



**A Renaissance
in
Ph.D Engineering Education
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Outline

1. State of Affairs
2. Warning signs
3. Business Model
4. Undergraduate Impact
5. NSF Funding
6. Renaissance of Eng PhD Program
7. Next Steps

State of Affairs

- ❖ 7000 Engineering Ph.D.s (1997)
- ❖ 7300 Engineering Ph.D.s in (2005)
- ❖ 42% to US. Citizens, Permanent Residents
- ❖ 30% of Ph.Ds into Academia
- ❖ Curriculum driven by Industry/Academe Needs
or----- Curriculum driven by Research
Infrastructure Growth?

Warning Signs

- ❖ China applications to Ph.D .(60% down 2003)
- ❖ Europe provides more Eng Ph.D.s (2003)
- ❖ Asia provides more Eng Ph.D.s (2003)
- ❖ US PhDs
 - ❖ Ready for Classroom?
 - ❖ Ready for Industry?
- ❖ M.S graduates (1993) earn more than Ph.D graduates (after 5 years). Has the “marketplace spoken?”

Renaissance of PhD Education

Which Path would you take?

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PhD

Industry



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**B.S.
ENG**

Business Model for PhD Education

- **Eng School “ranking” (and resulting prosperity) driven by graduate reputation**
 - > reputation (40%)
 - > research dollars (25%)
- **Ph.D. Students (Key to Labor Productivity -20K plus tuition)**
 - > External and Internal Assistantships
 - > 50-500 Supported across Colleges
 - > Benchmark with Medicine, Law, Business
- **Who is the Client? (Choose one)**
 - a) Industry employers
 - b) Academic employers
 - c) Supply-side funding sources

Impact on Undergrad Program

• Today's PhD is tomorrow's Faculty



- 2000 new faculty each year
- Preparation as Mentors, Teachers and Innovators?
- Benchmark with Law, Medicine and Business

NSF Eng Funding Impact

- 1) **7300 Eng PhDs**
- 2) **5034 (NSF Eng) Grad Students (2006)**
- 3) **89.7 mil (tuition and stipends)**
- 4) **$89.7 \times 1.57 = 141$ mil**
- 5) **25% of NSF Eng Budget**
- 6) **1000 “NSF PhDs” annually**
- 7) **15% of Eng PhDs via NSF**

Renaissance in Ph.D Education

- ❖ Ph.D. education is a “by-product” of research business (both employer and advisor)
- ❖ Need breadth *and* depth
- ❖ 70% to Industry – where is “value-added”?

Desired Attributes of an Engineering PhD

- **the ability to understand and be understood by those in other disciplines and other cultures**
- **world-class knowledge in a relevant specialty**
- **ability to develop work-class knowledge in related areas**
- **understanding of how specialized knowledge aligns with the larger context of knowing and understanding**
- **awareness of all effects of globalization and technology--and the price they exact on society**
- **leadership, as reflected in breadth of knowledge and ability to articulate ideas; confidence, poise, and focus**
- **ability to define and solve problems**
- **ability to deal with predicaments as well as problems**
- **ability to be both a thinker and a strategist**

Next Steps

- ❖ Spring 2007 – AdComm Feedback
- ❖ Summer 2007 – Fact finding
 - ❖ Interviews with recent PhDs, industry and academic leaders
- ❖ Early Fall 2007 - Workshop
- ❖ Late Fall 2007
 - ❖ Program for next generation of Ph.D.