Securing Funding from Industry

Working with Industry as Customer and Partner

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Why trust me?

- Not really sure… but…

- Worked outside of academe
  - 30+ jobs

- Ran senior design
  - ~6 years
  - $350k in industry sponsorship solicited
  - Supervised 39+ projects with dozen+ sponsors

- Industry Sponsored Research/Projects
  - 43 funded projects (30 are/were industry sponsored)
  - $6.2M in funding ($4.0M in industry sponsorship)

- My wife says that I am a swell guy (some of the time)
CoES Research Forum

Why Industry Sponsorship?

- **Myths**
  - Non-competitive (easy to get?)
  - Not fundamental (only applied – engineering?)
  - Cannot publish

- **Truth**
  - Takes time to cultivate relationships
  - Repeat customers only when successful
  - Extremely demanding work
  - Rewarding

- **Why I do it**
  - Learning experiences for students
  - Opportunity to gather stories for class
  - Validate research
  - Motivate research
Lessons

- Never accept a “NO”
  - Take risks; Jump on opportunities
- Talk a little, listen a lot
  - Axioms of Customers:
    - Customer is always right &
    - Customer does not know what the customer needs/wants
- Naivety is a good thing (keep it)
  - Ask questions; you are not smarter than others
- Money is never an issue
  - Clemson Awards and Contracts will help you find a way
- SME’s are fun (and the future)
  - Small companies are good partners
Lessons

● Student projects \(\rightarrow\) research projects \(\rightarrow\) student projects
  – Always find ways to interact

● If it is the right thing to do, then do it
  – Good learning experiences for students = good projects

● Integrate other faculty (buy-in)
  – Collaboration is fun; if you cannot do it, others can

● Lawyers are not entirely evil (they are always willing to help)
  – Know the Clemson staff

● Nurture networks
  – Use former students (including undergraduates)
  – Use professional organizations
  – Use departmental Industry Advisory Boards
  – Use colleagues
  – Use friends
• Technology push does not work
  – “I have a solution” vs. “we can find a solution”

• Trust must be built
  – Regular meetings (in person); then regular meetings (phone)
  – Be responsive
  – Student projects are low cost; high reward starters
  – Introduce to other faculty that might be relevant

• Publishing is possible
  – If you focus on non-core competencies
  – Timeline is longer (need industry approval)

• Stay in contact
  – Find excuses to increase contact (invite to campus for guest lectures, to review projects, for seminars; send newsletters…)

• Know CU Staff
(Pitch to Industry)

COLLABORATE WITH CLEMSON
Undergraduate
- Extra Curricular Projects
  - Paid Consultancies (faculty contacted for support and employ students)
  - Paid Engineering Services (companies directly contract with students)
- Curricular Projects
  - Creative Inquiry (multi-age, multi-semester, collaborative projects)
  - Undergraduate capstone courses (ME 401 and ME 402)
    - Summer (3-6 weeks and international)
    - Semester (14 weeks)
- Internships and Cooperative Education

Graduate
- Course Based Projects
  - ME 870/ME 891: Design projects
- Research/Development Based Projects
Three structured opportunities:

- **Creative Inquiry (multi-year, multi-disciplinary, multi-age)**
  - BMW LED Headlight design
  - NASA Lunar wheel design
  - Rotary lawnmower blade redesign

- **ME 4010 (pre-capstone; design method)**
  - Service Learning (design, build, install wind tunnels for elementary classrooms)
  - “inventor outreach” (design, build French fry cutting machine)

- **ME 4020 (capstone)**
  - Industry sponsored projects
  - Parallel teams on one project
  - Projects assigned an advisory committee (2 faculty + 1 gradvisor)
  - Coordination/Solicitation done by 1 faculty (currently Mocko)
  - Joint program with other universities (~80 students in 2010/2011)
Hoowaki needs fast analysis and optimization work done. Want to find alternative geometries that can support given loads with a defined volume. Need external validation from University in support of the effort to “impress” Hoowaki customer.

Value:

- to students: a parametric design and analysis project, experience in scope creep
- to customer: new geometries; external validation

CEDAR
Clemson Engineering Design Applications and Research
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http://www.clemson.edu/ces/cedar
A local businessman that runs a special event concession business approached Clemson University to design and fabricate a French Fry cutting device for <$2500 and attracts the crowd. ME 401 (Summer): designed a device for $3000 to fulfill request. Additional interest in a similar device for a restaurant.

**Service Learning (current approach)**

**Value:**
- to students: a design and build experience
- to customer: a finished device
ME4020 Semester-Long Projects

- Industry sponsored projects:
  - ~15 weeks in duration → 600 Manhours/team
  - Parallel teams (4-5 students) on projects
  - $10k per project (donation to department)
  - Teams design, prototype, test, build solutions
  - Advisory committee (2 faculty; 1 gradvisor)

- Objectives
  - Expose students to unstructured problems
  - Challenge students to develop professional communication skills
  - Give students the ownership of the projects

Fall 2011 Projects
- BMW: Ergonomic plug installer
- Cryovac: Beef primal fixture
- Rotary: Lawn mower blade testing
- TTI: Reciprocating saw test

Design of a road surface cleaning system for tire wear analysis (scale: diameter ≈ 20 ft)

Student demonstration a tail light installation fixture on a BMW X5 with associates.
Local entrepreneur had created a prototype small form factor personal tennis ball machine. Clemson addressed cost reduction, improved functionality, and addressed user interaction. The engineering team, two graduate students advised by faculty, held bi-weekly design reviews with the sponsor.

Value:
- To students: a design and build experience; experience in working with external sponsor
- To customer: engineering support for component selection; new concepts to simply system
Customer wanted a system to test prototype treads for mud release. Team at Clemson designed and built a system that is currently in use at sponsor’s research and development facility. Project included a follow-on validation project.

Value:
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Benefits to Industry

- Fresh look at your problems through impartial eyes
  - Student teams can bring a clean slate to your problem
- Extended access to graduating engineering students
  - An opportunity to “interview” an entire cohort of Clemson students
- Exposure to the latest tools, techniques, and technology
  - Students and faculty are trained in the latest design and analysis tools, in addition to a broad exposure of cutting edge research
- Multiple solutions using teams
  - Three to four distinct solutions developed, prototyped, and tested for every problem
- Access to Clemson facilities and faculty expertise
  - ME at CU is the largest engineering program in SC, and recognized as one of the top five Design Research programs in the nation
- Five solutions patented in the last five years
  - Sponsors have first right of refusal on all IP developed in the course is available

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STORY TIME
Challenges

- Ownership of the IP generated from these projects
  - Student owned, university owned, company owned?
- Guarantee of results
  - In most cases, design projects are sponsored through gifts to the department → cannot guarantee work product.
- Acquisition of material
  - Goods can not enter the University (State) possession.
- Clear expectations from industry partners and inexperience of students
  - Possible for scope creep and underestimation of time and cost.
- Liability of product development
  - Who will be liable if something goes wrong?
- Competition with local companies
  - Do not want to use University resources to undercut local shops
- University timeframes are typically in semesters (3-4 month segments)
  - Must align projects with the time frame of the university
Scholarship Impact

- **Funding**
  - 78%: 38 Graduates students supported (out of 49 total)

- **Scholarship**
  - 32%: 25 journal papers (out of 78)
  - 24%: 38 conference papers (out of 157)
  - 100%: 3 patents secured

- **Industry support is an enabler**
  - Problems in developing solutions → Motivations for research
  - Development efforts → Opportunities to test ideas
  - Funding support for students
  - Engineering experience for students
  - Excellent TEACHING Platforms

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