

Higher Education Institutions and Industry Collaboration

The Foundation for a Successful Industry

Daw Alwerfalli and Badih Jawad

A. Leon Linton Department of Mechanical Engineering
College of Engineering
Lawrence Technological University
2100 W. Ten Mile Road
Southfield, Michigan 48075, USA

Abstract

Globalization of industry and the recent advances in technology in all sectors of industry, indicate that higher academic institutions and the commercial engineering sector of industry should have strong collaboration if the US is to remain competitive and be able to innovate efficiently in the global marketplace. This paper will examine whether fresh university graduates are learning the right skills at university in preparation for their future commercial careers, something which many industry executives felt was not the case. Industry executives suggest a greater collaboration is needed between academia and industries such as aerospace, automotive manufacturing, medicine and IT is needed to prepare students for the real world challenges of a commercial career. This paper examines the challenges that face both industry and academia and how to Lawrence Technological University (LTU) have succeeded in implementing a curriculum that addresses the continually changing and growing specific needs of industry where LTU graduates are highly perceived in industry today as “Agile and *Readily Employable graduates*”.

Introduction

Many educators and industry executives believe that stronger collaboration is needed between higher academic institutions and the commercial engineering sector if the US is to remain competitive and able to innovate efficiently and succeed in the global market place. Industry executives feel that fresh university graduates need to learn the right skill sets at the university in preparation for their professional careers. Collaboration between higher academic institutions and industries such as aerospace and automotive and manufacturing is needed to prepare students for the real world challenges of a commercial career. How universities can accommodate industry-standard skills such as model-based robust design, advanced leadership and management skills, lean manufacturing and waste reduction and other skills into the current academic curriculum, depends entirely on the effective collaboration between academic institutions and industry. Hiring the candidate with skills for the right job is very difficult for many organizations. It is estimated that about 40-55 per cent of fresh university graduates intake requires training of some sort.

While higher academic institutions need to effectively interact with industry to prepare students for the challenging and continuously evolving commercial realities of a job outside academia, industry must partner with universities and commit relevant resources to universities, making new product releases and code available for academic instructional purposes and applied research, and that is the cost-effective approach for industry. Figure 1, shows how academia, industry and government agencies could partner together sharing program development, human resources needs and research facilities in efforts to effectively prepare the readily employable university graduates.

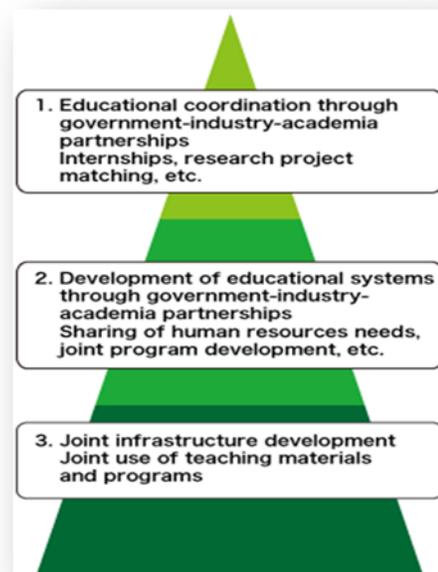


Fig. 1. Requirements for effective partnership of Academia, Industry and Government (12)

University researchers prioritize education and basic research and corporate scientists pursue products and profits. Success depends on finding common goals and negotiating plans that pay off financially and intellectually for all parties. In addition to their primary role as centers of generating knowledge, universities are increasingly viewed as economic

engines, contributing to local prosperity and regional growth. Partnerships between universities and industry can provide further opportunities for regional economic development, with each partner contributing its individual strengths to achieve a collective outcome. Forging such alliances can be a challenge, however, and organizations across the country are working to develop programs that can make these relationships more effective. **New York Academy of Sciences (NYAS)** has developed a successful collaboration program between the many diverse stakeholders involved in the science innovation ecosystem. NYAS seeks to fulfill its mission of advancing scientific knowledge through convening, disseminating, mentoring, and partnering activities. One particularly broad effort is the **Science Meets Business initiative** Figure 1. One current initiative is exploring the interactions between universities and emerging life sciences companies, and the venture capital community.

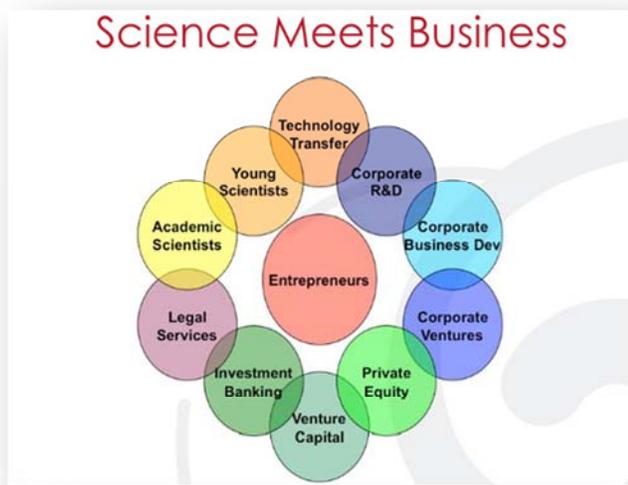


Fig. 2. Skill set required for preparing new graduates for professional careers (?)

Collaboration in Continuing Education

One of the core competencies of academic institutions is teaching. And many academic institutions have the courseware and ability to provide training for high-end manpower development. Many of these topics are of interest to industry. Therefore, a natural collaboration possibility is for the academic faculty and institutes to conduct training in topics of interest for industry. This model has existed for long time and is reasonably well understood. This form of relationship is also beneficial to both. Typically, in this form of collaboration, continuing education programs are offered which are designed for industry participants. Short intensive courses may be offered by faculty at some companies. The need for short term training program from academic institutions seems to be reducing, as the level of technology and competence in industry increases, but the need for programs for working professionals seems to be increasing. Programs for working professionals in management are now picking up in India. However, such programs for technology

areas have not developed in any serious manner. This is one area that can be potentially developed, and it is best done if both sides collaborate.

Georgia Tech. Packaging Research Center (PRC) has developed a unique collaboration model Figure (5) with industry. It involves creating a new culture in the university environment for innovation and effective technology transfer. Such a blended culture model involves not only academic faculty and graduate students as is typically practiced in most US universities, but also research faculty who are recognized technical experts working interactively with industry mentors who help define and steer programs and projects. These cross-discipline teams take a system view of the technologies to be developed, develops roadmaps, and completes the technology development at industry pace, starting with exploration and working through proof of concept to prototypes stages, all in constant communication with industry partners.



Fig. (3) Georgia Tech PRC simple collaboration Model (11)

Seven Best Practices for Industry-Academia Collaboration

On the basis of these observations, a set of seven guidelines that companies should follow to get the most value out of their research collaborations with industry. While adhering to this set of best practices will not guarantee success, it will help managers to steer around the pitfalls that overcome many of these partnerships and to realize more of their business potential. Taken together, these practices can measurably enhance the capability of industry-university collaboration to have positive impact on company products and processes

The Seven Keys to Collaboration Success

1. Define the project's strategic context as part of the selection process.

- Use your company research portfolio to determine collaboration opportunities.
- Define specific collaboration outputs that can provide value to the company.
- Identify internal users of this output at the working level; executive champions are not a substitute for this requirement.

2. Select boundary-spanning project managers with three key attributes:

- In-depth knowledge of the technology needs in the field
- The inclination to network across functional and organizational boundaries
- The ability to make connections between research and opportunities for product applications

3. Share with the university team the vision of how the collaboration can help the company.

- Select researchers who will understand company practices and technology goals.
- Ensure that the university team appreciates the project's strategic context.

4. Invest in long-term relationships.

- Plan multiyear collaboration time frames.
- Cultivate relationships with target university researchers, even if research is not directly supported.

5. Establish strong communication linkage with the university team.

- Conduct face-to-face meetings on a regular basis.
- Develop an overall communication routine to supplement the meetings.
- Encourage extended personnel exchange, both company to university and university to company.

6. Build broad awareness of the project within the company.

- Promote university team interactions with different functional areas within the company.
- Promote feedback to the university team on project alignment with company needs.

7. Support the work internally both during the contract and after, until the research can be exploited.

- Provide appropriate internal support for technical and management oversight.
- Include accountability for company uptake of research results as part of the project manager

Companies Expectations

Companies can expect to the following benefits in their collaboration with academia:

- Access to universities and a long-term relationship with students, right from the beginning of their studies or at least at a very early stage
- Securing permanent high recruitment potential
- Securing a strong presence at universities, this fosters their employer branding
- Close relationship with students at a very early stage and hire the best students
-

Benefits for students:

- Students gain a deep insight into companies from the beginning of their studies and a good understanding of the current challenges and management topics
- Exposure to the specific technology, products and processes of the company and understanding the various design, manufacturing, and marketing issues. They can align their studies to the real needs of the cooperating company and therefore get a good start in high-expertise jobs
- "Training on the job" begins at a very early stage

The collaboration between academia and industry is getting increasingly more important. The ability to hire highly qualified graduates with the latest knowledge and core competencies and management skills, plus the trade-off between real business challenges and academic research or new methodologies is accelerating this topic at an even faster pace. Companies must understand that their investment in collaborating with academia will yield the highest rate on investment.

Collaboration between Lawrence Technological University (LTU) and Chrysler Corporation

Lawrence Tech. has established a very strong collaboration program with Chrysler. The Chrysler-Faculty-Summer Internship Program, was initiated by Executive Vice President of Advance Manufacturing Engineering (AME) at Chrysler in 1995. Faculty with tremendous expertise in Manufacturing Engineering were invited to this program. It involved faculty in Manufacturing, Mechanical, IT and Computer and Electrical Engineering. Faculty with expertise in Lean Manufacturing, Production Planning, Quality, Tooling and Design joined various cross-functional AME teams to define and study chronic issues in vehicle design, manufacturing and assembly. The program started in 1995 and ended in 2008.

Professors were able provide optimal solutions to difficult manufacturing problems at various assembly plants of Chrysler such as JNAP, WTAP, CTC, TNAP and others.

They shared the solutions with their students at the class rooms at LTU. Through the entire internship program, they saved Chrysler over \$200,000,000. They launched successful graduate programs on site, arranged for doctoral student funds, internships and coop programs for LTU undergraduate students, also arranged for full time job opportunities for graduating students. The program was a real success.

Conclusions

Universities offer many valuable resources: highly educated people who generate new ideas, scientists who can serve as consultants to industry, numerous collaborative research opportunities, and a natural flow of new talent from universities to companies. Forging such alliances, however, can be a challenge. Universities have vested interests that tie them to their communities, making them a valuable local asset that can help facilitate regional development. Companies, however, are focused on their bottom line, and are more likely to relocate operations to places that offer more attractive economic conditions. Demonstrating the value proposition of a university for a company can help foster a partnership that ultimately benefits the local economy. The long term collaboration between Lawrence Technological University (LTU) and Chrysler had led to a successful win-win collaboration agreement for 14 years. In the Chrysler-Faculty-Summer internship program that Chrysler has enabled LTU faculty to bring to LTU class rooms rich knowledge of real world experience. LTU students were able to combine theory and practice when exposed to the latest manufacturing issues that faculty has provided Chrysler with practical solutions to be shared with LTU students to prepare them for a professional career. Chrysler has also benefited from LTU faculty applied research that saved Chrysler over \$200,000,000 during the 14 years summer internship program. Collaboration between LTU and Chrysler has led to doctoral student's funded research at Chrysler and student's summer internship and coop opportunities.

References

1. C. Ailes, D. Roessner and I. Feller, "The Impact on Industry of Interaction with Engineering Research Centers" (Arlington, Virginia: SRI International, 1997).

2. M.D. Santoro and S.C. Betts, "Making Industry-University Partnerships Work," *Research-Technology Management* 45, no. 3 (May 2002): 42-46.
3. T.J. Allen, "Managing the Flow of Technology" (Cambridge: MIT Press, 1984).
4. D. Ancona, H. Bresman and K. Kaeufer, "The Comparative Advantage of X-Teams, *MIT Sloan Management Review* 43, no. 3 (spring 2002): 33-39; and R. Reagans and E.W. Zuckerman, "Networks, Diversity, and Productivity: The Social Capital of Corporate R&D Teams," *Organization Science* 12, no. 4 (July 2001): 502-517.
5. R. Reagans and B. McEvily, "Network Structure and Knowledge Transfer: The Effects of Cohesion and Range," *Administrative Science Quarterly* 48, no. 2 (2003): 240-267.
6. Amabile, Teresa M.; Patterson, Chelley; Mueller, Jennifer; Wojcik, Tom; Odomirok, Paul W.;
7. Marsh, Mel; Kramer, Steven J. (2001): Academic practitioner collaboration in management research: a case of cross professional collaboration, in: *Academy of Management Journal*, 44 (2), pp. 418-431.
8. Barker, Derek (2004): The Scholarship of Engagement: A Taxonomy of Five Emerging Practices, in: *Journal of Higher Education Outreach and Engagement*, 9 (2), pp. 123-137.
9. Baskerville, Richard; Lyytinen, Kalle; Sambamurthy, Vallabh; Straub, Detmar (2011): A response to the design oriented information systems research memorandum, in: *European Journal of Information Systems*, 20 (1), pp. 11-15.
10. Boyer, Ernest L. (1996): The scholarship of engagement, in: *Journal of Public Service and Outreach*, 1(1), pp. 11-20. Bruneel, Johan, D'Este, Pablo; Salter, Ammon (2010): Investigating the factors that diminish the barriers to university-industry collaboration, in: *Research Policy*, 39(7), 2010, pp. 858-868
11. Georgia Tech. PRC publication, 2010
12. Establishing Government-Industry-Academia Consortium for Environment, Environmental Leadership Initiatives for Asian Sustainability (ELIAS) 2, Leadership training, 2011. <https://edu.gov.jp/asai/en/cooperation>.