Institute of Statistics and Computerized Information Systems
Faculty of Business Administration

End of Cycle Evaluation of Outcome and Educational Objective Assessment Results
(August 2009 – May 2011)

Prepared by:

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Introduction

Our Computer Information Systems (CIS) program went through a major redesign process during 2007-08. This process was based in the IS 2002 model curriculum, ABET's requirements and the experience of professors and alumni with the previous curriculum. Among other things, the new design included a careful alignment between course contents, student outcomes and educational objectives, and defined an assessment methodology to ensure that the attainment of educational objectives and student outcomes was properly measured. It also established "Project-based learning" as our main educational strategy. The new design was finally approved in May 2008 and its implementation began in January 2009.

As of August 2011 we have performed assessment in all semesters since the beginning of the new curriculum. In January 2009 we performed a pilot assessment process, which we used to test and refine our assessment methodology[1]. From August 2009 to January 2011 we have assessed all our student outcomes several times, and each one of them has been assessed with more than one method.

We believe now is a good time to close an assessment cycle. Although we have produced assessment reports for each semester, we believe it is appropriate at this point to prepare a report summarizing the assessment results for the two-year period and presenting the trend for the period.

Summary of the outcome assessment process

"To assure continuous improvement of the CIS program, as Figure 3-C-1 shows, the assessment process is carried out in periodic cycles composed of three phases: assessment, evaluation, and implementation of actions to improve the program, including the revision of educational objectives and/or student outcomes. This cycle takes two years and will close with the Advisory Board meeting this August. Next cycle will include an evaluation of the curriculum mapping to the IS 2010 Model Curriculum.

[1] Since it was a pilot process, we are not presenting the results produced in that semester. But these results are consistent with results obtained in other semesters.

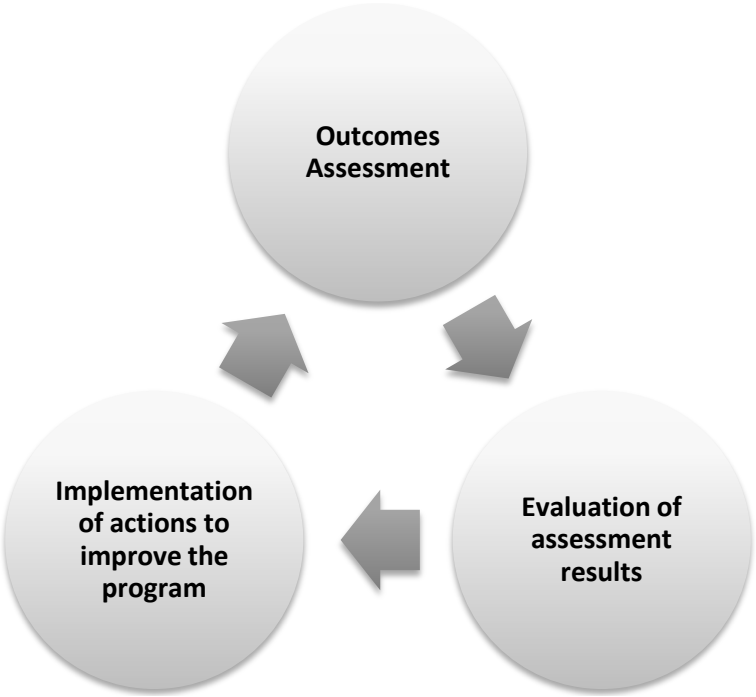

Figure 3-C -1 CIS Outcome Assessment Cycle

The assessment or data gathering phase includes three strategies: course embedded performance methods (course projects and short essays), exit interviews and graduating senior surveys. Each semester, course embedded measurements are made in all courses; the resulting data is entered by each professor in a specially designed Excel form for rubrics. In turn, the rubrics in Excel are submitted to the assessment coordinator, who combines all, linking them with another Excel workbook to produce a combined outcomes report. Individual exit interviews and graduating senior surveys are carried at the end of the student's last semester.

The evaluation phase is completed every two years and includes partial limited-evaluations carried out every semester in the cycle. Semester outcomes results, compiled from course embedded data gathered by faculty, are used to produce an assessment report which contains assessment results, an evaluation draft and recommendations. At the beginning of the following semester the report is discussed in a meeting with the CIS Program faculty to receive their recommendations and proposed actions. Some actions, such as changes to rubrics, emphasis on a particular topic, changes in teaching strategies or to the project specifications, agreed upon by the professors at the meeting may be implemented on the following semester.

At the end of the two year cycle a summary report, containing all findings during the cycle, is produced by the assessment coordinator and considered by the program faculty and by the Advisory Board early in the semester. The report may also contain proposed revisions to outcomes to be considered in the meeting. The next Advisory Board meeting is scheduled for the end of August 2011."[2]

[2] Self-Study 2011, BBA Program in Computer Information Systems

Evaluation of Outcome Assessment results

1. **Overall outcome attainment.** As can be seen from the following table, overall outcome attainment has been very good throughout all four semesters, except for outcome #2. The lowest attainment rate (excluding outcome #2) was 73.33, for outcome #8, and 100, for several outcomes. For outcome #2 the lowest percentage was 36.36, but this percentage increased to 92.86 in August 2011 and to 91.15 in January 2011. The main contributors to the results in outcome #2 are two projects prepared in COIS 4025 and COIS 4266, a COOP Employer Survey and a Graduating Senior Survey. (The individual contributions of these methods can be seen in Appendix 1.)

Outcome	Percentage of attainment			
	Aug 2009	Jan 2010	Aug 2010	Jan 2011
1. To analyze an operation within an organization, identify problems and make recommendations to solve these problems.	100.00	100.00	100.00	100.00
2. To select or design a system to solve the problems identified in an operation.	36.36	64.29	92.86	91.15
3. To plan and supervise the implementation of a system that solves the problems identified in an operation.	N/A	100.00	N/A	100.00
4. To use current techniques, skills, tools and best practices to design, implement and manage information systems.	98.22	100.00	82.95	88.69
5. To understand the impact that organizational, local and global environments have in the implementation and management of information systems.	85.72	100.00	100.00	95.42
6. To value the protection of information system resources in an organization, and to identify ways in which this protection can be achieved.	N/A	75.00	N/A	94.44
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.	N/A	85.72	100.00	93.75
8. To recognize the importance of ethical values and interpersonal relationships in an information systems professional.	100.00	100.00	80.30	73.33
9. To communicate effectively with a range of audiences.	100.00	99.13	100.00	86.11
10. To function effectively in teams seeking to accomplish a common goal.	N/A	77.78	83.33	100.00

2. **Contribution of individual methods to outcome attainment.** Appendix 1 presents a table with the individual contribution of each method used to assess each outcome. Most attainment rates of the individual methods were consistent with the overall attainment rate for the outcome, except for outcome #2. The following table presents the data that we want to emphasize about the contribution of some individual methods.

Outcome	Assessment Method	Percentage of attainment			
		Aug 2009	Jan 2010	Aug 2010	Jan 2011
2. To select or design a system to solve the problems identified in an operation.	Project in COIS 4025	36.36	42.86	85.71	87.50
4. To use current techniques, skills, tools and best practices to design, implement and manage information systems.	Project in COIS 4285	N/A	N/A	N/A	57.14
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.	Short essay in COIS 4278	N/A	71.43	N/A	75.00
8. To recognize the importance of ethical values and interpersonal relationships in an information systems professional.	Project in COIS 4275	N/A	100.00	N/A	00.00
10. To function effectively in teams seeking to accomplish a common goal.	Short essay in COIS 4998	N/A	66.67	50.00	100.00

a. **Contribution of the project in COIS 4025 to the attainment of outcome #2.** This is probably the main challenge that we faced during the cycle. The ABET Committee has been watching it for several semesters. The professor in charge of this course has implemented several corrective actions in course contents and educational strategies, like reviewing preliminary versions of the projects, providing feedback to students, allocating more time to the topic on logical design in COIS 4025, and starting the discussion of this topic earlier in the semester. As can be seen from the table, the contribution of this method increased from 36.36 in August 2009 to 85.71 in August 2010, and to 87.50 in January 2011, which clearly evidences the effect of the improvements implemented by Prof. María del R. Rodríguez-Orellana.

b. **Contribution of the assessment method in COIS 4285 to the attainment of outcome #4.** The percentage for this method was 57.14 in the semester of January 2011, which needs to be improved. The professor explained that this was the first time this project was assigned in this course, that students waited until the very end to work on the project and that the rubric has fewer characteristics (detailed performance criteria) than others, therefore the impact of not attaining one of them is higher. The professor plans to assign the project earlier in the course, to follow up more closely on student performance and to provide more student feedback. He also proposes to split some of the characteristics currently used in the rubric into two or more, so that the individual weight of each one is reduced.

c. **Contribution of the assessment method in COIS 4278 to the attainment of outcome #7.** The percentage for this method slightly increased from 71.43 to

75. The professor of this course has stated that although students are very much aware of the high level of change in the IS field, they take this for granted and sometimes don't evidence it in the assessment method. Although the attainment rate of 75 is not a problem, this situation should be addressed in the assessment method for this outcome next time the course is offered.

d. **Contribution of the assessment method in COIS 4275 to the attainment of outcome #8.** The percentage of attainment for this method went from 100.00 to 0. The professor of this course stated that students did not explicitly address ethics in the project, although implicitly they did it. This situation should be closely watched in the assessment method for this outcome next time the course is offered.

e. **Contribution of the assessment method (short essay) in COIS 4998 to the attainment of outcome #10.** The professor in charge of this course believes that this situation was incidental. It was mostly due to the fact that some students omitted (or addressed shallowly) in their essays, the part that contributes to support this outcome.

f.

g.

3. **Dropouts.** The number of dropouts, incompletes and failures in COIS 3255 has been consistently high (above 40%) throughout all four semesters. Although we consider dropouts to be out of the scope of the assessment process, since these students are not included in the assessment sample, it is an issue that we need to address anyway.

Total enrollment, dropouts and attainment rate for SICI 3255				
Semester	**Total students**	**Dropouts**	**Dropouts (%)**	**Attainment (%)**
Aug – Dec 09	25	13	52%	100.00%
Jan – May 10	31	17	55%	100.00%
Aug – Dec 10	24	11	46%	92.31%
Jan – May 11	21	9	43%	75.00%

a. In the last two semesters (August – December 2010, January – May 2011) we have addressed the dropout issue in COIS 3255 by incorporating several quizzes throughout the semester, and also by promoting student interaction among themselves. Although students agreed that these actions were very helpful, it was very difficult to confirm this in the semester of August-December 2010, because we had several interruptions during that semester. These interruptions may have offset whatever positive influence the implemented measures had, if any. But last semester (January – May 2011) we did not have such interruptions, and we did not see major improvements in

the dropout rate.

b. We must continue analyzing this situation in order to find explanations and to take additional corrective actions to improve it. For example, the need for more support to students through tutoring, or changing study habits and delays in acquiring course materials. This semester (August 2011) a senior student was hired to provide tutoring and the professor will conduct a survey to more accurately pinpoint the causes of this situation.

4. **Methodology**. Last semester we added additional assessment methods in order to complement the course project, which is our main method. Specifically, we added a Graduating Senior Survey and a COOP Employer Survey. During the four-semester period, we have also implemented changes to rubrics and project specifications. All these changes come from the assessment results from each particular semester, after being discussed by professors and the ABET Committee.

5. **Logistics**. We have emphasized that method descriptions, like projects and essay specifications, as well a survey questions, be in English. Also, that a high level of student feedback be provided and that projects be presented by students in order to validate student knowledge and skills.

Recommendations (improvements)

1. **Outcome #2 (Logical systems design).** The results obtained in COIS 4025 for the last two semesters have shown a high level of attainment (87.50 and 89.5).

   a. We recommend that the professor continues emphasizing the measures she has already implemented successfully (reviewing preliminary versions of the projects and providing feedback to students, allocating more time to logical design topic in COIS 4025, starting the discussion of this topic earlier in the semester, etc.).

   b. We also recommend exposing students to some of the components of a system (like screens, reports, and databases) earlier in the course sequence, using a user-oriented database management system. This could be done in the very first course that our students take (COIS 3211).

2. **Dropouts in COIS 3255.** The dropout issue on COIS 3255 should be more thoroughly addressed to find out its causes and to take whatever actions are necessary. Besides the strategies already implemented (using quizzes and promoting student interaction), the following strategies must be implemented, and we should measure their effect on dropouts:

   a. Provide more support to students through tutoring.

b. Analyze student behavior that may be having an influence in the dropout rate, like study habits and delays in acquiring course materials. Next time the course is offered, the professor in charge of this course (Prof. Katherine Franceschi) will be performing a student survey in order to more specifically identify the causes for this problem.

3. **Individual contribution of some methods to outcome assessment.** The ABET Committee has already talked to professors about possible causes for the situations mentioned before regarding individual contributions , and ways in which they should be addressed. We must analyze the results obtained next time the methods are applied in the respective courses. If those results are consistent with current results, then we will have to implement further actions.

4. **Methodology.** The ABET Committee should continue refining the assessment methodology by incorporating additional methods, revising current methods, and making sure all professors are fully aware of the alignment between outcomes, assessment methods, rubrics, and course contents.

5. **Logistics.** The ABET Committee should continue promoting the following logistic matters:

    a. That project descriptions that are still in Spanish be translated to English (COIS 4025 and 4275).

    b. That all professors fill the remarks column in the rubrics. This column should be used to enter student feedback regarding the score assigned to the corresponding characteristic, particularly when the student did not get the highest score.

    c. That all the assessment related documents be electronically stored in a central location. This will allow to electronically store the whole package (projects, project descriptions and rubric) used in the assessment process as evidence of the assessment results.

    d. That all professors deliver the project descriptions, together with the corresponding rubric, by the end of the semester.

    e. That students orally present their projects so that the evaluator can better assess it. Because projects are take-home, it is important for the evaluator to validate the extent to which the student really prepared the project himself. In the case of group projects, presentations will help the evaluator assess the individual contribution of group members to the project. Project presentations also constitute an additional opportunity to provide feedback to students.

    f. That management continue taking affirmative actions to ensure that all professors fulfill their assessment responsibilities.

The ABET Committee should also perform the following actions:

a. Conduct informative sessions for stakeholders on program design, constitutional table, assessment methodology, and educational strategies (like project based learning), to make sure all constituents understand the approaches being used in our program.

Modifications to student outcomes

Based on the assessment results obtained so far there is no reason to make any changes to student outcomes.

Assessment of educational objectives

"Assessment of educational objectives is carried out yearly, alternating each year between the [following] two assessment strategies: focus groups and surveys. On the second semester of each year, assessment is made using focus groups on even years and surveys in odd. A report containing results, an evaluation and recommendations is prepared. At the beginning of the following first semester, the report is discussed in a meeting with CIS faculty. Another meeting is conducted with the advisory board to discuss the assessment report."

We recently conducted an Internet-based alumni survey to assess educational objectives, whose results are presented in the table below.

Frequency distribution of attainment responses to the objectives of the program (n=31)

Objective		Very Frequently	Frequently	Sometimes	Never
Obj. 1	I have implemented information systems in an organization.	16.1%	25.8%	35.5%	22.6%
	I have managed the development of information systems in an organization.	12.9%	22.6%	32.3%	32.2%
Obj. 2	I have applied technological skills in the solution of problems related to information systems in organizations.	51.6%	25.8%	22.6%	0
	I have applied analytical and critical thinking skills in the solution of problems related to information systems in organizations.	54.8%	29%	16.1%	0.1%
Obj. 3	I take into consideration the context in which information systems operate (organizational culture, functional areas, industry regulations, etc.), when implementing and managing these systems.	58.1%	25.8%	12.9%	3.2%
Obj. 4	I maintain my professional expertise by updating my knowledge in technology and information systems.	61.3%	22.6%	16.1%	0

Frequency distribution of attainment responses to the objectives of the program (n=31)					
Objective		Very Frequently	Frequently	Sometimes	Never
Obj. 5	I perform my functions showing respect and appreciation for ethical values and interpersonal relationships	90.3%	9.7%	0	0
	I perform my functions emphasizing communication and team work.	83.9%	16.1%	0	0

As can be seen from the table, all educational objectives, except number one, got percentages of more than 75 in the combined categories of "Very Frequently" or "Frequently".

The lowest level of attainment was for objective #1, which got percentages of 41.9 and 35.5 in the combined categories of "Very Frequently" and "Frequently", for each of the two questions related to this objective. This level of attainment does not necessarily mean that our students are not prepared to accomplish this objective. We must keep in mind two important points before making any conclusion:

1. That the probability of accomplishing this objective in the first few years after graduation is lower than others.

2. That the accomplishment of this objective also depends on things not controlled by our academic program, like job opportunities, career paths, and personal preferences.

Modifications to educational objectives

After carefully analyzing the alumni survey results, and discussing them with the Advisory Board, we recommend the rephrasing of the first educational objective to make it more feasible for recently graduates to attain.

From: *"To implement and manage the development of information systems in an organization."*

To: *"To actively participate in any of the stages of the systems development life cycle*."

We also recommend changing the survey questions related to this objective accordingly.

Finally, we recommend conducting an alumni focus group to validate the assessment of educational objectives already performed through the alumni survey. We must keep in mind that through the Internet-based alumni survey we could not control that all respondents were really graduates from our program.

Tables and graphs

The following appendixes contain several tables and graphs that could be useful references.

Appendix 1: Trend for Outcome Attainment Along Several Semesters (Table)

Appendix 2: Trend for Outcome Attainment Along Several Semesters (Graphs)

Appendix 3: Mapping of student outcomes to SICI (required) courses, exit interview and ABET outcomes

Appendix 4: Mapping of student outcomes to SICI (elective) courses, exit interview and ABET outcomes

Appendix 5: Mapping objectives, outcomes and performance criteria ("SICI Constitutional Table")

Appendix 6: Mapping of assessment methods to student outcomes

Appendix 1
Trend for Outcome Attainment Along Several Semesters (Table)

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Aug 2009 to Jan 2011

Trend for all outcomes along several semesters

O #	Student outcomes	Assessment methods	Percentage of approval					
			Aug-09	Jan-10	Aug-10	Jan-11	Aug-11	Jan-12
1	To analyze an operation within an organization, identify problems and make recommendations to solve these problems.	*COIS 4025*	100.00%	100.00%	100.00%	100.00%		
		Coop Survey				100.00%		
		Senior survey				100.00%		
	Totals for this outcome		***100.00%***	***100.00%***	***100.00%***	***100.00%***	***0.00%***	***0.00%***
2	To select or design a system to solve the problems identified in an operation.	*COIS 4015*						
		COIS 4025	36.36%	42.86%	85.71%	87.50%		
		COIS 4266		85.71%	100.00%	93.75%		
		COIS 4405 (E)						
		Coop Survey				100.00%		
		Senior survey				83.33%		
	Totals for this outcome		***36.36%***	***64.29%***	***92.86%***	***91.15%***	***0.00%***	***0.00%***
3	To plan and supervise the implementation of a system that solves the problems identified in an operation.	*COIS 4278(1)*		100.00%		100.00%		
		Coop Survey				100.00%		
		Senior survey				100.00%		
	Totals for this outcome		***0.00%***	***100.00%***	***0.00%***	***100.00%***	***0.00%***	***0.00%***
4	To use current techniques, skills, tools and best practices to design, implement and manage information systems.	*COIS 3245*	100.00%	100.00%	89.47%	100.00%		
		COIS 3255	100.00%	100.00%	92.31%	75.00%		
		COIS 4015						
		COIS 4266	100.00%	100.00%	50.00%	100.00%		
		COIS 4285(E)				57.14%		
		COIS 4286	92.86%		100.00%			
		COIS 4405(E)						
		COIS XXX2						
		Coop Survey				100.00%		
		Senior survey				100.00%		
	Totals for this outcome		***98.22%***	***100.00%***	***82.95%***	***88.69%***	***0.00%***	***0.00%***
		COIS 4266	100.00%	100.00%	100.00%	93.75%		

Trend for all outcomes along several semesters

O #	Student outcomes	Assessment methods	Percentage of approval					
			Aug-09	Jan-10	Aug-10	Jan-11	Aug-11	Jan-12
5	To understand the impact that organizational, local and global environments have in the implementation and management of information systems.	*COIS 4278(1)*				100.00%		
		COIS 4278(2)		100.00%		100.00%		
		COIS 4405(E)						
		COIS 4465(E)	71.43%		100.00%			
		Coop Survey				100.00%		
		Senior survey				83.33%		
		Totals for this outcome	***85.72%***	***100.00%***	***100.00%***	***95.42%***	***0.00%***	***0.00%***

Trend for all outcomes along several semesters

O #	Student outcomes	Assessment methods	Percentage of approval					
			Aug-09	Jan-10	Aug-10	Jan-11	Aug-11	Jan-12
6	To value the protection of information system resources in an organization, and to identify ways in which this protection can be achieved.	*COIS 4275*		75.00%		100.00%		
		Coop Survey				100.00%		
		Senior survey				83.33%		
		Totals for this outcome	***0.00%***	***75.00%***	***0.00%***	***94.44%***	***0.00%***	***0.00%***
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.	*COIS 4278(2)*		71.43%		75.00%		
		Exit interview		100.00%	100.00%	100.00%		
		Coop Survey				100.00%		
		Senior survey				100.00%		
		Totals for this outcome	***0.00%***	***85.72%***	***100.00%***	***93.75%***	***0.00%***	***0.00%***
8	To recognize the importance of ethical values and interpersonal relationships in an information systems professional.	*COIS 4275*		100.00%		0.00%		
		COIS 4465(E)	100.00%		90.91%			
		COIS 4998(E)		100.00%	50.00%	100.00%		
		Exit interview		100.00%	100.00%	100.00%		
		Coop Survey				100.00%		
		Senior survey				66.67%		
		Totals for this outcome	***100.00%***	***100.00%***	***80.30%***	***73.33%***	***0.00%***	***0.00%***
9	To communicate effectively with a range of audiences.	*COIS 3245*	100.00%	95.65%	100.00%	100.00%		
		COIS 4025	100.00%	100.00%				
		COIS 4275		100.00%		100.00%		
		COIS 4278(2)		100.00%		75.00%		
		COIS 4465(E)			100.00%			
		COIS 4998(E)		100.00%	100.00%	75.00%		
		Coop Survey				100.00%		
		Senior survey				66.67%		
		Totals for this outcome	***100.00%***	***99.13%***	***100.00%***	***86.11%***	***0.00%***	***0.00%***
10	To function effectively in teams seeking to accomplish a common goal.	*COIS 4025*			100.00%	100.00%		
		COIS 4278(1)		100.00%		100.00%		
		COIS 4998(E)		66.67%	50.00%	100.00%		
		Exit interview		66.67%	100.00%	100.00%		
		Coop Survey				100.00%		
		Senior survey				100.00%		
		Totals for this outcome	***0.00%***	***77.78%***	***83.33%***	***100.00%***	***0.00%***	***0.00%***
	Tool developed by Prof. Arnaldo I. Ramos-Torres during Christmas vacation of 2008. All rights reserved.							

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Assessment of Student Outcomes
Aug 2009 to Jan 2011

Remarks

O #	Remarks		
1			
2	Outcome not assessed yet in this course		
	Outcome not assessed yet in this course		
3			
4	Outcome not assessed yet in this course		
	Outcome not assessed yet in this course		

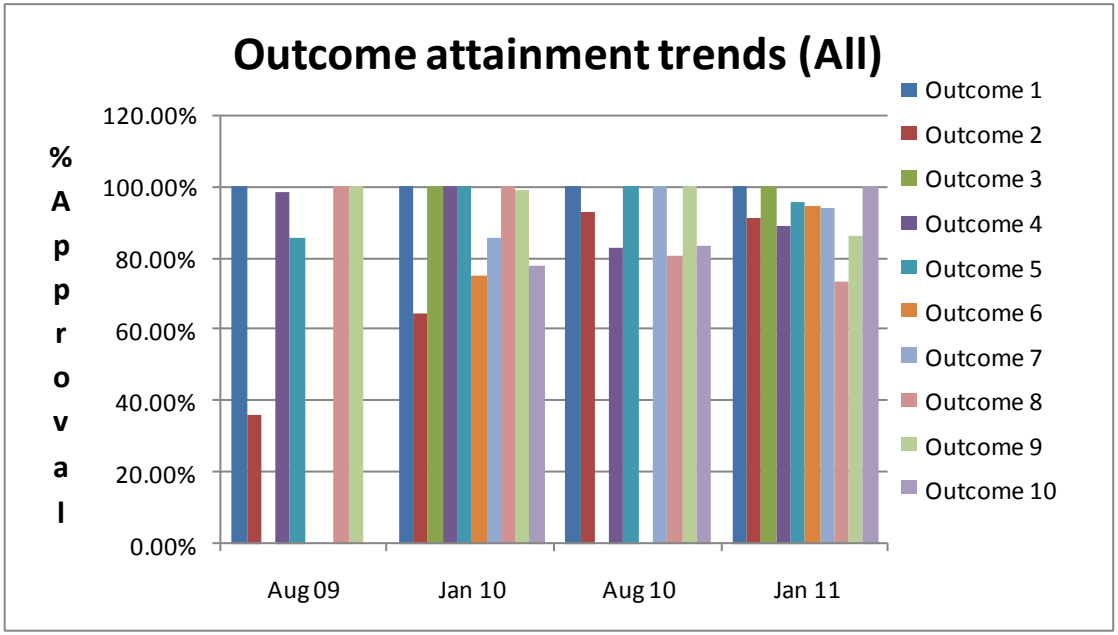
	Remarks

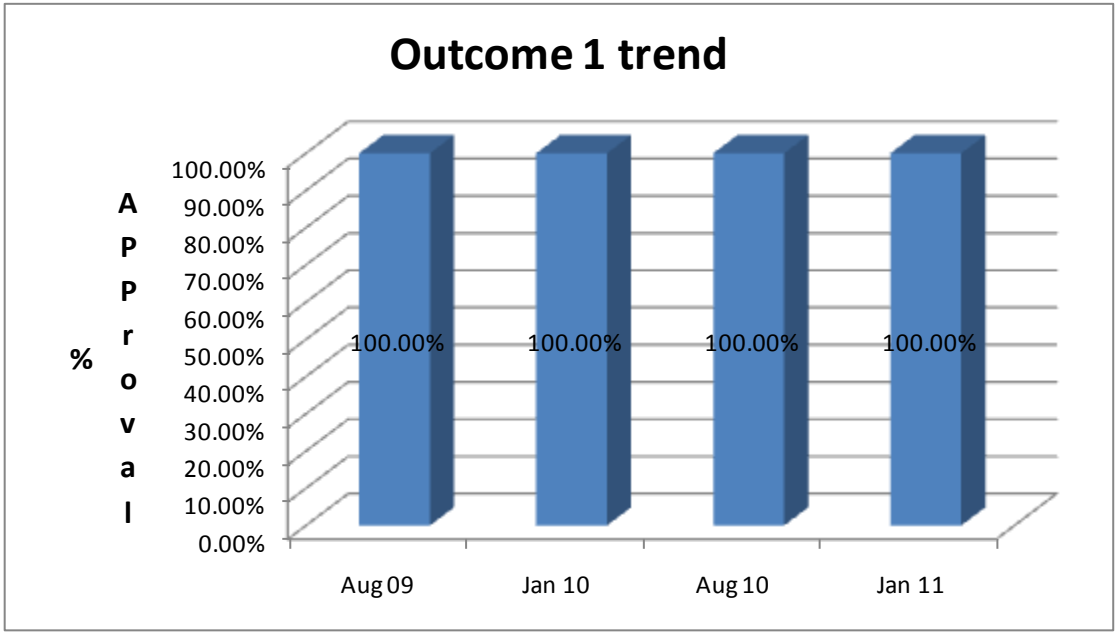
O #	Remarks		
5			

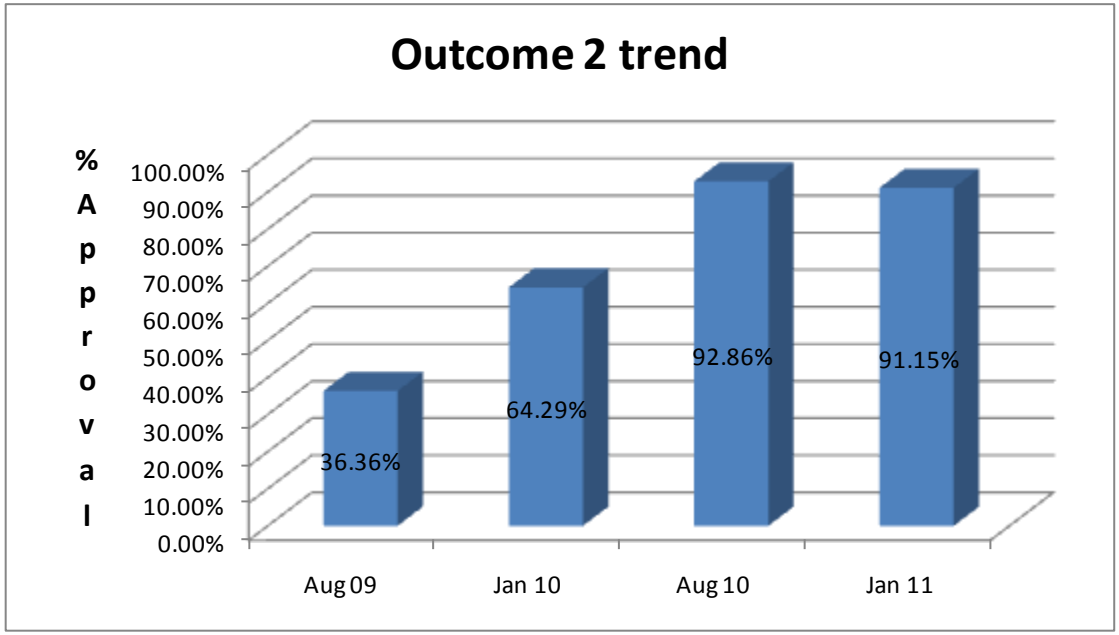
	Remarks

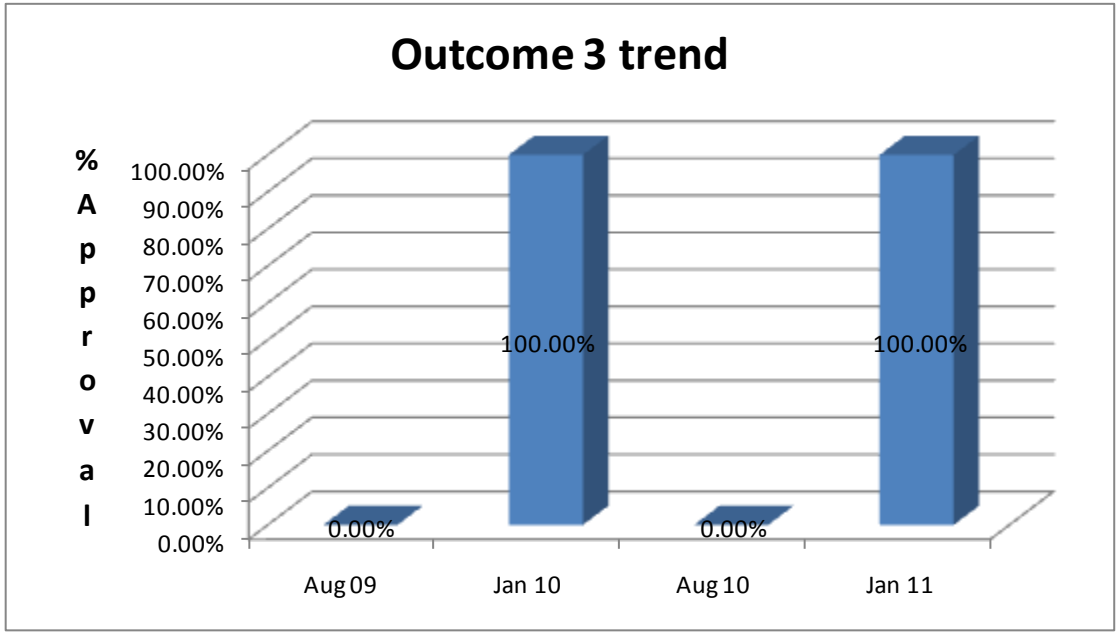
O #	Remarks		
6			
7			
8	Added to Outcome #8 in Jan 2010		
9	Moved to support Outcome #10 in Aug 2010		
10	Added to Outcome #10 in Aug 2010 Added to Outcome #10 in Jan 2010		
	Tool developed by Prof. Arnaldo I. Ramos-Torres during Christmas vacation of 2008. All rights reserved.		

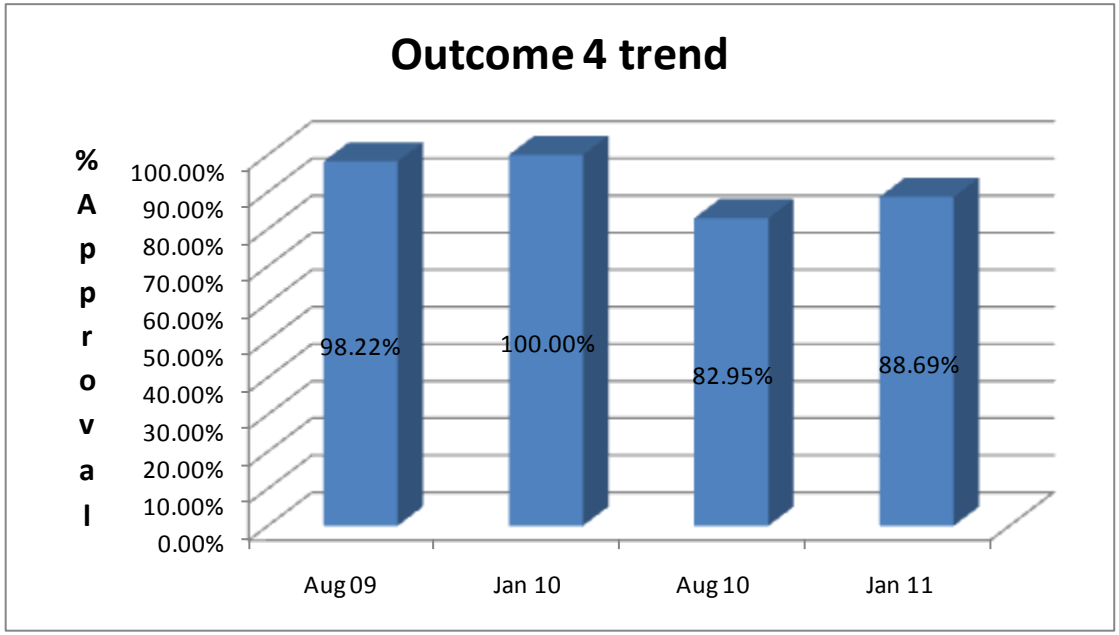
Appendix 2
Trend for Outcome Attainment Along Several Semesters (Graphs)


Outcome attainment trends (All)
% Approval
120.00%
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
Aug 09
Jan 10
Aug 10
Jan 11
Outcome 1
Outcome 2
Outcome 3
Outcome 4
Outcome 5
Outcome 6
Outcome 7
Outcome 8
Outcome 9
Outcome 10


Outcome 1 trend
% Approval
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
100.00%
100.00%
100.00%
100.00%
Aug 09
Jan 10
Aug 10
Jan 11


Outcome 2 trend
% Approval
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
36.36%
64.29%
92.86%
91.15%
Aug 09
Jan 10
Aug 10
Jan 11


Outcome 3 trend
% Approval
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
0.00%
100.00%
0.00%
100.00%
Aug 09
Jan 10
Aug 10
Jan 11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90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
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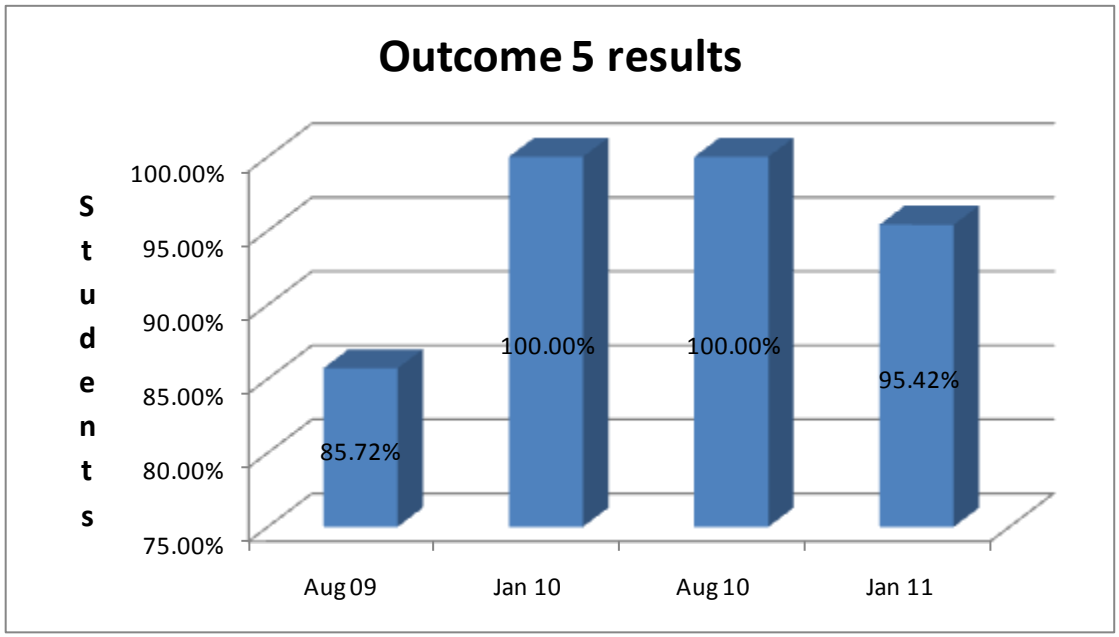
82.95%
88.69%
Aug 09
Jan 10
Aug 10
Jan 11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Students
100.00%
95.00%
90.00%
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100.00%
95.42%
Aug 09
Jan 10
Aug 10
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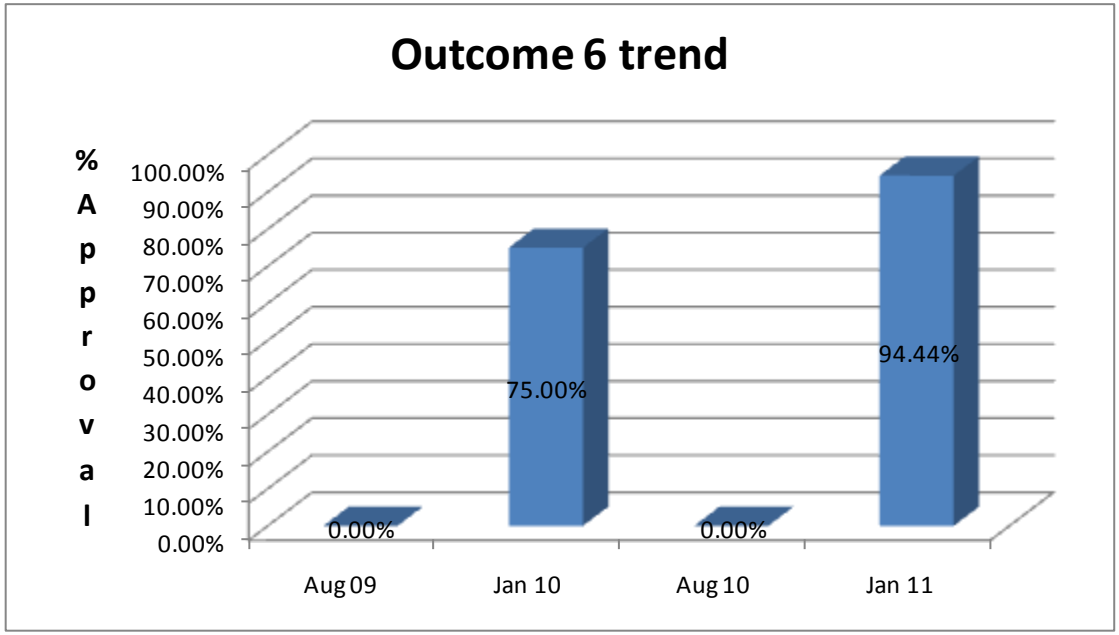
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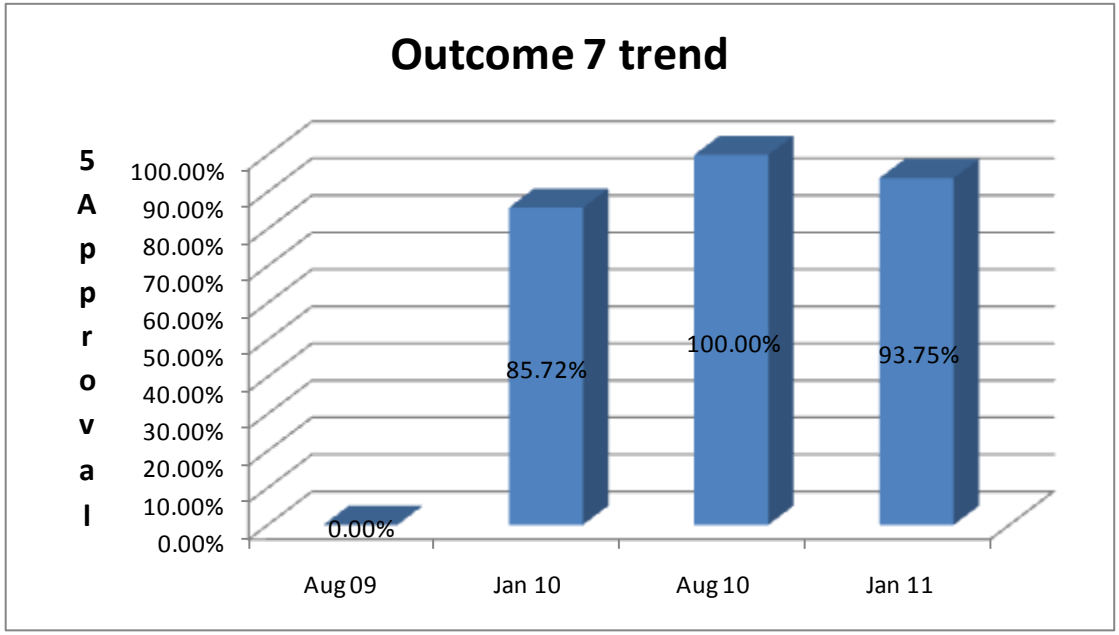
0.00%
94.44%
Aug 09
Jan 10
Aug 10
Jan 11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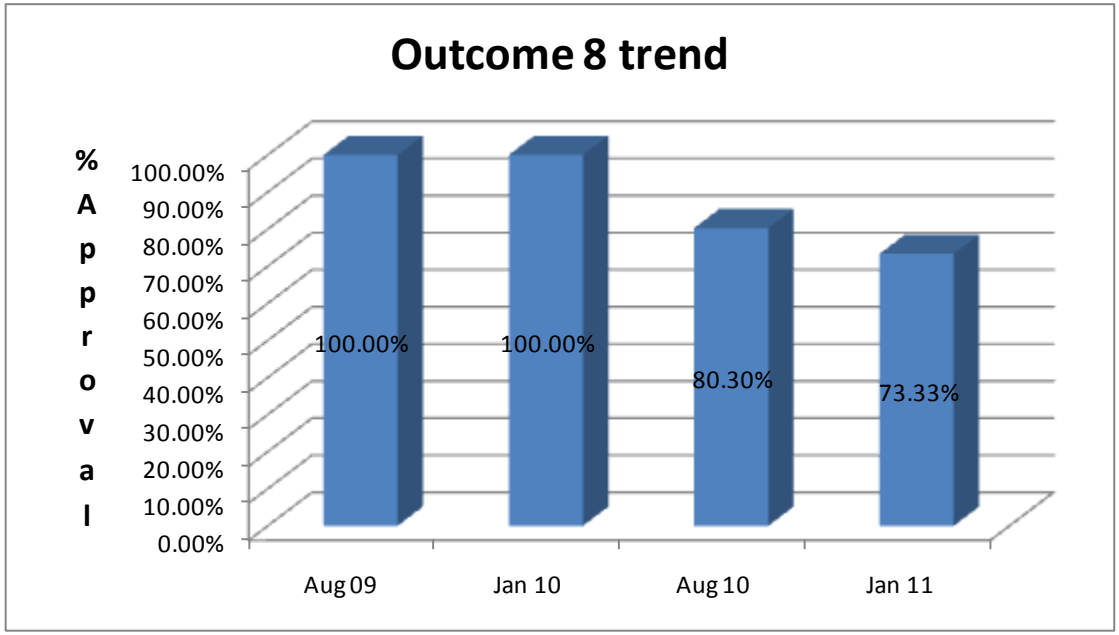
Aug 09
Jan 10
Aug 10
Jan 11


Outcome 8 trend
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70.00%
60.00%
50.00%
40.00%
30.00%
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10.00%
0.00%
100.00%
100.00%
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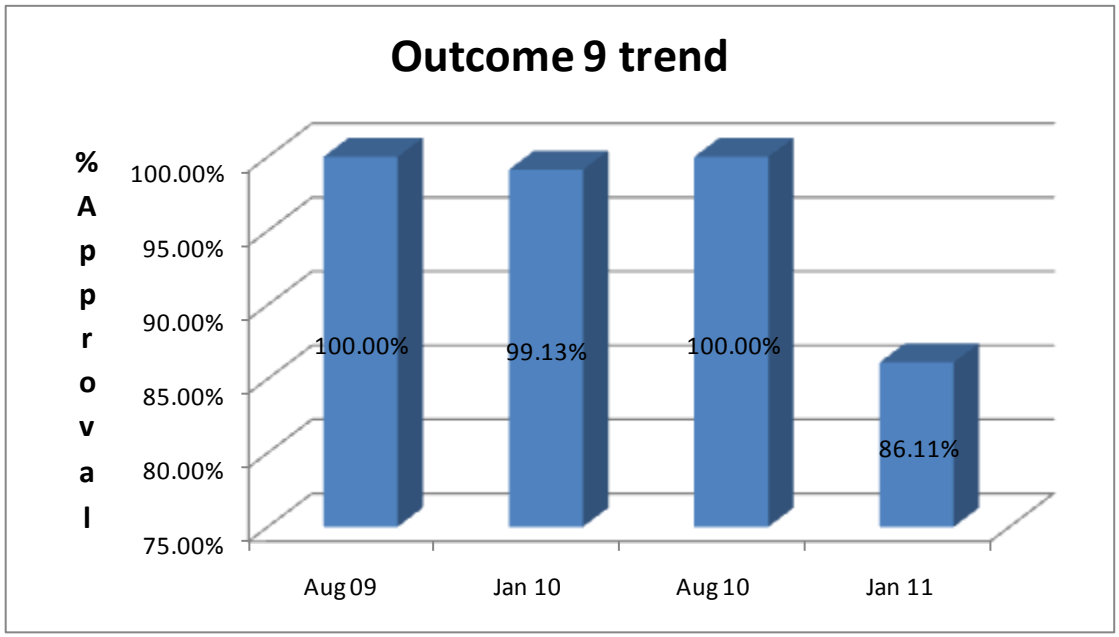
73.33%
Aug 09
Jan 10
Aug 10
Jan 11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% Approval
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95.00%
90.00%
85.00%
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75.00%
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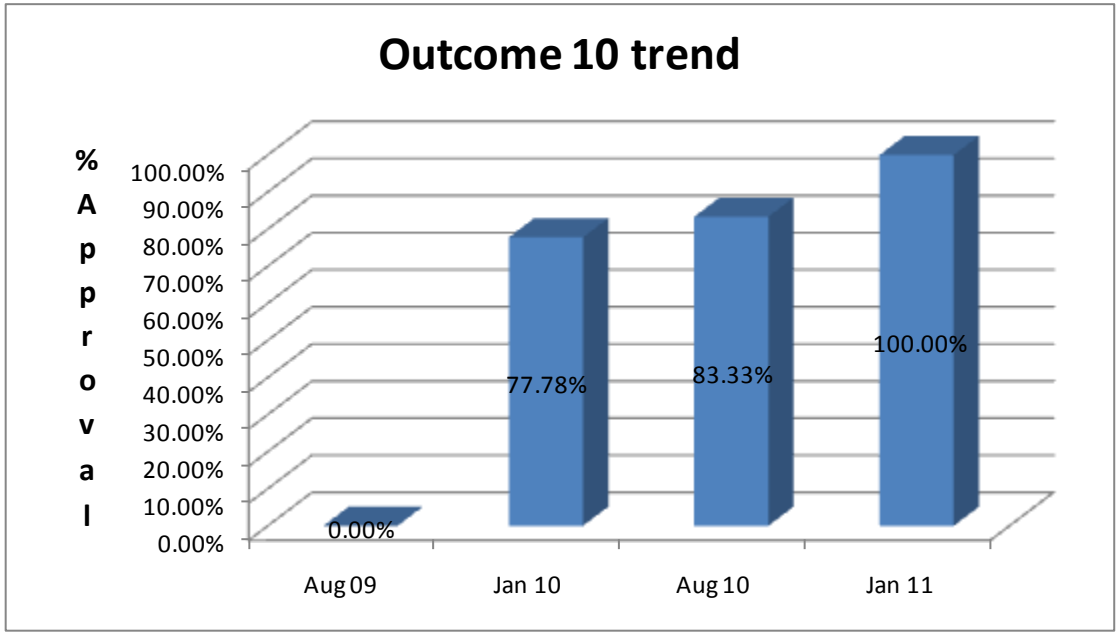
Aug 09
Jan 10
Aug 10
Jan 11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20.00%
10.00%
0.00%
0.00%
77.78%
83.33%
100.00%
Aug 09
Jan 10
Aug 10
Jan 11

Appendix 3
Mapping of student outcomes to SICI (required) courses, exit interview and ABET outcomes

Mapping of student outcomes to SICI (required) courses, Exit interview and ABET outcomes												
Prof. A. Ramos, Revised May 2010												
		Required courses									Exit	ABET
#	Student outcomes	3211	3245	3255	4015	4025	4266	4275	4278	4286	interview	outcomes
1	To analyze an operation within an organization, identify problems and make recommendations to solve these problems.					X						A,B,J
2	To select or design a system to solve the problems identified in an operation.				X	X	X					A,C,J
3	To plan and supervise the implementation of a system that solves the problems identified in an operation.								X			A,C,J
4	To use current techniques, skills, tools and best practices to design, implement and manage information systems.		X	X	X		X			X		A,C,I
5	To understand the impact that organizational, local and global environments have in the implementation and management of information systems.						X		X			G,J
6	To value the protection of information system resources in an organization, and to identify ways in which this protection can be achieved.							X				E,J
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.								X		X	H
8	To recognize the importance of ethical values and interpersonal relationships in an information systems professional.							X			X	E
9	To communicate effectively with a range of audiences.		X					X	X			F
10	To function effectively in teams seeking to accomplish a common goal.					X			X		X	D
	Note: We are trying to assess not more than three outcomes per rubric (or assessment method). (A large **X** means "add to this outcome", and a small **(X)** means "remove from this outcome".)											

Appendix 4
Mapping of student outcomes to SICI (elective) courses, exit interview and ABET outcomes

Mapping of student outcomes to SICI (elective) courses and ABET outcomes Prof. A. Ramos, Revised Dec 2010											
		Elective courses									ABET
#	Student outcomes	4285	4405	4465	XXX2	4998					outcomes
1	To analyze an operation within an organization, identify problems and make recommendations to solve these problems.					(See notes)					A,B,J
2	To select or design a system to solve the problems identified in an operation.		X								A,C,J
3	To plan and supervise the implementation of a system that solves the problems identified in an operation.										A,C,J
4	To use current techniques, skills, tools and best practices to design, implement and manage information systems.	X	X		X						A,C,I
5	To understand the impact that organizational, local and global environments have in the implementation and management of information systems.		X	X							G,J
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
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
8	To recognize the importance of ethical values and interpersonal relationships in an information systems professional.			X		X					E
9	To communicate effectively with a range of audiences.			X		X					F
10	To function effectively in teams seeking to accomplish a common goal.					X					D
	Notes: We are trying to assess not more than three outcomes per course. SICI 4998 could support any of the outcomes, depending on the particular job obtained by the student. But since students have to prepare a paper, outcomes 8, 9 and 10 should be assessed here.										

Appendix 5
Mapping objectives, outcomes and performance criteria
(“SICI Constitutional Table”)

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, February 2011

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.)	**SICI Courses supporting the outcome**	**ABET Outcomes supported**
1. To implement and manage the development of information systems in an organization.	1. To analyze an operation within an organization, identify problems and make recommendations to solve these problems.	1. To prepare functional, technical, and other requirements for an information system that solves the problems identified in an operation.	4025	A, B, J
	2. To select or design a system to solve the problems identified in an operation.	2. To design the components of an information system based on the functional requirements prepared for that system.	4015,4025, 4266, 4405(E)	A, C, J
	3. To plan and supervise the implementation of a system that solves the problems identified in an operation.	3. To develop a plan to implement an information system, including the phases and activities that this process requires.	4278	A, C, J
2. To apply technological, analytical, and critical thinking skills in the solution of problems related to information systems in organizations.	4. To use current techniques, skills, tools and best practices to design, implement and manage information systems.	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	A, C, I
		5. To code, test, and document computer programs to perform the automated processes that compose a system, using modern programming tools.	3255, 4266, 4405(E), XXX2 (E)	
		6. To design a properly normalized database based on requirements prepared by systems analysts or by users.	4015	

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, February 2011

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.)	**SICI Courses supporting the outcome**	**ABET Outcomes supported**
		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, 4285(E)	
3. To take into consideration the context in which information systems operate, when implementing and managing these systems.	5. To understand the impact that organizational, local and global environments have in the implementation and management of information systems.	8. To analyze administrative, organizational, local and global aspects that affect information systems, and to define strategies to deal with these aspects.	4278, 4266, 4405(E), 4465(E)	G, J
	6. To value the protection of information system resources in an organization, and to identify ways in which this protection can be achieved.	9. To prepare a disaster recovery plan for the information system operations of an organization.	4275	E, J
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.	10. To get related with professional associations, publications and Continuing Education alternatives in the geographic area where he lives or works.	4278, Exit	H
5. To perform his functions showing respect and appreciation for ethical values, interpersonal relationships, communication, and team	8. To recognize the importance of ethical values and interpersonal relationships in an information systems professional.	11. To identify and evaluate ethical and interpersonal relationship aspects related to information system professionals.	4275, Exit, 4465(E)4998(E)	E

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, February 2011

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.)	**SICI Courses supporting the outcome**	**ABET Outcomes supported**
work.	9. To communicate effectively with a range of audiences.	12. To prepare written reports and oral presentations related to information system topics.	3245, 4275, 4278, 4465(E), 4998(E)	F
	10. To function effectively in teams seeking to accomplish a common goal.	13. To demonstrate ability to work effectively in task-oriented groups, like information system project teams.	4025, 4278, Exit4998(E)	D

Appendix 6
Mapping of assessment methods to student outcomes

Institute of Statistics and Information Systems
Faculty of Business Administration
University of Puerto Rico - Rio Piedras
Major in Computer Information Systems

Mapping of Outcomes to Assessment Methods

O #	Student outcomes	Course/ Activity	Method description
1	To analyze an operation within an organization, identify problems and make recommendations to solve these problems.	*COIS 4025*	Project to define requirements for an information system
		Survey(E)	COOP Employer Survey
		Survey	Graduating Senior Survey
2	To select or design a system to solve the problems identified in an operation.	*COIS 4015*	Design and implementation of an information system using a DBMS
		COIS 4025	Project to define requirements for an information system
		COIS 4266	Design and implementation of an information system using emerging (non DBMS) tools
		COIS 4405 (E)	Design and implementation of an ecommerce system
		Survey(E)	COOP Employer Survey
		Survey	Graduating Senior Survey
3	To plan and supervise the implementation of a system that solves the problems identified in an operation.	*COIS 4278(1)*	Project to prepare a plan to implement an information system
		Survey(E)	COOP Employer Survey
		Survey	Graduating Senior Survey
4	To use current techniques, skills, tools and best practices to design, implement and manage information systems.	*COIS 3245*	Project on the design of a technological infrastructure for an IS
		COIS 3255	Program integrating several programming techniques, like text files, arrays, structures, menus, procedures, etc.
		COIS 4015	Design and implementation of an information system using a DBMS
		COIS 4266	Design and implementation of an information system using emerging (non DBMS) tools
		COIS 4285(E)	Design of a wide area network to support the operation of an information system
		COIS 4286	Design of a local area network to support the operation of an information system
		COIS 4405(E)	Design and implementation of an ecommerce system
		COIS XXX2	Project to prepare a data warehouse to support decision making
		Survey (E)	COOP Employer Survey
		Survey	Graduating Senior Survey

Mapping of Outcomes to Assessment Methods

O #	Student outcomes	Course/ Activity	Method description
5	To understand the impact that organizational, local and global environments have in the implementation and management of information systems.	*COIS 4266*	Design and implementation of an information system using emerging (non DBMS) tools
		COIS 4278(2)	Short essay on IS environment and IS profession
		COIS 4405(E)	Design and implementation of an ecommerce system
		COIS 4465(E)	Research paper on legal issues of computer technology
		Survey(E)	COOP Employer Survey
		Survey	Graduating Senior Survey
6	To value the protection of information system resources in an organization, and to identify ways in which this protection can be achieved.	*COIS 4275*	Project to prepare a disaster recovery plan
		Survey(E)	COOP Employer Survey
		Survey	Graduating Senior Survey
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.	*COIS 4278(2)*	Short essay on IS environment and IS profession
		Exit interview	Oral questions
		Survey(E)	COOP Employer Survey
		Survey	Graduating Senior Survey
8	To recognize the importance of ethical values and interpersonal relationships in an information systems professional.	*COIS 4275*	Project to prepare a disaster recovery plan
		COIS 4465(E)	Research paper on legal issues of computer technology
		COIS 4998(E)	Short essay
		Exit interview	Oral questions
		Survey(E)	COOP Employer Survey
		Survey	Graduating Senior Survey
9	To communicate effectively with a range of audiences.	*COIS 3245*	Project on the design of a technological infrastructure for an IS
		COIS 4275	Project to prepare a disaster recovery plan
		COIS 4278(2)	Short essay on IS environment and IS profession
		COIS 4465(E)	Research paper on legal issues of computer technology
		COIS 4998(E)	Short essay
		Survey(E)	COOP Employer Survey
		Survey	Graduating Senior Survey

Mapping of Outcomes to Assessment Methods

O #	Student outcomes	Course/ Activity	Method description
10	To function effectively in teams seeking to accomplish a common goal.	*COIS 4025*	Project to define requirements for an information system
		COIS 4278(1)	Project to prepare a plan to implement an information system
		COIS 4998(E)	Short essay
		Exit interview	Oral questions
		Survey(E)	COOP Employer Survey
		Survey	Graduating Senior Survey
	Tool developed by Prof. Arnaldo I. Ramos-Torres during Christmas vacation of 2008. All rights reserved.		