University of Puerto Rico at Bayamón

Computer Science Department

Continuous Improvement Report

Information Systems Program

Accreditation and Assessment Committee

Cycle 2012-2013

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INTRODUCTION

This document presents the analysis of the assessment data for the Information Systems program. The document is divided into two main sections. The first section summarizes the things that happened during the previous 2005-2008 and 2008-2011 cycles, when the Department started contemplating the idea of pursuing ABET accreditation. The second section details the analysis of the student outcomes during the current assessment cycle.

ASSESSMENT BACKGROUND

The purpose of this section is to present the continuous improvement process in place at the Computer Science Department for the cycles on academic years 2005-2006 through 2007-2008 and academic years 2008-2009 through 2010-2011. These cycles took place before sending the request for consideration for accreditation to ABET on January 2012. The Assessment and Accreditation Committee decided that the information presented here provides a much needed background for the Evaluation Team.

Assessment for the 2005-2008 Cycle

During the first year of this cycle, the Board of Trustees of the University of Puerto Rico approved a document submitted by then President Antonio García-Padilla entitled *Ten to the Decade* (*Diez para la Década*, in Spanish). This document contained ten broad goals for the university for the 2006-2016 years, among them the aim to attain accreditation for all eligible programs, including Computer Science and Information Systems. At that time, the Computer Science Department at Bayamón offered a bachelor's degree that was a hybrid between Computer Science and Information Systems. This program could contain more advanced coursework in both areas. The Committee decided that an assessment process was needed in order to determine the requirements for a future revision of the program. Students, alumni and employers were surveyed for this purpose and the data were collected and analyzed. This cycle concluded when recommendations for curricula modifications were made on academic year 2007-2008 as a result of these analyses. These modifications resulted in the implementation of

two programs. These programs were known at the time as Applied Computing Science and Information Systems & Technology.

Assessment for the 2008-2011 Cycle

The objective of this cycle was to assess the new programs so that two goals could be met: (1) confirmation of institutional accreditation by the Middle States Commission on Higher Education, and (2) paving of the way for a future request for accreditation by ABET. This cycle was crucial since, as a result of the implementation of the two new programs, the Department recruited two professors with a Ph.D. in Computer Science or closely related fields. These professors would be in charge for the development of new advanced coursework and for performing research. The Information Systems & Technology program was coordinated by a professor with a doctorate in this discipline. Also, the Department established an External Advisory Board during these years. This board is composed of students, alumni and employers and had their first meeting on academic year 2010-2011. The Accreditation and Assessment Committee submitted a set of educational objectives to the External Advisory Board for consideration. Modifications proposed by the board were integrated to the objectives after approval by the faculty of the Department. These educational objectives became effective immediately.

It is important to note that during academic year 2009-2010 there was a transition in leadership positions at the university, campus and departmental levels. This situation, coupled with a two-month student strike, caused a disruption in the assessment process of the new programs. Fortunately, it was also during this academic year that the chairman of the Department established a new Assessment and Accreditation Committee. The cycle goals were met. The institution received confirmation of accreditation by the Middle States Commission on Higher Education. Also, a revision of our Continuous Improvement Plan was implemented so that a more systematic assessment process could be achieved.

INFORMATION SYSTEMS PROGRAM - STUDENT OUTCOMES DATA ANALYSIS

This section presents the analysis of the Student Outcomes for the Information Systems Program at the University of Puerto at Bayamón. Each outcome was further divided into performance indicators and was analyzed using at least two instruments: one direct measurement and one indirect measurement. The main direct measurement for most of the outcomes was the post-test given[1] to all students enrolled in our Capstone course for the past three semesters. The other outcomes were assessed using rubrics[1]. The main indirect measure was a survey administered to the students in our Capstone course. Whenever a discrepancy was found, relevant materials from the courses were analyzed.

For the post-test, the analysis assumed the following scale:
- Satisfactory – the question was correctly answered by at least 75% of the students.
- Developing – the question was correctly answered by at least 50% of the students but less that 75%.
- Unsatisfactory – the question was correctly answered by less than 50% of the students.

For the student survey, the analysis assumed the following scale:
- Satisfactory – the indicator was graded as A or B by the student.
- Developing – the indicator was graded as C by the student.
- Unsatisfactory – the indicator was graded as D or F by the student.

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[1] Available to ABET's visiting team

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

a. Select the appropriate algorithm for a specific situation.

Two questions in the post-test were about this performance indicator. On average, 75% of the students answered the questions correctly, implying a satisfactory assessment for this indicator. All the students that completed the survey gave this indicator a satisfactory grade. Therefore, the achievement level for this performance indicator was met.

b. Analyze the asymptotic running time of simple algorithms using big-O notation.

Two questions in the post-test were about this performance indicator. On average, 56% of the students answered the questions correctly, implying a developing assessment for this indicator. 50% of the students that completed the survey also gave this indicator a satisfactory grade but 50% did not give a grade for this indicator. This is not surprising since algorithm analysis was not taught in the curriculum until the year 2010-2011. The Assessment Committee decided to analyze material from the Data Structures (SICI 4036) course. Data had to be used from current semester since the instruments we had from previous semesters did not provided us with enough information to measure this performance indicator efficiently. Thus we analyzed Parts I and II of Quiz #3 of SICI 4036. On average, 64% of our students answered questions concerning this indicator in a satisfactory manner. The committee concluded that the achievement level for this performance indicator is on a developing level.

c. Apply mathematical concepts in the solution of a given problem.

Two questions in the post-test were about this performance indicator. On average, 50% of the students answered the questions correctly, implying a developing assessment for this indicator. All of the students that completed the survey gave this indicator a satisfactory grade. Since there is a discrepancy, the Assessment Committee decided to analyze material from the Operations Research (SICI 4028) course. The mean grade of all students in two sections of the Operations Research course on this first test was 72.5%. The committee concluded that the achievement level for this performance indicator is met.

CONCLUSIONS AND RECOMMENDATIONS

The committee concluded that this outcome was met. The committee recommends:

- During the academic year 2012-2013 we have strengthened the material related to indicator 2b. This has been achieved through the Data Structure course (SICI 4036).
- Performance indicator 2c could be reinforced. The committee recognizes that it must revise the wording of the questions in the post-test. We realized that the cause of low performance in the post-test may be the consequence of poor drafting of the exam.

The committee expects that these modifications to the courses' topics will enhance the level of achievement for this outcome. The committee envisions that these changes could be implemented in academic year 2013-2014.

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

a. Analyze a problem.

Two questions in the post-test were about this performance indicator. On average, 79% of the students answered the questions correctly, implying a satisfactory assessment for this indicator. All of the students that completed the survey gave this indicator a satisfactory grade. Therefore, the achievement level for this performance indicator was met.

b. Identify and define the computational requirements needed in a real situation.

Two questions in the post-test were about this performance indicator. On average, 77% of the students answered the questions correctly, implying a satisfactory assessment for this indicator. All of the students that completed the survey gave this indicator a satisfactory grade. Therefore, the achievement level for this performance indicator was met.

c. Choose the appropriate software and/or hardware tools to meet the desired goals.

Three questions in the post-test were about this performance indicator. On average, 60% of the students answered the questions correctly, implying a developing assessment for this indicator. All of the students that completed the survey gave this indicator a satisfactory grade.

The Accreditation and Assessment Committee concluded that the rubrics for the SICI 4038 Research Seminar Workshop do not provide data to measure this indicator.
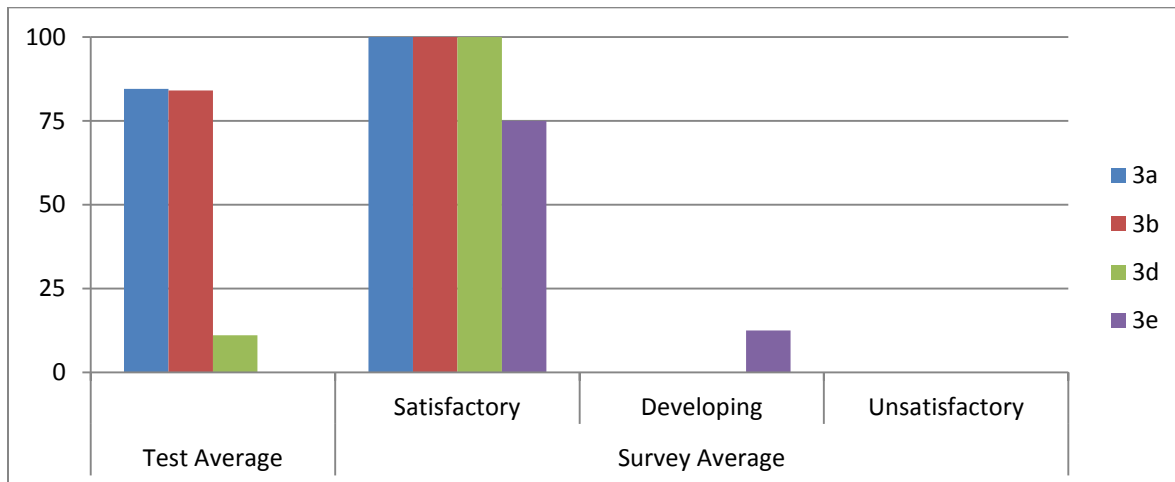
The committee concluded that this outcome was partially met. The committee recommends:

- Build some assessment tools to effectively measure the indicator 2c since the instrument used to measured performance indicator does not provide us with sufficient data to analyze it effectively. We interviewed the professors that administered SICI 4038 course. They concluded the students meet indicator 2c, since students use hardware and software tools to create conceptual diagrams (UML, ERD), organize their tasks (CPM, Gantt charts) and interpret their results (plots).

The committee expects that these modifications to the courses' topics will enhance the level of achievement for this outcome. The committee envisions that these changes could be implemented in academic year 2013-2014.

3. An ability to design, implement and evaluate a computer-based system, process, component or program to meet desired needs.

a. Design a solution for a given problem using the structured approach.

Two questions in the post-test were about this performance indicator. On average, 85% of the students answered the questions correctly, implying a satisfactory assessment for this indicator. All of the students that completed the survey gave this indicator a satisfactory grade. Therefore, the achievement level for this performance indicator was met.

b. Design a solution for a given problem using the object-oriented approach.

One question in the post-test was about this performance indicator. 84% of the students answered the questions correctly, implying a satisfactory assessment for this indicator. All of the students that completed the survey gave this indicator a satisfactory grade. Therefore, the achievement level for this performance indicator was met. A programming assignment (Assignment #1) was used to measure this performance indicator. The Computer Programming Grading Rubric was the instrument used to evaluate this assignment. Among the 40 students enrolled in two sections of the SICI 4036, a random sample of 10 assignments was chosen. The point average obtained by the students was 91%. This indicates a satisfactory achievement level. Therefore, this performance indicator was met.

c. Implement an algorithm using the appropriate programming language.

75% of the students that completed the survey gave this indicator a satisfactory grade. The Assessment Committee decided to analyze material from the Algorithms and Program Development II (COTI 3102) and the Data Structures (SICI 4036) courses. The instruments to measure the level of achievement of this performance indicator were a selection of exercises from the final exam related to the course Algorithms and Program Development II (COTI 3102) and the first homework of the Data Structures (SICI 4036) course. After analyzing the data obtained from COTI 3102 we obtained an average of 56% on these exercises. The analysis of the data obtained from course SICI 4036 showed that 85% of the students mastered this outcome. Therefore, the committee concludes that students are reaching this indicator since SICI 4036 is a sophomore course. The committee concluded that the achievement level for this performance indicator is met.

d. Implement abstract solutions using pseudo code, flowchart or natural language.

One question in the post-test was about this performance indicator. 11% of the students answered the questions correctly, implying a developing assessment for this indicator. All of the students that completed the survey gave this indicator a satisfactory grade. Since there is a discrepancy, the Assessment Committee decided to analyze material from the Algorithms and Program Development I (COTI 3101) course. In this course three exams are administered (Test 1, Midterm and Final). Questions relevant to implement abstract solutions using pseudo code,

flowchart or natural language were chosen from Test1 and Midterm. The students' achievement level for those questions on both exams was satisfactory (88%, 79%). Therefore, this performance indicator was met.
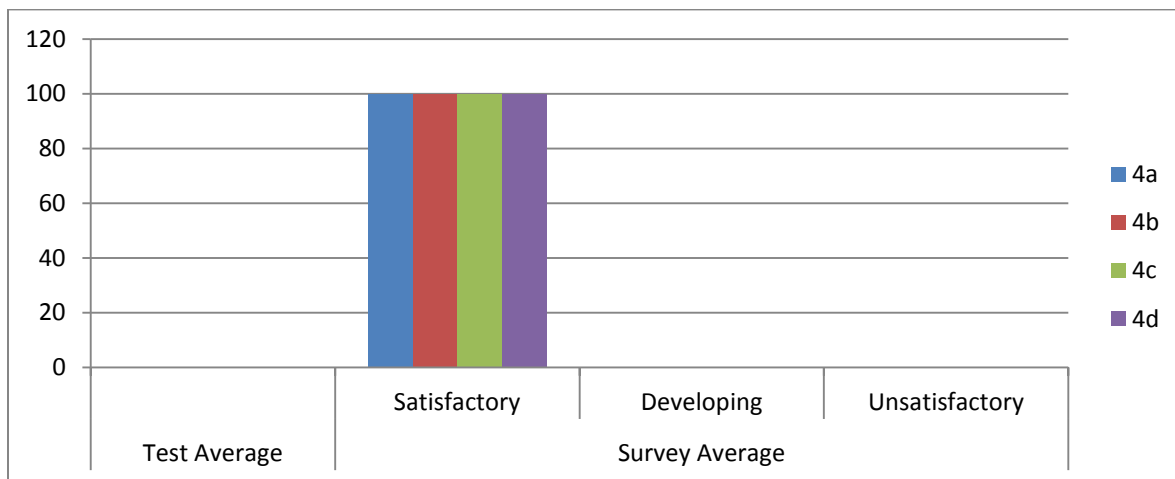
e. Perform both unit and systems testing.

75% of the students that completed the survey gave this indicator a satisfactory grade. Since this indicator was not included on the post-test, the Assessment Committee decided to analyze material from the Capstone course (Research Seminar Workshop, SICI 4038). The professors that teach this course told the Committee that they require students to perform on-the-spot testing at the moment they do their final presentation of their project but they are not required to present a testing plan nor a testing report. The Committee recommends that these documents should become a requirement for this course and for any other courses in which algorithms are implemented. Therefore, the achievement level for this performance indicator was met.

CONCLUSIONS AND RECOMMENDATIONS
The committee concluded that this outcome was met.

4. An ability to function effectively on teams to accomplish a common goal.

a. Evaluate a given problem within a team environment.

All of the students that completed the survey gave this indicator a satisfactory grade. Since this indicator was not included on the post-test, the Assessment Committee decided to analyze

material from the Systems Analysis and Design (SICI 3015) and the Data Communications (SICI 4037) courses. When the rubric for the final project of the Systems Analysis and Design course was analyzed, it was found that 76% of the students were graded as satisfactory. In addition, when the rubric for group class work of the Data Communications (SICI 4037) course was analyzed, it was found that 72% of the students were graded as satisfactory. The committee concluded that the achievement level for this performance indicator is met.

b. Perform the tasks assigned when working on a team.

All of the students that filled the survey gave this indicator a satisfactory grade. Since this indicator was not included on the post-test, the Assessment Committee decided to analyze material from the Systems Analysis and Design (SICI 3015) and the Data Communications (SICI 4037) courses. When the rubric for the final project of the Systems Analysis and Design course was analyzed, it was found that 76% of the students were graded as satisfactory. In addition, when the rubric for the group class work of the Data Communications course was analyzed, it was found that 80% of the students were graded as satisfactory. The committee concluded that the achievement level for this performance indicator is met.

c. Assist its teammates when needed.

75% of the students that completed the survey gave this indicator a satisfactory grade. Since this indicator was not included on the post-test, the Assessment Committee decided to analyze material from the Systems Analysis and Design (SICI 3015) and the Data Communications (SICI 4037) courses. When the rubric for the final project of the Systems Analysis and Design course was analyzed, it was found that 78% of the students were graded as satisfactory. In addition, when the rubric for group class work of the Data Communications course was analyzed, it was found that 74% of the students were graded as satisfactory. The committee concluded that the achievement level for this performance indicator was met.

d. Complete its duties assigned within a team environment.

All of the students that completed the survey gave this indicator a satisfactory grade. Since this indicator was not included on the post-test, the Assessment Committee decided to analyze material from the Systems Analysis and Design (SICI 3015) and the Data Communications (SICI

4037) courses. When the rubric for the final project of the Systems Analysis and Design course was analyzed, it was found that 73% of the students were graded as satisfactory. However, when the rubric for group class work of the Data Communications course was analyzed, it was found that 64% of the students were graded as satisfactory.   The committee concluded that the achievement level for this performance indicator was partially met.
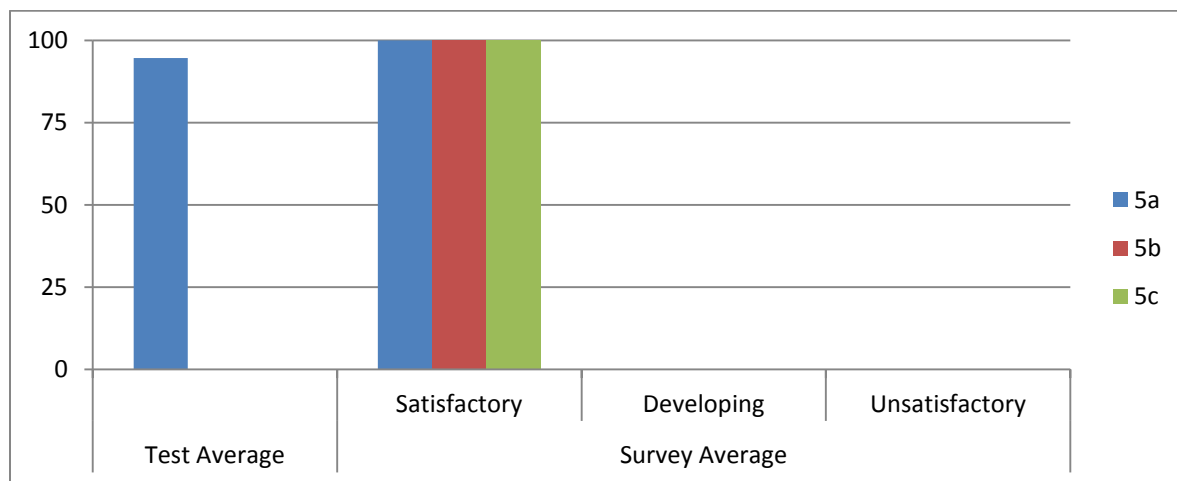
CONCLUSIONS AND RECOMMENDATIONS

The committee concluded that this outcome was met. The committee recommends:

- A time management and team building skill workshop should be developed and offered to the freshmen and sophomore students. This 3-hour workshop will be offered on the first semester 2013-2014.

The committee expects that these modifications to the courses' topics will enhance the level of achievement for this outcome. The committee envisions that these changes could be implemented in academic year 2013-2014.

5. An understanding of professional, ethical, legal, security and social issues and responsibilities.

a. Evaluate the ethical implications of an issue in the computing discipline.

Three questions in the post-test were about this performance indicator. On average, 96% of the students answered the questions correctly, implying a satisfactory assessment for this indicator.

All of the students that completed the survey gave this indicator a satisfactory grade. Therefore, the achievement level for this performance indicator was met.

b. Evaluate the social impact of a given computing technology.

All of the students that completed the survey gave this indicator a satisfactory grade. Since this indicator was not included on the post-test, the Assessment Committee decided to analyze material from the Algorithms and Program Development (COTI 3101-3102), Database Applications Programming (SICI 4030), Web Programming (COTI 4210) and the Data Communications (SICI 4037) courses. The Assessment Committee found out that, although material relevant to this indicator is covered in the courses mentioned, there were no proper measuring instruments. During the second semester for the academic year 2012-2013, 10 questions on the first test of in the Web Application Development course (COTI 4210) were used to measure this indicator. The students' average was 71.4%, which means that there is a developing level for this indicator.

c. Recognize the responsibilities inherent to the profession of computing.

All of the students that completed the survey gave this indicator a satisfactory grade. Since this indicator was not included on the post-test, the Assessment Committee decided to analyze material from the Systems Analysis and Design (SICI 3015) course. A rubric was used to analyze this performance indicator on the projects that the students submit in this class. On average, 82% of the students demonstrate attainment of this indicator. The committee concluded that the achievement level for this performance indicator is met.

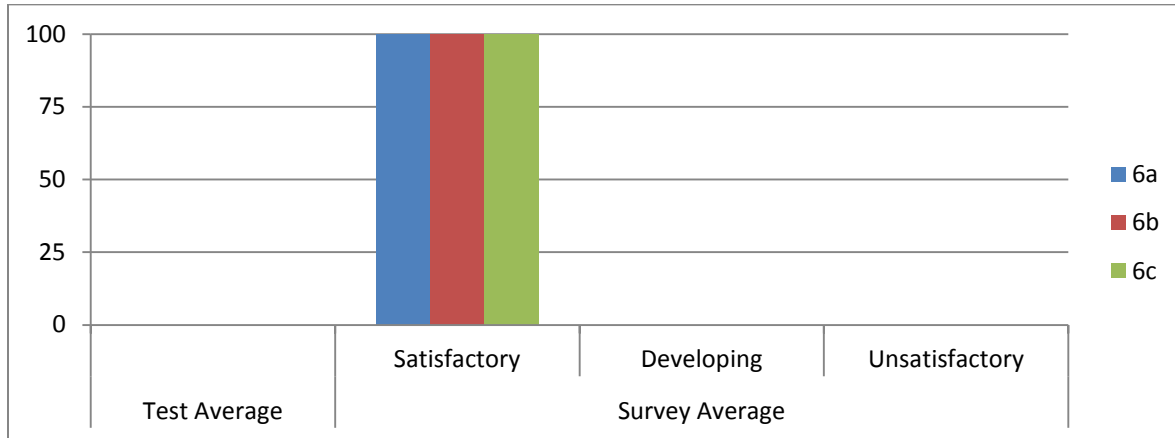## CONCLUSIONS AND RECOMMENDATIONS

The committee concluded that this outcome was partially met. The Committee recommends:

- A course in this area should be offered as part of the Information Systems program. We recommended a seminar that includes the topics of ethics and social impact of computing technology. This course has been named *Information, Computers and Society Seminar* (COTI 3XXX). Its syllabus has been drafted. The course is in the process of creation and it will be part of our curriculum revision.

- Developing proper instruments for measuring the social impact of computing technology through the courses. This change will be implemented in Data Communications (SICI 4037) course.

The committee envisions that these changes be implemented in academic year 2013-2014.

6. An ability to communicate effectively with a range of audiences.

a. Present different topics both orally and in writing.

All of the students that completed the survey gave this indicator a satisfactory grade. Since this indicator was not included on the post-test, the Assessment Committee decided to analyze material from the Systems Analysis and Design (SICI 3015) course for oral communication skills and Computer Architecture (SICI 4019) for writing skills. When the rubric from the Systems Analysis and Design course was analyzed, 87% of the students showed a satisfactory performance. The rubric from the Computer Architecture course showed a 77% satisfactory level. The committee concluded that the achievement level for this performance indicator was met.

b. Explain technical concepts using the correct terminology.

All of the students that completed the survey gave this indicator a satisfactory grade. The Assessment Committee decided to analyze material from the Systems Analysis and Design (SICI 3015) course for oral communication skills and Computer Architecture (SICI 4019) for writing skills. When the rubric from the Systems Analysis and Design course was analyzed, 73% of the

students showed a satisfactory performance. The rubric from the Computer Architecture course showed a 77% satisfactory level. The committee concluded that the achievement level for this performance indicator was met.
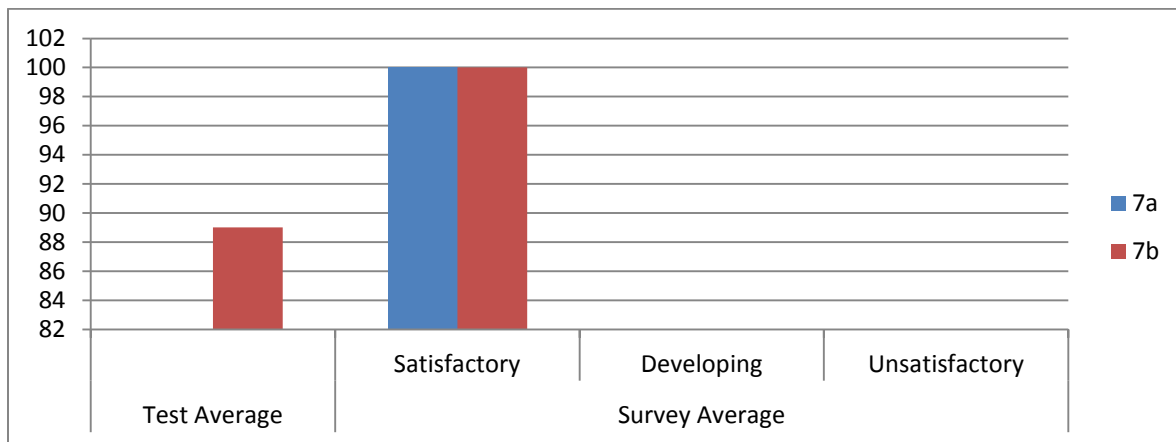
c. Display knowledge of technical report writing skills.

All of the students that completed the survey gave this indicator a satisfactory grade. The Assessment Committee decided to analyze material from the Computer Architecture (SICI 4019) and the Capstone courses (Research Seminar Workshop, SICI 4038). The rubric from the Computer Architecture course shows a 60% satisfaction on this indicator. The rubric from the Research Seminar Workshop, SICI 4038, shows 92% satisfaction on this indicator. The committee concluded that the achievement level for this performance indicator was met.

CONCLUSIONS AND RECOMMENDATIONS

The analysis from the Research Seminar Workshop SICI 4038 course is very conclusive that the students meet this outcome.

7. An ability to analyze the local and global impact of computing on individuals, organizations and society.

a. Identify the contribution of computing and other related professionals to society.

All of the students that completed the survey gave this indicator a satisfactory grade. The committee recognizes professors discuss the contribution made by the many computer science

pioneers in some courses through the program. However, at present we could not find the appropriate evidence to analyze more thoroughly this indicator.

b. Understand computational or technological advances and their impact to the profession.

One question in the post-test was about this performance indicator. 89% of the students answered the questions correctly, implying a satisfactory assessment for this indicator. All of the students that completed the survey gave this indicator a satisfactory grade. Therefore, the achievement level for this performance indicator was met.
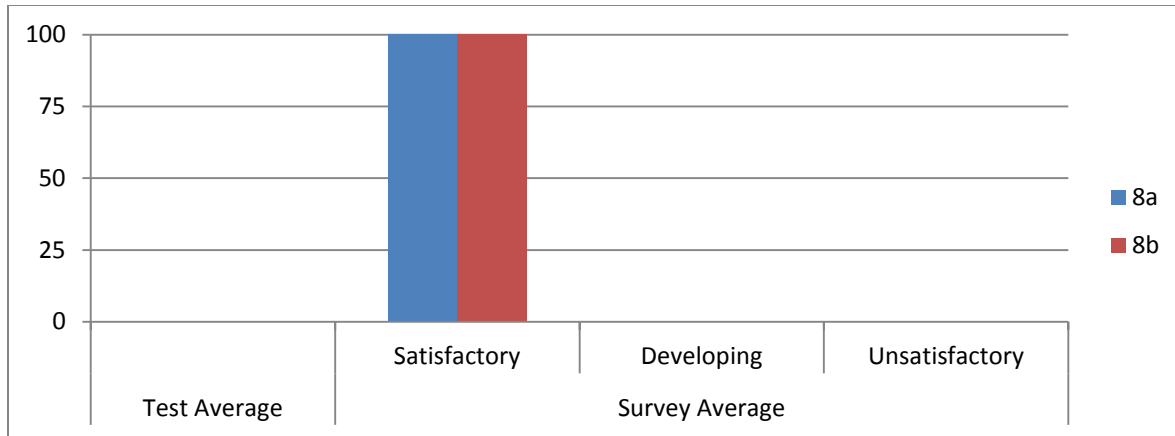
CONCLUSIONS AND RECOMMENDATIONS

The committee concluded that this outcome was partially met. The Committee recommends:

- Developing suitable instruments to measure indicator 7a. As part of the assessment analysis, the committee found out that this indicator was not measured in all courses that were indicated in the self-study. We recommend that professors measure the indicator as part of the coursework for a smaller number of courses, such as Information Systems Analysis and Design (SICI 3015), Computer Architecture (SICI 4019), Database Programming (SICI 4030), Data Communications (SICI 4037). This will make it easier for the committee to analyze the relevant data.

- Developing more post-test questions to measure indicator 7b. This would be implemented for the next assessment cycle, preferably starting with the post-test that students in the Capstone course (SICI 4038) would be taking at the end of this semester.

- Developing a seminar that includes the topics of ethics and social impact of computing technology as part of the curriculum. We recommended to include the course *Information, Computers and Society Seminar* (COTI 3XXX) to address the issues on outcome 5. The course is in the process of creation and it will be part of our curriculum revision. The committee understands that this course may also be used to address the issues on outcome 7.

The committee envisions that these changes be implemented in academic year 2013-2014.

8. Recognition of the need for and an ability to engage in continuing professional development.

All of the graduating students that completed the survey gave this indicator a satisfactory grade. It is important to note that our students continually receive orientations about their possibilities of continuing graduate studies. The Management of Computer Information Systems and Computer Science Graduate Program of the Polytechnic University of Puerto Rico as well as the Computer and Information Science and Engineering Graduate Program of the University of Puerto Rico at Mayaguez have held annual orientations about their programs. Also, we have compiled sufficient recommendation letters written by faculty members that endorse students for graduate school. Moreover, some of our students have participated in the NSF programs of Summer Research for Undergraduates Program on some of the universities at the States. Those alumni that answered their survey indicated that 24% have pursuit graduate studies and 56% have engaged in continuing professional development. Therefore, the achievement level for this outcome was met.

CONCLUSIONS AND RECOMMENDATIONS

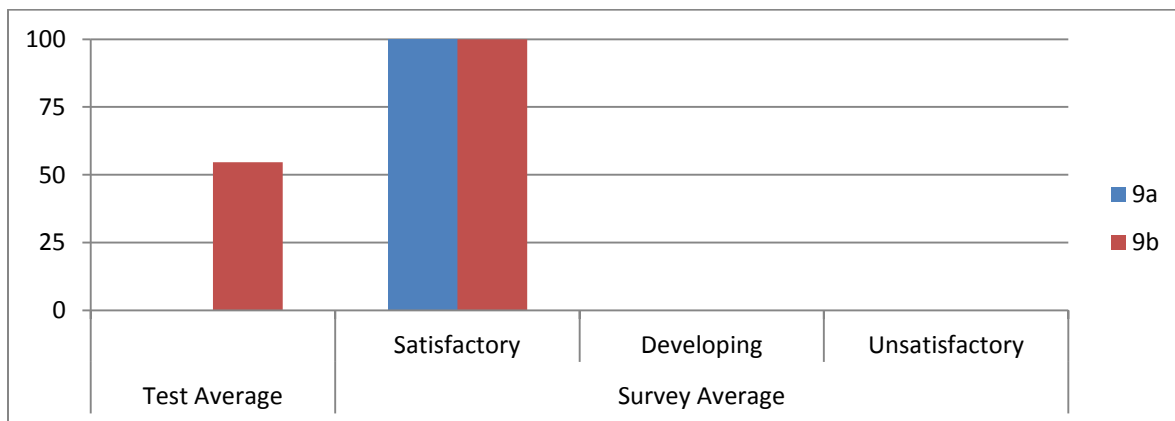The committee concluded that this outcome was met. The Committee recommends:

- Reviewing the syllabi for relevant courses to address this issue. Although this outcome was met, the committee recognized that there are no appropriate tools to measure this outcome efficiently in the following courses: Information Systems Analysis and Design (SICI 3015), Computer Architecture (SICI 4019), Fundamentals of Operating Systems (SICI 4029), Data Communications (SICI 4037), and Research Workshop (SICI 4038). It

seems that we are providing the necessary knowledge to students throughout the program, but we are not measuring them on these courses.

- Review the performance indicators that are part of this outcome.
- Developing suitable instruments to measure this outcome. As part of the assessment analysis, the committee found out that this indicator was not measured in all courses that were indicated in the self-study. This will make it easier for the committee to analyze the relevant data.

The committee envisions that these changes be implemented in academic year 2013-2014.

9. An ability to use current techniques, skills and tools necessary for computing practices.

a. Use hardware and software tools currently available.

All of the students that completed the survey gave this indicator a satisfactory grade. The Assessment Committee decided to analyze material from SICI 4036. A rubric was used to collect the observations of professors who teach this course. 93% of students demonstrated mastery on using the hardware and software tools. Therefore, the achievement level for this outcome was met.

b. Recognize emerging technologies and their implication to the practice of the profession.

Three questions in the post-test were about this performance indicator. On average, 55% of the students answered the questions correctly, implying a developing assessment for this indicator.

All of the students that completed the survey gave this indicator a satisfactory grade. This means that there is a developing assessment for this indicator.
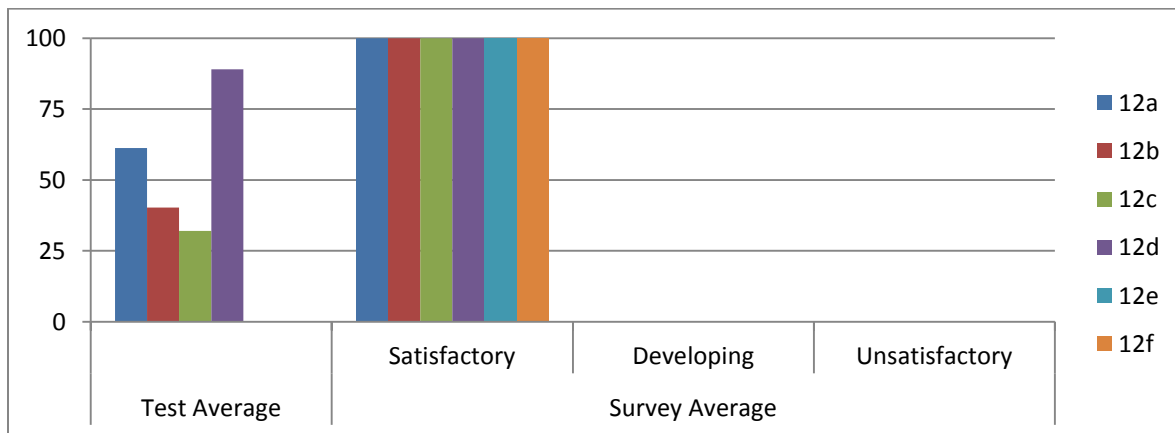
CONCLUSIONS AND RECOMMENDATIONS

The committee concluded that this outcome is met. The committee recommends:

- Include a new course of *Fundamentals of Information Systems* (SICI 3211), where we strengthen the topics of emerging technologies and their implications in the practice of the profession.
- The curricular revision will include this course.

The committee envisions that these changes be implemented in academic year 2013-2014.

12. An understanding of processes that support the delivery and management of information systems within a specific application environment.

a. Display basic knowledge of accounting and management principles.

Three questions in the post-test were about this performance indicator. On average, 61% of the students answered the questions correctly, implying a developing assessment for this indicator. All of the students that completed the survey gave this indicator a satisfactory grade. Since, there is a discrepancy, the Assessment Committee decided to analyze material from the Project

Management (COTI 4430) course. After analyzing the course COTI 4430 the committee found that there is not enough assessment instruments to measure this indicator.

b. Analyze the information flow in an organization.

Three questions in the post-test were about this performance indicator. On average, 40% of the students answered the questions correctly, implying a developing assessment for this indicator. All of the students that completed the survey gave this indicator a satisfactory grade. Since, there is a discrepancy, the Assessment Committee decided to analyze material from the Systems Analysis and Design (SICI 3015), Information System Project Management (COTI 4430) and Capstone (Research Seminar Workshop, SICI 4038) courses. A rubric was developed to analyze this performance indicator on the projects that the students submit on the Analysis and Design course (SICI 3015) a sophomore course. On average, 64% of the students demonstrate attainment of this indicator. The data collected from the course COTI 4430 (junior course) show a 71% of attainment of this indicator. All of the students showed attainment of this indicator on the capstone course SICI 4038 (senior course). Therefore, the achievement level for this outcome was met.

c. Understand the process operations within an organization.

One question in the post-test was about this performance indicator. On average, 32% of the students answered the questions correctly, implying a developing assessment for this indicator. All of the students that completed the survey gave this indicator a satisfactory grade. Since, there is a discrepancy, the Assessment Committee decided to analyze material from the Systems Analysis and Design (SICI 3015) and Capstone (Research Seminar Workshop, SICI 4038) courses. A rubric was developed to analyze this performance indicator on the projects that the students submit on the Analysis and Design course (SICI 3015). On average, 73% of the students demonstrate attainment of this indicator. After analyzing the results obtained from SICI 4038, 66% of the students show a satisfactory grade. Therefore, the committee classifies this performance indicator as developing.

d. An ability to discern between a transactional, management of information and decision support system. One question in the post-test was about this performance indicator. On average, 89% of the students answered the questions correctly, implying a satisfactory assessment for this indicator. All of the students that completed the survey gave this indicator a satisfactory grade. Therefore, the achievement level for this performance indicator was met.

e. Recommend viable solutions using computer systems as a main solution.
All of the students that completed the survey gave this indicator a satisfactory grade. Since this indicator was not included on the post-test, the Assessment Committee decided to analyze material from the Project Management (COTI 4430) and Capstone (Research Seminar Workshop, SICI 4038) courses. A rubric for the course COTI 4430 was used to measure this performance indicator. On average 78% of the student showed attainment of this performance indicator. Therefore, the achievement level for this performance indicator was met.

f. Construct an information system.
All of the students that completed the survey gave this indicator a satisfactory grade. Since this indicator was not included on the post-test, the Assessment Committee decided to analyze material from the Project Management (COTI 4430) course. A rubric for the course COTI 4430 was used to measure this performance indicator. All students showed attainment of this performance indicator. Therefore, the achievement level for this performance indicator was met.

CONCLUSIONS AND RECOMMENDATIONS
The committee concluded that this outcome is met. The committee recommends:
- To measure the indicator 21a in courses Introduction to Accounting Fundamentals I (CONT 3105) and Introduction to Accounting Fundamentals II (CONT 3106). The course COTI 4430 (Information Systems Project Management) is not the most appropriate for assessing indicator 12a.
- Strengthen the indicator 12c adding case studies in the courses SICI 3015 and COTI 4430. The course SICI 4038 will include UML and other models diagrams to measure indicator 12c.

- The creation of assessment instruments to measure the indicator 12c in Business Administration courses.

The committee envisions that these changes be implemented in academic year 2013-2014.