Milwaukee Engineering Research Conference
MERC 2019

ADVANCED MATERIALS & MANUFACTURING:
Value and Challenges in Multi-campus University/Industry Connectivity (Collaboration)

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Panelists
• Doug Dunham, PhD Director, Materials Science & Engineering Center, UW Eau-Claire
• Joe Hamann, PhD  Director, Advanced Engineering at Rexnord Corporation
• Jessica Silvaggi, PhD  Director of Technology Commercialization, UWM Research Foundation
• Konstantin Sobolev, PhD  Professor, Civil & Environmental Engineering
Discussion Topics

- What constitutes a “successful” industry/university partnership: metrics and values
- Benefits and challenges in strategic partnerships
- Multi-campus university/industry connectivity – potentials and challenges
- Lessons learned in Wisconsin
Access to the university physical facilities
Access to government funding
Acquisition of IPs
To accelerate or improve existing research
Public image in the society
Access to highly skilled researchers
Access to new technologies for a competitive advantage
Improve profitability
Improving skills of employees
Ability to recruit talented students
Increasing technical awareness in R&D
Creating a culture of innovation
Tax credits
Industry
University

- Updated technical knowledge
- Access to networks of knowledge creation and utilization
- University Ranking
- Recruitment of skilled staff and students
- Access to industrial information
- Access to government funding
- IP royalty
- Fulfill mission of positive impact on society
- Integration into labor market
- Creating entrepreneurial culture
Career development

Skilled students

Access to Resources

Financial rewards

Research funding

Practical applications

IP shares

Practical knowledge

Sense of accomplishment

Researcher
Communication Gap

- Difficult to identify academic research that can be developed into commercial products. Most research papers do not highlight the potential for commercial applications of their findings.
Cultural Gap

Culture of The University

- **Communalism** – Public knowledge
- **Universalism** – scientific findings are evaluated objectively regardless of ranks or status
- **Disinterestedness** – neutral and impersonal judgement
- **Originality** – new contributions to existing knowledge
- **Skepticism** – requires critical scrutiny, debate, peer review and contradiction

Culture of Industry

- **Proprietary** – as little as necessary is made public
- **Local** – focused on local technical problems
- **Authoritarian** – acting within a hierarchy in the workplace
- **Commissioned** – to achieve specific practical goals (ROI)
- **Expert** – expert problem solving rather than creativity

*The difference between academic and industrial science, Dr. Shawn Cunningham, 2011*
Lack of Long-Term Relationships

- Mostly transactional relationships not strategic; sometimes limited partnership with individual faculty on an as-needed basis.

Uncertainty in Relationships = Uncertainty in ROI
Companies who view one another as competitors within an industry, rather than collaborators working on a national interest, are reluctant to cooperate to solve common manufacturing problems.

Reluctance to Collaborate between Industry Partners

Thomas-Kilmann Conflict Mode Instrument (TKI)
Absorptive Capacity

Ability of businesses to recognize the value of new external knowledge, assimilate it and apply it to commercial ends.

Skill Gaps

MR Shop floors “Mixed Reality”

Maintenance & operations
1. Smart goggles provide metrics, instruction, and remote support to maintenance workers. 
2. Sensors on machines generate diagnostic data and machine learning helps predict failures and improve productivity.

Production
3. Smart robots automate production.
4. Smart goggles with cameras and motion sensors help train workers and overlay assembly instructions.
5. Smart equipment like safety vests and hard hats monitor surroundings.

Design & development
6. Virtual prototypes allow rapid iteration, assembly simulation, advanced testing, and remote collaboration. Full-body motion tracking informs ergonomic design of workspaces and assembly lines.

Reporting & analytics
7. All devices are connected to a data management system, which digitally documents each step of the process. Advanced analytics predict demand patterns to optimize production.

Quality control
8. Machines use sensors, computer vision, and photogrammetry to evaluate products against standards. 3D models give inspectors access to all product specs during production.

Distribution
10. Product sensors provide visibility into the entire supply chain.
In the US, contributions by the private sector account for less than 5% of university R&D budgets.