Global Competitiveness and Outsourcing: Who Will Engineer the Future?
• IAB reorganization
  – 22 companies
  – 26 members

• Tim Ash appointed Vice President
Today’s Theme

Global Competitiveness and Outsourcing: Who Will Engineer the Future?
Agenda

- Update on Spring Action Items
- Department Update
- The Impact of Global Competitiveness & Outsourcing on Higher Education
- Intellectual Property: CSU’s Perspective
- Q&A
Agenda (cont’d)

- Break
- Roundtable Discussion I
- Industry Spotlight: Plexus Technology Group
- Student Project Presentation
- Lunch
- Roundtable Discussion II
- Next Steps and Closing Thoughts
**Spring Action Items**

**Action item:** Initiate meeting with Poudre School District to discuss increasing engineering education in the curriculum.

**Status:** Interim superintendent announced; meeting on hold. Dr. Tom Chen developed an Integrative K-12 College Training Program for the Computer and Semiconductor Industry.

**Action item:** Incorporate K-12 outreach component into the existing senior design program.

**Status:** In progress; ECE student adviser working with Legacy High School to include high school students in the senior design experience. Three students currently involved in one project this semester.

**Action item:** Initiate meeting with Poudre School District to discuss increasing engineering education in the curriculum.

**Status:** Interim superintendent announced; meeting on hold. Dr. Tom Chen developed an Integrative K-12 College Training Program for the Computer and Semiconductor Industry.
The PEER program is designed to:

• Push ECE education into high schools to increase positive awareness of ECE industry

• Provide concrete career paths and curricula for people interested in pursuing a career in ECE

• Create a coalition among different educational establishments and industry to address workforce training and retraining
Spring Action Items

Current Status of PEER Program

• The program officially started Sept. 1, 2004.

• An introductory digital logic design course is being taught this semester at Fort Collins High School with an enrollment of 15 students.
  – The credits for the digital logic course are transferable to CSU upon successful completion of the course.

• HP engineers are helping teach a computer chip design class this semester at Fort Collins High School with an enrollment of 20 students.
  – HP has taught computer chip design classes at Fort Collins High School over the past 3 years.
  – Every year, HP absorbs a certain number of students from this class to do mask designs at HP with a great deal of success.
Spring Action Items

PEER Plan for 2005

- Add early acceleration program in PSD to recruit 8th and 9th graders from Jr. High Schools
  - Schedule for 9th graders will include “Introduction to Engineering” course

- Add a C++/Java class at Fort Collins High School
  - This is a new AP class developed within the PEER program

- Start an Associate of Science Degree program in Integrated Circuit Design at FRCC
  - A 2-year degree program intended to train entry-level designers for non-R&D type design tasks.

- Start a certificate program in IC mask design engineering at FRCC
  - This is an 18-month program to train silicon chip mask designers
Current Funding Sources of the PEER Program

Two major funding sources:

- National Science Foundation - **$600,000** fund for three years from the Partnership for Innovation program

- Colorado Institute of Technology - **$221,000** fund for one year

**Total funding: $821,000**
Spring Action Items

**Action item:** ECE will consider reaching out to local high school counselors as a way to further promote engineering education.

**Status:** ISTeC hosted first ever Information, Science, and Technology Day for High School Students and Counselors.

- 102 students in attendance
- 14 Colorado high schools represented
- 6 CSU departments represented
Spring Action Items

**Action item:** Plan Student Advising Day in conjunction with CSU’s Career Fair.

**Status:** ECE hosted Student Advising Day on September 16.

- Companies in attendance: Agilent, HP, IBM, LSI Logic, Plexus, Raytheon, Sun Microsystems, Western Area Power Administration, and Woodward
- 68 Students in attendance
- Favorable feedback from students and employers
Spring Action Items

Student Advising Day Evaluation Results:

All results based on a scale of 1-5:
(1=poor; 2=fair; 3=average; 4=good; 5=excellent)

**Student feedback:**
1. Quality of event: Average – 4.44
2. Relevance of topic: Average – 4.72
3. Overall: Average – 4.58

**Employer feedback:**
1. Quality of event: Average – 4.36
2. Event format: Average – 4.18
3. Overall: Average – 4.27
**Spring Action Items**

**Action item:** Increase IAB’s involvement in senior design program by sending the board a list of all student projects early in the year. This gives board members plenty of time to review the list and determine whether they would be willing to serve as a customer for one of the projects.

**Status:** Project list distributed to IAB in September. ECE student adviser working with board members to assign customers to various projects.

**Action item:** Provide list of ECE faculty speaking engagements.

**Status:** List of faculty talks now available on the ECE web site.
ECE Department Update

• ECE Welcomes Two New Faculty Members
  – Dr. Mario Marconi
  – Dr. Steven Reising

• Dr. Steven Abt Appointed Interim Dean for College of Engineering

• Randy Bartels Honored by Optical Society of America and National Science Foundation

• Current enrollment:
  – Undergraduate: 327
  – Graduate: 153

• 2004 Scholarships: 34 scholarships awarded to ECE students

• CCHE Index increased from 101 to 110

• Department launched new web site: www.engr.colostate.edu/ece
A glimpse at the new ECE web site

www.engr.colostate.edu/ece

• Home Page
• Industrial Associates Board
• Alumni Hall of Fame
• Research
• ECE Faculty Speaking Engagements
Increased Student Quality

CCHE Index

Fall 2004 Ave Admit
ACT=27.2, GPA=3.73

Previous Ave Admit
ACT=26.0, GPA=3.68

HS GPA
(or class rank)

ACT (or SAT score)

140-150
130-140
120-130
110-120
100-110
90-100

19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Undergrad Degrees Awarded

Undergraduate Degrees Awarded
(not including Fall 2004)

BSCpE
BSEE

Calendar Year

Number

1999 2000 2001 2002 2003 2004

0 10 20 30 40 50 60 70 80
Disposition of 93 ECE majors who took EE100 in Fall 1999

Status as of Fall 2004

- Graduated: 34
- Still at CSU: 5
- Dismissed: 12
- Left CSU: 14

Total Enrollment: 93

Categories:
- Other
- CS
- COE
- ECE
Graduate Degrees Awarded

Graduate Degrees Awarded
(not including Fall 2004)
Proposal Activity in Terms of Dollars

<table>
<thead>
<tr>
<th>Year</th>
<th>$ VALUE SUBMITTED</th>
<th>$ VALUE FUNDED</th>
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<tbody>
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<td>1993</td>
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<tr>
<td>2004</td>
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</tbody>
</table>
Research Expenditures

![Bar Chart]

- $500,000
- $1,000,000
- $1,500,000
- $2,000,000
- $2,500,000
- $3,000,000
- $3,500,000
- $4,000,000
- $4,500,000
- $5,000,000

Years:
- 1993
- 1994
- 1995
- 1996
- 1997
- 1998
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
Global Competitiveness & Outsourcing

Leading factors impacting higher education:

1. Increased homeland security
2. Increased quality in graduate programs abroad

Issue: In the debate on outsourcing and globalization, there is a lack of hard data concerning the impact of its evolution on engineering education in the U.S.*

*Source: The Interface IEEE – August 2004
Increased Homeland Security

• More restrictive visa policies may be dissuading talented foreign students from applying to study in the U.S.

• In a survey of 126 institutions released in September, the Council of Graduate Schools found an 18% decrease in admissions of foreign graduate students this fall compared to fall 2003.

  – Largest drops in admissions: China – 34%, India – 19%;
    South Korea – 12%

• While visa processing times have improved in the last year, perceptions abroad have been slower to change.

• Educators must be able to understand and keep up with changing security policies.

The Problem: Over the last ten years there has been:

- 50% decline in student interest in engineering among Americans
- 14% decline in engineering degrees awarded to U.S. students

Meanwhile, interest in engineering continues to grow in other countries.

*Source: National Science Board: Science & Engineering Indicators 2002*
Other countries recognize the value of engineering

- Europe graduates 3 times as many engineers as the US, Asia graduates 5 times

- 46% of the degrees awarded in China are engineering degrees

- Only 5% of US college degrees are in engineering

*Source: Institute for Engineering Education*
Foreign countries are building up the Natural Science and Engineering (NS&E) capabilities of their younger cohorts at a greater rate than the United States has been able to achieve.

They have been able to raise the rate at which their college-age youth earn first university NS&E degrees.
The United States has relied heavily on noncitizens, U.S. women, and small but growing numbers of minority students of both sexes to sustain its degree production without whose increasing participation the number of S&E doctorates would have stagnated or declined.

*Source: Science and Engineering Indicators- 2002*
No longer dreaming of America

In India and China, far fewer students consider the U.S. the best place to go:

• Stagnant U.S. economy has decreased the available funds to grad students and lessened students’ prospects of finding good jobs after earning their degree.

• China has pumped more money into its own degree programs, making it more appealing to students.
  – 333,000 Chinese students intend to enroll in grad programs in China, up 20% from last year

• India’s booming economy has led many recent grads into the workforce instead of graduate school.

Tuition costs another factor

Average Cost of an MBA in 4 Countries

Foreign students are flocking to countries other than the United States because of lower costs. *The Chronicle* looked at the price of M.B.A. programs as one example.

<table>
<thead>
<tr>
<th>Country</th>
<th>Average length of program</th>
<th>Total tuition</th>
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</thead>
<tbody>
<tr>
<td>Australia</td>
<td>18 months</td>
<td>$34,900</td>
</tr>
<tr>
<td>Britain</td>
<td>one year</td>
<td>$31,500</td>
</tr>
<tr>
<td>Canada</td>
<td>two years</td>
<td>$23,800</td>
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<tr>
<td>U.S. (Private)</td>
<td>two years</td>
<td>$63,832</td>
</tr>
<tr>
<td>U.S. (Public)</td>
<td>two years</td>
<td>$43,674</td>
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</table>

Sources: American Association to Advance Collegiate Schools of Business; American Council on Education; Association of MBA's; Chronicle Reporting
Are U.S. institutions really suffering?

While international enrollment numbers are down for some universities, the quality of applicants may be getting better.

Example:
The University of Southern California has the largest international enrollment in the U.S. In 2004:

– Applications by foreign students were down 30%

– However, the quality of those applying was good, so admissions were only down 6.7%

– Since a larger portion of admitted students turned up for the start of classes, new international enrollments only dropped by 1.7%

*Source: The Chronicle of Higher Education, Oct. 8, 2004*
How have these trends affected ECE at CSU?

Our current numbers follow the national trend:

**2003 graduate school applicants:**
- 706 total applicants – 93% international
- 165 students admitted but did not attend – 81% international
- 37 admitted and attending – 59% international

**2004 graduate school applicants:**
- 306 total applicants – 91% international
- 87 students admitted but did not attend – 90% international
- 30 admitted and attending – 63% international
Graduate Degrees to Int’l Students

Percent of Graduate Degrees Awarded to Int'l Students
(not including Fall 2004)

<table>
<thead>
<tr>
<th>Calendar Year</th>
<th>ME</th>
<th>MS</th>
<th>PhD</th>
<th>Total</th>
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<tbody>
<tr>
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<td>2004</td>
<td>90%</td>
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</table>
What are the ramifications for ECE in the long-term?

1. The need to educate students for competitive careers in a global economy

2. Recruit students into our program in the face of negative publicity of outsourcing and the perceived undercutting of the value of an engineering degree in the U.S. due to global competition.

3. Increased emphasis on continuing education - retrain engineers in fields that have suffered excessive outsourcing.

*Source: The Interface IEEE – August 2004*
Questions for IAB

1. Is the quality of international education really competitive? How does industry see the collaboration at a research level with U.S. vs. foreign universities? With continued cuts in R&D, will industry begin outsourcing to foreign universities?

2. We continue to see manufacturing being outsourced – do you believe the same thing will happen with R&D and design?

3. In the long-term, how do we guarantee our undergraduates will have jobs?
Global Competitiveness and Outsourcing: Who Will Engineer the Future?

Gary Amato
Intellectual Property: Colorado State’s Perspective
Global Competitiveness and Outsourcing: Who Will Engineer the Future?
Susan Hunter
IAB President

Global Competitiveness and Outsourcing:
Who Will Engineer the Future?
1. How does global competitiveness and outsourcing affect your company/industry?
   - What types of jobs are being outsourced?
   - What are the current trends, and will these trends change?
   - For jobs not being outsourced, what skill sets should future engineers possess?

2. How should CSU respond to the situation?
Industry Spotlight

John Nichols
Plexus Technology Group

Global Competitiveness and Outsourcing:
Who Will Engineer the Future?
Overview

Global Competitiveness and Outsourcing: Who Will Engineer the Future?

Brooke O’Dell & Bryce Eldridge
Roundtable Discussion

Tim Ash
IAB Vice President

Global Competitiveness and Outsourcing: Who Will Engineer the Future?
Roundtable Discussion

How can CSU, the ECE department, and the IAB work together to address the issues and concerns surrounding global competitiveness and outsourcing?
Next Steps and Closing Thoughts

Tony Maciejewski

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