOs) in the CS curriculum. The CLOs address the student outcomes, as each CLO helps the students in attaining the abilities required at the time of graduation. The relationship between CLO of a course and the CS SOs are expressed as a CLO-SO map as shown in the syllabi. The CLO-SO maps of CS core curricula is shown in Table 20.

Table 20: Computer Science courses alignment with Student Outcomes.

Course	Student Outcomes (SO)									
	a	b	c	d	e	f	g	h	i	j	k
Programming-1	✓	✓	✓						✓		
Database	✓	✓	✓						✓		
Software. Engineering	✓	✓							✓		✓
Operating System	✓	✓							✓		

Criteria 6: Faculty

Faculty members in the faculty of CIT are highly qualified with varied international experiences and qualifications. Yearly contract-based faculty hiring process makes faculty qualifications fluid, resulting in change of specialization and qualitative assessment of qualified faculty. To account for the qualification details of each faculty member, we designed a template for faculty CVs detailing all the relevant information. Deficiencies arising from this process include inadequate details listings and partially filled CVs. The faculty workload is the summative of the time spent by a faculty member within a department for teaching, administration, and research. The major problem we faced is that some faculty members are teaching courses from other departments and it is difficult to measure faculty time across departments. We solved this problem by considering all courses instructed by a faculty member based on one department irrespective of course assignments. Other problems include University regulations assigning zero credit hours to all instructions with time less than two hours and this results in assignment of zeros credit hours to our laboratory courses. The workaround to eliminate all possible predicaments related to credit hours-based workload calculations, it is proposed to consider contact hours "actual time instructor expends" as the measure to estimate faculty workload.

1. Faculty Qualifications

The Computer Science department is privileged to have full-time tenure-track faculty members and teachers' assistant's tenure-track faculty which can cover the curriculum. The faculty members also need to have strong academic and research record. The department would need to have faculty development program. If some part of the curriculum not covering by full time faculty, the college can hire part-time adjuncts. The non-major course can teach by supporting department. The size of qualified faculty is should be more than adequate to cover curricula of the program. Additionally, the faculty of computing and Information Technology can share faculty with IT and IS programs based on special requirements.

2. Faculty Workload

The University has regulations for the assignment of teaching workload and remuneration of all faculty members. In the faculty of Computing and Information Technology, department follows rank and profile-based teaching workload distribution per semester: Professor: 10 credit hours, Associate Professor: 12 credit hours, Assistant Professor: 14 credit hours, Lecturer: 16 credit hours. The faculty is expected to spend working hours in teaching, student mentoring, advising and administrative affairs. The faculty members are also required to participate actively in various department-level committees and department council. The teaching load can be

minimized for faculty members holding administrative positions.

3. Faculty Size

The department is able to cover all facets of program through experienced and qualified faculty members. The need of the program is not limited to the program curricula, department understands this and maintains a small student-to-faculty ratio. This enables the department to provide students with adequate support, advising and mentoring. Each faculty member advises 5-10 students. One faculty representative is responsible for the department alumni relations. The department daily affairs are carried out by department level council and collegial committees for the quality and accreditation of the program curricula and laboratory assignments, up-to-date availability of text and reference material, the matter pertaining to student advising, transfer and mentoring.

4. Professional Development

The department need to conduct special attention to the Faculty Professional Development Programs. The faculty frequently organizes and conducts activities aimed at enhancing the professional capabilities of the faculty members. The faculty organizes following activities at the University: Workshops, Short courses, Seminars, Consultations.
During an academic year, several workshops and short courses are housed at the faculty of Computing and Information Technology. These activities are selected carefully to introduce and refresh faculty with new ideas, technology and information. During semester workshops related to use of the blackboard “a mean of e-learning” and statistical tool: Software Package for Social Sciences SPSS were organized. The department also encourages faculty members to follow short courses in management, finance and human resource development in pursuance of the same goals. The research committee arranges regular seminars to transmit and assimilate in-house research activities to all faculty members. The department has the policy to promote research and scholarly activities. In this endeavor, the faculty members are encouraged to continue research in their area of specialization and interest. Yearly, the faculty members actively participate in the competition for the award of funds against the research proposals. The funded projects are for six months to one year. In addition to that, the faculty members are provided with funds to participate in international conferences and workshops. The details of research activities conducted by faculty members are listed in the faculty resume.

5. Authority and Responsibility of Faculty

The Head of Department (HoD) conduct the oversight, under the administration of Dean and Vice Deans of the Faculty of Computing and Information Technology, President and Rector of University. The HoD is responsible for smooth operations and the daily affairs of the department under the supervision of Dean and Vice Deans. HoD makes informed decisions using the department council and committees and presents them to college council and Dean. This administrative hierarchy ensures compliance of the program to the mission and vision of the University. The instructors are responsible for the course material and achievement of student outcomes in line with course learning outcomes, while department and Faculty administrative hierarchy ensure the achievement of the student outcomes. The faculty member and students are surveyed at the end of each semester. An exit survey is conducted on the graduating students, to evaluate the instruction proficiency and the achievement of SOs. The student outcomes assessments, indirect or direct are discussed in the department council with the help of faculty members. The Department’s Curriculum Committee makes required action recommendations with respect to modifications to ensure continuous improvement.

Criteria 7: Facilities

Appropriate facilities must be available to foster faculty-student interaction and to create a climate that encourages professional development and professional activities. Computing and information infrastructures must be in place to support the scholarly activities of the students and faculty and the educational objectives of the institution. The ABET accreditation process was an excellent opportunity for the FCIT to map and inventory the facilities it has access to. However, difficulties initially arose but can be streamline in both campus with the coordination of girl's section representatives. In short, the abet will have not issues if the facilities are adequate is per the university/ ministry policy.

Criteria 8: Institutional Support

The focus here is on the discussion related to institutional support for our programs. However, this criterion is not a big issue for a public university in KSA because the requirements are taken care of by the university management which in turn is facilitated by the ministry of education. This criterion also requires discussion on faculty hiring and retention program and expects a program to have a proper faculty hiring procedure in place.

5. Conclusion

The abet provide a framework for assessment and evaluation process that can help in developing the standard program and revised the curriculum as per the industry requirements. The program accreditation is a corner stone to meet the education objectives and leads towards outcome-based education. This paper highlighted the problem faced during the abet process which focus to achieve the skills, knowledge and behavior that the students gain through the curriculum in a program. The process of developing and qualifying ABET accreditation for computing programs can be utilizing to achieve the goals of academia and industry in the form of achieving program Student Outcomes and Program Educational Objectives. In summary, the process can be adopted by abet seeking program to develop the Self-study report and to establish the process of continuous improvement.

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Dr. Atiq-Ur-Rahman received his BS degree in computer science from University of Peshawar and MS degree in computer system engineering from GIK Institute of Engineering Sciences and Technology, Pakistan in 2004 and 2008, respectively. He completed his PhD in Information Technology from Universiti Teknologi PETRONAS, Malaysia in 2013. He worked as a System Engineer in National database and registration authority Pakistan from 2004 to 2006. Currently, he is working as an Assistant Professor, Head of computer science department and Head of Quality and Academic Accreditation Unit in Northern Border University, Kingdom of Saudi Arabia. His research interest focuses on the energy-efficient design, routing, deployment, coverage and Quality of service in wireless sensor networks and Under Water Sensor Networks. He is also senior member of the Universal Association of Computer and Electronics Engineers (UACEE), Institute of Research Engineers and Doctors (IRED) and American Society for Engineering Education (ASEE). He has a significant number of research publication in the renowned journals and conferences. He is a reviewer in several journals and a technical program committee

member in international conferences. He attended ABET "fundamental and Advanced Assessment Workshop" in USA.

Dr. Hejab M. Alfawareh received his BS degree in and MS degree in computer science in 2003 and 2004, respectively. He completed his PhD in Information Technology from Universiti Utara Malaysia in 2010. He worked as Assistant Professor in Zarqa University, Jorden, Nijran University Saudi Arabia. Currently, he is working is an Assistant Professor and a member of Quality and Academic Accreditation Unit in Northern Border University, Kingdom of Saudi Arabia. His research interest focuses on Artificial Intelligence and social computing. He is also senior member of the Engineering Electronics Jorden and IACSIT. He has a significant number of research publication in the renowned journals and conferences. He is a reviewer in several journals and a technical program committee member in international conferences. He also attended ABET "fundamental and Advanced Assessment Workshop".

Dr. Saleh M. Altowaijri received his Ph.D. degree from Swansea University in the area of cloud computing. He is currently the Dean of the Faculty of Computing and Information Technology, Rafha, Northern Border University. He has over eight years of research experience and has published several book chapters, conference, and journal papers. His research interests include grid and cloud computing, database management systems, data mining, information systems, information technology risk management, and emerging ICT systems in healthcare and transportation sectors. He is a Reviewer of several international conferences and journals.