Developing an accreditation process for a computing faculty with focus on the IS program

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ABSTRACT

The 3-year migration of the computing faculty for three undergraduate programs from ad hoc teaching to three accredited programs is the focus of this paper. This journey started after numerous international accreditation organizations were surveyed, and ABET was chosen as the faculty's target. In this paper, the timelines and processes for covering missing data, persuading instructors to collaborate, involving students in the process, and building an assessment model are discussed. Evidence from one of the three programs, the Information Systems program, is provided. In addition, during the 3 years, an accreditation system called AIMS was developed using Oracle to reduce the cost of writing numerous reports in different formats. This system aided the faculty in receiving accreditation from ABET for three programs in addition to other accreditation systems at low cost.

Keywords: Technical Knowledge; ABET, Information Systems, Accreditation System, Accreditation Process, and AIMS.

INTRODUCTION

The Faculty of Computing and Information Technology (FCIT) at King Abdulaziz University (KAU) has offered three undergraduate programs in three different departments (Computer Science, Information Technology, and Information Systems) since 2006. The dean of the faculty along with the three heads of department (HoDs) agreed to establish an Academic Accreditation Unit (AAU). The first task for this unit was to survey international accreditation organizations. The unit was looking for an organization that accredits computing programs and can be adapted to KAU regulations. On 2 April 2010, the faculty chose the Accreditation Board for Engineering and Technology (ABET) (ABET-CAC, 2011-2012) as one of the best international accreditation organizations that fits KAU requirements. One of the major advantages is that ABET does not restrict institutions to follow specific procedures. ABET and the Computer Society Curricular Guidelines provide recommendations (Homkes & Strikwerda, 2009). The procedures FCIT followed to receive accreditation for the three programs were the same for all three programs with minor changes in each program depending on the program's involvement with other external programs and the HoD's strategy with instructors and students. Therefore, in this paper, the focus is on the Information Systems program because some believe that the IS credit standard is the most problematic standard (Hilton, Johnson, & Kasper, 2004) and involves the business department in the curriculum. The accreditation process outcomes related to this program are also discussed.

ABET focuses on the process and continuing improvement. It starts from orienting freshmen students about a program until they achieve the program objectives after graduation. Thus, ABET accreditation covers all levels starting from the Course Learning Outcomes (CLOs) for each course, which are mapped to the Student Outcomes (SOs) for the entire program (what students are expected to know and be able to do by the time they graduate), and maps each SO to one of the Program Educational Objectives (PEOs) that each student has to achieve after about three years of graduation. In addition, ABET collects data through direct assessments, such as exams, and indirect assessments, such as surveys. The assessments are evaluated so instructors can provide a useful statement of improvement for the next cycle. After the improvement statement is applied, the continuing improvement loop is closed.

A brief history about the FCIT and the IS department is provided in section 2. In section 3, the structure of the IS curriculum is briefly discussed. ABET concepts, such as PEO, SO, and CLO, are defined in section 4. In section 5, the accreditation system developed (AIMS) is described. In section 6, the focus is the assessments model. In sections 4 through 6, results of the developed accreditation process are illustrated.

THE FCIT AND THE IS DEPARTMENT

FCIT, one of 18 main-campus faculties/colleges of KAU, was established as an independent faculty in 2006 to meet the need in the Kingdom of Saudi Arabia for skilled professionals in the technology fields (Technology, 2013). Since being established, FCIT has consisted of three independent departments, namely, Computer Science (CS), Information Technology (IT), and Information Systems (IS). The curriculums of these programs were built according to the standard described in "Computing Curricula 2005: The Overview Report" (Shackelford et al., 2006). FCIT currently runs three undergraduate programs and three graduate programs in three academic departments. The Information Systems (IS) program is an outgrowth of the Computer Science (CS) program. Thus, the three programs decided while preparing for accreditation to have a faculty-wide central AAU, a central Academic Assessment Unit (AAsU), and a common Industrial Advisory Board (IAB), among other common processes.

The process of defining the vision and mission of the IS department began in a workshop on ABET conducted by the Faculty of Engineering on 20 January 2010. The vision of the department is "[t]o be recognized as the pre-eminent Information Systems Department in the region, known for its scientific and practical innovations and commitment in delivering high-quality education and market-responsive researches and services," and the mission of the department is "[t]o provide students with superior, cutting-edge educational experiences and essential practical skills required to excel in all areas related to Information Systems."

The Department of Information Systems offers a bachelor's degree, which can be completed within five academic years, in the following five tracks (majors): Decision Support System (DSS), E-Systems Development (ESD), Information Systems Security (ISS), Applied Information Systems (AIS), and Management Information System (MIS).

CURRICULUM

The curriculum is consistent with the program's objectives. IS students are expected to develop the professional, legal, life-long learning, and ethical skills required in a professional environment. The IS curriculum also covers the major requirements defined in ABET Criteria for Accrediting Computing Programs (ABET-CAC, 2011-2012), which are as follows:
   a. Information Systems: One year that must include:
   1. coverage of the fundamentals of a modern programming language, data management, networking and data communications, systems analysis and design and the role of Information Systems in organizations.
   2. advanced course work that builds on the fundamental course work to provide depth.
   b. Information Systems Environment: One-half year of course work that must include varied topics that provide background in an environment in which the information systems will be applied professionally.
   c. Quantitative analysis or methods including statistics.
   Laboratory instructions play an important role in computational technology education. Therefore, the department ensures that the undergraduate courses are accompanied by extensive laboratory work to provide students with sufficient practical experience in the various fields of computation instrumentation. Thus, the department has always been concerned with developing, updating, and modernizing its laboratory facilities.

Students have to complete 140 credit hours in order to complete the requirements for a degree, as shown in Table 1 (Appendix). The Information Systems curriculum consists of 41 credits of general education, including basic sciences, mathematics, statistics, Islamic culture, and English language proficiency courses; 33 credits of compulsory FCIT courses, 57 credits of core Information Systems courses, and 9 credits of elective Information Systems courses. An important component of the IS curriculum is a one-summer non-credit but mandatory internship that the students undertake after completing not fewer than 100 credit hours of coursework. During this internship, the students gain valuable practical training in a computer industry environment.

The IS program has a clearly spelled-out and well-communicated curriculum. The curriculum is regularly reviewed to keep it aligned with recent industry and IT requirements. The curriculum design and the core courses offered to IS students illustrated in Figure 1 (Appendix) are offered as semester-length courses and prerequisites.

The obstacle facing each program is that each course has a number of sections offered each semester. These sections are taught by different instructors and on more than one campus. Thus, each HoD has to standardize the assessments and the evaluation processes for

all sections of each course. Otherwise, students may move from one section to another seeking the easiest assessments. Therefore, the HoD assigns a coordinator for each course called "course coordinator." The course coordinators are selected by the Department Council for the core courses and by the Faculty Council for the general courses. Candidate course coordinators should be qualified in the specific field of the course and should have experience in instruction and exam observation in addition to being able to lead work teams and to deal effectively with students.

The duties and responsibilities of the course coordinators include developing and improving the courses they are in charge of in addition to performing daily and routine activities related to the course. The course coordinators communicate directly with the course instructors and the head of the department. The coordinators' responsibilities include the following:

1. Creating a supportive and attractive environment for the course that enhances academic achievement.
2. Developing, improving, and updating the course content to keep pace with the advancements in the course's scientific field.
3. Directly supervising and observing the performance of teaching assistants and the scientific materials offered in the labs.
4. Making sure the sequence of the course topics is consistent with the schedules in which the topics are distributed and arranging with the coordinators of related courses to prevent overlaps or gaps in the course content if the same or related topics are offered in more than one course.
5. Cooperating with the academic members in charge of teaching the course and preparing the course syllabus by referring to the specific course description.
6. Arranging and improving course delivery practices in addition to supervising, observing, and passing on experience and professional practices to less experienced instructors.
7. Updating the course portfolio and the course online content on the Electronic Course Management System.
8. Course coordinators may attend course instructors' lectures to confirm that the instruction is delivered professionally and help them to overcome any obstacles.
9. Making sure that the course content and instruction methods help students achieve the established objectives of the course.
10. Arranging and supervising meetings with the course teaching team at least every two weeks in order to discuss topics related to or that affect the educational process and to discuss any difficulties the students or the instructors might face. Topics such as exam dates and assessment methods can be discussed during such meetings.
11. Arranging and supervising meetings at least once a month with course students from different sections in order to identify and address any academic difficulties that might block the students' academic achievement and to document the points discussed for the sake of the development process.
12. Evaluating the students' academic performance by analyzing the results and students' interviews in addition to creating questionnaires that serve these goals. Furthermore, identifying the strengths and weaknesses in student performance and documenting these points objectively in addition to reporting the necessary recommendations for enhancing student achievement in the course.
13. Supervising the process of grading students' assignments, projects, and tests and making sure that the marking process is standardized in all sections of the course.
14. Collecting random samples of students' assignments, projects, and tests in a course. These samples should meet all the criteria for assessing student performance. Furthermore, these samples should be collected from every section of the course and

should reflect the different levels of performance, i.e., above average, average, and below average.

15. Supervising the process of preparing the exams.
16. Supervising students' evaluations of course instructors at the end of each semester.
17. Preparing a final course report at the end of each semester.

MAPPING CLOS, SOS, AND PEOS TO KAU MISSION

At KAU, the education process must continually improve. This begins at the program orientation and is completed when students get a job after graduation. Therefore, the continuing improvement loop covers all course levels starting from three to 40 CLOs for each course to only 10 SOs and with three PEOs. At the end, the three PEOs must be mapped to the KAU mission as illustrated in Figure 2 (Appendix).

In the following three sections, the CLOs, SOs, and PEOs in the IS program are described in more detail. Then, they are mapped with another level. At the end of each section, the process of building them is discussed.

a. Course Learning Outcomes (CLOs)

CLO stands for Course Learning Outcome. Others researchers call such statements Instructional Objectives. Mager (Mager, 1997) defined them as "a collection of words and/or picture and diagrams intended to let others know what you intend for your students to achieve." Mager also described the three primary attributes of a well-constructed objective:
- It is related to intended outcomes, rather than the process for achieving those outcomes.
- It is specific and measureable, rather than broad and intangible.
- It is concerned with students, not teachers.

CLOs are explicit statements about competencies that students are expected to attain. Instructors use these statements to assess student learning. They are based on observable (hence, measurable) tasks that students are asked to perform (for example, answer a question, solve a problem, complete an assignment). The CLOs, derived directly from course content (the curriculum), reflect instructor goals and priorities in delivering the course content. They are linked to student outcomes through mapping documented in the course file. In FCIT terminology, the terms course binder and course articulation matrix are used to refer to the course file and the tool that shows CLOs-SOs mapping, respectively. Course instructors are asked to align (simply map) their questions and assignments to CLOs. The instructors are urged strongly to communicate their CLOs to students.

CLOs provide a reliable basis for assessing outcomes at the program level for the following reasons:
- Instructors with different levels of expertise are able to deal with the CLOs since they relate directly to course content.
- Since the relation to the topics is clear, the CLOs are easier to agree on and more reliable to map to when devising course assessments.
- They are easier to communicate to students since the CLOs relate directly to what the students are doing in class and on assignments.
- The CLOs provide better diagnostics when problems are identified at a higher level.

Simply, instructors who have a clear understanding of what is it that they are asked to do are more likely to do it successfully. There are many benefits to communicating attainable, clearly articulated, and measurable outcomes to learners. The most important are increasing education quality and being able to measure (demonstrate) success. Numerous useful

references, such as (Anderson, Krathwohl, Airasian, & Cruikshank, 2000; Mager, 1997) can be found for help in writing CLOs.

The faculty recommends writing one to three CLOs per instruction week per course. In FCIT, there are 14 instruction weeks. Thus, 14 to 42 CLOs are appropriate for each course. Exceeding three outcomes per week may overwhelm students and significantly increase the burden of assessing their attainment. Moreover, although more CLOs appeal to precision-minded faculty, they have a negative aspect as far as CLOs student surveys are concerned. The Faculty of Engineering held three workshops, on 3 and 6 November and 8 December 2010, to help the instructors write CLOs and build course binders. All the courses binders were finalized and reviewed by the department ABET Committee on 12 December 2011.

Changing a CLO is possible under some guidelines. First, proposed changes have to be agreed on by the coordinator of the course and others involved in the course. Second, the changes are communicated to the ABET committee representative. Changes are applied only at the beginning of semester so that they are communicated to students and addressed properly. For academic year 2011-2012, KAU recommended that CLOs be revised only once in the academic year so that they could be assessed for two cycles. The change process is not needed for wording adjustments that do not change the underlying observable action to be assessed. These changes are encouraged to make CLOs more accessible to students.

b. Student Outcomes (SOs)

ABET (ABET, 2013) defines Student Outcomes 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."

Any program can establish its own SOs through indirect assessment of the instructors and industries, and they can be asked about the skills, knowledge, and behaviors that they require for students pursuing their studies or applying for a job. However, FCIT agreed after several workshops 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. ABET numbered the SOs using letters, not numbers. For example, the SOs for the IS program are the following:

a. An ability to apply knowledge of computing and mathematics appropriate to the discipline.

b. An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.

c. An ability to design, implement, 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.

j. An understanding of processes that support the delivery and management of information systems with a specific application environment. (Technology, 2013)

The first nine ABET SOs (a through i) are identical to all computing programs offered in the Faculty of Computing and Information Technology, while the last SO (j) is specific to the Information Systems program.

The process of defining SOs was started in a workshop on ABET conducted by the Faculty of Engineering on 2 June 2010. Based on the ABET CAC General Criteria, preliminary drafts of the SOs for the IS program were prepared and discussed in the workshop. The SOs were further discussed with the instructors and finally adopted in the Department Council meeting on 20 October 2010. The final version of the SOs was printed and distributed among stakeholders.

Students are one of the most important stakeholders in the degree program. The faculty has a tradition of involving students in developing curricular and co-curricular activities. Initially, students were not involved in the process of establishing SOs. However, students were later involved. The first serious attempt was made during Spring 2012, when a full-day faculty-wide focus group meeting was organized on 1 April 2012. In this focus group, selected students (10 senior students from each male and female section) called the Student Focus Group from the department participated in the discussion on SOs. Overall, the students agreed with the existing SOs. A photograph of this event is shown in Figure 3 (Appendix).

Each IS course is designed to cover CLOs, which in turn are mapped to SOs. On 26 December 2011, the ABET Committee decided to identify three Key Student Outcomes (KSOs) for each course and concentrate on these for the assessment and performance evaluation. As a result of varied discussions with instructors and course coordinators, a maximum of three KSOs was identified and finalized for each course. The departmental ABET committee explored various different possibilities to identify KSOs for courses, including seeking consent from the faculty members based on their expertise (for a given course) and CLO coverage/exposure hours for a given course. After comprehensive deliberations, three KSOs were chosen for each core course based on CLO-coverage/exposure hours. Table 2 (Appendix) shows the final mapping of the core courses to the KSOs on 6 March 2012. The KSOs for each course were communicated to the respective course coordinator/instructor via email and are available to students and instructors. The KSOs were also discussed and approved in a Department Council meeting.

c. Program Educational Objectives (PEOs)

ABET (ABET, 2013) defines Program Educational Objectives as follows: "Broad statements that describe what graduates are expected to attain within a few years of graduation. Program educational objectives are based on the needs of the program's constituencies."

The process of defining PEO was started in a workshop on ABET conducted by the Faculty of Engineering on 7 April 2010. Preliminary drafts of the PEOs were prepared and discussed in the workshop. The preliminary drafts were discussed with the instructors and finally approved at the Department Council meeting on 20 October 2010. The final versions of the PEOs were printed and distributed among the stakeholders. The PEOs for the Information Systems program are as follows:

1. Work as an integral part of the information field, connecting people with information with technology (Academic Excellence/Knowledge and Skills).
2. Advance in their careers through knowledge of computer information systems, communication skills, and understanding of business and contemporary issues (Research Excellence/Continuing education and advance studies).

Contribute to the economic growth and welfare of Saudi society through developing and managing information systems for business and research (Contribution to the society/Providing professional services/Jobs). (Technology, 2013)

The PEOs describe the career and professional accomplishments the program prepares graduates to achieve. These educational objectives mainly address educational elements in the missions of the university and the faculty. These objectives also address elements related to serving society. The first element in the balanced missions, i.e., scientific research, is served through the departmental goals depicted in the vision of the Information Systems department, namely, promoting creativity and stimulating innovation. The department encourages instructors to conduct advanced research that incorporates state-of-the-art techniques with society's social and ethical concerns. Undergraduate students are also encouraged to participate in research activities particularly in the BS Senior project (CPIS-498 and CPIS-499) and small course projects. Enhancing students' technical competence and their ability to use modern IT tools will lead to successful careers in research and development or academia. Table 3 (Appendix) shows each of the 10 SOs mapped to the three PEOs.

The mission of King Abdulaziz University is "the advancement of society through pioneering research and cultural and scientific excellence." Table 4 (Appendix) shows each PEO mapped to each of the three main elements in the KAU's mission.

The stakeholders in the IS program are primarily the following groups: employers, alumni, and the Industry Advisory Board (IAB). Feedback from the IAB members, industrial survey, and the alumni survey helps the department evaluate to what degree Objectives 1 and 3 are being met, and which professional careers should be served as expressed in Objective 2. A photograph of the meeting with the IAB is shown in Figure 4 (Appendix). In Figure 3 (Appendix), a photograph of the meeting with the Student Focus Group is shown. In Figure 5 (Appendix), a photograph of the event with alumni is shown.

Relating each PEO to its fostering outcome is also important to close the continuous improvement loop. Whenever a program educational objective is evaluated in the workplace as unsatisfied, the program has to look at the related outcomes. Actions should be taken in the program, through curricular and extracurricular activities, to raise the students' level of achievement of related outcomes.

THE ACCREDITATION SYSTEM - AIMS

AIMS stands for the Accreditation Integration and Management System. This in-house electronic system manages academic information of interest to accreditation. AIMS was developed to relieve the faculty of the burden of dealing with seemingly endless paperwork and allow them to concentrate on teaching/learning and academic development. The system was designed to separate academic data from process thus allowing the multiple accreditation-specific logics to be implemented as separate reporting modules. ABET does not provide an assessment tool (Burge & Leach, 2010); thus, AIMS was developed to support ABET in addition to the National Commission for Academic Accreditation and Assessment (NCAAA) (Assessment, 2009), the national accrediting body in Saudi Arabia. AIMS was developed using Oracle technology and is accessible from anywhere through a standard Web browser. AIMS has also been developed to adapt the frequent changes in ABET SOs discussed in (Lending & Mathieu, 2010). Figure 6 (Appendix) presents two snapshots of the AIMS.

The development focus for now is on the quality of the data model, data content, and reporting. The AIMS mainly provides the following services:
1. Provides the basis for a sustainable assessment of course and program data.
2. Provides a common place to store official versions of documents and information related to courses and degree programs.

3. Automatically generates documents of interest such as instructors' resumes in a consistent format. All the instructors' resumes became available on AIMS on 7 April 2012. This feature helps build a Course Allocation Table in which each course allocated to an instructor is justified based on seven criteria: high degrees, experience, certifications, memberships, awards, activities, and publications. The table was approved by the Department Council on 10 April 2012.

4. Automatically generates accurate, up-to-date course catalogs, including a syllabus, teaching documentation, lab manuals, and course assessment components. Course binders were ready by 12 December 2011, and lab manuals were uploaded to AIMS on 7 April 2012.

5. Generates comprehensive course documentation that automatically integrates, and samples students' work.

6. Generates dynamically various operational reports such as textbook lists and outcome coverage tables.

7. Provides an electronic display room for material of interest to ABET evaluators.

8. Generates reports in NCAAA automatically from the accreditation data.

THE ASSESSMENT MODEL

In ABET (ABET, 2013) terminology, assessment refers to "processes that identify, collect, and prepare data to evaluate the attainment of program educational objectives and student outcomes." The FCIT is committed to meaningfully and sustainably assessing undergraduate programs. To achieve this goal, FCIT developed a formal assessment plan that involves various direct and indirect assessments of courses, programs, outcomes, and overall student and faculty experiences. The plan specifies which assessments to perform and identifies the data sources, frequency, and stakeholders of each assessment. A robust assessment process is in place to ensure consistent results. An AAU is responsible for developing and administering the assessments according to the plan and delivering the results to the respective stakeholders. Electronic support systems are in place to relieve filing and reporting burdens. Departments, administrators, and instructors are free to concentrate on evaluation and improvement.

a. FCIT Assessment Framework

This framework is the basis of a continuous improvement cycle that starts with collecting data, goes on to draw conclusions based on interpreting the data, and suggests appropriate improvement actions. Another round of assessment and evaluation of results can reveal how effective previous actions were and can help suggest further improvements. The continuous improvement cycle can be summarized as assessment, evaluation, and improvement actions.

FCIT splits the continuous improvement cycle into two parts and assigns responsibilities for each to different parties:

1. Assessment is assigned to a dedicated college-level unit, called the Academic Assessment Unit.

2. Evaluation and improvement are assigned to assessment stakeholders such as course instructors, program heads, and curriculum committees.

This division of responsibility is beneficial on many levels, mainly:

1. It helps make the continuous improvement cycle more sustainable.

2. The college can efficiently allocate the resources (administrative, technical, and clerical) needed to support the tedious and often costly assessments processes.

3. The dedicated unit can build expertise and experience that enhance the efficiency and reliability of the assessment processes.
4. Shifting the burden of assessments away from assessment stakeholders allows them to focus on what really matters to them: improving their programs.
5. A separate assessment unit using unified processes can provide a college infrastructure that can better scale to accommodate more programs.

b. Assessment Characteristics

Assessment at FCIT has the following main characteristics:
- It starts from observable actions by students at the course level, the CLO.
- It relies on a combination of direct and indirect measurements to produce and corroborate evidence.
- It uses suitable sampling of performance data. For example, when course outcomes performance is assessed, data does not have to be collected for every assessment in every course for every semester. FCIT believes less is more here. Good sampling can yield representative results while being sustainable and avoids overwhelming the assessment administrators and stakeholders.
- It is based on the actual scores students receive exams and other assessment tools used to evaluate their learning. FCIT does not believe in using adjusted (curved) scores for outcome assessment as they can obscure actual student performance, which is the basis of the outcome performance assessment.

c. Role of Academic Assessment Unit (AAsU)

Although assessment preparations started earlier, the unit was formally established on 28 September 2011. The unit was assigned the following broad mission:
1. To help instructors develop suitable performance assessment rubrics. The instructors participated in a workshop to help build rubrics with the Faculty of Engineering on 15 December 2010.
2. To develop and perform academic assessments regularly, according to the requirements of the academic accreditation agencies that FCIT targets.

Moreover, the unit is expected to lead efforts in developing the FCIT assessment plan. They report back data with their interpretation guidelines. The unit can further assist by pointing out trends and possible development opportunities and/or remedy actions. Stakeholders are ultimately responsible for interpreting the data and deciding on the best courses of action.

d. Assessment Cycle

Every time an assessment is repeated, FCIT goes through a cycle. For example, FCIT assesses courses every major semester, so there are two course assessment cycles every academic year. The cycle length does not depend on operational considerations. A cycle length can be based on how often data is sampled or how often FCIT is ready to make changes. An example is the PEO assessment cycle. It depends on how often FCIT is willing to significantly revise the curriculum, which is ultimately needed if the PEOs are changed significantly. Typically, a 3- to 5-year cycle is recommended to keep up with the job market. FCIT chose 3 years to cope with the KSA's rapidly changing computing needs. Current assessments frequencies and completed cycles are shown in Figure 7 (Appendix).

The IS objectives and outcomes are driven mainly by the ABET criteria and the input of its constituencies, and are aligned with the KAU mission. The program objectives set a guideline for program curriculum development and teaching procedure. To ensure the program educational objectives and student outcomes are achieved, various assessment tools have been approved. The assessment process consists of two levels. The first level of assessment and evaluation process is conducted at the end of every semester, and the results from this assessment process are used to improve the educational process to achieve the targeted student outcomes. The second level of assessment and evaluation process is conducted every 3 years (or when deemed necessary) through external input from IS constituencies. The results from this second level of assessment and evaluation process are used to refine the program's educational objectives and/or program student outcomes. In the meantime, the IS program faculty stays updated on field developments and use the latest information in their courses, thus contributing to a dynamic curriculum. For the second level of assessment and evaluation, FCIT is in the midst of a 3-year cycle, and is collecting data from constituencies.

The improvement strategy, which happens every semester, includes assessing course-related data regarding SOs. Direct assessments and indirect assessments are included. Based on the assessment and analysis report generated, the ABET Committee evaluates the results and recommends actions. The recommendations are reported and discussed in Department Council meetings and then implemented.

CONTINUOUS IMPROVEMENT IN CURRICULUM

The IS program seeks to maintain a dynamic, clearly defined, and well-communicated curriculum. The curriculum is regularly reviewed to maintain alignment with recent industry and IS requirements.

- The IS Program conducted a gap analysis on 2 April 2010 between the current curriculum and the ACM/AIS Curriculum Guidelines for Undergraduate Degree Programs in Information Systems 2010 (Topi et al., 2010) and ABET Criteria for Accrediting Computing Programs 2011-2012 (ABET-CAC, 2011-2012). This survey helped the HoD understand how the current program is ready for ABET.
- Every course has a course coordinator who is responsible for standardized delivery across the sections. A coordinator survey was conducted to discover the extent of communications and cooperation among course coordinators and instructors in various teaching activities such as the course delivery plan, preparation of various assessments, and examinations.

1. Observations Based on the Fall 2011 Results
   - Minor unnecessary changes are needed to align the existing IS curriculum with the two resources.
   - The extent of coordination between the course coordinator and instructors was less than desired (25%).

2. Proposed Actions Based on the Fall 2011 Results
   - Replace the course CPIS-357 (Software Quality and Testing) with CPIS-363 (Intelligent Systems) after 1 year because there is no urgent need for it.
   - The title of the course CPIS-352 (IS Applications Design and Development) should be changed to Enterprise Architecture.
   - The CLOs of the course CPIS-312 (Information and Computer Security) should be updated according to ACM/IEEE/AIS-2010.
   - Increase the credit hours for CPIS334 from 2 to 3.

- Increase the credit hours for the environment courses (BUS230, BUS232, BUS233, and ACCT333) from 2 to 3 hours after 1 year because doing so requires external communication with the business department.
- The course coordinators and instructors were advised to have more frequent interaction and closer coordination in teaching and examination-related activities.

3. Observations Based on the Spring 2012 Results

- The result of the coordinator survey conducted in Spring 2012 was 70% while it was 25% in the previous semester.
- The result of the coordinator survey (conducted after Spring 2012) clearly indicates an improvement in the coordinators' responsibility and extent of coordination with instructors.

CONTINUOUS IMPROVEMENT IN SOS

This section shows that the IS program closed the continuous improvement loop for the Student Outcomes in Fall 2011, and performance improved in the following semester, Spring 2012.

a. Direct Assessments

1. Preliminary Observations Based on the Fall 2011 Results

During Fall 2011, the direct assessment was based on the scores students received in each course in their final exam only. Each instructor has to map each question to a KSO or keep it without any mapping.

Based on the assessment presented in Fall 2011, for each course, the course coordinators were asked to suggest future actions for quality improvement in their courses in consultation with concerned instructors. In Fall 2011, SOs, namely, f and i, were not achieved at the program level. The departmental ABET Committee identified limitations in the assessment plan and suggested actions for improvement.

The target success criteria for SO achievement were defined as follows. A student outcome is achieved if 60% of the students receive 60% or higher in the outcome; otherwise, the SO is not achieved. It is evident from the program-level SO analysis report that SOs, namely, f and i, could not be achieved, as illustrated in Figure 8 (Appendix).

After careful analysis of these results, the department ABET Committee identified the following limitations in the existing assessment plan.

- One of the main reasons for the failure to achieve the SOs (f and i) is that the assessment plan is not comprehensive and does not include sufficient assessments. The committee used only one assessment method, namely, the final examination, to assess the SOs. However, the final exam might not be sufficient for assessing all aspects (performance indicators) of these outcomes; for example, outcomes f and i could be more appropriately assessed through quizzes, midterms, lab-based practical examinations, and projects rather than through a written final examination.
- Another limitation in the existing assessment plan is that, for some courses, the sample size is small.

2. Proposed Actions Based on the Fall 2011 Results

- It has been advised to make the final examination more comprehensive and KSO-based.
- In addition to the final examination, other assessments such as labs, projects, midterm examinations, quizzes, etc., will be used in subsequent evaluations of the SOs.

- The students will be exposed to more interactive problem-solving activities, including classroom discussions to get a better understanding of how to analyze a problem.
- The students will be assigned more group projects during the coming semesters.

3. Preliminary Observations Based on the Spring 2012 Results

The direct assessment analysis report for Spring-2012 is shown in Figure 9 (Appendix). The program-level SO analysis reported except for f and i, all the SOs were successfully achieved, which had not been achieved in Fall 2011. However, a marginal deficiency in achieving SO j was reported.

b. Indirect Assessments

To guide the evaluation of the results of the collected surveys, performance targets have been set to define the preset level of attainment. Table 5 (Appendix) summarizes the tools for the indirect assessment and evaluation of SOs through student course surveys, exit surveys, faculty course reports, and IAB feedback, showing the frequency of the assessment and the expected level of attainment. Only the student surveys were conducted at the end of Fall 2011 and Spring 2012.

1. Preliminary Observations Based on the Fall 2011 Results

A careful analysis of the indirect assessment showed that all SOs were achieved and above the target. This result may be attributed to the following reasons:

- The sample size of the survey was small. In some surveys, only 10-15 participants responded.
- The sample was not inclusive and varied.
- The participants were not properly educated about the survey objectives.

2. Proposed Actions Based on the Fall 2011 Results

- More serious efforts should be made regarding the indirect assessment of SOs.
- The constituents should be properly informed about the survey objectives.

3. Preliminary Observations Based on the Spring 2012 Results

At the end of every semester, students are asked to rate a course they have taken, with particular emphasis on how well the targeted student outcomes were achieved. The survey questions are directly related to the specific CLOs included in the course syllabus and distributed to students at the beginning of the semester. The syllabus also relates the CLOs to the SOs, and thus, the results are mapped back to the SOs per the ABET requirements. The raw data collected from the student evaluations is stored and analyzed, and the results are passed on to the instructor and department head for further evaluation and appropriate action.

A careful analysis of the indirect assessment shows that all SOs were achieved and were well above the target. Students attempted these surveys for very few courses, and few students showed interest in taking these surveys. Thus, the sample was not inclusive and varied.

This result may be attributed to the following reasons:

- The lack of awareness and complexity of these surveys in terms of difficulty in understanding, language, time consuming, etc.
- Students attempted surveys for very few courses. In some surveys, only 5-10 participants responded and often only partially.
- The participants were not properly informed about the survey objectives.

c. Combining Direct and Indirect Assessments

After the results of the direct and the indirect assessments were combined. The direct assessment accounted for 60% and the indirect assessment accounted for 40%. For the 2011-2012 academic session, all SOs were achieved, as shown in Table 6 (Appendix). Thus, the loop for this academic session was closed.

CONTINUOUS IMPROVEMENT IN ABET AWARENESS

Initially, instructors were hesitant about the ABET criteria and processes after the AAU and HoD's sustained and coordinated efforts. More guidance was required, especially regarding implementing the continuous improvement process. In addition, the students were not aware of the ABET criteria in Fall 2011. Therefore, the following two methods were used to increase awareness.

a. Workshops

The Faculty Council decided the AAU, HoD, ABET consultants, and the ABET Managing Director of Professional Services should conduct workshops to educate instructors and students about accreditation in general and the ABET criteria in particular. Figure 10 (Appendix) shows photographs of three events. In addition, student focus groups were formed, and they participated in a workshop on ABET.

b. Newsletters

The Department Council decided to increase awareness by publishing a newsletter once a semester in addition to the workshops. The first newsletter was issued for Fall 2011 and was approved by the department on 26 December 2011. The second newsletter was issued for Spring 2012 and approved by the department on 29 April 2012. The following bullet points were emphasized in the newsletters:
- General information about ABET and the department
- Description of previous ABET events and upcoming events
- Recent research publications related to improving the teaching methods or the CLOs
- Definitions of ABET terms, such as PEOs and SOs.

CONTINUOUS IMPROVEMENT IN STUDENT PROCESSING

The transcripts of recent graduating students (Spring 2012) were analyzed on 17 April 2012. Based on the findings, a detailed analysis was performed to discover the reasons for violations, so that remedial measures could be taken to ensure no aberrations in future.

The academic advisers were informed of the violations, such as track violations, exceeding 10 semesters, course-level violations, and reasons students failed courses. After the violations were examined, the ABET committee submitted the following recommendations to the HoD to take the necessary actions:
1. The Registrar Office at the university must be informed of the violations to improve the system to take care of the track violations.
2. Academic advisors should devote more time to students and be available for advising during advising hours.
3. An online advising system should be implemented to enhance communication between the advisees and the advisor.
4. Teaching duties should be allocated based on the instructors' specialties.

CONCLUSION

In this paper, the IS HoD described the experience developing an accreditation process at FCIT, and examples from the Information Systems department were discussed. In 2010, FCIT instructors participated in workshops conducted by a group of members from the Faculty of Engineering to help define the department's vision and the mission, to establish the three PEOs, and to adapt the 10 ABET SOs. The Faculty of Engineering members also led workshops on building rubrics, writing CLOs, and structuring course binders. At the end of the workshops, FCIT decided to focus on becoming accredited by the ABET within 2 years.

During 2011, units were established to support the accreditation processing, such as AAsU. In addition, all the departments used the AIMS system to finalize course binders. During this period, three KSOs were introduced for each course. At the end of the year, the IS department issued the first newsletter, the "ABET Newsletter," to increase awareness of ABET among instructors and students.

The year 2012 was the most critical year to finalize building the accreditation process. An upgraded version of AIMS was introduced, so instructors can upload their resumes and lab manuals. The faculty and the department also increased the focus on ABET awareness. A Student Focus Group was established, and the second IS ABET newsletter was issued.

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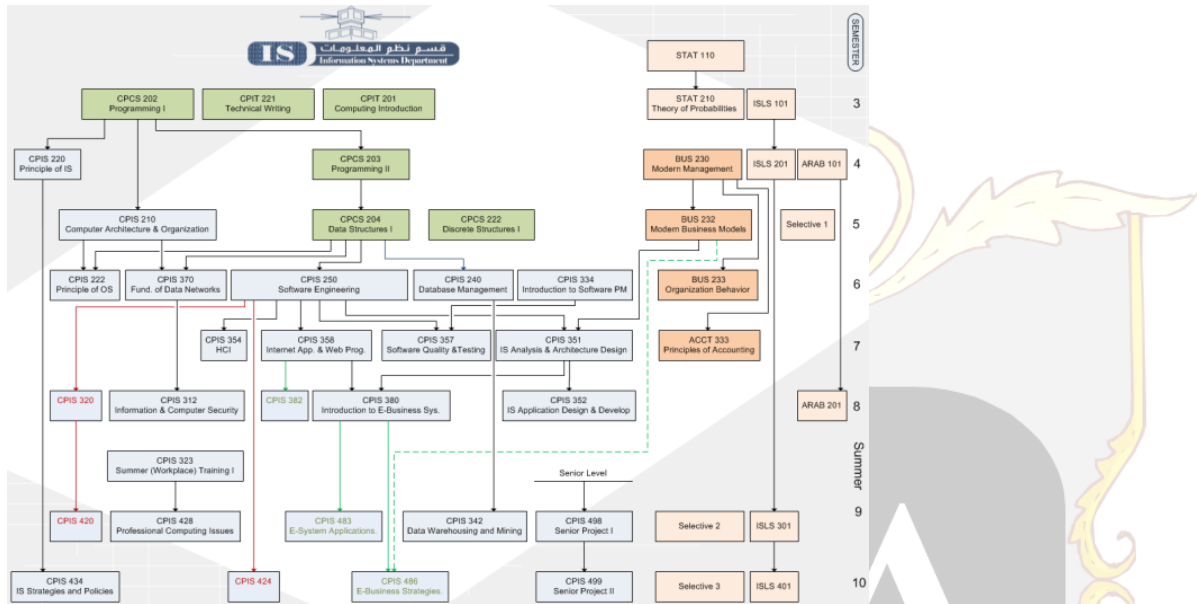
APPENDIX

Figure 1. The IS Curriculum (Prerequisites and Levels)
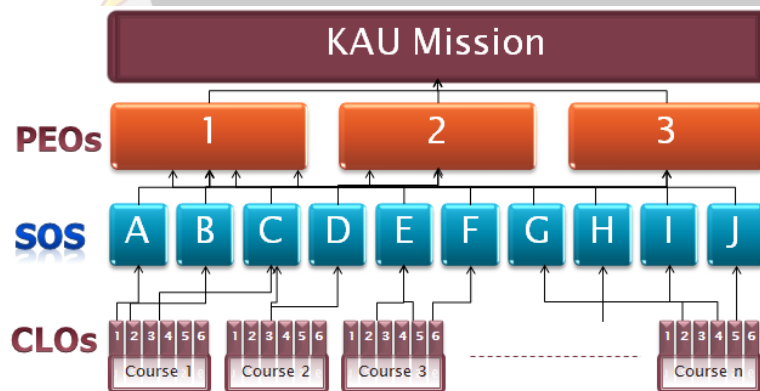

Figure 2. Mapping CLOs to SOs to PEOs to the KAU Mission

Figure 3. Student Focus Group Meeting

Figure 4. IAB Meeting

Figure 5. Alumni Meeting

(a) The Program Binder Page
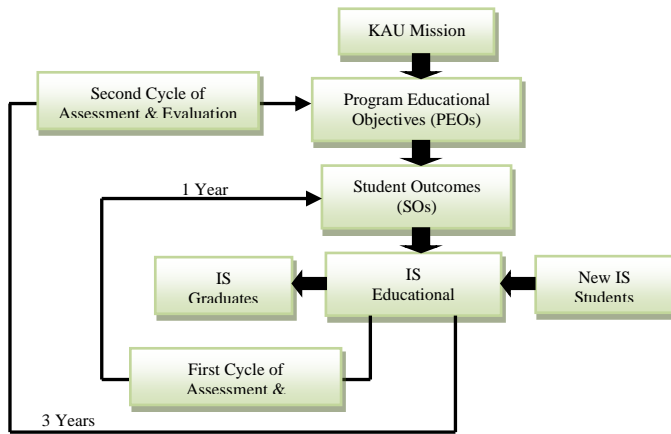(b) The Course Binder Page
Figure 6. The AIMS

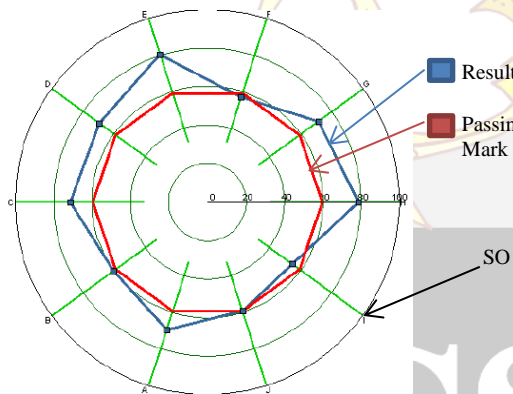Figure 7. Assessment Cycles

Figure 8. The Result of the Direct Assessments of SOs in Fall 2011
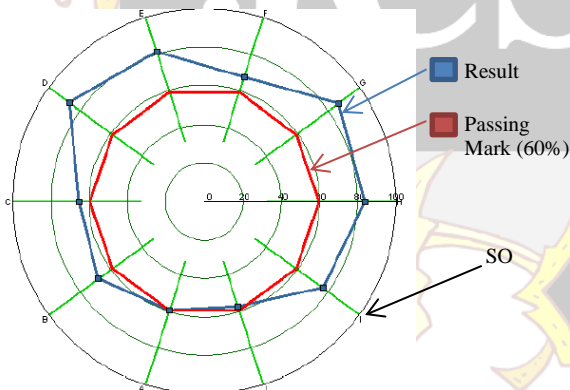

Figure 9. The Result of Direct Assessments of SOs in Spring 2012

(a) by the HoD   (b) by a consultant   (c) by an ABET member

Figure 10. ABET Orientation Workshops

Table 1. Distribution of Total Credit Hours

Requirements			Credit Hours
1	University Requirements		26
2	Applied Science Requirements		15
3	Faculty Requirements	Core	24
		Electives	9
4	Program Requirements	Core	57
		Electives	9
Total Credit Hours			140

Table 2. Key Student Outcomes (KSOs) Coverage in Required Courses

Course Code	1	2	A	B	C	D	E	F	G	H	I	J
CPIT-201											X	X
CPCS-202												
CPCS-203			X	X	X							
CPCS-204			X	X								X
CPIT-221						X	X	X				
CPCS-222			X								X	X
CPIS-334				X		X				X		
CPIS-428							X		X			X
CPIS-210			X	X							X	
CPIS-220				X				X				X
CPIS-222			X	X							X	
CPIS-240			X	X	X							
CPIS-250				X					X			X
CPIS-312			X				X			X		
CPIS-323												
CPIS-342			X		X						X	
CPIS-351					X	X						X
CPIS-352				X	X						X	
CPIS-354				X	X				X			
CPIS-357												
CPIS-358				X	X						X	
CPIS-370				X			X		X			
CPIS-380				X	X				X			
CPIS-434							X		X			X
CPIS-498						X		X		X		
CPIS-499						X		X		X		

Table 3. Mapping SOs to PEOs

PEO \ SO	Program Objective#1	Program Objective#2	Program Objective#3
A	✓		✓
B	✓	✓	✓
C	✓	✓	✓
D			✓
E	✓		✓
F	✓		✓
G	✓		
H	✓	✓	
I	✓	✓	✓
J	✓	✓	✓

Table 4. Mapping PEOs to the KAU Mission

Program Educational Objectives	Mission of KAU		
	Academic Excellence	Advanced Research	Serving society Needs
PEO-1: Be able to work as an integral part of the information field, connecting people with information with technology.	✓	✓	
PEO-2: Be able to advance in their careers through knowledge of computer information systems, communication skills, and understanding of business and contemporary issues.	✓	✓	
PEO-3: Be able to contribute to the economic growth and welfare of Saudi society through developing and managing information systems for business and research.	✓		✓

Table 5. The Tools Used for Indirect SO Assessments

Assessment Tool	Frequency of Assessment	Assessment Approach	Expected Level of Attainment
Student Surveys	Semester	Indirect	70%
Exit Surveys	Semester	Indirect	70%
Faculty Course Report	Semester	Indirect	70%
Industrial Advisory Committee Feedback	Annual	Indirect	

Table 6. The Result of the Direct and Indirect Assessments of SO for 1 Year

Assessment Tool	Term	SO									
		A	B	C	D	E	F	G	H	I	J
Direct Assessment	Fall-2011	70	61	72	70	81	58	72	79	55	60
	Spring-2012	60	69	66	88	82	68	87	84	77	58
	Average(%)	65	65	69	79	82	63	80	82	66	59
Indirect Assessment											
Student Survey	Fall-2011	77	78	80	76	84	84	83	75	82	77
	Spring-2012	73	70	73	86	82	69	63	100	60	76
	Average(%)	75	74	77	81	83	77	73	88	71	77
Overall Achievement of SOs (60% of Direct + 40% of Indirect Assessment)		69	69	72	80	82	69	77	84	68	66