College of Engineering Curriculum Committee (2007-08)
Final Report (4/15/2008)

Members

Prof. Michael Mackey, Chair
Prof. Athanasios Papanicolaou
Prof. Ralph Stephens
Prof. Mark Andersland
Prof. Julie Jessop
Dean Alec Scranton, *ex officio* nonvoting
Katherine Cribben, student representative, nonvoting

Summary

This year, the College of Engineering Curriculum Committee met seven times. The following sections list specific charges and progress made this year.

Progress According to Specific Charges

Charge # 1: Monitor the effectiveness of the newly introduced "Grabbing the Globe" lecture series in satisfying the stated goals of the college global awareness initiative and ABET outcome, k. If needed, recommend appropriate changes.

Progress made:

A recent change in the organization of this seminar series has resulted in individual departments arranging for speakers using support provided by the College Dean's Office. The Committee decided to poll Department Executive Officers as to the usefulness of the seminar series, its organization, whether the Departmental Program uses the series to satisfy ABET outcome h, and, if so, what assessment, if any, is used. All College departments responded, and the general impression (4/5 DEO's) was that the seminar series was a valuable contribution to the curriculum. Weaknesses in organization were noted, however, and the Committee has some recommendations as to how such organization might be improved. There was a lack of communication between departments in the scheduling of these talks; more college-wide communication between seminar organizers is needed to make these seminars available to the College as a whole. One DEO suggested that a mixer follow the seminar (with refreshments) to encourage more student/speaker interaction, a suggestion that the Committee found very attractive.

Four out of five departments used these seminars to satisfy in part ABET Outcome h, with all four departments using some metric for this assessment, ranging from attendance to a small writing assignment. All four departments that use the series for Outcome h indicated that the seminar series was valuable in this regard.

One DEO expressed the opinion that when the College was organizing the seminars they were more useful for ABET, and in general were more useful for the department. This individual recommended a return to the College-organized seminars.

Recommendations:

The Committee concludes that the seminar series be continued in its current format, but that new procedures be instituted to improve interdepartmental communication. Towards this end, the Committee recommends that each Department should provide the Associate Dean for Curriculum with a list of scheduled seminars two weeks before the start of the semester in which the seminar will be presented, and we further recommend that the Dean for Curriculum distribute to all DEO's a master list of seminars for the upcoming semester during the first week of classes. In this way, each department will be aware of upcoming Grabbing the Globe seminars with enough advance notice to incorporate these presentation into their curriculum.

Charge # 2: Participate in the Professionalism, Ethics and Leadership in Engineering Education Initiative (PELEEI). Contribute as requested to the deliberations of the PELEEI task force.

Progress made:

In late March, Prof. Allan Guymon attended a Committee meeting and shared the PELEEI group's desire to establish an updated focus for this initiative, as a PELEEI representative . A new name (and acronym) for this initiative is being proposed. The new name is Leadership, Ethics, and Professionalism (LEAP) and reflect the fact that this task force is more focused on positive improvement to the undergraduate curriculum in these areas than in the past. At this point, the group is actively involved in developing a program designed to incorporate content in ethics, leadership, and professionalism within the College curriculum. The goal is to re-define the initiative to be more focused on opportunities for improvement in these areas, rather than in the identification of inappropriate student behavior. Although still in the planning stage, LEAP plans to explore the possibility of incorporating these topics into Core courses (e.g., introducing Ethics in EPS I; developing an upper division course in leadership, etc.).

The Curriculum Committee sees much promise in the ideas presented by Prof. Guymon and is very much interested in further development of these approaches.

Recommendations:

The Committee recommends that LEAP continue its redefinition into an initiative promoting positive educational enhancement in the College, and also recommends that the Curriculum Committee work with LEAP in the future to develop a proposal that implements these changes towards the improvement of the coverage of ethics, leadership, and professionalism in the College curriculum.

Charge # 3: Review Course Activity Reports (CAR) for the College of Engineering core curriculum courses (59:xxx & non-college courses) in coordination with the core-course coordinators. Include an analysis of the format and the level of detail that should be required in the CARs. If specific problems need addressing, either with the overall process or with individual courses, report these to the EFC.

Progress made:

The Course Activity Reports (CAR) for five College Core courses (Circuits, EPS I, EPS II, Statics, Thermodynamics) were reviewed by the Curriculum Committee. Only four of five core course CAR forms were available for the 2007 academic year, with no CAR provided for EPS I; further, no CAR was available for EPS I last year. Three of the four core course CAR's used the new format created by Dean Scranton, the Core Course Coordinators, and the Curriculum Committee, while EPS II used the older format since this course was last taught in Spring 2007. The new format provided guidance that improved the ABET required metrics relative to the previous year, however, not all four of the CAR's had adequate metrics or evaluative conclusions based on Mastery 80-100%, Competency 50-80%, and Exposure < 50%, as contained in the new CAR template. Two of the CAR forms changed the percentages for these three categories, without explanation. Also, the category results were not included in several CAR's, making an overall assessment difficult.

Assessment of ABET Program Outcomes a-f was very limited in the CAR's, due to a rather restricted set of goals identified for these courses. Upon reviewing these materials, it was noted that the new CAR format does not provide for a mapping of the ABET outcomes to the course learning goals, a change which should be incorporated in a revised template. Although each departmental program must provide their own such mappings in the Self Study, each program includes Outcomes a-f as a base subset of their Program Outcomes, and would thus likely benefit from such information being contained in the CAR. The new format also allows for semester-by-semester updates, evaluations, and recommendations for the future semester. In several courses this information was not provided, as this new format has just been implemented.

As noted above, no CAR was available for EPS I. Committee discussion revealed that there was little coordination between instructors involved with the didactic and design portions of the course. Given the rather different focus for each subgroup of the course, it was suggested that it might be more appropriate for separate CAR’s to be prepared

In the course of discussing these CAR’s, the Committee considered the usefulness and appropriateness of the use of EASY Course Goal surveys. In this area, the Committee was divided, with part of the Committee recommending that the College discontinue the use of these survey tools, and the other part of the Committee feeling that discontinuation of these survey-based assessments may well be justified, but that such a change merits further investigation and feedback from the EFC and the College faculty. There are good reasons to question the utility of this survey approach, as the large number of surveys presented to students each semester has led to rather low compliance, thus rendering the resulting data of questionable assessment value. Thus, the Committee has recommended a new charge to the Curriculum Committee for next year to investigate the utility of the EASY survey mechanism for assessment of the College Core Courses.

Overall, the CAR’s have improved compared to last year, but more compliance by the College Core Course Coordinators is required to ensure that proper evaluation and improvement of these courses will continue. In general, the improved content of the CAR’s are more evaluative and should be more helpful for incorporation into ABET Self-Study documents by departmental programs. However, more adherence to the new format, as well as the inclusion of quantitative metrics, conclusions, and recommendations for course improvement are needed.

Recommendations:

1. The new CAR format needs to include conclusions and would be improved by including a mapping of Program Outcomes a-f to specific course goals, in order to better facilitate use of this information by departmental programs for ABET accreditation.

2. All future CAR's need to define quantitative assessment metrics, evaluations, and recommendations for improvement of the course each time the course is taught.

3. For Engineering Problem Solving I, separate course coordinators should be appointed for the didactic and design portions.

Charge # 4: In the spring semester, monitor the results of the ongoing assessment of the math sequence being performed by the College of Engineering Office of the Dean.

Progress made:

The assessment of the math sequence was performed in accordance with the procedure established previously by the Curriculum Committee and the EFC. In this procedure, College of Engineering faculty are surveyed regarding the students' demonstration of mathematical abilities in engineering courses. Faculty teaching selected engineering courses which require mathematical skills were polled regarding the "relevance to their course" and the "students' preparedness" in each math topic taught in the core mathematics sequence. The entire text of the report, along with details as to the survey questions and the raw assessment data, is included as a separate document as an attachment. The list of topics is provided in Appendix A of this report, and the list of faculty who were polled is provided in Appendix B. A summary of the survey results is provided in Appendix C. The survey was conducted in the spring based upon courses that were taught during the fall semester. The survey deadline was extended twice to maximize the number of responses. Finally, based upon an April 1 deadline, 9 out of 16 faculty responded to the survey.

The data indicate that the students were well prepared by the mathematics sequence with "preparedness" ratings from engineering professors averaging 3.8 on a 5.0 scale. The average preparedness ratings were greater than 3.5 in 58 out of 61 topics. For nearly every topic, the average preparedness was rated higher than the average relevance to the course. The lowest average ratings for preparedness (less than 3.5) were for the following topics: 22M:31—Topic 13 and 22M:34—Topics 9 and 12. These topics had average relevance ratings between 2.5 and 3.0. These results have not been observed in the past and will be monitored in the future for a trend. Variations in relevance exist, but arise from the specialized nature of the courses surveyed. A low relevance for a specific course does not mean that the topic is unimportant for engineers (every topic had at least one relevance rating of 4 or 5). We do not recommend that any of the mathematics topics be dropped from the curriculum.

Recommendations:

The survey response rate was relatively slow and culminated in 56% of the polled faculty completing the survey. In addition, the responses have been consistent from year to year, and there is interest in

using this tool to assess the physics and/or chemistry courses. Therefore, we recommend that the math survey be conducted less frequently, with no single faculty member polled for more than one sequence (*i.e.,* math, chemistry or physics) a year.

Charge # 5: Recommend specific charges for the 2008-09 Curriculum Committee.

1. Continue to monitor the effectiveness of the newly introduced "Grabbing the Globe" lecture series in satisfying the stated goals of the college global awareness initiative and ABET outcome, h, paying particular attention to increasing interdepartmental communication in advance of scheduled seminars to make these presentations more available College-wide. If needed, recommend appropriate changes to the series organization or content.

2. Participate in the Leadership, Ethics, and Professionalism (LEAP) initiative, contributing as requested in the redefinition of this task force, and examine possible enhancement in these areas within the College Core Course Curriculum.

3. Review Course Activity Reports (CAR) for the College of Engineering core curriculum courses (59:xxx & non-college courses) in coordination with the core-course coordinators. Include an analysis of the format and the level of detail that should be required in the CARs. If specific problems need addressing, either with the overall process or with individual courses, report these to the EFC.

4. Examine the usefulness of the Easy Course Goals Survey in the assessment of College Core Courses, and recommend any changes in such use, if warranted, to the EFC.

5. In the spring semester, monitor the results of the ongoing assessment of the math sequence being performed by the College of Engineering Office of the Dean. Explore extending this assessment mechanism to include the undergraduate Chemistry and Physics sequences, in order to determine if these important courses are serving the needs of the College curriculum.

6. Recommend specific charges for the 2009-10 Curriculum Committee.

Additional Progress Made

In the Fall Semester, the Curriculum Committee recommended the approval of a new course entitled 'Energy and Society', a 3 h social science course as an available GEC course for all University students. A copy of the course description and ABET description is provided as Appendix I to this report.

Also in the Fall Semester, the Curriculum Committee, working with the Associate Dean for Curriculum and the College Core Course Coordinators, approved a new format for the Course Assessment Report (CAR) to be used for all Core courses. A template for this new format is included in Appendix II.

Appendix I – Recommended Core Course CAR Format
Course Assessment Report
College of Engineering, The University of Iowa

(Revised 14 November 2007)

Course: 59:005 Engineering Problem Solving I (3 semester hours)
Semester and Instructor: Fall 2007, Allan Bradley
Coordinator: Keri Hornbuckle
Student Head Count*: XXX*
Teaching Assistants*: XX TAs (YY FTE)*

I. Assessment Techniques
Indicate how the students' achievement of each course goal was assessed.

Course Learning Goal

Assessment Technique

II. Course Goals and Program Outcomes

Course Learning Goal	**Program Outcome** *e.g., a(●), b(●), c(●), d(○)*

Notes:
○ *denotes moderate contribution to the outcome* ● *denotes substantial contribution to the outcome*

III. Program Outcomes (provided for reference).

New graduates from the College of Engineering Undergraduate Programs will have:
(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

IV. Assessment

Log of Recent Changes and Improvements. This section contains a running account of course improvements, including the motivation for the changes.

This section will be provided to the instructors each semester before the course is taught, and coordinators will add a brief account of the current semester's changes. At any one time ~4 years will be included.

Part A. Improvements and Recommendations this Semester. Provide a description of course improvements that have occurred this semester relative to those of previous semester (including the motivation for these changes), and recommended changes for upcoming semesters as needed.

Part B. Quantitative Assessment Results. Provide a quantitative assessment for each course learning goal.

Example of a quantitative review of a course learning goal:

Appendix II – Proposed New College Course Description
Course Proposal
Energy and Society (52:xxx)
(3 sh social science course for COE students)
Initial Offering: Spring 2008

Background:
The goal of this proposal is to receive approval to offer this course as a 3 sh lower level Social Science or Humanity elective for College of Engineering students beginning in the Spring 2008 semester. Furthermore, the data collected from this initial offering of the course will be utilized to propose this course as a General Education course for all UI students. It should be noted that the course will build upon the 1 sh First-Year Seminar ("The Energy Future") that is currently (Fall 2007) being offered for the 3rd time by Professors Scranton and Murhammer.

Course Description:
This will be an introductory course involving the history of energy development and use throughout the world and how energy has affected the development of human societies. The historical overview will provide students with concrete examples of the societal impact of engineering advances. The course culminates with the current state of energy consumption in the world, including the current distribution of energy sources, global variations in consumption, and the advantages/disadvantages of current energy sources. The course will include analysis of the role of fossil fuel consumption in global climate change and an evaluation of potential scenarios for the energy future.

Pre(co)requisite(s):
None.

Textbook:
Harold H. Schobert, "Energy and Society [An Introduction]," Taylor and Francis, 2002.

Instructors:
David W. Murhammer, Department of Chemical and Biochemical Engineering
Alec Scranton, Department of Chemical and Biochemical Engineering

Course Goals:
1. Gain an appreciation for the history of energy sources and use throughout the world.
Gain an appreciation for current energy consumption throughout the world and its relationship to economic development.
Gain an appreciation for the advantages and disadvantages of fossil fuels and nuclear energy.
Gain an appreciation for the important energy-related innovations throughout history.
Gain an appreciation for the distribution of nonrenewable energy reserves throughout the world.
Gain an appreciation for how the availability of inexpensive fossil fuels has shaped modern day society.
Gain an appreciation for the societal issues involved in energy policy in the United States and throughout the world.

Gain an appreciation of the causes and effects of climate change and potential approaches for mitigating these effects.
Gain an appreciation for potential sustainable energy sources and possible future scenarios for energy generation.

ABET Outcomes Addressed:

(h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

The global, economic, environmental, and societal impact of energy-related engineering advances is the primary focus of the course. Based upon the historical content when the advance was made, nearly every lecture will deal with one or more of these aspects. The course will provide very strong support of this outcome.

(j) A knowledge of contemporary issues

Energy is clearly an important contemporary issue, and the course will finish with lectures covering the current energy situation, and possible scenarios for the energy future.

Topics (45 total lectures):

1. Introduction: What is energy? Etc. (1 lecture)

Human Energy (1 lecture)
Fire and firewood (1 lecture)
Early use of waterwheels and wind energy (1 lecture)
Technological developments leading to commercial electricity generation/principles of electricity generation (2 lectures)
Impacts of electricity on society (2 lectures)
Electricity from falling water (1 lecture)
Electricity from coal (2 lectures)
History and societal issues associated with coal (2 lectures)
Energy for transportation (2 lectures)
History and societal issues associated with petroleum (5 lectures)
Petroleum and its products (2 lectures)
Impact of automobiles and other modes of transportation on society (2 lectures)
History and societal issues associated with natural gas (2 lectures)
Current status of fossil fuel use and reserves (1 lecture)
Environmental issues related to fossil fuel (3 lectures)
History and societal issues associated with nuclear fission (3 lectures)
History and societal issues associated with hydropower (2 lectures)
Societal issues associated with renewable energy generation (solar, wind, etc.) (3 lectures)
Current status of renewal energy generation (2 lectures)
The energy future (5 lectures)

Class Assignments:

3-4 exams (including final exam)
Project to design an off the grid home (this project has been very popular in our First-Year Seminar)
Other assignments to be developed (short papers, etc.)

College of Engineering Curriculum Committee (2007-2008)

Final Report on Math Assessment Charge
April 14, 2007

Math assessment charge

In the spring semester, monitor the results of the ongoing assessment of the math sequence being performed by the College of Engineering Office of the Dean.

Sub-committee members

Julie Jessop, Ph.D.
Alec Scranton, Ph.D.

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Observations:

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The survey response rate was relatively slow and culminated in 56% of the polled faculty completing the survey. In addition, the responses have been consistent from year to year, and there is interest in using this tool to assess the physics and/or chemistry courses. Therefore, we recommend that the math survey be conducted less frequently, with no single faculty member polled for more than one sequence (*i.e.*, math, chemistry or physics) a year.

APPENDIX A: Survey Questions

Core Math Course: 22M:031 Single Variable Calculus

	Topics covered during class
1)	Pre-calculus: absolute value, intervals, lines, functions and their graphs including trig and inverse trig functions, exponential and log, base e and natural log.
2)	Limits: Definition (intuitive, geometric and epsilon-delta). Limit theorems and their use. One sided limits and limits at infinity.
3)	Continuity and introduction to the derivative; define point-wise continuity and continuity on an interval; state and explain intermediate value theorem and extreme value theorem; define derivative of a function at a point and connect to slopes of tangent lines and instantaneous rates of change.
4)	Differentiation techniques, products, quotients, chain-rule
5)	Derivatives of trig functions, inverse trig functions, exponential and log functions
6)	Applications of derivative, implicit differentiation, related rates, differentials and tangent line approximation.
7)	Max-Min and the Mean-Value Theorems, absolute max-min of continuous function on a closed bounded interval, critical points, endpoints, increasing and decreasing functions, the mean value theorem, relative max/min, first derivative test and some applied max-min problems
8)	Taylor polynomials and the remainder; extend the Mean-Value Theorem to approximate and estimate error.
9)	Graphing concavity, second derivative test, curve-sketching
10)	Exponential growth and decay; L'Hospital's rule; graphs involving log and exponential functions.
11)	Definite Integral and Fundamental Theorem of Calculus; definition of definite integral via Riemann sums, properties, relate to anti-derivative via the Fundamental Theorem.
12)	Techniques of integration; standard rules for anti-differentiation and use of substitution
13)	More techniques of integration include integration by parts and partial fractions
14)	Improper integrals and numerical integration
15)	Area and volumes of revolution

APPENDIX A: Survey Questions

Core Math Course:
22M:032 Multivariable Calculus

	Topics covered during class
1)	Explicit, implicit, parametric equations for curves, including lines, circles, ellipses, and parabolas.
2)	Vector geometry addition, scalar multiple, dot product, projections and angles, cross product. (postpone determinants and oriented areas and volumes until later in the course)
3)	Functions of several variables (include polar/cylindrical coordinates)
4)	Partial derivatives, directional derivatives, differential
5)	Tangents lines and planes, relation to gradient vector
6)	Maxima and minima
7)	Applications of MAX-MIN
8)	Multiple integrals in 2-dimensions
9)	Multiple integrals in 3-dimensions (somewhere in 2- and 3- dim integrals, do polar/cylindrical coordinates; this means confronting “change of variable” “stretching factor” in some form)
10)	Parametric curves, velocity, curvature
11)	Vector fields and flows
12)	Integration on curves (work integrals)

APPENDIX A: Survey Questions

Core Math Course:
22M:033 Matrix Algebra

	Topics covered during class
1)	Matrix arithmetic: addition, multiplication, properties
2)	Vectors: addition, scalar multiplication - algebraic and geometric
3)	Linear combinations, linear independence, basis subspace - examples from R2 and R3
4)	Reduced row echelon form of a matrix; calculation by hand and with computer
5)	Solving linear systems and finding bases for row space and column space of matrix
6)	Inverse of an nxn matrix: existence; calculate by hand and with computer
7)	Use of inverse in solving systems of equations. Rank and dimension
8)	Null Space; solution of Ax=0; General solution of Ax=b
9)	Determinants; definition and properties; calculate by hand (row reduction) and computer; Expansion by minors (Laplace expansion of determinant)
10)	Applications of determinants: Cramer's rule; cross- product.
11)	Eigenvalues and eigenvectors: linear transformation; eigen-value, -vector, - space and examples
12)	Diagonalization: P-1AP=D, where columns of P are basis for Rn consisting of eigenvectors of A, and D is a diagonal matrix of eigenvalues of A. Examples of diagonalization
13)	Orthogonal bases: calculation by hand and by computer; Orthogonal diagonalization of symmetric matrix: principal axis theorem; calculation by hand and by computer.
14)	Fitting a line or curve to data: Vandermonde matrices; least squares fittings.
15)	Projection in R2 and R3: projecting a vector on a line and into a plane
16)	Orthogonal matrices in R2 and R3: Applications of principal axis theorem
17)	Rotations and reflections in R2 and R3
18)	Exams, review/practice

APPENDIX A: Survey Questions

Core Math Course: 22M:034 Differential Equations

	Topics covered during class
1)	Classification of differential equations; direction fields
2)	Exponential growth and decay; related physical phenomena
3)	Linear equations and integrating factors
4)	Separable equations
5)	Reduction of order, application of nonlinear equations: Bernoulli and logistic equations, gravitation
6)	Sample computer lab assignment: direction fields; integration and differentiation; solution of first-order differential equations and initial value problems. Mechanical and electrical oscillation: modeling by initial value problems
7)	Linear, constant-coefficient second order equations: homogeneous case; the characteristic polynomial
8)	The method of undetermined coefficients
9)	Oscillation and resonance (plus amplitude modulation and other phenomena)
10)	The Laplace transform L; definition and foundations; some table entries; 1st differentiation rule
11)	Solving initial value problems using Laplace and inverse Laplace
12)	Sample computer assignment: Laplace transform (beyond constant coefficient equations and beyond the familiar table entries); undetermined coefficients; amplitude modulation.
13)	More on the Laplace transform: 1st and 2nd shift rules, 2nd differentiation rule, discontinuous inputs, periodic functions, impulse functions, convolution, impulse response, transfer function
14)	Linearity; the Wronskian
15)	Use of a known homogeneous solution to find another; variation of parameters
16)	Topics chosen from: (I) Systems: generalities, reduction of higher-order equations to first-order systems. (II) Linear systems: homogeneous with constant coefficients; eigenvalues; the cases of complex and repeated eigenvalues; non-homogeneous systems; simultaneous differential equations. (III) Brief introduction to nonlinear second-order equations and first-order systems; phase plane and energy methods; the pendulum; predator-prey and competing species; nonlinear oscillators; autonomous systems and stability

Appendix B. Faculty Polled for Survey

Jasbir Arora	53:033	Principles of Structural Engineering
Linda Boyle	56:162	Quality Control
Audrey Butler	52:161	Mass Transfer and Separation
Pablo Carrica	58:080	Experimental Engineering
Richard Jerz	56:032	Design for Manufacturing
Andrew Kusiak	56:134	Process Engineering
Hosin Lee	53:063	Principles of Transport Engineering
John Lee	56:144	Human Factors
Zhiqiang Liu	55:040	Linear Systems
Karl Lonngren	55:070	Electromagnetic Theory
Michael Mackey	51:040	Biological Systems Analysis I
James Maxted	55:032	Intro to Digital Design
Tonya Peeples	52:185	Process Dynamics/Control Design
Madhavan Raghavan	51:050	Biomechanics
David Rethwisch	52:171	Thermodynamics/Transport lab
H.S. Udaykumar	58:048	Energy Systems Design

APPENDIX C: Survey Results

22m:031

Relevance 1 = not relevant, 5 = very relevant

	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Topic 7	Topic 8	Topic 9	Topic 10	Topic 11	Topic 12	Topic 13	Topic 14	Topic 15
User 1	5	5	5	4	4	4	4	4	4	5	4	4	4	4	5
User 2	5	3	3	3	5	5	3	2	2	4	2	3	2	3	1
User 3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1
User 4	5	1	3	5	5	5	1	1	5	1	4	3	1	1	1
User 5	4	2	2	3	5	2	2	3	3	5	2	2	2	3	2
User 6	4	1	1	3	1	1	1	1	1	3	2	3	3	4	2
User 7	5	5	5	5	5	5	5	3	5	5	5	4	5	5	3
User 8	5	3	3	4	4	3	5	4	4	5	3	3	3	5	2
User 9	3	1	1	1	1	1	1	1	1	1	1	1	1	1	2
User 10	3	5	2	5	5	3	5	3	1	5	1	3	5	3	1
Mean	4.20	2.70	2.60	3.40	3.60	3.00	2.80	2.38	3.13	3.63	2.88	2.88	2.63	3.25	2.00
Median	4.5	2.5	2.5	3.5	4.5	3	2.5	2.5	2.5	4.5	2	3	2.5	3	2

Preparedness 1 = not prepared 5 = well prepared

	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Topic 7	Topic 8	Topic 9	Topic 10	Topic 11	Topic 12	Topic 13	Topic 14	Topic 15
User 1	4	4	4	4	4	4	5	5	5	5	5	5	4	4	5
User 2	5	5	5	5	5	5	5	5	5	5	5	5		5	5
User 3	4														
User 4	3		3	3	3	3			3		3	3			
User 5	4	4	4	3	3	4	4	3	4	3	4	4	4	4	4
User 6	4	3	3	3	3	3	3	3	3	3	3	3	3	2	3
User 7	4	4	4	3	4	3	4	3	4	4	3	4	4	4	3
User 8	4	4	4	3	4	4	4	4	4	4	4	3	3	3	4
User 9	4	3	3	3	3	3	3	3	3	3	3	3	3	3	4
User 10	3	4	4	5	5	4	4	3	3	5	5	5	3	4	4
Mean	3.9	3.9	3.8	3.6	3.8	3.7	4.0	3.6	3.8	4.0	3.9	3.9	3.4	3.6	4.0
Median	4	4	4	3	4	4	4	3.5	4	4	4	4	4	4	4

APPENDIX C: Survey Results

22m:032

Relevance 1 = not relevant, 5 = very relevant

	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Topic 7	Topic 8	Topic 9	Topic 10	Topic 11	Topic 12
User 1	5	4	4	4	4	5	4	5	4	5	5	5
User 2	1	1	1	4	3	3	2	1	1	1	2	3
User 3	1	1	1	1	1	1	1	1	1	1	1	1
User 4	1	1	3	5	4	5	4	1	1	1	1	1
User 5	2	3	2	2	2	3	3	2	1	2	1	4
User 6	2	3	3	2	2	4	4	1	1	4	4	2
User 7	2	4	3	5	3	5	3	5	2	3	5	3
User 8	3	2	2	1	2	1	2	1	1	1	1	1
User 9	3	5	2	3	2	5	5	5	2	3	4	2
Mean	2.22	2.67	2.33	3.00	2.56	3.56	3.11	2.44	1.56	2.33	2.67	2.44
Median	2	3	2	3	2	4	3	1	1	2	2	2

Preparedness 1 = not prepared 5 = well prepared

	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Topic 7	Topic 8	Topic 9	Topic 10	Topic 11	Topic 12
User 1	5	5	5	4	4	4	4	4	4	5	5	4
User 2	5	5	5	5	5	5	5	5	5	5	5	5
User 3												
User 4			3	3	3	3	3					
User 5	4	4	4	4	4	3	3	4	4	4	4	3
User 6	3	3	4	4	3	4	4	3	3	3	2	3
User 7	3	4	3	3	3	4	3	3	2	3	4	3
User 8	4	4	3	3	4	3	4	3	3	3	3	3
User 9	4	5	4	4	4	4	4	4	4	4	4	4
Mean	4.0	4.3	3.9	3.8	3.8	3.8	3.8	3.7	3.6	3.9	3.9	3.6
Median	4	4	4	4	4	4	4	3.5	3.5	3.5	4	3

APPENDIX C: Survey Results

22m:033

Relevance 1 = not relevant, 5 = very relevant

	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Topic 7	Topic 8	Topic 9	Topic 10	Topic 11	Topic 12	Topic 13	Topic 14	Topic 15	Topic 16	Topic 17	Topic 18
User 1	5	5	5	4	4	5	5	4	4	4	4	5	5	5	5	4	5	5
User 2	4	4	4	4	4	2	2	1	1	1	1	1	1	3	1	1	1	
User 3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
User 4	5	5	5	3	4	5	5	5	5	5	5	1	1	1	1	1	1	1
User 5	3	2	2	1	1	1	3	3	1	1	3	2	2	4	2	1	1	1
User 6	4	3	1	2	1	1	2	1	2	3	4	4	3	5	2	1	1	1
User 7	5	5	5	2	5	5	5	5	4	4	5	5	4	4	5	3	3	5
User 8	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1
User 9	5	5	4	4	4	3	3	3	3	5	3	2	3	5	2	2	2	5
Mean	3.67	3.44	3.11	2.44	2.78	2.67	3.00	2.67	2.44	2.78	3.00	2.44	2.33	3.33	2.33	1.67	1.78	2.50
Median	4	4	4	2	4	2	3	3	2	3	3	2	2	4	2	1	1	1

Preparedness 1 = not prepared 5 = well prepared

	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Topic 7	Topic 8	Topic 9	Topic 10	Topic 11	Topic 12	Topic 13	Topic 14	Topic 15	Topic 16	Topic 17	Topic 18
User 1	5	4	5	4	5	4	5	5	5	4	5	4	5	5	4	5	5	5
User 2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
User 3																		
User 4	4	4	2	2	2	3	3	3	3	3	2							
User 5	4	4	4	4	4	4	3	3	3	4	3	4	4	4	4	4	4	3
User 6	3	3	3	3	3	3	2	3	3	3	3	2	2	2	3	3	3	3
User 7	4	4	4	4	3	4	4	4	3	3	3	3	3	4	4	3	3	4
User 8	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
User 9	5	5	5	3	4	4	4	4	4	5	4	4	4	5	4	4	4	3
Mean	4.1	4.0	3.9	3.5	3.6	3.8	3.6	3.8	3.6	3.8	3.5	3.6	3.7	4.0	3.9	3.9	3.9	3.5
Median	4	4	4	4	3	4	3	3	3	3	3	3.5	3.5	4	4	3.5	3.5	3

APPENDIX C: Survey Results

22m:034

Relevance 1 = not relevant, 5 = very relevant

	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Topic 7	Topic 8	Topic 9	Topic 10	Topic 11	Topic 12	Topic 13	Topic 14	Topic 15	Topic 16
User 1	4	4	4	5	5	5		5	5	4	5	5	5	4	4	5
User 2	1	3	3	4	3	5	3	2	1	2	1	1	1	1	1	1
User 3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
User 4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
User 5	2	5	3	2	3	5	2	2	5	2	4	4	5	3	2	5
User 6	2	4	3	1	4	4	1	3	1	1	3	2	2	2	3	1
User 7	5	5	5	4	5	5	5	3	5	5	5	4	5	5	5	5
User 8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
User 9	3	5	5	5	3	5	5	3	5	5	5	5	5	1	3	4
Mean	2.22	3.22	2.89	2.67	2.89	3.56	2.38	2.33	2.78	2.44	2.89	2.67	2.89	2.11	2.33	2.67
Median	2	4	3	2	3	5	1.5	2	1	2	3	2	2	1	2	1

Preparedness 1 = not prepared 5 = well prepared

	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Topic 7	Topic 8	Topic 9	Topic 10	Topic 11	Topic 12	Topic 13	Topic 14	Topic 15	Topic 16
User 1	5	4	5	5	5	4	4	5	4	5	5	4	5	5	5	4
User 2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
User 3																
User 4																
User 5	4	3	4	4	4	1	4	4	1	4	4	3	2	4	3	3
User 6	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
User 7	4	4	4	4	3	4	3	3	3	4	3	3	3	4	4	3
User 8	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
User 9	4	4	4	4	4	5	4	4	3	3	3	3	4	4	3	4
Mean	3.9	3.7	4.0	4.0	3.9	3.6	3.7	3.9	3.1	3.9	3.7	3.4	3.6	4.0	3.7	3.6
Median	4	3.5	4	4	3.5	3.5	3.5	3.5	3	4	3.5	3	3	4	3.5	3