

**Institute of Statistics and Computerized Information Systems
Faculty of Business Administration**



**Proposed modifications to SICI educational objectives,
learning outcomes, performance criteria and rubrics**

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Introduction

During the implementation of a project, it is typical that several changes to the project design show up. My experience designing systems and working in complex projects has shown me that, unless these changes are “show stoppers”, it is better to document them and wait until a proper moment to incorporate them into the design. Otherwise, you may get into a “never-ending-changing-cycle” which weakens the original design and threatens the success of the project.

The pilot implementation of the SICI assessment process produced some potential modifications for this process. Also, my recent attendance to an ABET assessment workshop in Baltimore¹ provided me ideas and information for some additional modifications. The time has come to incorporate these changes.

Scope of modifications

Proposed modifications consist mostly of the following:

1. A reorganization between outcomes and performance criteria, by shifting some details from outcomes to performance criteria, and merging some outcomes.
2. Increasing the emphasis of some outcomes, like communications and teamwork.
3. Modification of some of the verbs used.

None of the original outcomes were eliminated and no “totally new” outcome was added.

Rationale for the modifications

The main reasons to propose these modifications are:

1. To obtain a closer mapping between our outcomes and ABET's².
2. To emphasize outcomes on teamwork and communication. Right now these outcomes are bundled in just one outcome, together with ethics and interpersonal relationship.

¹ “Empower Your Assessment Leader Through IDEAL”, Institute for the Development of Excellence in Assessment Leadership, ABET, Baltimore, Maryland

² Originally, ABET did not allow accreditation candidates to use ABET's outcomes. According to Gloria Rogers, that position has been changing, and now it is allowed to use them. But still the alternative of defining particular outcomes and mapping them to ABET's is used by many universities.

3. To reduce the level of detail on “hard outcomes”, particularly the ones related to tools (# 4, 5, 6 and 7, all of them related to objective #2).
4. To establish a clearer difference between outcomes # 4, 5, 6 and 7 (all of them related to objective #2) and performance criteria # 4, 5, 6 and 7. Right now they look quite similar, maybe because the “hard outcomes” are too detailed.
5. To simplify assessment. If the number of outcomes is reduced, we will have to prepare fewer rubrics. And, if outcomes are phrased in a less detailed way, we will have more flexibility when mapping them to courses.
6. To improve some of the verbs used, as well as to reduce the use of compound verbs.

Approach recommended

In order to expedite the analysis and approval of the modifications without disrupting the whole project, we recommend the following approach:

1. Try to minimize changes to the rubrics already prepared and the data already collected. We have to be very careful in order to accomplish this.
2. Preserve the usefulness of rubrics both for grading projects and for assessing outcomes. To the extent that rubrics are only useful for assessment, professors may not be inclined to use them.
3. Perform changes in the English version first, and then translate them into Spanish.
4. Review and approve changes at the ABET Committee level. The fact that changes are mostly related to organization and level of detail justifies this approach.

Modifications to educational objectives

Our educational objectives are closely related to the professional characteristics that IS2002 identifies for Information Systems professionals³. Since the objectives have this solid foundation, few changes are recommended.

1. Reduce the use of verbs in objective #1. One way to do it is to use only the verbs belonging to the highest cognitive levels.

³ ACM, AIS y AITP (2002). IS 2002: Model Curriculum and Guidance for Undergraduate Degree Programs in Information Systems, pages 6 and 7

- Eliminate in objective #3 the restriction stated by the phrase “**organizational context**”, in order to allow for the context outside the organization. The local and global context will be addressed later on in a modification proposed to outcome #8.

Before	After
1. To select, design, implement, operate information systems in an organization.	1. To implement and manage the development of information systems in an organization.
3. To take into consideration the organizational context in which information systems operate, when selecting, implementing and managing information systems.	3. To take into consideration the context in which information systems operate, when implementing and managing these systems. (Note: Local and global context will be addressed in a modification proposed to outcome #8.)

Modifications to student outcomes (previously called “learning outcomes”)

As we said before, the proposed modifications to outcomes are mostly oriented to obtain a closer mapping between our outcomes and ABET’s, and to reduce the level of detail, leaving the details to the performance criteria. The specific changes being proposed are the following:

- Merge all outcomes related to objective #2⁴ into a single one. This way the difference between our outcomes and our performance criteria will be clearer, and our outcomes will be closer to ABET’s. Also, assessment will be simplified because it will be easier to assess just one outcome than four.

Before	After
4. To design a technological infrastructure, consisting of hardware, software and communications networks, to support the operation of an information system.	4. To use current techniques, skills, tools and best practices to design, implement and manage information systems.
5. To design the automated processes that compose an information system, like data validation, data base updates, data inquiries and report writing.	(Already included in performance criteria #5.)
6. To apply the principles and techniques that should be taken into consideration when designing data bases.	(Already included in performance criteria #6.)
7. To define the data communications requirements to implement and effectively operate an information system.	(Already included in performance criteria #7.)

⁴ Objective # 2: “To apply technological, analytical, and critical thinking skills in the solution of problems related to information systems within organizations.”

Before	After

2. Address the “local and global perspective”, together with the organizational context, in outcome number 8. ABET requires this in one of the outcomes, and we can easily make this change in this outcome. The second part of the outcome was eliminated because it is redundant with the performance criteria.

Before	After
8. To recognize the importance that organizational aspects have in the success of information systems, and to identify ways in which these aspects should be addressed.	8. To understand the impact that organizational, local and global environments have in the implementation and management of information systems.

3. To emphasize the ability to work in teams and the ability to communicate, by defining a separate outcome for each. ABET has separate outcomes for each of these abilities, and they put a lot of emphasis on them. We have both of them embedded in just one outcome, which also includes ethical values and interpersonal relationships.

Before	After
11. To recognize the importance of ethical values, interpersonal relationships, communication, and teamwork in an information systems professional.	11. To recognize the importance of ethical values and interpersonal relationships in an information systems professional.
	12. To communicate effectively with a range of audiences.
	13. To function effectively in teams seeking to accomplish a common goal.

Modifications to performance criteria

ABET allows a great deal of flexibility in defining performance criteria. We don't have to map our performance criteria to ABET's. First, because they don't prescribe performance criteria. Second, because they don't even require the program to have these criteria. But of course, we need to define performance criteria in order to be able to use direct assessment methods. Also, if we want to provide feedback to students regarding their performance, we need performance criteria at some level of detail.

1. Define the performance criteria corresponding to the two new outcomes (communication and teamwork).

Before	After
(None)	12. To prepare written reports and oral presentations related to information system topics.
(None)	13. To demonstrate ability to work effectively in task-oriented groups, like information system project teams.

2. Merge performance criteria # 9 and 10 into only one, and focus it towards a deliverable that will include both, as we did with most other performance criteria.

Before	After
9. To identify and evaluate the implications of risk factors in information systems.	9. To prepare a disaster recovery plan for the information system operations of an organization.
10. To describe general controls applicable to the information system function in organizations, as well as specific controls for applications.	(Merged into proposed outcome #9. A disaster recovery plan includes both general and application controls.)

3. Eliminate performance criteria #13. We already defined a particular performance criterion for teamwork, so there is no need to keep this one. Consider using it as one of the questions for an exit interview.

Before	After
13. To classify the projects prepared throughout the different courses as "individual" or "group", and to indicate to what extent the interaction with other people improved those projects.	(We already proposed a particular performance criterion for teamwork (#13). Teamwork may also be assessed through a question in the exit interview, if necessary.)

Modifications to verbs

Although it is correct to have compound verbs, it is convenient to minimize their use. One way to do it is to eliminate the verbs that belong to the lowest cognitive levels, and keep the ones belonging to the highest. Proposed verb changes are already incorporated to the objectives, outcomes and performance criteria in the following table. Words eliminated are identified within parenthesis and underlined>. New words are highlighted in bold.

Modifications to rubrics

Modifications to rubrics due to changes in outcomes and performance criteria will be minimal. As stated before, modifications to outcomes consisted mostly of a reorganization and

changes in emphasis, therefore rubrics already incorporate some characteristics to assess all modified outcomes. Of course, rubrics may have to be reviewed, but this review can be part of the continuous improvement process.

SICI “constitutional” table with proposed modifications already incorporated

The following table contains all the proposed modifications. It also contains, at the end of each outcomes, a mapping with ABET’s outcomes (presented in Appendix 1).

<p style="text-align: center;">University of Puerto Rico Faculty of Business Administration, Information Systems Major “SICI Constitutional Table” Educational objectives, student outcomes and performance criteria (including modifications) Prof. A. Ramos</p>		
<p>Educational objectives (What the graduate must accomplish in the first few years (3 to 5) of his professional career.)</p>	<p>Student outcomes (What the student must know, value, and be able to do, at the time of his graduation, which will enable him to achieve the educational objectives.)</p>	<p>Performance criteria (What the student must be able to do, or to produce, in order to show that he complies with the learning outcomes.)</p>
<p>1. To (select, design) implement (operate) and manage <u>the development of</u> information systems in an organization.</p>	<p>1. To analyze an operation within an organization, identify problems and make recommendations to solve these problems. (a?, b, j)</p>	<p>1. To prepare functional, technical, and other requirements for an information system that solves the problems identified in an operation. (4025)</p>
	<p>2. To select or design a system to solve the problems identified in an operation. (a?, c, j)</p>	<p>2. To design the components of an information system based on the functional requirements prepared for that system. (4025)</p>
	<p>3. To plan and supervise the implementation of a system that solves the problems identified in an operation. (a?, c, j)</p>	<p>3. To (prepare) <u>develop</u> a plan to implement an information system, including the phases and activities that this process requires. (4278)</p>
<p>2. To apply technological, analytical, and critical thinking skills in the solution of problems related to information systems in organizations.</p>	<p>4. To use current techniques, skills, tools and best practices to design, implement and manage information systems. (a, c, i)</p>	<p>4. To identify the hardware, software and data communication components needed to operate an information system, and to integrate them in a technological solution. (3245)</p>
		<p>5. To (prepare) <u>code</u>, test, and document computer programs to perform the automated processes that compose a system, using modern programming tools. (3255, 4266)</p>

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Educational objectives (What the graduate must accomplish in the first few years (3 to 5) of his professional career.)	Student outcomes (What the student must know, value, and be able to do, at the time of his graduation, which will enable him to achieve the educational objectives.)	Performance criteria (What the student must be able to do, or to produce, in order to show that he complies with the learning outcomes.)
		6. To design a properly normalized database based on requirements prepared by systems analysts or by users. (4015)
		7. To identify the components of a communications network, mention the main characteristics of these components, and to present the way they integrate into a network. (4286)
3. To take into consideration the (organizational) context in which information systems operate, when (selecting) , implementing and managing (information) these systems.	5. To understand the impact that organizational, local and global environments have in the implementation and management of information systems. (g, j)	8. To (identify) <u>analyze</u> administrative, organizational, local and global aspects that affect information systems, and to define strategies to deal with these aspects. (4278, 4266)
	6. To value the protection of information system resources in an organization, and to identify ways in which this protection can be achieved. (e, j)	9. To prepare a disaster recovery plan for the information system operations of an organization. (Note: We can use the same rubric we use now.) (4275)
4. To maintain his professional expertise by updating his knowledge in technology and information systems.	7. To be aware of the high level of change in the Information Systems field, and the need to use different mechanisms to update his knowledge. (h)	10. To get related with professional associations, publications and Continuing Education alternatives in the geographic area where he lives or works. (Will require a rubric for exit interview.) (exit interview)

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<p>Educational objectives (What the graduate must accomplish in the first few years (3 to 5) of his professional career.)</p>	<p>Student outcomes (What the student must know, value, and be able to do, at the time of his graduation, which will enable him to achieve the educational objectives.)</p>	<p>Performance criteria (What the student must be able to do, or to produce, in order to show that he complies with the learning outcomes.)</p>
<p>5. To perform his functions showing respect and appreciation for ethical values, interpersonal relationships, communication, and team work.</p>	<p>8. To recognize the importance of ethical values and interpersonal relationships in an information systems professional. (e)</p>	<p>11. To identify and evaluate ethical and interpersonal relationship aspects related to information system professionals. (Will require a rubric for exit interview.) (exit interview)</p>
	<p>9. To communicate effectively with a range of audiences. (f)</p>	<p>12. To prepare written reports and oral presentations related to information system topics. (3245, 4025, 4275)</p>
	<p>10. To function effectively in teams seeking to accomplish a common goal. (d)</p>	<p>13. To demonstrate ability to work effectively in task-oriented groups, like information system project teams. (Will require a rubric for exit interview.) (4278 and exit interview)</p>

Appendix 1

ABET's Computing Accreditation Criteria (2007-08 Accreditation Cycle)	
Criterion 2: Program Educational Objectives	
The program has documented, measurable educational objectives that are based on the needs of the program's constituencies.	
Criterion 3: Program Outcomes	
The program has documented, measurable outcomes that are based on the needs of the program's constituencies.	
The program enables students to achieve, by the time of graduation:	
(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 within a specific application environment

