3.4 Best Peactices to Integrate Research and Industry

3.4.1 Why Integration with Industry?

The very nature of ERCs dictates continual involvement of industry (e.g., through strategic planning, by providing an industrial perspective on the research connected to specific projects, and with joint projects). The end objective is transferring tangible deliverables to industry, thus accomplishing a successful hand-off.
The subsections that follow discuss several aspects of this integration with industry in the context of the research thrust leaderâ€™s role, best practices, and things to avoid. A case study for one second-generation (Gen-2) ERC is at the end.
Readers should be aware that some of the best practices delineated in this section received additional comments in late 2010 and early 2011 from persons very familiar with ERC interactions with industry. These comments were of two general types: (1) suggestions relating to Gen-2 ERCs that were intended to clarify relationships between the ERC Director, the Industrial Liaison Officer (ILO), and research thrust leaders with respect to their industry-focused responsibilities; and (2) comments most applicable to the newer third-generation (Gen-3) ERCs. Because Gen-3 ERCs are addressed in Section 3.6, comments most related to Gen-3 integration with industry appear there. Three comments that typify some of the interchange appear below:
â€œExcellent write-up â€¦ [but] written for decentralized management model and a product (not process) center ...â€• [Editorial Note: Gen-3 process center addressed in Section 3.6.]

â€œ... this technical industry interface stuff is a force fit, whether you are Gen-2 or Gen-3. Some of it would be more appropriate if the Center has a testbed manager structure, but it should all be coordinated by the ILO.â€•

â€œ[Several] comments mainly refer to the role of the 'Industrial Collaboration and Innovation Director' and his/her interactions and relationships with other leadership members, in particular Thrust Leaders. The Industrial Collaboration and Innovation Director is a requirement of the Gen-3 Centers, and the functions and responsibilities are somewhat different [from] the ILO required in Gen-2.â€•

3.4.2 Research Thrust Leaderâ€™s Role in Integration with Industry

The research thrust leader is an important technical interface between an ERC and its industrial partners. Depending on the ERC, and recognizing that the Center Director is the top technical interface with industry, the Director may delegate to one or more research thrust leaders certain responsibilities. These responsibilities could include (a) helping to identify opportunities for effective collaborations between principal investigators in various thrusts and appropriate industrial partners, or (b) helping to manage the expectations of industrial partners. (Individual research faculty are also valuable in providing leads for the ILO to further develop.)
Roles of the thrust leader may include

- identifying critical bottlenecks that industry will encounter;
- developing strategies to lead and focus the thrust to find solutions to these bottlenecks; and
- aiding the Director as technical â€œco-gatekeeper,â€• which entails monitoring progress of industrial deliverables while ensuring the long-term scientific goals of the thrust are accomplished.

Finally, one of the most important functions of a research thrust leader lies in balancing the individual projects within a thrust and facilitating opportunities for coordinated interactions among an ERC's thrusts. With respect to industry, this function bears with it a responsibility of being aware of what industry currently requires and will require in the future as well as the expectations of various industrial partners relative to the research thrusts.

3.4.3. Best Practices Regarding Portfolio Balance, Communication, and Roadblocks

As part of a successful research thrust, there should be a mixture of both short- and long-term deliverables that are of interest to industrial partners. The portfolio should also be balanced within the thrust without compromising the ERC's scientific and engineering vision. Moreover, it is incumbent on the Center Director, aided appropriately by thrust leaders in concert with the

ERC's industrial and scientific advisors, to establish a balance between more fundamental scientific work and work that will further the technological state of the art.
Based on technical insight into the capabilities of principle investigators working within the thrust, the research thrust leader can communicate with *senior technical* industry personnel to ensure that their needsâ€"both short- and long-termâ€"are being addressed. The ILO should be kept well apprised of such interactions to be effective in maintaining the overall engagement of industry members over the long term. From time to time, research thrust leaders can also organize meetings, panel discussions, and other mechanisms that involve both industry representatives and researchers. These â€œget-togethersâ€• might, for example, address the needs of industry, explain research progress as well as the lack thereof, and reveal potential technical roadblocks that must be overcome.

3.4.4 Best Practices for Industrial Collaboration

The research thrust leader should foster a culture of collaboration between industry in general and the ERC. This type of collaboration will enable access to the latest technology advances made by the ERC, thus helping to ensure that industry is kept abreast of the current state-of-the-art and allowing efforts of the center to be focused on extending these advanced capabilities rather than reproducing them time after time for different segments of industry.
As an example of collaboration, an industrial mentorship program should be enabled. This would involve seeking appropriate mentors from the industrial partners who are well versed in the relevant technological and scientific disciplines of the university partners. These mentors would be available to students, preferably at regularly scheduled opportunities.
It is important to establish ERC-wide consistency with regard to industrial collaborations. To achieve this consistency, a common set of collaboration policies should be determined among the research thrust leaders within the ERC and in close consultation with the ILO.

3.4.5 Things to Avoid

To manage a research thrust effectively it is best for research thrust leaders to avoid intellectual-property issues, instead delegating those to the administrative and industrial liaison/legal staff of the center. Research thrust leaders should focus on the technical, not the legal, goals of the ERC and technology transfer. It must be noted that this type of delegation should not be interpreted as reducing the ILO to an administrative functionary. In most cases, intellectual-property issues requiring negotiations are conducted by the responsible academic partner, thus allowing the ILO to avoid appearing to be industry's adversary in technology-transfer engagements.
In addition, bilateral financial â€œdealsâ€• (e.g., involving commonly held ERC intellectual property) between individual ERC investigators and industry should be avoided. Such an outcome would threaten the sustained support of the ERC from NSF. Negotiating financial terms with potential member companies should only be done on behalf of the ERC as a whole by the appropriate ERC staff. In fact, a consistent umbrella of industry-ERC partnership rules should be adhered to. (It should be noted that this guidance could impact any Gen-2 ERC that elects to use â€œhome-grownâ€• start-ups as a mechanism for technology transition and commercialization.)
Conflicts between the desire to continue basic research versus the need to produce development products, which are usually under the purview of testbed managers, should be dealt with only through clear and mutually subscribed-to policies and procedures. Research thrust leaders should note that industry can sometimes serve a role in this situation by stepping in and helping to make sure that the research ideas get turned into desirable end products.

3.4.6 Case Study: Project Mentor Program at the Center for Structured Organic Particulate Systems (C-SOPS)

One instrument for promoting scientific collaboration and a better integration between academic and industrial colleagues is the establishment of a formal mentor program reaching all projects in the thrust. Such a program has been successfully implemented at the Rutgers-based C-SOPS, with a membership exceeding 30 companies. The mentor program is best described in terms of the roles and responsibilities of both the industrial and academic personnel.

3.4.6.1 Industrial Roles

Lead Project Mentor

- Is the primary contact with the academic project team
- Acts as chair of the mentor team composed of all projectsâ€™ mentors

- Coordinates project evaluation on behalf of the center
- Working with the project leader, provides feedback to the Steering Committee and makes recommendations on any changes needed
- Attends the annual NSF site visit when required
- Acts as a center champion with NSF
- Provides input for technical reports as requested by the project leader.

Individual Project Mentors

- Participate in monthly project team teleconferences
- Assist lead mentor in project progress evaluations
- Provide an industrial perspective to center researchers
- Evaluate progress in project on behalf of their companies
- Help students (and faculty) gain an understanding of issues that are important in using center research findings in practical applications
- Facilitate incorporation of center findings into industrial practice
- Serve as project "champions," helping convey to their companies and the center executive committee a sense of the value delivered by the project
- Help center researchers gain additional resources (e.g., materials, equipment) from vendors and industrial contributors
- Provide other support in agreement with lead project mentor and project leader, including examples like:

o connecting to cutting-edge research relevant to the project;
o proposing or supporting advanced experimental approaches, design of experiments, or data analysis;
o providing tools, input, or support for capacity analysis, resource utilization, and project scope;
o conducting additional literature searches, such as using advanced search engines available to industry; and
o providing research technical expertise, where relevant.

3.4.6.2 Academic Roles

Project Leader

- Develops overall research plan for project
- Coordinates all project research activities with respect to participants, universities, and interrelated projects within and outside the thrusts
- Assures that all project participants are aware of the overall ERC strategic plan and their places within it
- Proposes and harmonizes deliverables with testbed leader
- Tracks and reports progress relative to thrust-level scientific goals and testbed deliverables (includes early communication of deviations from plan)
- Identifies and procures needed project resources (includes leveraging external funding)
- Organizes monthly project meeting for entire project team
- Maintains Social-Text (enterprise networking) workspace for project
- Prepares two technical reports annually and provides input to the thrust leaders in compilation of the project report and site-visit presentations in a timely manner
- Provides timely project-level input to the center-wide NSF annual reporting process.

Project Participants (Faculty)

- Propose research plans for allocated project tasks
- Participate in monthly project meetings and teleconferences
- Work with the project leader to ensure that all project-task participants are aware of the overall ERC strategic plan and their place within it
- Provide frequent updates on status to project leader
- Provide formal, written inputs to project leader in a timely fashion when project reports and presentations are due.

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