ERC Best Practices Manual

Industrial Collaboration and Innovation Chapter Update

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Motivation

- ERC Best Practices Chapter on Industrial Collaboration and Tech Transfer last updated ~2001
- Gen-2 (Class of 1994-2006) and Gen-3 (Class of 2008 - present) ERCs tasked to:
  - develop a membership program for industrial collaboration and tech transfer
  - stimulate tech transfer through member firms by information exchange, hiring of graduates, industry sponsored research, and translational research with small firms.
  - develop graduates better prepared for effective practice in industry and leadership in technological development.
- Advent of Gen-3 leads to greater focus on innovation. Gen-3 ERCs:
  - expand program to include Innovation Partners devoted to stimulating entrepreneurship and innovation
  - are charged with developing graduates who are more creative and innovative and better prepared for leading innovation in a global economy.

Revised Chapter Structure

- Previous structure focused on Industrial Collaboration and Technology Transfer (Primary Gen-2 focus). New structure reflects those elements plus increased focus on innovation ecosystems.
- Informed by previous chapter; Previous and current ILO, NSF and SciTech Communications input; and ILO Consultancy Visit findings:
  - Strategy and Architecture of Industrial Sponsorship
  - Industry Communications and Marketing
  - Technology Commercialization and Innovation Strategies
  - IP Strategy & Execution Including IP Rights and IP Management Budgets & Protocols
  - Research Program Strategies to Meet Industry and ERC Needs
  - Education Programs with Industry
- Addresses establishing partnership with industry, building industrial constituency, benefits and difficulties of industrial interaction, building an "innovation ecosystem," the role that the NSF plays, etc.
- Also defines innovation ecosystem, along with the management and delivery of IP from the perspective of ERC planners.
- 21 Case Studies illustrate effective approaches.

Chapter Outline

ESTABLISHING AN INDUSTRIAL PARTNERS PROGRAM

BUILDING AN INDUSTRIAL CONSTITUENCY

BUILDING AN INNOVATION ECOSYSTEM

ROLE OF THE INDUSTRIAL LIAISON OFFICER

NSF ERC PROGRAM SUPPORT FOR INDUSTRIAL LIAISON

Attachments

- ERCs and Acronyms
- NSF's Cooperative Agreement: Program Terms and Conditions on Industrial Collaboration in ERCs
- ERC Sample Industrial Membership Agreement

Establishing an Industrial Partners Program

5.1.1 Foundational Agreements to Establish Industry Collaboration and Innovation
- 5.1.1.1 ERC Agreement with Host University Regarding Overhead and IP Returns
- 5.1.1.2 ERC Host University Agreement with Domestic Partnering Universities
- 5.1.1.3 ERC Agreement with Foreign University Partners
- 5.1.1.4 ERC Agreement with ERC Researchers
- 5.1.1.5 ERC Agreement with Student Researchers
- 5.1.1.6 ERC Agreement with Industry Members

5.1.2 Establishing the Membership Agreement
- 5.1.2.1 Necessary Elements of the Industrial Membership Agreement
- 5.1.2.2 Structure of the Industrial Membership Agreement
- 5.1.2.3 Membership Tiers and Fees
- 5.1.2.4 In-kind Contributions in Lieu of Cash for Membership Fees

5.1.3 Industrial Membership Rights and Responsibilities
- 5.1.3.1 Member Rights
- 5.1.3.2 Member Responsibilities

5.1.4 Engaging Industrial Consortia, Regulatory Agencies, & Industry Associations

5.1.5 Involving Foreign Firms

Major Takeaways

Agreements should be in place in the first year with:

- Partnering universities – IP management, Invention disclosure management, Overhead and IP returns to ERC vs. other units, industry partner rights
- Faculty – Industry rights to IP; Participation expectations
- Students - policies protecting students should dissertation work potentially affect the value of a company in which the faculty advisor has an ownership or managerial interest.
- Foreign universities – Faculty and student exchanges; Facility usage; IP management
- Industry partners – Rights and responsibilities

Major Takeaways

- Industrial Partner Agreement overall intent - establish a contract that is:
  - mutually beneficial and equitable to both parties
  - scalable to a large ERC industrial membership
  - applicable to companies of all sizes
  - clear in outlining any rights and obligations of company subsidiaries/sister/parent organizations

Major Takeaways

Structure of the Industrial Membership Agreement

- General Obligations of the Universities and Industry Members
- Expectations and Obligations of Industry Members
- Entities that are Eligible to Serve as Industry Members
- Use of Resources
- Term and Termination
- Applicable Law
- Publication Rights
- Confidentiality
- Intellectual Property Rights and Management
- Membership Structure, Fees, Tiers, and Benefits
- In-kind Contributions in Lieu of Cash for Membership Fees

Major Takeaways

- NSF required member responsibilities:
  - Meeting with the ERC a minimum of twice a year
  - Developing annual SWOT analysis and presenting to the NSF site visit team
  - Reviewing progress on ERC projects
  - Providing input on ERC strategic plans
  - Providing feedback on proposed project plans
- Involving foreign firms:
  - NSF policy permits foreign firms to be involved in an ERC on a *quid pro quo* basis, exchanging personnel, sharing support, risks, benefits, information, and their own facilities to the same degree as participating U.S. firms.
  - ERC must assure that there is a true two-way and equitable flow of information - the same standard as domestic firms.
  - In 2012, 22% of 326 ERC industrial members were foreign firms (10-13% in2002).

Building an Industrial Constituency

- 5.2.1 R&D and Commercialization Strategies to Serve Industry
  - 5.2.1.1 Developing and Maintaining an Industry-Relevant Research Agenda
  - 5.2.1.2 Balancing the Needs of University Researchers and Industry
  - 5.2.1.3 The Changing Roles of Academic and Industry Researchers in Commercialization
- 5.2.2 Attracting Corporate Members
  - 5.2.2.1 Strategic Plan for Recruitment
  - 5.2.2.2 Marketing the Center
- 5.2.3 Engaging with Industry Members
  - 5.2.3.1 Effectively Engaging Industry Champions
  - 5.2.3.2 Information Exchange with Companies
  - 5.2.3.3 Industrial Input into Strategic Planning
  - 5.2.3.4 Mechanisms to Enhance Interactions
  - 5.2.3.5 Industry / University Collaborative Research Teams
  - 5.2.3.6 Tracking Interactions with Industry and Innovation Partners
  - 5.2.3.7 Balancing Long- and Short-Term Research
  - 5.2.3.8 Industry Support for Consortia vs. Directed Research
  - 5.2.3.9 Measuring Program Effectiveness
  - 5.2.3.10 Start-up and Small Company Challenges and Opportunities
- 5.2.4 Benefits and Challenges of Interacting with ERCs
  - 5.2.4.1 Benefits to Industry of Engaging with ERCs
  - 5.2.4.2 Benefits to the Center of Industrial Involvement
  - 5.2.4.3 Benefits of the ERC to the University
- 5.2.5 Driving Toward Self Sufficiency

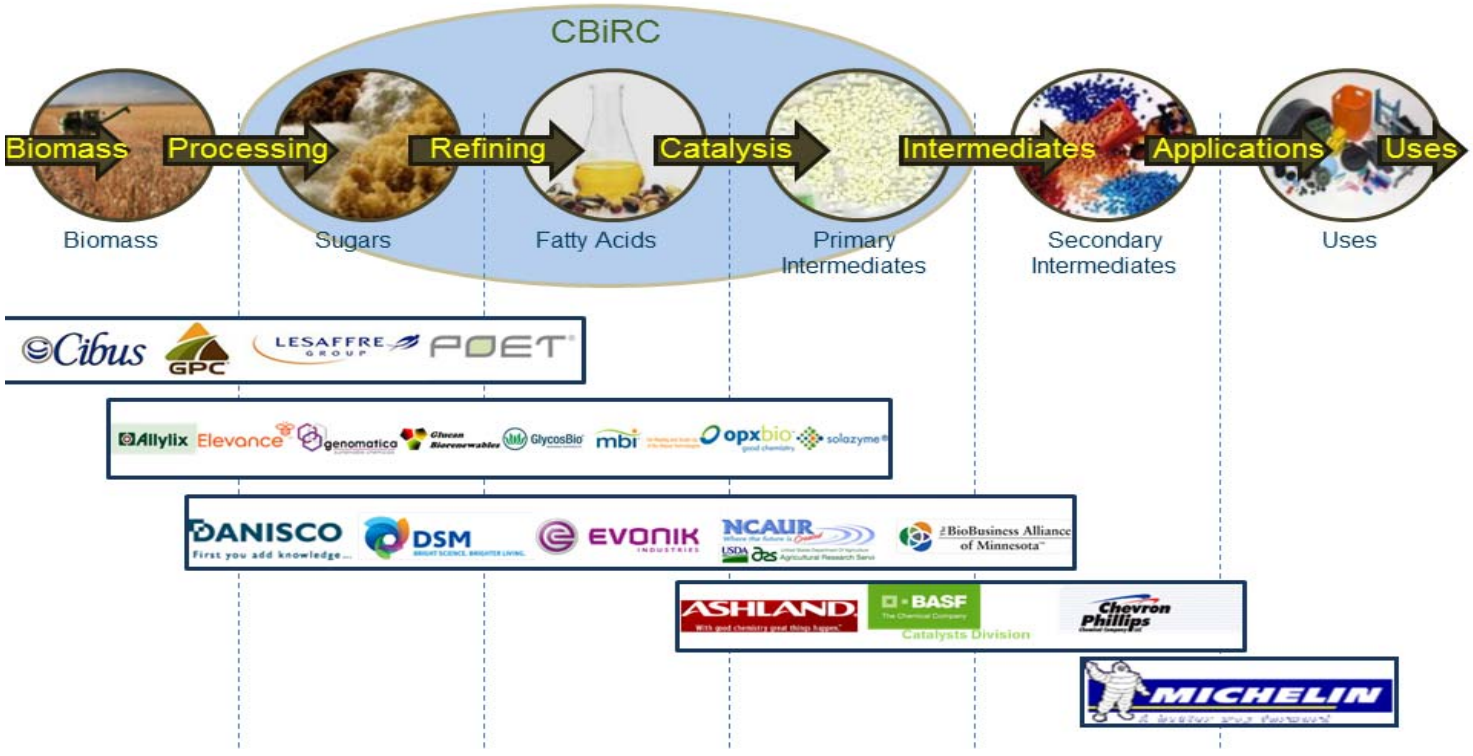
Major Takeaways

R&D and Commercialization Strategies to Serve Industry

- Most ERCs have established processes for including industrial input in formulating new research and overseeing ongoing work - most often during annual or semi-annual IAB meeting or subgroup thereof.
- Depending on the diversity of interests, research focus meetings can be held during plenary sessions or in industry-specific breakout sessions with only those representatives interested in a particular topic in attendance.
- The diversity of interests among members can make a group meeting of them and ERC researchers a challenge in agenda-setting. Keeping these meetings focused on the goal of developing a consensus in the research direction is vital.
- ERC members may want to explore research directions that don't map perfectly onto the ERC's core research goals – met through other mechanisms, such as sponsored contract research or fellowship research.
- Industry members should be made aware of the myriad collaborative opportunities and should have a clear understanding of the differences in IP policies, especially as it pertains to multiple ERC partner institutions – consider a matrix for illustration to industry.

Major Takeaways

Strategic plan for recruitment
Populating along the value chain



Major Takeaways

- Marketing the Center
  - ILO typically leads and industry experience and understanding of technical field and contacts can be key
  - ERC visibility enhanced when Director travels and gives presentations at technology meetings and meetings.
  - Even greater impact if the key faculty also play a marketing role at similar events.
  - Industry partner promotion can be powerful
  - Cold calls, etc. are typically less effective
  - Social media mining results yet to be proven, but some look promising – LinkedIn Cloud
- A well-developed marketing strategy includes:
  - an analysis of the industry sectors affected by the center's research
  - An assessment of the value chain
  - the value drivers that industrial sponsors will find attractive in a research and technology transfer relationship.

Major Takeaways

- Marketing plans may include as key elements:
  - financial and technology commercialization goals
  - specific actions and timelines needed to reach those goals
  - a budget for the Industrial Membership Program

- This plan includes strategies recruiting new members, and also for retaining existing ones through customer service activities such as:
  - communications of center research activities and results,
  - faculty interactions with sponsor companies,
  - interactions with students to gain know-how and recruit, and
  - regular visits to sponsors' sites.

Major Takeaways

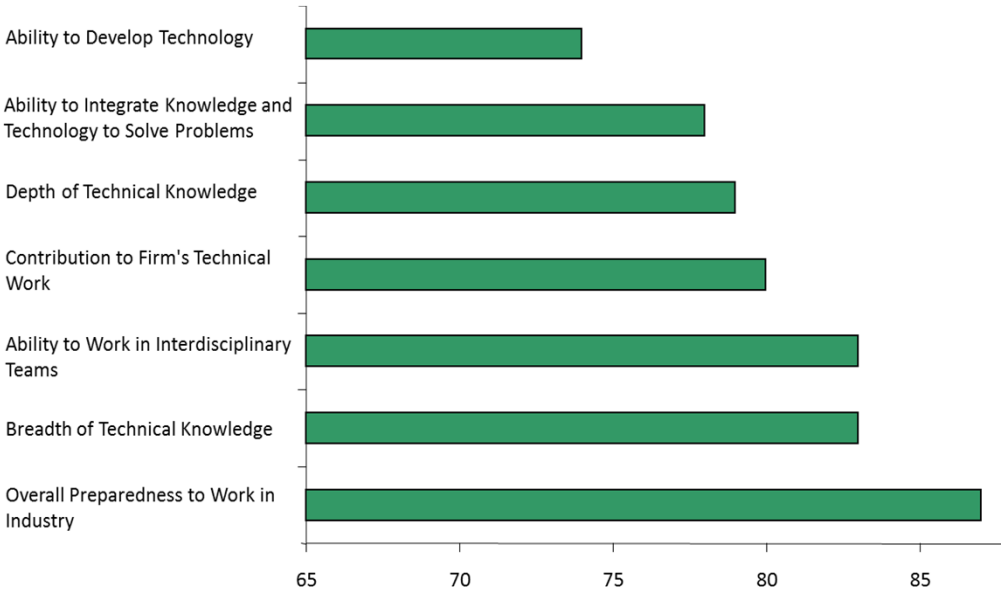
- Studies in 2004 and 2012 of benefits to industry show general agreement:
  - The Impact on Industry of Interactions with Engineering Research Centers—Repeat Study; SRI International: Arlington, VA, December 2004.
  - IAB Involvement in ERCs: Assessing and Strengthening the Role; Peter Seoane: As presented at the NSF ERC Annual Meeting, Washington, DC, November 2012.
- ERC industry members generally very satisfied with the ERC programs.
  - 2012 study found ~90% of members felt their expectations of ERC had been met or exceeded
  - In both studies, ~75% of respondents felt benefits matched or exceeded financial commitment
- 2012 study confirmed industry members recognize strengths of the ERC IAB model
  - Industry felt ERC systems-level approach and industrial consortium model kept a focus on cross-disciplinary research in complex fields addressing important problems in industry and gives industry input into how best to direct NSF funding.
  - Industry valued the ERC's ability to work on pre-competitive research that brings together scientists and engineers (sometimes from competitors) with academic researchers.
  - Industry valued their participation to improve chances that technology will transition to industry and be scaled up and development of the ERC students in preparation to joining industry.

Major Takeaways

- 2012 study queried industry as to the single most important factor, and three most important factors, influencing decision to join IAB:
  - Follow developments in a field related to company's business (61%)
  - Support advances in a technology space important to company (53%)
  - Gain access to specific expertise resident in the ERC (37%)
  - Establish relationships with ERC faculty (33%)
  - Network with other IAB members (28%)
  - Evaluate students as potential employees (26%)
  - Leverage company resources through collaborative research (23%)
  - Access ERC developed intellectual property (19%)
  - Seek partnerships with other IAB members (11%)
  - Gain access to ERC facilities / equipment (9%)
  - All other responses (5%)

Major Takeaways

- Recruitment - 2004 study - most important reason for joining ERC:
  - access to new ideas and know-how
  - access to faculty and ERC technology
  - prior relationships with ERC faculty.
- Retention - 2004 study - identify & rate top factors contributing to benefits gained from ERC participation (rated as very or extremely important):
  - continuous existence of strong ERC "champion" in the company unit (53%)
  - responsiveness of ERC faculty/researchers to our needs (51%)
  - management support of the ERC within our company (49%)
  - the closeness between the ERC's specific technical focus and ours (48%)
  - the ERC's efforts to communicate and stay in contact with sponsors (48%)



Percentage of industrial supervisors rating the former ERC students / graduates hired by their firms as "Better Than" or Much Better Than" equivalent hires without ERC experience.

Major Takeaways

- General experience (time in the trenches) can provide guidance as much as studies.
  - Best Practices for Industry Members of an Engineering Research Center; 2012 ERC Startup Briefings Presentation; Lynn Preston, Leader of the ERC Program: NSF, November 2012.
- For industry to gain maximum benefit from partnership with ERC:
  - Early and long-term engagement enables members to reap the most rewards; The level of active industry member participation is directly related to benefits accrued.
  - Active participation in strategic planning, providing guidance on research and education through the IAB, brings relevance. Industry and the ERC gain significant benefits in high level, long-term partnerships to guide the center's strategic plan.
  - ERC students are different - bring them to the firm for ERC-relevant internships.
  - Become a champion for a thrust or a testbed. Nothing engages and impacts like active engagement and championing of a specific project. Get in the trenches.
  - Provide sponsored project in addition to membership support for the most payback to the firm - the value of the research and education goes beyond core research

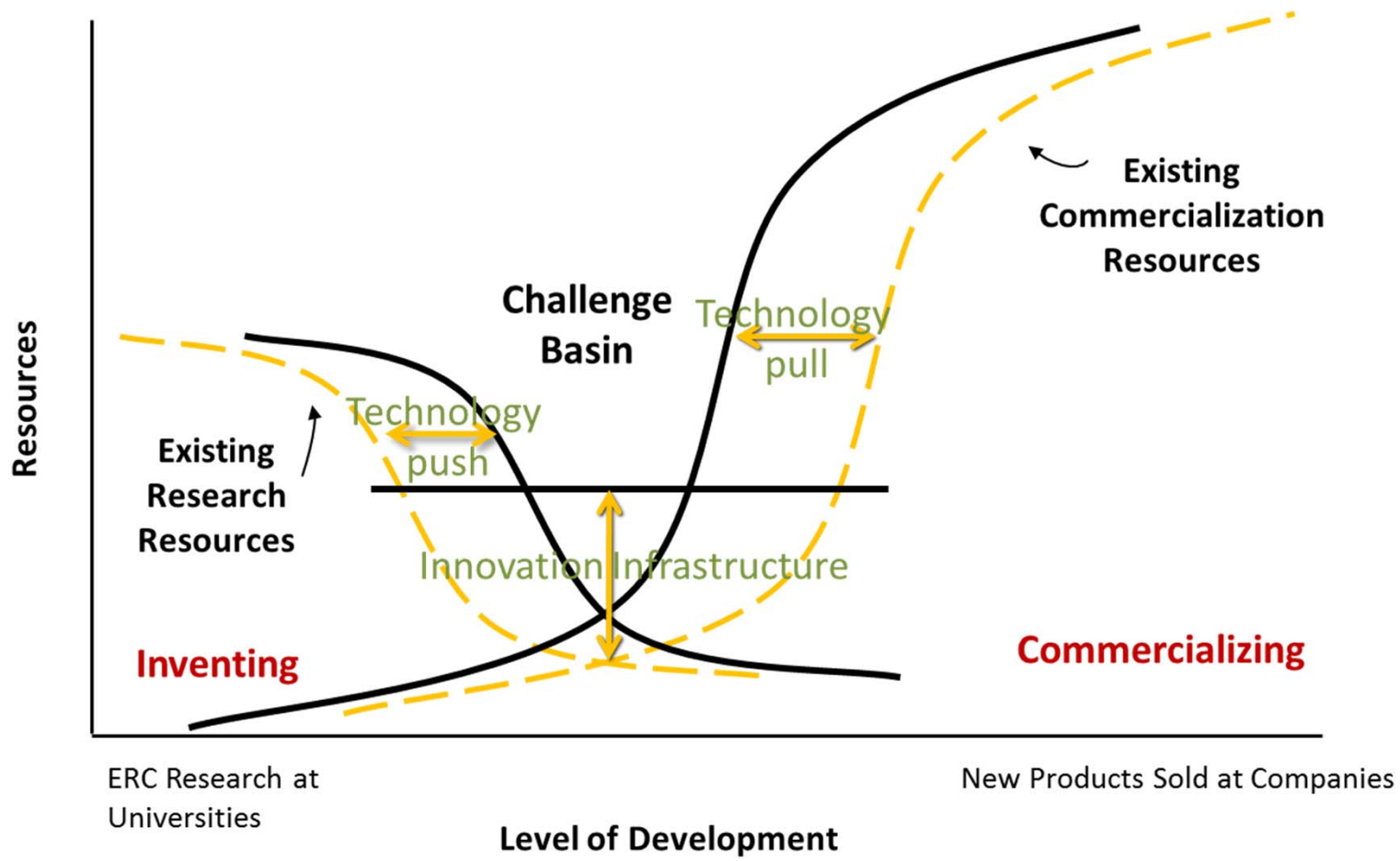
Major Takeaways

- Preparing for Self Sufficiency - 2010 study of graduated ERCs found that 83% of the then-35 graduated ERCs are self-sustaining.
  - Post-Graduation Status of National Science Foundation Engineering Research Centers, Report of a Survey of Graduated ERCs; SciTech Communications LLC: Melbourne, Florida: January 2010.
- Major findings:
  - Broad involvement of faculty, staff, industrial partners, and university administration in transition planning is critical. Self-sufficiency, which includes replacing substantial NSF support (financial and otherwise), is not a trivial challenge and all stakeholders need to be engaged and brought into the process from an early stage.
  - Effective implementation of a realistic transition strategy that builds on and enhances the center's strengths is key. While the Center's attention will be focused on forming and growing programs in the early years, a realistic self-sufficiency plan should be crafted, with input from all stakeholders, prior to the sixth year review.
  - Institutional factors (e.g. degree of university commitment, extent to which the center is prized, whether center's policies support cross-disciplinary research and education) are critical. The ERC should be a leader on campus in establishing a systems-level approach to research and development, fostering research and education collaborations with industry, and building strong innovation programs – serving as templates for other programs to establish the "ERC culture" across the partnering universities.
  - Post NSF funding cycle, education, outreach, and industrial collaboration programs are typically under the most stress, since the research program can to a degree rely on more traditional funding sources for a university. In order to maintain a true ERC culture, these programs, especially education, must be sufficiently valued by faculty and students such that they will be maintained. This usually requires a core group of faculty dedicated to these functions.

Building an Innovation Ecosystem

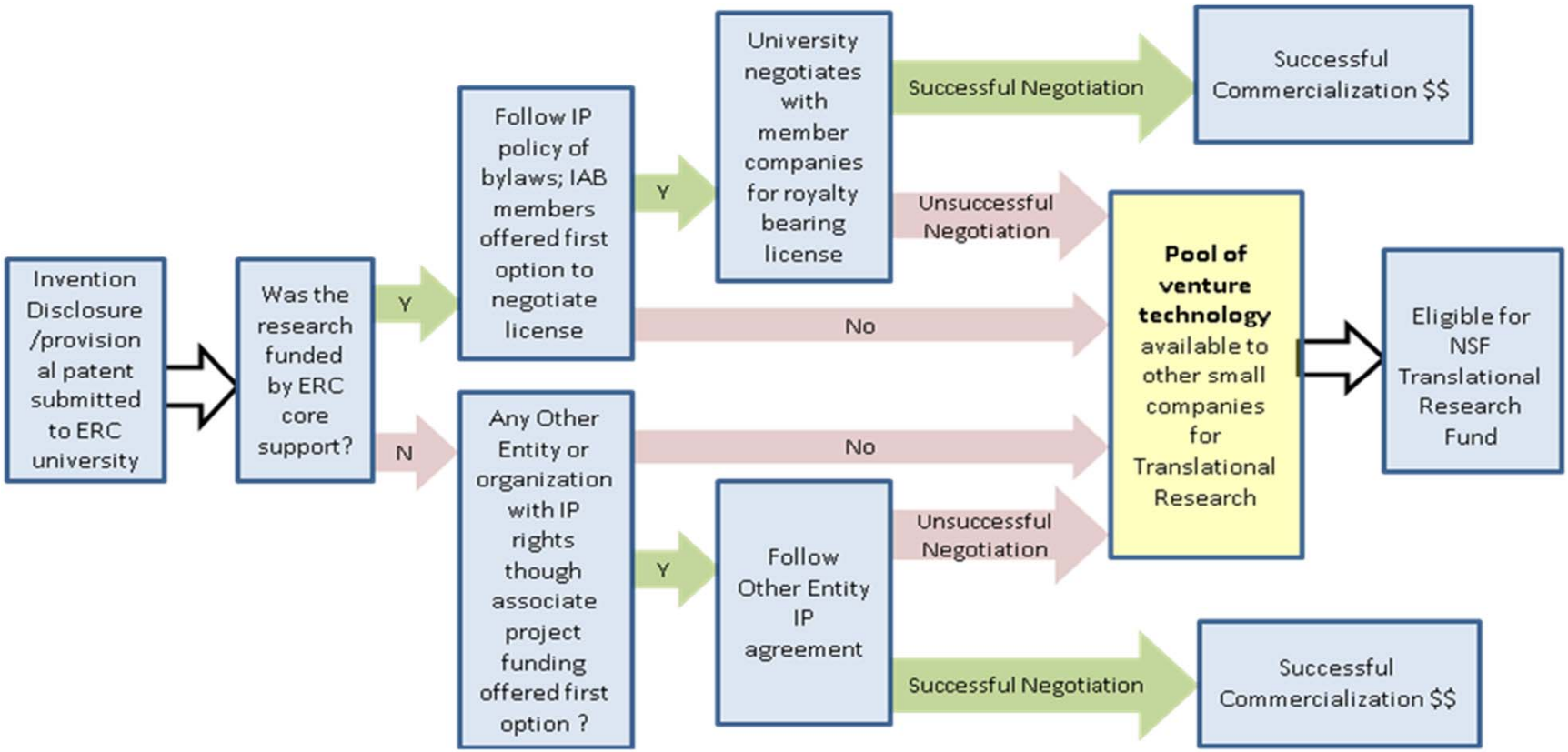
- 5.3.1 Defining the ERC Innovation Ecosystem
  - 5.3.1.1 The Virtuous Innovation Cycle
- 5.3.2 Intellectual Property Management and Delivery
  - 5.3.2.1 The ERC IP Process Flow
  - 5.3.2.2 Membership Levels and IP Rights
  - 5.3.2.3 IP in Relation to Funding Source
  - 5.3.2.4 Invention Disclosure to University and ERC
  - 5.3.2.5 Intellectual Property Vetting
  - 5.3.2.6 Invention Disclosure to Industry Members
  - 5.3.2.7 Industry Member Rights
  - 5.3.2.8 License Negotiation
  - 5.3.2.9 Sponsored Projects with Member and Non-Member Large Firms
  - 5.3.2.10 NSF Translational Research Fund
- 5.3.3 Engagement of Innovation Partners
- 5.3.4 Real and Perceived Conflict of Interest
- 5.3.5 Education Programs with Industry
- 5.3.6 Role of Venture Capitalists and Other Investors

Major Takeaways



Jackson, Deborah J., "What is an Innovation Ecosystem?"; National Science Foundation: Arlington, VA, 2012 (http://erc-assoc.org/docs/innovation_ecosystem.pdf).

Major Takeaways



Major Takeaways

IP in Relation to Funding Source

- ERC Core Research – Funded through Center unrestricted, discretionary funds. IP generated not normally subject to ownership by industry, although ERC industry members enjoy preferential licensing rights over non-associated companies (e.g. First Option; NERF)

- ERC Sponsored / Directed Research – Projects usually funded by a single company through a separate research agreement that outlines terms and conditions specific to that research project, and is managed through the ERC. IP depending on the specific agreement between the university and the company. Some ERCs confer rights of IP from sponsored research based on a premium level of membership.

- Associated Research – Sponsored or directed research projects in the scientific/technical field of the ERC, but are funded through the home department of a center researcher rather than through the ERC. Associated projects are only included in the ERC's research project portfolio if all or part of the project is critical to the ERC achieving its strategic research plan. Reported as this captures the breadth of the impact of the ERC and its researchers in the field of focus of the ERC.

- Research Funded by a Consortium − IP rights are further complicated by the involvement of several companies in funding work as a consortium. Typical that all members of the consortium have equal access to the technology and equal rights for IP ownership or use through licensing, although this can be specific to the ERC and specific consortium needs.

Major Takeaways

Establish an Invention Disclosure system between the ERC and the university (host and partners) to identify ERC inventions in a timely manner. ERCs have implemented systems such as:

- ERC researchers being instructed to submit ERC supported research inventions to both the university technology transfer office and the ERC ILO simultaneously;
- ERC ILO communicating regularly (e.g., monthly) with university tech transfer offices to assure that ERC funded research subject to Industrial Membership Agreement rights are identified timely;
- University technology transfer offices customizing their invention intake systems to flag the NSF ERC agreement number to identify ERC core research inventions
- ILOs communicating regularly (e.g., monthly) with ERC funded researchers to query if any invention disclosures have been submitted or are in preparation.

Major Takeaways

Invention Disclosure to Industry

- Transmission of ERC Invention Disclosures to members is usually done through U.S. mail, sometimes through email, and preferably through posting on the secure portion of the ERC website.
- Emails indicating that new invention disclosures are available for review through the ERC's secure website provides the advantages of being able to track members that access the information and also allows multiple groups that are authorized to access the information in a member company to easily review the invention disclosure.
- Sometimes companies don't want to read the full invention disclosure (or even receive invention disclosures) in order to not compromise company intellectual property that may be under development (contamination). The ERC can mitigate this concern:
  - By providing only a non-enabling abstract of the invention to industry by regular mail or email and inviting them to request the full invention disclosure if they wish;
  - If providing the invention disclosure by regular mail, enclose in a sealed envelope with a non-enabling abstract external to the sealed envelope and a tear-off return slip indicating whether the industry member reviewed the full disclosure and whether it wishes to exercise any IP rights
  - If providing the invention disclosure by access to the ERC's secure website, assure that the member is directed first to a non-enabling disclosure on the site and then clicks through to the full invention disclosure if they wish, using a password or some other trackable form of access.

Major Takeaways

- Engaging economic development groups, alumni affairs and development offices, etc., is atypical to most university research programs – ERC is unique.

- Mutually beneficial relationships leverage existing infrastructure & processes:
  - Technology transfer offices of Partner Universities - Produce technology showcases for entrepreneurs, investors, and companies that can be well served by inclusion of ERC research and advances
  - University Partner Business Schools / Centers for Entrepreneurship - Increase influence on campus by providing workshops and courses in entrepreneurship to faculty and students
  - University and department development, alumni and corporate relations - looking for research programs that can significantly impact quality of life for development of philanthropy prospects
  - Regional innovation organizations – Looking for opportunities to engage with the university in areas focused on innovation (e.g. workshops/education, entrepreneur networks, tech vetting)
  - Regional and State Economic Development Organizations - Looking for opportunities for industry to recruit and benefit companies – and create jobs.
  - Angel investors and venture funds – Looking for tech. opportunities, as well as expertise

- Force fits to count Innovation Partners don't result in any significant benefit.

Major Takeaways

- COI can be a looming challenge in ERCs with an increased innovation focus. ERC faculty (including Directors) have been tightly coupled with start-up companies as founders, officers, advisors, or consultants.
- Large companies can be reluctant to join or heavily contribute to an ERC if they perceive pipelining of technology (or the potential) to small or spin-off companies.
  - There can be an inherent COI challenge for faculty or ERC leadership that start up companies or are involved in spin-offs if those companies compete for ERC technologies with industry members.
  - Project funding decisions that are driven or heavily influenced by ERC leadership who have a personal stake in the outcomes of those decisions through start-ups, might be perceived as compromised, and this could be extended to the ERC.
- The university COI policy is typically not set up to address this front-end potential COI (companies being reluctant to join if they see innovation programs as stymieing their ability to access technology), as university COI policies are focused on managing the back end—post invention.
- A process to identify and manage COI at the ERC level (across all institutions and partners) has sometimes not existed, but should be established early.

Major Takeaways

- NSF "Engineering Research Centers Program Statement on Conflict of Interest in Technology Transfer on the Dual Role of Center Faculty in an Industrial Capacity":
  - *It is generally recognized that technology transfer may be enhanced when ERC faculty or students spin off start-up companies. A conflict-of-interest situation may occur when ERC personnel, including those from the lead university and any core partner universities, have outside interests in companies—financial or otherwise—that may be affected by ERC activities. This applies whether the company is a member of the ERC or not, as long as the company's interests fall within the field of the ERC's technical focus. ERC personnel should exercise the greatest care and sensitivity so as not to give the impression that public funds are being used to enhance the private income of faculty and students supported by the ERC, or to deter participation by other industrial partners in the ERC.*
  - *In accordance with Article 33, "Investigator Financial Disclosure Policy," of the General Conditions, which incorporates by reference Section 510 of NSF's Grant Policy Manual (GPM 510), Principal Investigators (Center Directors), Co-PIs and any other Key Personnel who are responsible for the design, conduct or reporting of NSF-funded research are required to disclose to their universities any significant financial interest (exceeding $10,000 in salary, other payments for services, intellectual property rights, or equity interests) that would reasonably appear to be affected by NSF-funded research. In addition to the Center Director, this would also apply to the Deputy or Associate Director(s), Thrust Leaders, and individual PIs working in the Center who carry out the above functions. GPM 510 also requires Awardees to have a written and enforced conflict-of-interest policy and to submit the required certifications as a condition of future funding increments.*

Role of the Industrial Liaison Officer

5.4.1 Requirements and Functions of the ILO Position
5.4.2 Critical Qualifications, Experiences, & Characteristics of Successful ILO
5.4.3 Most Satisfying Aspects of the Role
5.4.4 Most Difficult Aspects of the Role

Major Takeaways

- The skillset needed to perform the ERC ILO function – ability to:
  - Work with the Center Director in developing/implementing a Technology Transfer Strategic plan for the Center
  - Work closely with the Center Leadership Team to recruit new industry partners by networking and actively seeking opportunities for industrial participation in research as well as educational center activities
  - Retain and increase interaction with current center industry partners
  - Facilitate student/industry relations through internships, student participation in joint projects with industry, fellowships, seminars, career placement, etc.
  - Assist in the formation of new industry partnerships, start-ups, and other industrial enterprises
  - Work with the Tech Transfer Offices at the core universities in filing disclosures, technology transfer and licensing agreements
  - Develop invention handling procedures and participate in licensing negotiations in conjunction with industry partners and ERC core partner campus Technology Transfer offices
  - Organize periodic meetings with center industry partners
  - Maintain an active website for industry partners
  - Document financial contributions from center industry partners
  - Prepare a report of industry collaborations for NSF

Major Takeaways

- Most satisfying aspects for an ILO:
  - Excitement and intellectual stimulation of working at the intersection of cutting-edge research and technology development; developing education experiences to produce a new type of high-value industry professional; working closely with ERC leadership, faculty, and industry partners in designing research programs to meet industry needs; and creating an environment that fosters innovation.
  - Position presents a rare opportunity to work in a creative environment of university/industry/government collaboration.
  - The constant challenge in building an industrial partnership base and maintaining the relationships with industry to serve the center, industry, and nation can be especially satisfying as the ILO sees the fruit of that labor with every research collaboration and knowledge and technology transferred to the private sector to impact the US economy and our citizens' quality of life.
  - The ILO has the opportunity to work with Education and Outreach Director(s) in crafting education programs that provide ERC students—and faculty—with an understanding of industrial research and development practice, technology commercialization, and innovation. The ERC provides a unique structure that enables industry, the NSF, and universities to collaborate deeply and broadly.
  - The ILO position provides for a unique experience that serves ERC ILOs well as they move to other positions in their careers. The ERC ILO is a high-profile national position and ILOs are typically known to many industry and university professionals as they promote the ERC.

Major Takeaways

Most challenging aspects of the ILO position:

- Time management / Insufficient time for multiple activities
- Challenge of motivating faculty members to take timely action on opportunities to interact with industry.
- Lack of support staff. Most ILOs are realistic about budgetary constraints, but still would value technical support staff.
- Time spent in IP discussions to multiple members and project sponsors.
- Other challenges faced by the ILOs have included:
  - Mediating between industry and faculty researchers when projects don't go as planned
  - Additional coordination among industry champions and faculty researchers on the respective campuses in the various subthrust areas, especially for multi-institutional ERCs
  - The loss of member companies from the center
  - Providing mechanisms for researchers and industry representatives to meet and exchange ideas that may lead to sponsored research projects in the center
  - Creation of a team environment where center and industry researchers can effectively collaborate and communicate on their projects
  - Coordinating inputs from industry champions and their respective faculty researchers on various campuses. Competing for the attention of these various individuals, with varying priorities, personalities, and working styles, is a real challenge.

NSF ERC Program Support for Industrial Liaison

5.5.1 Importance of NSF Imprimatur to ERC
5.5.2 NSF Support for Industrial Liaison
5.5.3 NSF Program Director Role in Industrial Liaison
5.5.4 NSF as Evangelist and Shepherd

Major Takeaways

- NSF Support for ERC ILO
- NSF has created periodic forums in which ERCs can draw on the knowledge and experiences of others. Those of most value to the ERC Industrial Liaison officer are:
  - ILO closed sessions and breakout sessions before and during the NSF ERC Program meeting (now held every other year, usually in late November);
  - NSF-sponsored ILO retreats organized by the ILOs to focus on topical issues of importance to active ERCs;
  - Monthly ILO Working Group web conferences organized by NSF to disseminate information of use to the ILOs and gain feedback from the ILOs regarding program policies and operational procedures; and
  - ILO consultancy visits to train new ILOs (generally in the first 18 months after a new ERC is established).