A Web-Based Paperless System for Implementing a Minimally Intrusive Outcomes Assessment

> Shing Chang & Brad Kramer <u>changs@ksu.edu</u> : <u>bradleyk@ksu.edu</u> IMSE, K-State

"K-STATE ASSESSMENT SHOWCASE" October 24, 2008

IMSE Program Improvement Process



Background

- K-State first participated in "ABET 2000" in 1999
- Direct assessment strategy was adequate in 1999
- Continuous improvement required that we redefine our program objectives, outcomes, and a direct assessment strategy.

K-STATE IE EDUCATIONAL OBJECTIVES

Revised: November 2004

K-State B.S.I.E. graduates can use modern engineering & scientific management tools to design, develop, implement & improve integrated systems to produce goods and services in a professional and ethical manner.

Technical Performance Goals:

1. Identify problems and improvement opportunities related to the production of goods and services.

2. Measure, evaluate, and improve production of good and services.

3. Develop and design production processes and systems to produce goods and services.

4.Implement efficient and effective production processes and systems to produce goods and services.

Professional Performance Goals:

1. Participate & function effectively in team environments.

2.Communicate in a professional role with capability to write technical reports and present results effectively.

3. Understand ethical & social responsibility.

4.Understand the individual's responsibility for their professional development & career path.

K-State IE Student Learning Outcomes

IMSE graduates upon graduation are able to:

- a) Apply knowledge of mathematics, science and engineering
- b) Design and conduct experiments and analyze and interpret data
- c) Design a system, component or process
- d) Function on a multi-disciplinary team
- e) Identify, formulate, and solve engineering problems
- f) Understand professional ethics
- g) Communicate effectively
- h) Understand impact of engineering solutions on society
- i) Engage in lifelong learning
- j) Knowledge of contemporary issues
- k) Use modern engineering tools

IMSE Student Learning Outcomes

- We defined specific skills and abilities for each outcome that we expected each of our graduates to possess at graduation. For example,
 - a) Apply knowledge of mathematics, science and engineering
 - a1. Apply matrix theory.
 - a2. Use computer to reach numerical solutions
 - a3. Apply knowledge of statistics

Direct Assessment of Program Outcomes

- We mapped each assessment component to experiences that we required of each student.
- For example, "a1. Apply matrix theory" is assessed in IMSE 560 Operation Research I in which the assignment requiring students to use simplex methods to solve LP problems is assessed.

Table 1. IMSE Program Outcomes Definitions and Assessment Strategy (revised 8/23/05)					
(a) Apply knowledge of mathematics, science and Engineering	(b) Design and conduct experiments & Analyze and interpret data	(c) Design a system, component or process	(d) Function on a multi-disciplinary team	(e) Identify, formulate and solve engineering problems	(f) Understand professional ethics
 Apply matrix theory. Use computer to reach numerical solutions Apply knowledge of Statistics 	 Design an experiment and collect data Implement appropriate statistical methods Identify significant factors of the experiment & make recommendations based on analytical results 	 I.Identify system requirements, constraints and assumptions Create alternative designs Evaluate alternatives 	 Understand your role and the effect this has on a group Be a member of groups composed of various individuals Evaluate the contribution of team members 	 Identify objectives, constraints, assumptions and problems Model the problem Obtain solution to the problem Interpret and validate the solution. 	 Identify situations related to ethical dilemmas. Know IMSE professional and academic ethics.
		Assessm	ent Strategy		
A1: 560 – manually solve simplex methods. 560 – do manual sensitivity analysis A2 – See K A3: 643 – simulation project – compare alternatives, 623 – analyze & interpret project results 541 – early labs	 B1: 541 – design experiments in labs 6, 8, 9 B2: 623 – design & do experiments with human subjects. 541 – apply appropriate statistical methods in Lab 9 (product and process design) B3: 541 – identify significant factor in Lab 8 (helicopter) 	C1: 555 – final project 643 –projects 591-592/580 – Capstone project C2: 555 – final project 643 –projects 591-592/580 – Capstone project C3: 555 – final project 643 –projects 591-592/580 – Capstone course design project	D1: 580 – Students describe the roles that each individual in their department/group will perform 591-592 – Describe their roles in final reports D2: 201, 251 – participation on multiple teams D3: 580 – Analyze roles via peer and self evaluation 591-592 – Provide peer and self evaluation in final reports	E1: 541identify objectives, constraints, and assumptions in Lab 9 (toy race car) 560 - take word problems, model as LPs E2: 541 - Model distance traveled in Lab 9 E3: 541 - build a winning race car in Lab 9 560 -develop solutions E4: 560 - interpret and validate LP solutions 541 - interpret and validate the travel distance model in Lab 9	F1: 201 – project/exam F2: Sr. Design analysis

Metric Goal

The IMSE faculty approved the following statement as a universal standard to judge whether our program outcomes are being achieved.

At least 80% of our students should perform at an acceptable level for each assessment exercise. Acceptable is defined to mean the equivalent of a "C" in terms of the teacher's definition of that grade.

For example, one of the components for assessing our student learning outcome (a) is to "apply matrix theory to manually solve a problem with the simplex method." If there are 20 students in the IMSE 560 – Operations Research I course, our minimum standard for this component is that at least 16 out of the 20 students in the class should obtain the equivalent of a "C" or better for the specific assignment/question that is used to assess this component.

Evaluation Process

- Assessment reports are collected each semester.
- A summary of the class reports is generated.
- The undergraduate course and curriculum committee reviews the reports to assess progress.
- Action items are generated and presented to the rest of the faculty for discussion and approval.

Summary Report

Summary Date: <u>05/18/05</u> (a) Apply knowledge of mathematics, science and Engineering

Outcome/Components	Assessment Methods	Assessment Results	Conclusions, Recommendations and Actions	Completion Date	Faculty Responsible
1.Apply matrix theory.	IMSE 560 - solve LP - sensitivity analysis	78% (11 out of 14 students) are acceptable for both tasks	No recommendation. Since one student did not attend class or do any work after the first test, the statistic is biased.	N/A	Hooker/Easto n
1.Use computer to reach numerical solutions	IMSE 560 - HW 4 and a project	92% (13 out of 14 students) can model the problem.71% (10 out of 14 students) perform the task satisfactory	A few students did not turn in HW 4. This assignment should be made compulsory.	FA 05	Hooker/Easto n
1.Apply knowledge of Statistics	IMSE 541 -Lab2/Hw3 -Lab5 -Exam 1. questions on hypothesis testing and control chart	10 out of 11 students(91%) performed C or better for Lab 2 11 out of 11 students (100%) performed C or better for Lab 2 Exam 1 questions also show 91% and 100% students can solve hypothesis test problem and control chart problem	No recommendation.	N/A	Chang
	IMSE 643 -Statistical Tests on two projects	Only one of 24 reports lacked appropriate statistics. 95% performing at a "C" level or better.	No recommendation.	N/A	Easton

A Minimally Intrusive Assessment System

- Direct assessment
- Short feedback cycle time
- Fully utilize existing courses and experiences
- However, there is still too much paper work involved...
 - Can it be improved?
 - How can we make it simple?

Hands On Exercise

- You are required to copy 30 handouts to your students for each subject you teach. There are 10 subjects covered in this semester.
- TTYP: What is the goal? What is the process to achieve this goal?

Hands on exercise continues...

- Will the following conditions change your process?
 - Resource constraints: no secretary or co-op student help
 - Equipment constraints: copy machine does not have auto sort or binding function
 - Last minute changes: you would like to make changes and add new material during the semester

A Web-Based ABET Document Control System

- From paper to paperless
- Assessment process remains the same, but the difference is...
 - Instead of submitting course report via paper reports, faculty can submit the report through a web interface.
 - Contents of a report are stored in a database.



Three User Groups

Users

- Faculty who need to file reports
- Undergraduate Committee members
 - Faculty who need to summarize and evaluate the reports
- Administrators
 - Those who need to coordinate, organize and store the assessment paper work and results

Login Screen

<u> </u>		s Internet Exp	lorer					
	Attp://aries.ims	se.ksu.edu/ABET/	login.asp		~	Google	•	P -
File Edit	View Favorites	Tools Help						
* 🕸 👔	🏉 IMSE ABET SYS					🙆 • 🔊	🔹 🌐 🝷 🔂 Pag	e 🕶 🙆 Tools 👻
Enginee		Ind ivity AE	dustrial an BET Docun	d Manufaci nent Manag	turing S gement S	ystems I System	Engineerii	ng
				Sign in				
			UserID: Password:					
				Sign In				

Simple User Interface



Industrial and Manufacturing Systems Engineering

ABET Document Management System

[Home] [Account] [Committee] [Administrative Menu] [Sign out]

		2007 👽 Fall 👽 Submit
Name: Dr.Chang		
	Incomplete	
No Course		
	Completed	
	Introduction to Statistical Quality Control	
IMSE541	mu oducuon to stausucai Quaity Conu or	

User Functions

- File class reports
- Manage password

IMSE Engineering Productivity

Industrial and Manufacturing Systems Engineering

ABET Document Management System

[Home] | [Account] | [Sign out]

::Login Status: Who::

•••	D 117		2007 🖌 Fall 🖌 Submit
Nan	ie: Dr.Who	-	Incomplete
<u>a</u>	IMSE591- 592	Senior I	Design
		[C1]	Identify system requirements, constraints and assumptions
		[C2]	Create alternative designs
		[C3]	Evaluate alternatives
		[D1]	Understand your role and the effect this has on a group
		[D3]	Evaluate the contribution of team members
		[F2]	Know IMSE professional and academic ethics

Completed	
No Course	

Paperless Class Report (1)

[Home] | [Account] | [Sign out]

::Login Status: Wh	0:
Historical Report	

[Outcomes Assessment Data]						
[Instructor] Dr. Who	[Fall2007]					
[Category] (C) Design a system, component or process						
[Component] (C1) Identify system requirements, constraints and assumptions						
[Course] (IMSE591-592) Senior Design						
[No. of students] 0						
[No. of student received a grade of C or higher]						
[% of student received a grade of C or higher]						

Paperless Class Report (2)

[Method of Assessment]	
	<u>~</u>
	~
[Assessment Results]	
	<u>^</u>
	×
[Teaching Suggestions]	
	<u>^</u>
	~

Temporary Save Complete Reset Cancel

Completed Reports

[Home] | [Account] | [Committee] | [Administrative Menu] | [Sign out]

::Login Status: Chang::

		2007 🔽 Fall	🧹 Submit
Name: Dr.Chang			
	Incomplete		
No Course			

_	Completed						
<u></u>	IMSE541 Introduction to Statistical Quality Control						
		[A3]	Apply knowledge of Statistics	2/26/2008 10:51:53 AM			
		[B1]	Design an experiment and collect data	2/26/2008 10:09:28 AM			
		[B2]	Implement appropriate statistical methods	2/26/2008 10:11:06 AM			
		[<u>B3]</u>	Identify significant factors of the experiment & make recommendations based on analytical results	2/26/2008 10:13:08 AM			
		[E1]	Identify objectives, constraints, assumptions and problems	<u>2/26/2008 10:25:35 AM</u>			
		[E2]	Model the problem	2/26/2008 10:31:18 AM			
		[E3]	Obtain solution to the problem	2/26/2008 10:35:50 AM			
		[E4]	Interpret and validate the solution	2/26/2008 10:43:26 AM			
		[K2]	Use modern statistical tools	<u>2/26/2008 10:18:52 AM</u>			

Committee Functions

An Overview of

- who has or hasn't done what
- when a report is uploaded or changed
- Review each report
- Provide recommendations
- Record corrective actions

Committee Overview

[Home] | [Account] | [Committee] | [Administrative Menu] | [Sign out]

2007 V Fall V Submit

Fall2007 Outcomes Assessment

[A] [B] [C] [D] [E] [F] [G] [H] [I] [J] [K]

[A] Apply Knowledge of Mathematics, Science, and Engineering

Outcome/ Component	Class/ Process	Faculty Responsible	Date of submission	Date of Assessing	Operation
A1	IMSE560	Hamett, Mike	3/3/2008 1:25:24 PM	Incomplete	Assess
A2	IMSE560	Hamett, Mike	3/3/2008 1:25:55 PM	Incomplete	Assess
A3	IMSE541	Chang, Shing	2/26/2008 10:51:53 AM	Incomplete	Assess
A3	IMSE623	Rys, Margaret	Incomplete	Incomplete	N/A
A3	IMSE643	Easton, Todd	2/25/2008 11:15:08 AM	Incomplete	<u>Assess</u>
					▲ top

[B] Design and conduct experiments & Analyze and interpret data

Outcome/ Component	Class/ Process	Faculty Responsible	Date of submission	Date of Assessing	Operation
B1	IMSE541	Chang, Shing	2/26/2008 10:09:28 AM	Incomplete	Assess
B2	IMSE541	Chang, Shing	2/26/2008 10:11:06 AM	Incomplete	Assess
B2	IMSE623	Rys, Margaret	Incomplete	Incomplete	N/A
B3	IMSE541	Chang, Shing	2/26/2008 10:13:08 AM	Incomplete	<u>Assess</u>

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Committee Recommendations & Actions

[Undergraduate Commitee Recommendations]



[Corrective Actions]



Administrator Functions

An Overview of

- who are assigned to report
- numbers of completed and incomplete items
- Maintain Users/Levels
- Maintain courses related to assessment
- Maintain program outcome categories/sub categories
- View submission reports by time stamps

Administrator Overview

[Home] | [Account] | [Committee] | [Administrative Menu] | [Sign out]

Overview	Maintain User Maintain Course	Maintain Category	View Log	::Login Status:
Summary Report	Year & Semester		2007	 Fall Submit
Faculty No	Name	Num.of Assessment	Completed	Incompleted
<u>IE000</u>	test.Chou,Shih-Hsiung	0	0	0
<u>IE001</u>	Dr.Kramer,Bradley A	0	0	0
<u>IE002</u>	Dr.Ben-Arieh,David	4	3	1
<u>IE003</u>	Dr.Chang,Shing	9	9	0
<u>IE004</u>	Mr.Deines,Timothy	2	2	0
<u>IE005</u>	Dr.Easton,Todd	17	11	6
<u>IE006</u>	Dr.Hamett,Mike	7	6	1
<u>IE007</u>	Dr.Lee,Stanley	0	0	0
<u>IE008</u>	Dr.Lei,Shuting	4	0	4
<u>IE009</u>	Dr.Pei,ZJ	0	0	0
<u>IE010</u>	Dr.Rys,Margaret	11	0	11
<u>IE01099</u>	Dr.Who,Guess	6	0	6
<u>IE011</u>	Dr.Galvan,Doris	0	0	0
<u>IE999</u>	Mr.Stegman,Matt	0	0	0

hang::

Admin User/Level

[Home] | [Account] | [Committee] | [Administrative Menu] | [Sign out]

	Overvie	w M	laintain User N	faintain Course Main	tain Category Vi	ew Log	
	2007Fall						ADD NEW USER
	Faculty No	Title	Last Name	First Name	IMSE ID	Level	Operation
I							
	IE01099	Dr.	Who	Guess	GW	В	Edit Delete

::Login Status: Chang::

Admin Courses

[Home] | [Account] | [Committee] | [Administrative Menu] | [Sign out]

Overview	Maintain User Maintain Course Maintain Category View Lo	g
7Fall		ADD NEW COURSE
Course No	Course Title	Operation
IMSE015	Engg Assembly	Edit Rename Delete
IMSE050	Plant Tour	Edit Rename Delete
IMSE201	Intro IE	Edit Rename Delete
IMSE251	Manufact Processes Lab	Edit Rename Delete
IMSE541	Introduction to Statistical Quality Control	Edit Rename Delete
IMSE555	Layout	Edit Rename Delete
IMSE560	OR I	Edit Rename Delete
IMSE580	MSDA	Edit Rename Delete
IMSE591-592	Senior Design	Edit Rename Delete
IMSE623	Ergonomics	Edit Rename Delete
IMSE633	PPIC	Edit Rename Delete
IMSE643	Simulation	Edit Rename Delete

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Admin Outcome Categories

[Home] | [Account] | [Committee] | [Administrative Menu] | [Sign out]

Overview	Maintain User Maintain Course Maintain Category View Log			-
			ADD NEW	CATEGORY
Category No	Category Title		Opera	ation
А	Apply Knowledge of Mathematics, Science, and Engineering	Edit	Rename	Delete
В	Design and conduct experiments & Analyze and interpret data	Edit	Rename	Delete
С	Design a system, component or process	Edit	Rename	Delete
D	Function on a multi-disciplinary team	Edit	Rename	Delete
Е	Identify, formulate and solve engineering problems	Edit	Rename	Delete
F	Understand professional ethics	Edit	Rename	Delete
G	Communicate Effectively	Edit	Rename	Delete
Н	Understand impact of engineering solutions on society	Edit	Rename	Delete
Ι	Lifelong learning	Edit	Rename	Delete
J	Knowledge of contemporary issues	Edit	Rename	Delete
K	Use modern engineering tools	Edit	Rename	Delete

::Login Status: Chang::

Admin edit sub-categories

[Home] | [Account] | [Committee] | [Administrative Menu] | [Sign out]

Overview	Maintain User Maintain Course Maintain Category View Log	::Login Statu
Category A Title: Apply K	nowledge of Mathematics, Science, and Engineering	ADD NEW COMPONENT
Component No	Component Title	Operation
A1	Apply matrix theory	Rename Delete Course
A2	Use computer to reach numerical solutions	Rename Delete Course
12	A mater two and a dama of Chestingian	Barrana Datata Cauna

Admin logs

- Class report log
- Resubmit log
- Committee report log

[Home] | [Account] | [Committee] | [Administrative Menu] | [Sign out]

Overview	Maintai	n User Ma	intain Course	Maintain Category	View Log		::Login Status: (
					 [Edit]	Log] [Reedit Log]	[Committee Log]
			Ī	EDIT LOG			
Assess. No.	Editor	Date		IP		Action	Operation

Technical Spec.

- Microsoft Office Access Database (2003 format)
- User interface: Microsoft ASP (Active Server Pages) scripting language
- Host: Microsoft server 2003
- Resource: one skilled graduate student in 6 months (weekly development meetings!)

Hands On Exercise Revisit

- You are required to copy 30 handouts to your students for each subject you teach. There are 10 subjects covered in this semester.
- TTYP: What is the goal? What is the process to achieve this goal?
- TTYP: How do you evaluate your process? What are the metrics?

Work to do

- Deadline function
- E-mail reminder function
- Tie it to the university-wised assessment report
- Provide a data archive to go beyond ABET
- KEY POINT: Are we going to be better off tomorrow than today or yesterday?

A Framework of Paperless Assessment at K-State



On-demand Reports

Lessons Learned

- It is about the process. Automation will not necessarily achieve the goal.
- Don't let automation dominates your process.
- How flexible is the automation system? What if your student (system developer) graduates? How easy is it to revise the system?
- What is the connectivity to other systems?
- Who and how do you train your users? (e.g. Camtasia Studio 5)
- Continuous improvement your feedbacks.

Backup Slides

(published link: http://docs.google.com/Presentation?id=d6kvmn5_145f2jn9jgt)

Specific Program Outcomes

- a) Apply knowledge of mathematics, science and engineering
 - 1. Apply matrix theory.
 - 2. Use computer to reach numerical solutions
 - Apply knowledge of Statistics
- Design and conduct experiments and analyze and interpret data
 - 1. Design an experiment and collect data
 - 2. Implement appropriate statistical methods
 - Identify significant factors of the experiment & make recommendations based on analytical results

- c) Design a system, component or process
 - Identify system requirements, constraints and assumptions
 - 2. Create alternative designs
 - 3. Evaluate alternatives
- d) Function on a multidisciplinary team
 - 1. Understand your role and the effect this has on a group
 - 2. Be a member of groups composed of various individuals
 - Evaluate the contribution of team members

Specific Program Outcomes (Cont'd)

- e) Identify, formulate, and solve engineering problems
 - Identify objectives, constraints, assumptions and problems
 - 2. Model the problem
 - 3. Obtain solution to the problem
 - 4. Interpret and validate the solution.
- f) Understand professional ethics
 - Identify situations related to ethical dilemmas.
 - 2. Know IMSE professional and academic ethics.

- g) Communicate effectively
 - 1. Write a technical report.
 - 2. Write an executive summary.
 - 3. Identify factors that make or break a professional presentation.
- h) Understand impact of engineering solutions on society
 - Know key Industrial Engineers and their contribution to society
 - 2. Understand the impact of design in a global, economic, environmental, and societal context.

Specific Program Outcomes (Cont'd)

- i) Engage in lifelong learning
 - Participate in IMSE Assembly and learn about current career requirements
 - 2. Develop a career plan
 - Collect information from various sources and present results
- j) Knowledge of contemporary issues
 - Know contemporary issues facing IEs in industry
 - Know skills needed for contemporary IE activities

- k) Use modern engineering tools
 - Use modern mathematical and computational tools
 - 2. Use modern statistical tools
 - 3. Use modern communication tools to communicate with class instructor and team members

IMSE Class I Industrial & Manufacto Outcomes Assessm	Report Template (Revised May 15, 2005) uring Systems Engineering ent Data Collection Form
Outcome:	
Component:	
Class/Process:	_ Instructor/Evaluator:
Semester/Time:	_Number of students:
Method of Assessment:	
Assessment:	
Conclusions/Recommendations	S:
	Signature Date