Changing Employer Expectations
Under the Economic Turmoil a Skills Gap Simmers

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Iowa State University

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Collegiate Employment Research Institute
Michigan State University

American Society For Engineering Education
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Why are We Here Today?

- "Employer Expectations Are NOT What They Use To Be"
- Change Rate: Dramatic
- Understanding:
  - The Driving Forces
  - The Impact
    - Graduates’ Success
    - Engineering Education
    - Employer Engagement
From easy to straddle to a leap of faith

THE GAP:
SAME AS YESTERDAY OR WIDENING
University to Work Gap: circa 1995
University to Work Gap: 2011
Moving the Cheese
First Skills Gap “Awakenings”

Mid-1980s:
- Employer Ability-Based Position Description Mapping
- Behavioral/Ability-Based Selection, Hiring, Performance Management

Early 1990s:
- GE Globalization Announcement
- SCANS
- ABET Criterion 2000
The Skills Gap and the World of Engineering Practice

“First Awakening” (circa 1985-1990)
- Ability and Competency-Based “Targeted Selection™”
- Experiential Education and Professional Practice
- Targeted Schools
  - Limited
  - Resources & Engagement

“Second Awakening” (circa 1995-2000)
- ABET Got It Right!
  - “To be considered for accreditation, engineering programs must be designed to prepare graduates for the practice of engineering at a professional level.”
  - Criterion 3. Program Outcomes and Assessment
ABET Criteria 2000

Criterion 3. Program Outcomes and Assessment

Engineering programs must demonstrate that their graduates have:

(a) **an ability** to apply knowledge of mathematics, science and engineering
(b) **an ability** to design, conduct experiments, as well as analyze and interpret data
(c) **an ability** to design a system, component or process to meet desired needs
(d) **an ability** to function on multidisciplinary 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 and social context
(i) a recognition of the need for, and **an ability** to engage in lifelong learning
(j) a knowledge of contemporary issues
(k) **an ability** to use the techniques, skills, and modern engineering tools necessary for engineering practice
12 Essentials for All Graduates: A Benchmark

- Developing professional competencies
- Communicating effectively
- Solving Problems
- Balancing Work and life
- Embracing Change
- Working Effectively in a Team
- Working in a Diverse Environment
- Managing time and priorities
- Navigating across boundaries
- Acquiring knowledge
- Thinking Critically
- Performing with integrity
From Graduation to Established Career

Apply Learning
Writing Effectively
Teamwork
Grasp Realities Workplace
Acquire Learning
Demonstrating Initiative

Communicate Orally
Think Analytically
Acquire Learning
Evaluate Alternatives
Creative Solutions
Teamwork
Leadership
Utilize Technology
Grasp Realities
Demonstrate Initiative
Reshaping labor utilization

NEW CHALLENGES AND A WIDENING GAP
What Jobs Will Leave?
The Path Is Broken!
A Demographic Necessity

Communicate Orally
Think Analytically
Acquire Learning
Evaluate Alternatives
Creative Solutions
Teamwork
Leadership
Utilize Technology
Grasp Realities
Demonstrate Initiative

Apply Learning
Writing Effectively
Teamwork
Grasp Realities Workplace
Acquire Learning
Demonstrating Initiative
THE STARTING JOB IS DEAD!
LONG LIVE THE STARTING JOB!
The ISU CERI Study
How Did We Get There? Importance and Acceleration!

Phase 1 (ISU)
Key Word Mining Employer Position Descriptions

Phase 2 (CERI)
“2007 Recruiting Trends” Survey

www.ceri.msu.edu

www.engineering.iastate.edu
Competency Importance: ExEd vs Full Time Employment Fall 2008

Source: 1,000 F2008 ISUCMS Engineering Positions Descriptions

Bar chart comparing Experiential Education and Full Time Employment for various competencies.
# Changing Employer Expectations: Outcomes

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<thead>
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## Changing Employer Expectations

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<tr>
<th>Competency</th>
<th>2003-4 Fulltime</th>
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<td>Proj*</td>
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Phase 2: “The Changing Abilities?”

What we asked:

- “An ability to plan and manage a project”
- “An ability to build a successful team”
- “An ability to build and sustain working professional relationships”
- “An ability to analyze, evaluate and interpret data from various sources”
- “An ability to engage in continuous learning”
- “An ability to understand impact of company practices in a global (economic, societal and environmental) setting”
- Etc.,
“an ability to plan and manage a project”

<table>
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<tr>
<th>Importance to entry level positions</th>
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<tr>
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</tr>
<tr>
<td>Important</td>
<td>32%</td>
</tr>
<tr>
<td>Somewhat Important</td>
<td>25%</td>
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<tr>
<td>Not at all</td>
<td>4%</td>
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<table>
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<th>Change in importance in the last five years</th>
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<tr>
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<tr>
<td>Same level</td>
<td>55%</td>
</tr>
<tr>
<td>Less Important</td>
<td>0%</td>
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“an ability to build working relationships”

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</table>
HIGHEST In Importance

ALL Majors Agree – The TOP 3

- “An ability to build and sustain working professional relationships”
- “An ability to analyze, evaluate and interpret data from various sources”
- “An ability to engage in continuous learning”
FASTEST Changing In Importance

- “An ability to plan and manage a project”
- “An ability to build and sustain working professional relationships”
- “An ability to analyze, evaluate and interpret data from various sources”
- “An ability to engage in continuous learning”
Employer Expectations:
“Not What They Used To Be!”
So say: 28,000 ISUCMS Positions Descriptions and CERI Survey of 900+ Employers

Yesterday’s Objectives are Today’s Outcomes!
The New Standards:

- Build and sustain professional relationships
- Analyze, evaluate and interpret data
- Engage in continuous learning
- Communicate through persuasion and justification
- Plan and manage a project
- Create new knowledge
- Seek global understanding
- Mentor and develop others
- Build a team
- Initiative: The Holy Grail

Paper is available at www.ceri.msu.edu
The New Look for Young Professionals

- The T-shaped Professional or adaptive innovator (IBM)
- IDEO’s terminology
- Applicable to all education levels
The I Professional: Going Deep

Deep in at least one discipline
(analytic thinking & problem solving)
Tinkers

- Claude Levi Strauss
  - Tinker vs. Engineer
  - Tinker redefines the means to do something
  - “Tinker Toys”

- Judy Estrin CEO JLABS
  - Today’s best talent
    - Deep understanding (respect)
    - Breadth (communicate/boundaries)
    - Infectious excitement (passion)
    - Compulsive tinker (drive)
T-**Shaped Professionals**
*(Both Deep and Broad)*

**Boundary Crossing Competencies**
- Communication, teamwork, networks, critical thinking, global understanding,
- Perspective, organizational culture, project management, etc

<table>
<thead>
<tr>
<th>Many disciplines</th>
<th>Many systems</th>
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<tr>
<td>(understanding &amp; communications)</td>
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Jim Spohrer, IBM Labs
Smarter Planet
13 Key University Research Centers

1. Transportation & Supply Chain (traffic & rail)
2. Water & Waste
3. Food & Products (Nano)
4. Energy & Electricity (oil)
5. ICT/Cloud Computing (Info) (telecom, intelligence & infrastructure)
6. Buildings & Construction
7. Banking & Finance
8. Retail & Hospitality/Media & Entertainment
9. Healthcare & Family (Bio)
10. Education & Professions (Cogno)
11. City & Security
12. State & Scaling
13. Nation & Rules/Incentives (government)
ME

- Pushing the “Inner Edges” (DeWitt Jones)
- Laying it all out there
- Requires reflection
- Sense of direction
- Can tell my story
Interdisciplinary Study

- Taking ownership of education
- Negotiating departmental boundaries
- Building clusters of knowledge
- “I am not a generalist”
Boundary Crossing Abilities

- Requires Practice
- Multiple skills packaged continually in different ways
- Gaining exposure
- Social learning – ambiguous, complex and chaotic
T-Shaped and Engineering Reality
PROFESSIONAL EXPERIENCE REQUIRED
Starting Job Has a New Home! Ready or Not Here IT Comes!

- Starting Job has Moved to College
- Choices:
  - Internships
  - Co-ops
  - Professional Experience
  - Other engagement: no longer equal
  - Preparatory experiences
## The Evidence

<table>
<thead>
<tr>
<th>Competency</th>
<th>Eng FT 5 yrs ago</th>
<th>Eng Intern Today</th>
<th>NonEngFT 5 yrs ago</th>
<th>NonEngInt Today</th>
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<tr>
<td>Analyze</td>
<td>31%</td>
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<td>Communicat.</td>
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<tr>
<td>Teamwork</td>
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<td>Customer Ser.</td>
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<tr>
<td>Global</td>
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Employer Expectations: “Not What They Used To Be!”
So say: 28,000 ISUCMS Positions Descriptions and CERI Survey of 900+ Employers

Yesterday’s Outcomes are Today’s Intern Expectations
Internship: A High Stakes Event

- Definition of a HSE
- Characteristics
  - Knowing what your interests are
  - Frequency
    - How do you gain practice?
- Feedback
  - Reflection on practice
  - Reflection in practice
  - Timing: ongoing continual
- Difficulty
Achilles' Heel

- Mentors
  - Employers: I don’t want to do this!
  - Faculty: Isn’t there an assessment?
- Long-term outlook
- $$$$
The T-Professional Meets the H.S. Internship

- *I* professionals – transition
- *T* professional – cross boundaries
- Traditional internships (2 to 4 months)
  - Accommodate transitions
- Year long experiences
  - Facilitates crossing boundaries
  - Work on “sandwich year”
Professional Year Experience

- Revisit the “Gap” or “Sandwich”
- Time: long enough to boundary cross
- Maturity: a real plus
- Nature of senior year courses and capstones
- University of Toronto: Engineering
Professional Experience in Engineering: A Clear Message?

Outcomes At-Graduation
1996 – 2009
10,000 Graduates

The In-Profession Numbers:
- Cooperative Ed: 90%
- Semester Internship: 83%
- Summer Internship: 80%
- No Ex Ed: 54%
- Market Difference: 28%
Sustainability, Talking and Walking

Employer:
- HR: Badly Attritted
- Rotation/Professional Development Programs: Few Remain
- Corporate Universities: Few Remain

ABET, Criteria 2000 & Professional Societies
- “To be considered for accreditation, engineering programs must be designed to prepare graduates for the practice of engineering at a professional level.”
- Gone by 2001-2002!
- ABET Accreditation of Cooperative Education:
  - Eliminated 2001-2002!

Program (Specific) Criteria:

<table>
<thead>
<tr>
<th>Key Word Frequency</th>
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<tbody>
<tr>
<td>“Ability/Competency”</td>
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<td>“Demonstrated”</td>
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<td>2</td>
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<td>“Prepare to”</td>
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Criterion 3:
Criterion 3. Program Outcomes and Assessment

Engineering programs must **demonstrate** that their graduates have:

(a) **an ability** to apply knowledge of mathematics, science and engineering

(b) **an ability** to design, conduct experiments, as well as 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 multidisciplinary 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 lifelong learning

(j) a knowledge of contemporary issues

(k) **an ability** to use the techniques, skills, and modern engineering tools necessary for engineering practice
ABET Criteria 2000/2011

Criterion 3. Program Outcomes and Assessment

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ABET Criteria 2000/2011

Criterion 3. Program Student Outcomes and Assessment

Engineering programs must **demonstrate** that their graduates have:

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- **(i)** a recognition of the need for, and **an ability** to engage in lifelong learning
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ABET Criteria 2000
What Others Are Saying

- National Society of Professional Engineers (NSPE)
  - Leadership
  - Project Mgt
  - Business Concepts to Eng Practice
  - Incorporate by 2020

- ABET Industry Advisory Committee
  - Diversity of Thought
  - Teaming in Diverse Environment
  - Address by 2020

By 2020 .... Really
Back to the Future

The Third Awakening

Discovery with Purpose
What Questions Do You Have?